Society of Antiquaries *of* **Scotland**

Portmahomack on Tarbat Ness: Changing Ideologies in North-East Scotland, Sixth to Sixteenth Century AD

by Martin Carver, Justin Garner-Lahire and Cecily Spall

ISBN: 978-1-908332-09-7 (hbk) • ISBN: 978-1-908332-16-5 (PDF)

Society of Antiquaries of Scotland

Portmahomack on Tarbat Ness: Changing Ideologies in North-East Scotland, Sixth to Sixteenth Century AD

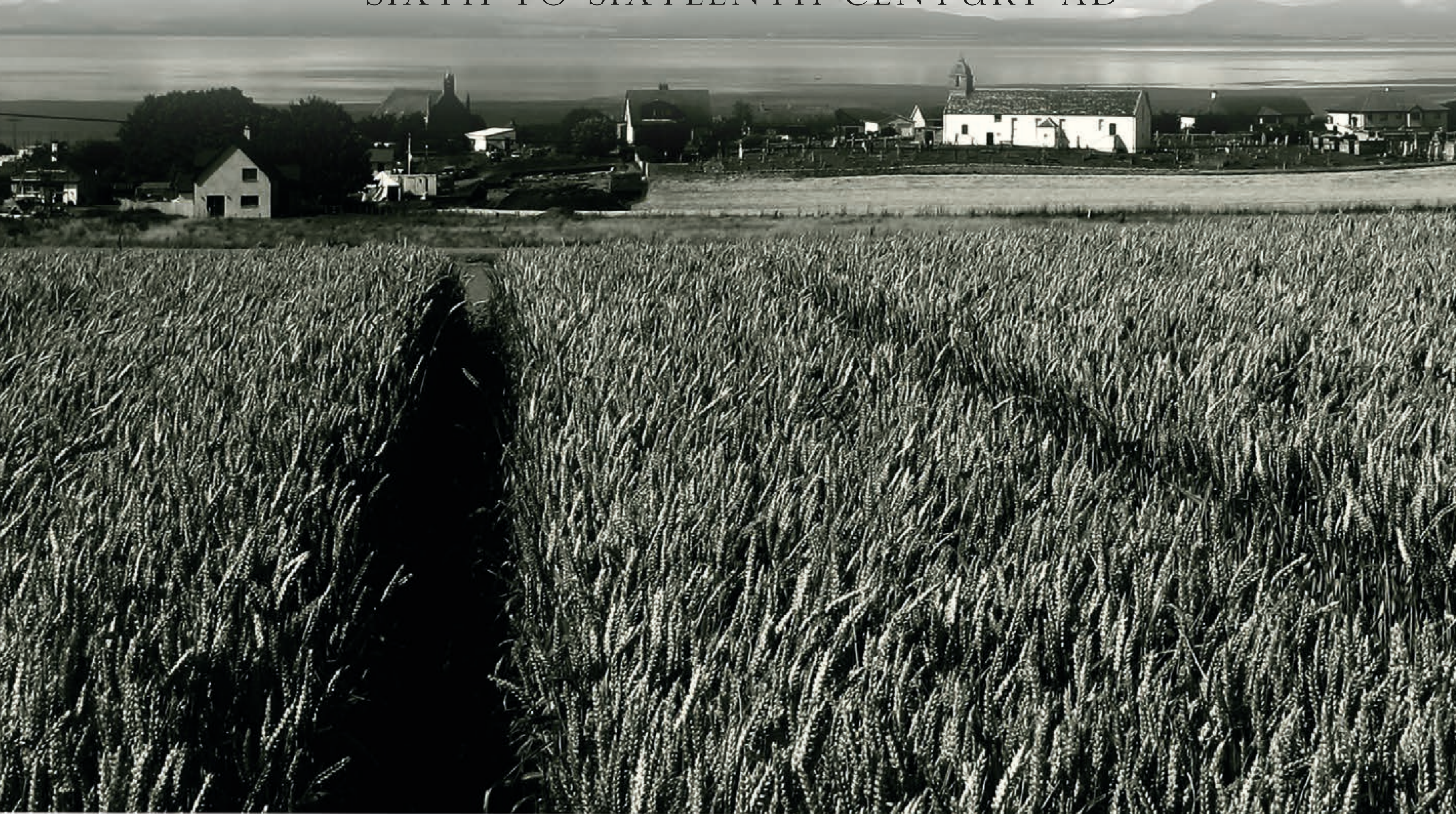
by Martin Carver, Justin Garner-Lahire and Cecily Spall

ISBN: 978-1-908332-09-7 (hbk) • ISBN: 978-1-908332-16-5

MARTIN CARVER • JUSTIN GARNER-LAHIRE • CECILY SPALL

PORTMAHOMACK ON TARBAT NESS

CHANGING IDEOLOGIES IN NORTH-EAST SCOTLAND, SIXTH TO SIXTEENTH CENTURY AD



St Colman’s Church looking north-west with the Dornoch Firth in the background

Portmahomack on Tarbat Ness

Portmahomack on Tarbat Ness

Changing Ideologies in North-east Scotland, Sixth to Sixteenth Century AD

MARTIN CARVER, JUSTIN GARNER-LAHIRE and CECILY SPALL

Drawing on contributions to the field investigation and record by Fred Geddes, Jill Harden, Madeleine Hummler, Martin Jones, Annette Roe and Nicky Toop; and to the post-excavation analysis from Steve Allen, Steve Ashby, Mark Blackburn, Lawrence Butler, Ewan Campbell, Shirley Curtis-Summers, Claire Ellis, Ian Freestone, Allan Hall, Derek Hall, Mark Hall, Derek Hamilton, Mhairi Hastie, Andy Heald, George Haggarty, Tim Holden, Matilda Holmes, Nick Holmes, Fraser Hunter, Richard Jackson, Harry Kenward, Sarah King, Monica Maleszka-Ritchie, Kellie Meyer, Janet Montgomery, Catherine Mortimer, Anthony Newton, James Peake, Nigel Ruckley, Krish Seetah, Clare Thomas, Nicky Toop, Lauren Walther, Becca Walters, Penelope Walton Rogers and Hugh Willmott.

Jacket images © University of York and Martin Carver
Back flap: © Historic Environment Scotland

Published in 2016 in Great Britain by the Society of Antiquaries of Scotland
Published online in 2019 by the Society of Antiquaries of Scotland

Society of Antiquaries of Scotland
National Museum of Scotland
Chambers Street
Edinburgh EH1 1JF
Tel: 0131 247 4115
Fax: 0131 247 4163
Email: administration@socantscot.org
Website: www.socantscot.org

The Society of Antiquaries of Scotland is a registered Scottish charity No. SC010440

ISBN 978 1 90833 209 7 (hbk)
ISBN 978 1 908332 16 5 (pdf)

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

HISTORIC SCOTLAND ALBA AOSMHOR

FAS HERITAGE

UNIVERSITY of York

Design and production by Lawrie Law and Alison Rae
Typesetting by Waverley Typesetters, Warham, Norfolk
Open Access edition produced by Biblichor Ltd, Edinburgh
Hardback Manufactured in Serbia by Štamparija Grafostil

Contents

Contents of the Digest of Evidence

The online archive is held by the Archaeological Data Service and will be found using the following link: http://dx.doi.org/10.5284/1031216.

Acknowledgements

The research project reported here was initiated by Martin Carver, Professor of Archaeology at the University of York, at the invitation of the late Caroline Shepherd-Barron, Chair of Tarbat Historic Trust. From its inception to its publication and beyond, the project has been carried out in close partnership with the Trust. Caroline was succeeded as Chair by Tony Watson who for over a decade has been an understanding friend and unfailing supporter of the archaeology of the Tarbat peninsula.

The funding was provided by a number of diverse sponsors. The evaluation stage (1994–5) was supported by Highland Council (£30,000). The fieldwork 1996–2000 was funded by the Heritage Lottery fund (£233,361). Fieldwork from 2002 to 2008 was funded by Highland Council, Historic Scotland and the National Museums of Scotland, with important contributions from Ross and Cromarty Enterprise, the Society of Antiquaries of Scotland and the Russell Trust. The post-excavation programme 2009–2013 and this publication were financed by Historic Scotland. The University of York contributed the services of Professor Carver as director and provided support for the Field School between 1994 and 2007, a benefit equivalent to £210,000. The University of York's Department of Archaeology supported the project from its inception and funded the hosting of the Online Archive. The total cost of the project, excluding the University of York contribution, was £670,061 at its completion in 2013, against an original projection in 1994 of £636, 969, an overrun of 5% (see Bulletin, 1, 68) (OLA 1.2.1). From the principal institutions that supported us, Graham Watson, John Coles, David Clarke and in particular Rod McCullagh are foremost among those whose vision, good offices and good sense made the project happen.

The fieldwork was subcontracted to FAS Heritage of York, two of whose officers, Justin Garner-Lahire and Cecily Spall, were appointed co-directors of the project by Martin Carver. This proved to be an exceptionally fruitful and innovative partnership. Justin Garner-Lahire directed fieldwork from 1994 to 2002, and Cecily Spall from 2002 to 2007. Cecily Spall directed the post-excavation programme from 2008 to 2013. Important contributions to the research reported here were made by Barri Jones (discovery of the site from the air), Jill Harden (first test trench, 1991), Fred Geddes (church architect), Madeleine Hummler (researcher and supervisor of Sector 1 and Field School tutor), Annette Roe (supervisor of church excavation) and Nicky Toop (researcher and site recorder). During its thirteen-year fieldwork programme the project's directors were deeply indebted to Faith and Roy Jerromes for their valuable and affectionate services to the administration of the site and the wellbeing of its workforce. In 2007 four study days were held in which invited experts visited the site and gave us the great benefit of their informal advice and support, which we are pleased to acknowledge: Eric Fernie, Tom Clancy, Alex Woolf, Lesley Abrams, Catherine Hills, Susan Youngs, Julia Smith, Michael Ryan, Ewan Campbell, Aidan Macdonald, James Barrett, Roger Mercer, Niall Brady, John Bradley, Heather King, Betty O'Brien, Bernard Meehan, Rosemary Cramp, Jill Harden, Laura Hindmarch and Erlend Hindmarch, Malcolm Cooper, Rod McCullagh, Sally Foster, Neil Price, Stefan Brink, Chris Lowe, Chris Morris, Mark Hall, Raymond Lamb, Julian and Linda Richards. The full list of participants in each season of fieldwork will be found in OLA 1.2.3.

This book represents the work of the three principal authors (Carver, Garner-Lahire and Spall) who have each signed off all the chapters. It makes extensive use of the data, analysis and interpretation in the eight Data Structure Reports researched and written by Cecily Spall, which will be found in OLA 5 (interims) and OLA 6 (results by sector). These incorporate initial studies of Sector 1 and Structure 1 by Madeleine Hummler and of Sector 4 (the church) by Annette Roe. The understanding of the site has been immeasurably enhanced by the contributions of specialists: Steve Allen (coffin wood), Steve Ashby (bone objects), Mark Blackburn (sceat), Don Brothwell (human remains), Lawrence Butler (medieval sculpture), Ewan Campbell (glass), Shirley Curtis-Summers (carbon and nitrogen stable isotopes and osteology), Ian Freestone (glass), Allan Hall (plants), Derek Hall (medieval pottery), Derek Hamilton (radiocarbon dating), Mhairi Hastie (plants), Andy Heald (metalworking), George Haggarty (medieval pottery), Tim Holden (plants), Maltida Holmes (fish and shellfish), Nick Holmes (coins), Elizabeth Hooper (illustrations), Simon Howard (geology), Harry Kenward (insects), Sarah King (human remains), Finbar McCormick (animal bones), Kellie Meyer (Pictish sculpture), Leigh Millar (illustrations), Janet Montgomery (oxygen and strontium isotopes), Catherine Mortimer (metalworking), Anthony Newton (pumice), James Peake (glass), Trevor Pearson (illustrations), Peter Rowe (flint), Nigel Ruckley (geology), Krish Seetah (animal bones), Clare Thomas (leather), Becca Walters (starch), Lauren Walther (oxygen and strontium isotopes), Penelope Walton Rogers (textiles) and Hugh Willmott (glass). Their reports as submitted will be found in full in OLA 7 and summarised here in the Digest of Evidence. The illustrations are largely the work of FAS Heritage, and owed to Cecily Spall, Nicky Toop and Richard Jackson in particular. Chapters 5.3.2, 5.3.6, 5.3.7, 6 and 7 were initiated by

Cecily Spall, the remainder by Martin Carver. The text was edited by Martin Carver and Cecily Spall. The picture editor was Cecily Spall. The book as a whole was conceived by Martin Carver.

The *Tarbat Discovery Centre* (the restored church, museum and visitor centre) was created by Tarbat Historic Trust, led by Caroline Shepherd-Barron, designed by Higgins Gardner (London) and funded by the Heritage Lottery Fund. The centre continues to flourish under its current Chairman Tony Watson and Manager Michele Cadger. Contact www.tarbat-discovery.co.uk.

◆

A great deal of information about the past of an ancient rural landscape is embedded in local knowledge and makes scant appearance in any library. Newcomers to the region have more than average reason to be grateful for the interest and kindness shown by residents in providing information, advice and friendship. The project directors would particularly like to thank local farmers, councillors, trustees and residents Eric Barnes, Kate Dane, Hamilton Cormac, Jan Dane, Martin Dane, Jane Durham, Phil Durham, Richard Durham, Janet Gill, James Gordon, Douglas Gordon, Duncan Johnson, Michael Lang, Gillian Mackenzie, The Rev. John Macleod, Heather and Willie Macrae, Jim Paterson, Dave and Jill Scott, Lachlan Stewart, Caroline and John Shepherd-Barron, Donald and Cath Urquart, Billy Vass, and Tony and Muriel Watson for sharing a wealth of lore and knowledge with us, and for their unforgettable hospitality. We also thank historians Monica Clough, for sharing her vivid sense of the Middle Ages in Easter Ross, and Finlay Munro, for his love of the church of St Colman; and archaeologists Ewan Campbell, David Clarke, Steve Driscoll, Sally Foster, Jill Harden, Fraser Hunter, Ian Keillor, Anna Ritchie, Douglas Scott, Graham Watson and particularly Rod McCullagh for their guidance and access to unpublished information. The book has been greatly improved by comments from the Society's peer reviewer Sally Foster, and others who kindly accepted our invitation to review particular chapters or issues: Ewan Campbell (5.7 and 6), Colleen Batey (6), John Barber (5.9), Rosemary Cramp (5.3) and Fraser Hunter (4). Our thanks also to Erin Osborne-Martin, Managing Editor for the Society of Antiquaries of Scotland, and Alison Rae and Lawrie Law, production managers. French and German summaries were provided by Madeleine Hummler.

The monastic arts, especially the sculpture and metalwork, represent some of the most important of our finds. As explained in the appropriate chapters, the emphasis here has been largely focused on function and archaeological context, rather than art history. However, such art-historical analysis as is attempted has been greatly illuminated by the observations and insights of Isabel and George Henderson, both in their publication (2004, passim) and in subsequent personal communication. I (Martin Carver) owe much to their benevolent guidance. Lastly I would like to pay my affectionate respects to my teacher Rosemary Cramp, who for forty years has supported my ventures, tolerated my foibles and attempted to domesticate my learning. I hope she will find inspiration in this new signal of early Christian art and ingenuity from the north-east.

At the time of writing, a new research project is taking shape on the Tarbat peninsula under the direction of the Department of Archaeology at the University of Aberdeen and undertaken in partnership with Tarbat Historic Trust.[1] We were pleased to be consulted about the new work, which has initially addressed the later prehistoric period, and its results will surely expand and modify the vision of the Moray Firth in the Late Iron Age that will be encountered in these pages. So the baton of archaeology is handed willingly from one researcher to the next, each one testing and refining the legacy of the past and urging all of us to put a gilt-edged value on its cumulative reality.

Picture Credits

We are grateful to the following for permission to reproduce images: Historic Environment Scotland: Illus 1.4, 4.11, 5.4.1, 5.10.9b, c; National Museums Scotland: 5.3.2–7, 5.7.9a, b, 6.4d; T. E.Gray: 1.8, 5.3.2–5.3.10, 5.3.13, 5.3.15, 5.3.16, 5.3.18, 5.3.26, 5.3.27, 5.3.43, 5.3.52, 5.8.2; Historic Environment Scotland and Ian G. Scott: 5.3.5, 5.3.10, 5.3.15, 5.3.44, 5.3.51, 5.3.32; University of Aberdeen: 5.3.10; Kerstin Keillar: 1.9, 5.10.7; David Longley and Lloyd Laing: 4.23; Ordnance Survey, Crown Copyright, all rights reserved: (part) 2.3-5, 2.7–8, 2.18, 2.23, 3.1–2, 3.4, 3.9, 3.14–15, 3.17–20, 3.28, 4.1, 4.6–7, 4.9, 4.12–14, 4.24–26, 4.30, 5.1.1, 5.2.1, 5.3.11, 5.4.2, 5.5.1–3, 5.5.7, 5.5.9, 5.7.1, 5.7.3, 5.8.1, 6.1–2, 7.1, 7.20, 7.24–25 (whole) 7.33; Ewan Campbell: 4.23; Neil Carlin: 4.4; Eleonora Destefanis: 5.3.46; Gemeindebibliothek Mals: 5.3.46; Tomás Ó Carragáin: 5.3.48; National Monuments Service, Department of Arts, Heritage and the Gaeltacht: 5.3.48; Shirley Curtis-Summers: 3.25, 5.2.7; National Museum of Ireland: 5.7.10c, 5.7.11; Niall Sharples: 5.9.4; Tarbet Historic Trust: 5.7.10a; Stadtbibliothek Bamberg: 5.6.16a; Royal Library of Copenhagen 5.6.16b; Stadtsbibliothek Nürnberg: 5.6.16c; Jesse Meyer, Pergamena Parchment and Leathers, Montgomery, NY: 5.6.16f.

All other images are © University of York and Martin Carver. Line drawings are by FAS Heritage and special thanks are owed to Richard Jackson for finds drawings and Liz Hooper for her reconstruction drawings of Cross C.

Martin Carver
York
January 2016

[1] http://www.abdn.ac.uk/geosciences/departments/archaeology/the-northern-picts-project-259.php

List of illustrations

List of illustrations in the Digest of Evidence

List of Tables

TABLES IN THE DIGEST OF EVIDENCE

Summary

Between 1994 and 2007, the University of York, in conjunction with Highland Council and the Tarbat Historic Trust, undertook a programme of archaeological research on the Tarbat peninsula in Easter Ross, north-east Scotland, in pursuit of the origins and development of the kingdom of the northern Picts (fourth to ninth century). Investigations were focused on the church of St Colman in Portmahomack, which stands on a ridge overlooking the Dornoch Firth. Here fragments of Pictish sculpture had previously come to light and a cropmark of a ditch enclosing 3.3ha surrounded the church in a manner reminiscent of the monastery on Iona. In addition to the area of the church itself, extensive areas of the adjacent fields in the valley to the south were excavated, amounting to 0.74ha in total. Four successive settlements were defined: an *estate centre* occupied *c* AD 550–*c* 680, a *monastery* (*c* 680–*c* 800), a *trading farm* (*c* 800–*c* 900) and a *township* with a parish church (*c* 1100–1600).

The *estate centre* (Period 1) comprised a cemetery of long-cist burials under mounds on the ridge, with evidence for cereal production, water management and metalworking in the valley. High-status finds included a gilt-bronze harness disc and five flat-headed dress pins paralleled on seventh-century sites elsewhere in Britain. Although not itself overtly Christian, this 'cemetery-settlement' was replaced rapidly but peacefully in the late seventh century by a planned *monastery* in a landscaped valley (Period 2). On the ridge, the cemetery was extended by burials predominately of adult men with stone 'head-boxes' laid in orderly rows, two of whom originated in Scandinavia. Graves were marked by stones inscribed with a cross, and large cross-slabs with Pictish symbols were erected at the edges of the burial ground. There were indications of a stone church in the same locality. The stream in the valley was dammed to create a pool. A paved road was laid from the cemetery across the valley bottom where it was carried by a bridge. In addition to the farming of cattle, the monastery had three important products: the making of sculpture, from which a chisel and 264 large pieces of ornamental carving were recovered; the production of church plate, evident from moulds, crucibles and studs; and the preparation of vellum, argued from calf bones, smoothers, evidence for stretcher frames, a stone-lined tank and piles of astringent ash. The vellum and fine metalwork producers were served by buildings with a distinctive symmetric (bag-shaped) plan constructed of timber frames and turf walls.

The part of the monastery nearest the sea was burnt down between *c* 780 and 810, and shortly thereafter many carved stone monuments were broken up and their pieces scattered over the workshops. This most probably took place in the context of the Norse intrusions into the Moray Firth area. The site quickly recovered, but under new management; production of vellum and sculpture ceased. Metalworking using the same technology resumed, but it was now dedicated to the production of buckles, pins and strapends and acorn-shaped objects interpreted as weights for trading. These were all inferred from clay moulds. Further south, the former monastic metalworking building was converted to a kiln barn for drying grain. This *trading farm* (Period 3) remained active for little more than a hundred years; thereafter the site decayed until its revival after the Norse wars in the eleventh or twelfth century. At this point, the parish church of St Colman was founded. It was joined in the thirteenth century by a fishing village, marked by extensive mounds of shells, and in the fifteenth century by a smithy, with a wide distribution of slag. Burial recommenced within the parish church, on a small scale in the thirteenth century and intensively in the fifteenth when a large contingent of people appears to have arrived from the west coast, as indicated by stable isotope analysis. This *township* (Period 4) flourished until the Reformation (here late sixteenth to early seventeenth century) when it moved to its modern site. The investigation also included the later history of the church building up to its conversion to a museum in 1999.

The events at Portmahomack were reflected in the surveys undertaken on the peninsula. There were burial sites along the coast from the Bronze Age onwards, and long cist graves had been located at sites later marked by Pictish cross-slabs, at Nigg, Shandwick and Hilton of Cadboll. It is suggested that in the later eighth century, a time when the monastery is thought to have controlled the whole peninsula, these landmark crosses were erected at the site of the principal landing places to celebrate ancestral figures noted for their sanctity.

The investigation as a whole produced a wealth of human bone, artefacts, animal bone and botanical samples, and has benefitted from analysis of stable isotopes and seventy-two radiocarbon determinations. The interpretation offered for the Tarbat sequence is that its settlements represent a succession of ideological alignments in response to the wider politics of the day: local lordship gave way to the monastic project, particularly strong in northern Britain and Ireland, while under Norse influence the monastic mood changed to an emphasis on wealth creation. These competing pressures were resolved in the medieval period, largely at the expense of social equality.

Résumé

Un programme de recherches archéologiques centré sur la péninsule de Tarbat, Easter Ross, dans le nord-est de l'Ecosse, fut entrepris entre 1994 et 2007 par l'Université de York avec la participation du Highland Council et du Tarbat Historic Trust ; son but était de mieux cerner les origines et l'évolution du royaume des Pictes du nord (IVe au IXe siècle apr. J.-C.). Les recherches se sont concentrées autour de l'église de St Colman à Portmahomack, située sur une crête surplombant l'estuaire de Dornoch. A cet endroit des fragments de sculpture picte avaient été mis à jour et les traces d'une enceinte encerclant un surface de 3.3ha autour de l'église avaient été relevées par photographie aérienne ; cette enceinte rappelle celle qui ceint le monastère établi sur l'île d'Iona. En plus du secteur de l'église, les fouilles ont décapé des surfaces importantes des champs limitrophes situés dans la vallée au sud de l'église, sur un total de 0.74ha. On a ainsi pu identifier quatre phases d'habitat successives : un *domaine* occupé entre environ 550 et 680 apr. J.-C., un *monastère* datant d'environ 680 à 800 apr. J.-C., un *établissement agricole et marchand* établi entre environ 800 et 900 apr. J.-C., et enfin une *commune* avec église paroissiale datée de 1100 à 1600 apr. J.-C.

Le *domaine* (Phase 1) contenait une nécropole de sépultures en forme de cistes longs sous tumulus érigés sur la crête ; les données indiquent également que la production des céréales, le travail des métaux et la gestion des eaux étaient concentrés dans la vallée. Des objets tels un disque de harnais en bronze doré et cinq épingles de costume à tête plate connues sur d'autres sites britanniques datant du VIIe siècle suggèrent un établissement de haut niveau social. Quoiqu'il ne soit pas certain que cet 'habitat-cimetière' ait été chrétien, un *monastère* lui succéda de toute pièce et rapidement, mais sans signes de conflit, dans la vallée aménagée (Phase 2). On élargit le cimetière sur la crête ; les tombes étaient principalement des sépultures d'hommes adultes alignées en rangs réguliers, comprenant des 'encadrements de tête' en dalles de pierre. Parmi les défunts, deux étaient originaires de Scandinavie. Des pierres inscrites avec des croix signalaient la présence des sépultures ; de plus, de grandes dalles verticales ornées de croix et de symboles pictes furent érigées à la périphérie du cimetière. Certains indices documentent la présence d'une église en pierre au même endroit. On construisit une digue dans la vallée pour créer un étang et une voie pavée menant du cimetière vers le fond de la vallée où un pont permettait de la traverser. En plus de l'exploitation du bétail, le monastère fabriquait trois produits de haute importance : la sculpture, attestée par un ciseau et 264 grands morceaux de pierre décorés de motifs ciselés ; la vaisselle liturgique, documentée par la présence de moules, de creusets et de clous ornés ; la préparation du vélin (*vellum*), dont on a pu démontrer l'existence par la présence d'ossements de veaux, de lissoirs, de châssis, d'une cuve en pierre et de monceaux de cendre caustique. Les producteurs de vélin et les artisans du métal travaillaient à l'intérieur de bâtiments de plan particulier symétrique (en forme de sac) construits en pans de bois et mottes de gazon.

Le secteur du monastère le plus proche de la mer fut incendié entre environ 780 et 810 apr. J.-C. et peu après un grand nombre de monuments en pierre furent détruits et leurs morceaux éparpillés dans les ateliers. Cet incident s'inscrit fort probablement dans le contexte des incursions norroises dans la zone de l'estuaire du Moray. L'établissement fut rapidement remis en état, mais sous un nouveau régime : la production du vélin et de la sculpture fut abandonnée. Par contre le travail du métal se poursuivit ; il utilisait les mêmes techniques mais était maintenant dédié à la fabrication de boucles, d'épingles, d'extrémités de courroies et d'objets en forme de gland que l'on interprète comme poids de commerce. Tous ces objets ont été documentés à partir de leurs moules. Plus au sud, les anciens ateliers de métallurgie de l'époque monastique ont été transformés en grange pour sécher le grain. L'établissement agricole et marchand (Phase 3) ne fut exploité que pendant un peu plus d'un siècle ; le site tomba ensuite en désuétude jusqu'à la reprise de son occupation au XIe ou au XIIe siècle, après la conclusion des guerres norroises. C'est à ce moment-là que l'église paroissiale de St Colman fut fondée. La paroisse se développa au XIIIe siècle en un village de pêcheurs marqué par de grands amoncellements de coquillages; une forge avec une ample concentration de scories est documentée au XVe siècle. Les inhumations reprirent à petite échelle à l'intérieur de l'église paroissiale au cours du XIIIe siècle et beaucoup plus intensivement au XVe siècle, quand une population importante semble être arrivée de la côte ouest de l'Ecosse, d'après les résultats des analyses isotopiques. Cette *commune* (Phase 4) prospéra jusqu'à la Réformation (fin du XVIe ou au début du XVIIe siècle dans notre région) pour ensuite se déplacer vers son emplacement actuel. Nos recherches ont également inclus l'histoire plus récente de l'église jusqu'à sa transformation en musée en 1999.

Les évènements relevés à Portmahomack se reflètent dans les prospections effectuées sur la péninsule. Des sépultures datées à partir de l'âge du Bronze s'échelonnaient le long de la côte et de longs cistes funéraires étaient situés aux endroits-mêmes où les grandes dalles à croix pictes de Nigg, Shandwick et Hilton of Cadboll seront érigées plus tard. Nous proposons que ces dalles à croix étaient des monuments-repères, érigés vers la fin du VIIIe siècle (c'est-à-dire quand le monastère exerçait son contrôle sur toute la péninsule) aux endroits les plus propices à la navigation et servant à commémorer des ancêtres connus pour leur sainteté.

Les fouilles ont produit une très grande quantité d'ossements humains et animaux, d'objets et d'échantillons destinés à l'analyse des restes botaniques ; l'analyse des isotopes stables s'est également révélée fructueuse et 72 dates radiocarbone ont été obtenues. Nous interprétons la séquence de Tarbat comme une succession de sites d'habitat représentant les divers courants idéologiques répondant à la situation politique plus large de chaque époque : les seigneurs locaux firent place à un projet monastique qui était particulièrement prononcé dans le nord des Iles britanniques et en Irlande, tandis que l'ambiance monastique se transforma sous influence norroise pour donner plus de poids à l'acquisition de richesses. Ces pressions concurrentes ont trouvé leur résolution au Moyen Age, mais au détriment de l'égalité sociale.

Zusammenfassung

Zwischen 1994 und 2007 wurde ein archäologisches Untersuchungsprogramm von der Universität York, mit Beteiligung vom Highland Council und vom Tarbat Historic Trust, auf der Halbinsel Tarbat, Easter Ross, im Nordosten von Schottland durchgeführt. Das Ziel war, die Ursprünge und die Entwicklung des Königreichs der nördlichen Pikten (4. bis 9. Jahrhundert) zu bewerten. Die Kirche von St Colman in Portmahomack, die auf einer Erhöhung über dem Dornoch Firth liegt, war im Mittelpunkt der Untersuchungen. Dort wurden Stücke von piktischer Steinplastik schon früher entdeckt und eine Luftaufnahme dokumentierte die Anwesenheit einer 3,3ha großen Anlage rund um der Kirche, wie es auch beim Kloster auf der Insel Iona vorkommt. Außer den Untersuchungen im Bereich der Kirche wurden umfangreiche Flächen (insgesamt 0.74ha) der benachbarten Felder im südlich der Kirche gelegenen Tal untersucht. Eine Nachfolge von vier Siedlungsphasen wurde bestimmt: ein *Landgut* zwischen ca. 550 und 600 n. Chr., ein *Kloster* zwischen ca. 680 und 800 n. Chr., ein *landwirtschaftlicher und gewerblicher Betrieb* zwischen ca. 800 und 900 n. Chr., und eine *Gemeinde* mit Pfarrkirche zwischen ca. 1100 und 1600 n. Chr.

Das *Landgut* (Phase 1) besaß ein Gräberfeld mit Bestattungen in langen Steinkisten, die unter Grabhügeln auf der Erhöhung lagen; dazu gab es auch noch Hinweise auf Getreideproduktion, Metallhandwerk und Wasserwirtschaft im südlich gelegenen Tal. Unter den Funden, die auf einen hohen sozialen Status weisen, gab es eine vergoldete Pferdegeschirr-Bronzescheibe und fünf flachköpfige Kleidungsnadeln, die auch anderswo im 7. Jahrhundert in Großbritannien vorkommen. Obwohl nicht speziell christlich, wurde diese ‚Gräberfeld-Siedlung' im späten 7. Jahrhundert sehr bald – aber friedlich– durch ein geplantes *Kloster* im umgestalteten Tal ersetzt (Phase 2). Das Gräberfeld auf der Erhöhung wurde mit regelmäßig gereihten Bestattungen von vorwiegend erwachsenen Männern mit ‚Kopfumrahmungen' aus Steinplatten erweitert. Unter diesen Individuen stammten zwei aus Skandinavien. Die Gräber waren von mit einem Kreuz gravierten Grabsteinen gekennzeichnet und große Kreuzplatten mit piktischen Symbolen wurden am Rande des Gräberfeldes aufgestellt. Einige Angaben weisen auch auf die Anwesenheit einer Steinkirche am gleichen Ort. Durch den Bau eines Staudammes im Tal wurde der Bach ein Weiher. Eine gepflasterte Straße führte vom Gräberfeld über die Talsohle, wo eine Brücke errichtet wurde. Außer Viehzucht war das Kloster in drei sehr bedeutenden Tätigkeiten beteiligt: die Gestaltung von Steinplastik, was von einem Meißel und 264 großen Bruchstücken von verzierten Steinen bezeugt wird; die Erzeugung von liturgischen Gefäßen, wie es die Gussformen, die Schmelztiegel und die Beschlägen belegen; und die Vorbereitung von Pergament (*vellum*), was man von den Kälberknochen, den Glättern, den Streckrahmen, einem Steinbecken und von ätzender Aschenhäufen ablesen konnte. Die Handwerker, die Metallgegenstände und Pergament erzeugten, benutzten Gebäude mit Holzrahmen und Sodenwänden, die einen eigenartigen, symmetrischen (sackförmigen) Plan aufwiesen.

Der Teil des Klosters, der in unmittelbarer Nähe der Küste lag, wurde zwischen ca. 780 und 810 n. Chr. abgebrannt, und kurz danach wurden die vielen Steindenkmäler zerbrochen und über die Werkstätten gestreut. Dies fand sehr wahrscheinlich in Zusammenhang mit den altnordischen Eingriffen im Moray Firth Bereich statt. Die Siedlung wurde rasch wiederhergestellt, aber unter neuer Leitung: Pergament und Steinplastik wurden aufgegeben. Dagegen lebte das Metallhandwerk weiter und verwendete die gleichen Techniken; es wurden aber andere Waren erzeugt, wie Schnallen, Nadeln, Riemenzungen und eichelförmige Gegenstände, die man als Gewichte für den Handel deutet. In allen diesen Fällen waren es die Tongussformen, die diese Deutungen erlaubt haben. Weiter südlich wurde das ehemalige Gebäude der Metallhandwerker des Klosters in eine Scheune umgebaut; sie diente jetzt zum Trocknen des Getreides. Der *landwirtschaftliche und gewerbliche Betrieb* (Phase 3) war nur etwas mehr als einhundert Jahre lang tätig; danach geriet die Siedlung in Verfall, um dann im 11. oder 12. Jahrhundert, also nach den altnordischen Kriegen, wiederaufzuleben. Die Kirche von St Colman wurde zu diesem Zeitpunkt gegründet. Später, im 13. Jahrhundert, kam auch ein von erheblichen Muschelhaufen gekennzeichnetes Fischerdorf hinzu, und im 15. Jahrhundert ist eine Schmiede mit einer großen Konzentration von Schlacken nachgewiesen. Bestattungen wurden wieder innerhalb der Pfarrkirche angelegt, in kleinem Ausmaß im 13. Jahrhundert und dann intensiv im 15. Jahrhundert, als, nach den Aussagen der Isotopenanalyse, eine größere Zuwanderung aus der westlichen Küste stattfand. Die *Gemeinde* (Phase 4) blühte bis zum Zeitpunkt der Reformation (hier im späten 16. und frühen 17. Jahrhundert) und wurde dann an ihren heutigen Standort versetzt. Die Untersuchungen haben auch die spätere Baugeschichte der Kirche bis zu ihrer Umgestaltung zu einem Museum in 1999 einbezogen.

Die Ereignisse in Portmahomack werden in den Prospektionen auf der Halbinsel widergespiegelt. Es gab bronzezeitliche und spätere Grabstätten entlang der Küste und Bestattungen in langen Steinkisten an den Orten, wo später große piktische Kreuzplatten, wie diejenige von Nigg, Shandwick und Hilton of Cadboll errichtet wurden. Es wird hier vorgeschlagen, dass diese Kreuzplatten als Landmarken im späteren 8. Jahrhundert – also wann das Kloster wahrscheinlich die ganze Halbinsel kontrollierte – am Ort der wichtigsten Landungsstellen errichtet wurden, um besonders heilige Ahnen zu ehren.

Das gesamte Untersuchungsprogramm hat eine Menge von Menschen- und Tierknochen, Artefakten und botanischen Proben ergeben und die isotopischen Analysen sowie die 72 Radiokarbonmessungen haben unsere Auswertung unterstützt. Die Abfolge in Tarbat wird von uns so gedeutet: Die verschiedenen Siedlungen stellen eine Reihenfolge von ideologischen Anpassungen in Erwiderung auf die weitere zeitgenössische politische Lage dar. Die lokale Herrschaft wurde durch das monastische Projekt (das im Norden der Britischen Inseln und in Irland besonders stark ausgeprägt war) ersetzt, während die klösterliche Stimmung unter altnordischen Einfluss sich zum Vermögensaufbau umwandelte. Diese konkurrierenden Spannungen wurden im Mittelalter überwunden, aber vornehmlich auf Kosten der sozialen Gleichstellung.

Guide to the archaeological terms and abbreviations used in the text

Sector – major area of investigation (prefix Sector); eg the interior of the church, Sector 4
Intervention – an operation of investigation on the ground (prefix Int) eg excavations in the church Int 17
Structure – a major construction, made of a set of features (prefix S); eg Bag-shaped building S1
Feature – an interpreted activity, made from a set of contexts (prefix F); eg culvert F432
Context – a defined element of stratigraphy (prefix C); eg primary burning C2704
Find – a recovered artefact or sample (no prefix); eg lunette knife 24/4575, where 24/ denotes the Intervention number
TR – piece of sculpture recovered at Tarbat, numbered 1–264
Burial – a human interment (prefix Burial), numbered 1–190
SK – skeleton number; a skeleton from a burial of the same number
Digest of Evidence – summary reports at the back of the book. Page numbers, texts and illustrations are prefixed D

Chapter 1

The Late Iron Age, Pictish, Medieval and Later Settlement at Portmahomack

Introduction

The purpose of this volume is to present the recent archaeological discoveries made at and around Portmahomack on the Tarbat peninsula in north-east Scotland, and to consider their significance. Tarbat lies at the northern end of a fault line and waterway running from the Irish Sea to the Moray Firth (Illus 1.1). Its peninsula separates the Dornoch, Cromarty and Moray Firths, and represents an important landfall in the maritime arena of the North Sea (Illus 1.2). Its name, gaelic *Tairbeart,* means crossing place or portage, which in this case should refer to a route for transporting boats between the firths (Illus 1.3). Well positioned for communication in a predominately maritime era, the peninsula is also favoured with natural resources: it has the relatively dry and sunny climate typical of the east coast, with a well-drained sandy soil watered by small streams and suitable for growing cereals and raising cattle (frontispiece). It has several good landing places, including the sandy beach on the Portmahomack bay, one of the most protected and accessible in the region. The present village attends the bay with the fishing port at one end and, at the other, St Colman's Church, focus of the investigation reported here (Illus 1.4).

The Tarbat peninsula is known to have been occupied from the Bronze Age or possibly the Neolithic period, and the Portmahomack site from the sixth century to the present day. The story that follows is focused on the ten centuries from about 550 to about 1550, when the site of St Colman's was successively a Late Iron Age estate centre comprising a cemetery dating to the late sixth to late seventh century, with an implied high-status settlement in the vicinity, a Pictish monastery that flourished from about 680 to 820, a farm also active in manufacture and trade between 820 and 900 and a medieval township beginning around 1100 and rising to some prominence in the fifteenth century. For ease of reference, the lives of these very different settlements are placed in a framework of four periods of unequal length (Periods 1–4), each defined by an absolute date range. The few events noted before the mid-sixth century are grouped as Period 0 and the history of the locality after 1600, mostly revealed by the church, as Period 5. The scheme is set out in Table 1.1. The colloquial terms for these periods are those in current use, but they have no great precision. The Late Iron Age in this area equates to a 'post-Roman Iron Age' and is associated with, but is not defined by, an early Pictish culture. The local people in Periods 1 to 4 could all be Picts, but here only Period 2 has its characteristic symbols. Monastic signatures are strongest in Period 2, but monastic aspirations are not ruled out of order in Period 1, or their memories in Period 3. Period 3 is 'Scotto-Norse' in the same sense that contemporary Yorkshire is Anglo-Scandinavian, acknowledging the contribution and occasional hybridisation of two cultures in conflict. This scheme takes the dated periods as fixed a priori, and leaves open to argument the question of what happened in them and how these events deserve to be described by traditional terminology. Thus although the episodes stratified in Period 2, between *c* 680 to 810, have already entered the literature as a Pictish monastery, both terms will need to be justified in the pages that follow.

In addition to its attractions for early settlers, the area has long been noted as home to a set of elaborate and individual Pictish cross-slabs carrying characteristic symbols and surviving from our Period 2 (Illus 1.5). Three great monuments once stood overlooking the firths at Nigg, Shandwick and Hilton of Cadboll (Illus 1.3; Illus 1.6). Those at Nigg and Shandwick still stand some 3m high and are in the care of local trustees; while that at Hilton of Cadboll is represented by two major pieces, the upper part in the care of the National Museums of Scotland and the lower, discovered in 2001, currently kept at Balintore. These monuments, together with those now known from Portmahomack, constitute some of the most accomplished and expressive stone carving known from early Medieval Europe (see Chapters 5.3 and 5.10).

Table 1.1
Time periods at Tarbat

Period 0	Before the mid-sixth century – *Neolithic to Iron Age* [Chapter 4]
Period 1	Mid-sixth to late seventh century – *Late Iron Age – Early Pictish* [Chapter 4]
Period 2	Eighth century – *Monastic – Late Pictish* [Chapter 5]
Period 3	Ninth to eleventh century – *Scotto-Norse* [Chapter 6]
Period 4	Twelfth to sixteenth century – *Medieval* [Chapter 7]
Period 5	After 1600 – *Post Medieval* [Chapter 7]

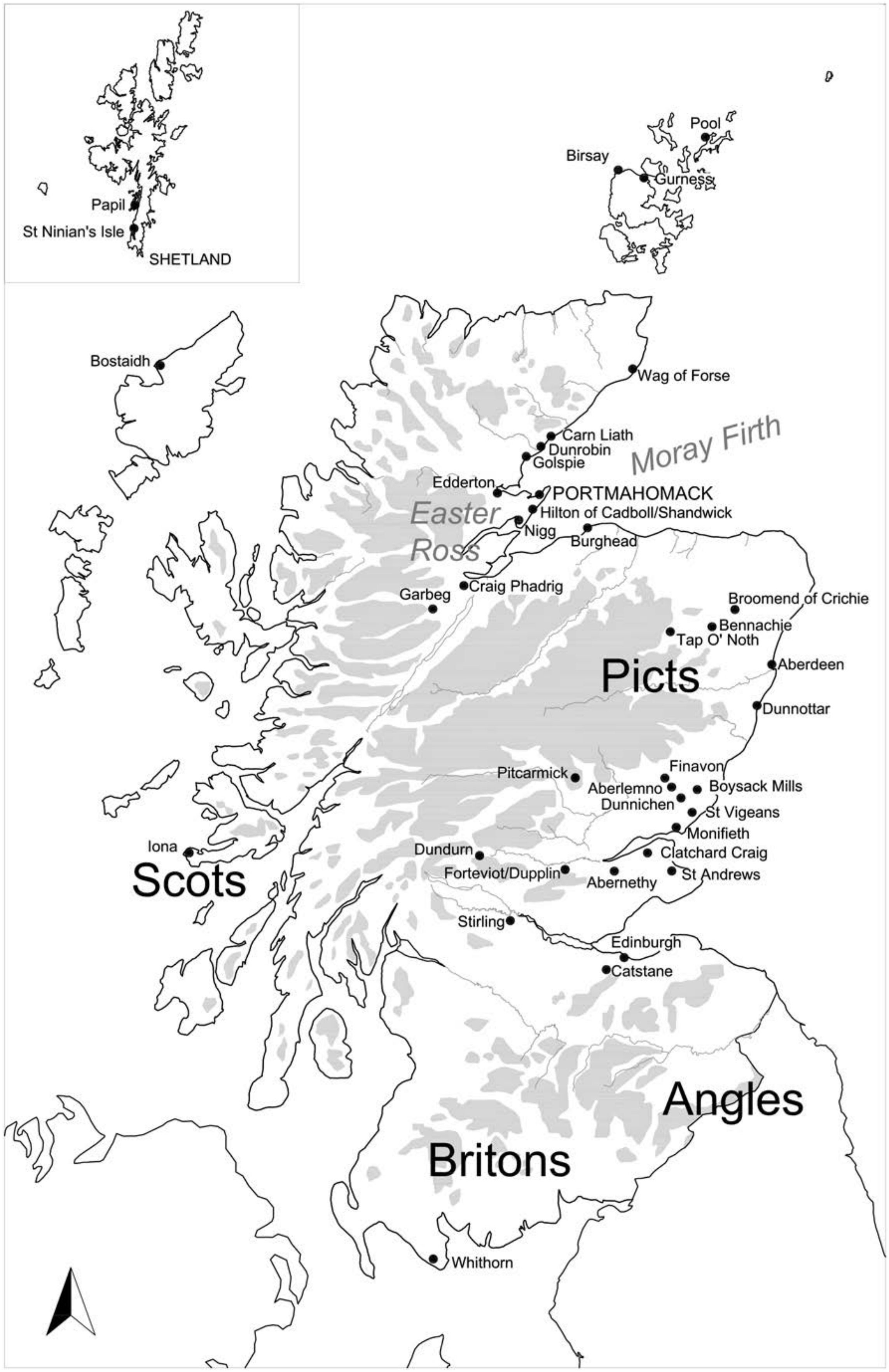


Illustration 1.1
Map of early historic Scotland, showing location of the Moray Firth and the Tarbat peninsula

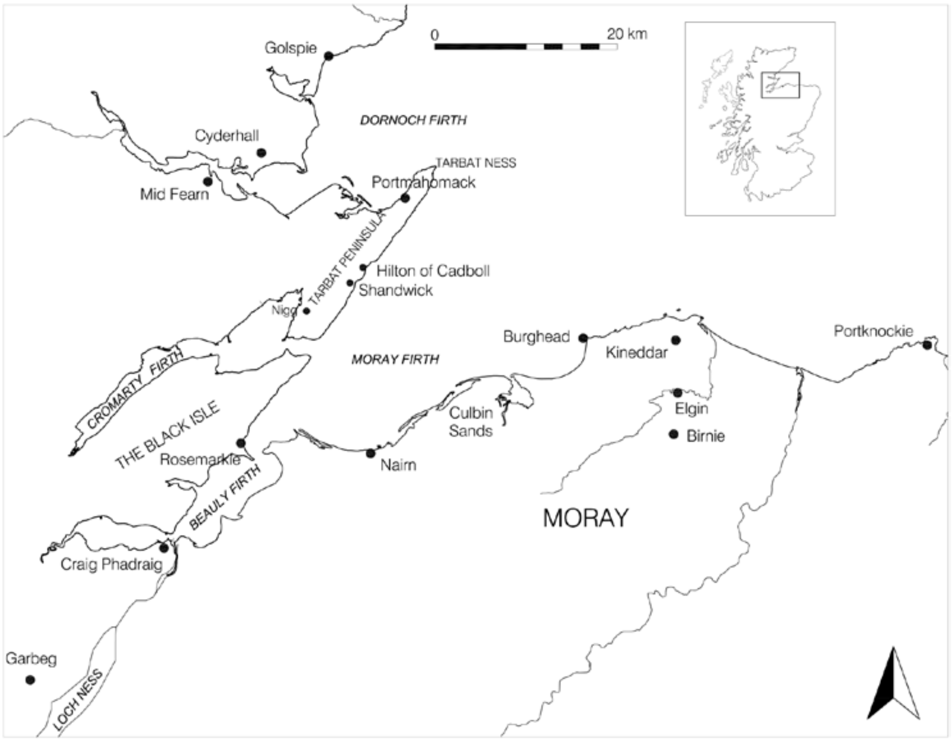


Illustration 1.2
North-east Scotland showing Portmahomack on the Tarbat peninsula in the Moray Firth

Research incentives

There were always strong reasons for placing the Tarbat peninsula among the key centres of the Pictish nation, and strong reasons too for placing the study of the Picts high on the agenda for research. The early Middle Ages, broadly the fifth to eleventh century in archaeological usage, is a watershed in European history. At the beginning of this period, lands on both sides of the Alps were under the control of imperial Rome, and its official religion and governing ethos was Christianity. By the end of the period, Europe had been rearranged into a large number of kingdoms, most of which reflected (and still reflect) the multiple loyalties of the first millennium AD. Those that were Roman provinces still remember their Roman boundaries, and sometimes those of their Iron Age predecessors; those that lay beyond the frontier remember tribal and language divisions. The eighth century, when Germanic pagan, Roman Christian and Arab Islamic ideas confronted each other with especial potency, was at the pivot of this formative process for both Britain and Europe (Illus 1.7). In theoretical terms, a system of *core and periphery*, with the core at Rome or Byzantium, had been replaced by one of *peer polity* where communities, often following different ideologies, constructed nations and alliances in pursuit of a secure, stable and prosperous future. In the course of the early Middle Ages, most of Europe's peoples endured fundamental religious or political upheavals or conversions that provided the deep-rooted basis for the cultural and intellectual complexities of modern times. The premise addressed here is that, while the trajectory of each nation-building region will be broadly reflective of the wider European narrative, each region is liable to have found an individual, experimental and eclectic solution. Therein lies the explanatory value of the experience of a particular people, in this case the Picts.

Research procedure

Archaeologists today believe that they can chronicle the aspirations of nation building through the examination of sites, monuments, artefacts and landscapes. The changing material remains of cemeteries, settlements, buildings, standing crosses and their locations represent not only levels of investment, but references to particular ways of thinking, to alliances and agendas, politics and belief; and the archaeological study of site sequences can demonstrate the way that these things changed. A great deal of the new information relevant to the task has come to light as a result of statutory investigations in advance of building; a particular success can be noted in the dozens of early medieval settlements and cemeteries that have come to light in advance of road building in Ireland with the support of the National Roads Authority. Structured research projects also have their place, since questions directly related to state formation and belief can be selectively posed and answered. While historical and archaeological thinking and theory have certainly stimulated our version of the past over the past few decades, the influence of new discoveries, investigated at an appropriate precision and scale, has been paramount.

The research goal of the project reported here was to chronicle the emergence of the northern Pictish kingdom (Illus 1.2) and its changing ideology. The broader aspiration, that the example offered by the Picts might throw light on a European phenomenon, has become increasingly plausible as the results were obtained and studied. The Pictish area is one of many in which ethnicities and religious prescriptions were being reconstructed during the period AD 500–1000, a process involving continual interaction between the parties concerned. To study a rich site within the monumental landscape of one region is one way of unlocking the deeper social, economic and ideological thinking that underlies the generalisations of cultural practice. However, both the site and landscape selected must be able to capture change.

Opportunity: The Tarbat Discovery Programme

The Tarbat project was initiated through the interests of a local group of enthusiasts (Tarbat Historic Trust) whose aim was to restore the redundant church of St Colman at Portmahomack.

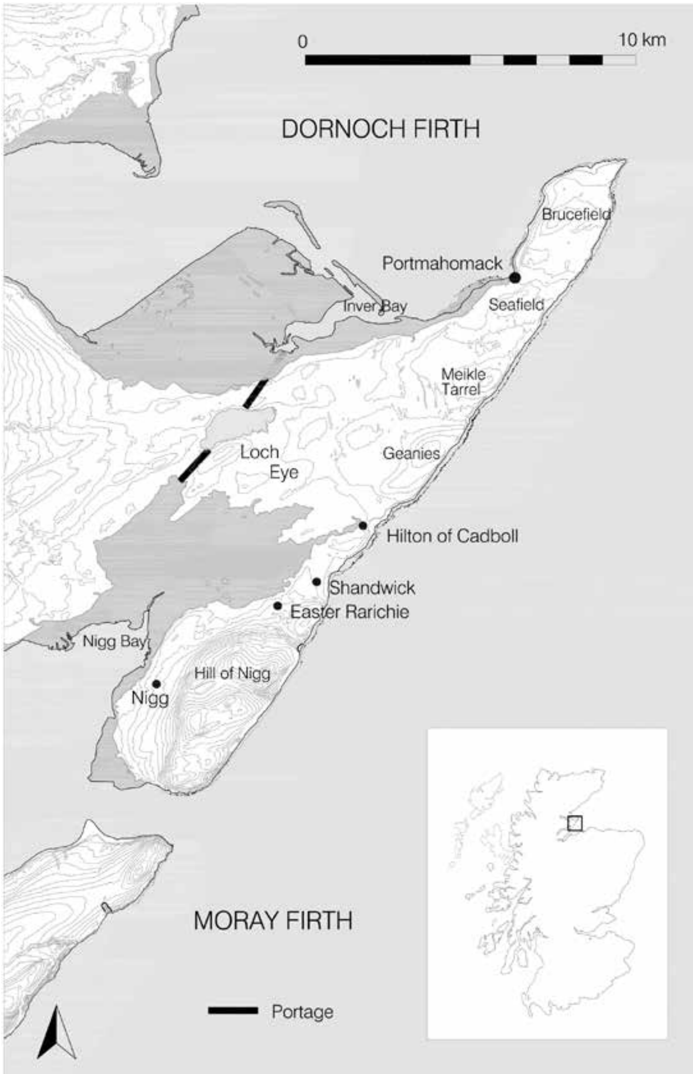


Illustration 1.3
The Tarbat peninsula, showing the chain of hilly ground, land below the 10m contour, the probable portage route (shown as a thick black line) and the location of the principal Pictish monuments (at Portmahomack, Hilton of Cadboll, Shandwick and Nigg)

Archaeological investigation was seen as one method of improving the historic value of the property and so earn support for its renewal. The archaeological research would write a new history of the area and the objects discovered could form the basis of a museum display that would in turn give the redundant church a fresh long-term social purpose. The site promised good returns. The position of the church above the beach overlooking the Dornoch Firth suggested a landing place, the valley behind the church looked good for human occupation and the presence of fragments of sculpture retrieved from the churchyard in the last two centuries hinted at the presence of a settlement of the eighth century or thereabouts. Compared to Ireland where 47,000 early medieval settlements had been located by 2014 (O'Sullivan et al 2014, 1, 49), Scotland had produced only a few documented sites tested by trial excavation (Alcock & Alcock 1987; Alcock 2003) and a handful of examples excavated to scale, at Dunadd in Argyll (Lane & Campbell 2000), Easter Kinnear and Hawkhill in Angus (Driscoll 1997), Pitcarmick in Perthshire (Carver et al 2012) and most recently Rhynie (Noble et al 2013). More ample investigations had taken place outside the Scottish and Pictish heartlands in the western or northern isles (for example at Bornais, South Uist: Sharples 1999, 2005, 2012; Old Scatness, Shetland: Dockrill et al 2010). These studies had in general defined defended places or isolated buildings within ecological, economic or social contexts that were still thinly drawn (for overviews see Ralston 1997; 2004). Mapping the detailed layout, functions, sequence and context of almost any early medieval settlement in Pictland was therefore prominent on the research agenda of the early 1990s.

Among the chance finds of carved stone in the later nineteenth century, one piece in particular (TR10) suggested a special character for Portmahomack, since it featured a Latin inscription carved in relief in insular majuscules, recalling the orthography of illuminated manuscripts of the eighth century (Illus 1.8; p 10). This rare occurence had raised the possibility that a monastery of that date lay hidden somewhere in the area (Brown, T J 1972; Henderson I H 1975; Higgitt 1982). The hypothesis was reawakened in 1984, when an aerial photograph revealed the cropmark of a ditch encircling the church on the landward side, in a manner reminiscent of that seen at Iona (Illus 1.9). A test trench dug by Jill Harden on behalf of the Tarbat Historic Trust in 1991 showed that this cropmark was that of a ditch at least 6 metres wide and 1.4 metres deep; it contained peat that returned three radiocarbon dates in the Iron Age, AD 140–590 (Harden 1995, 226, p 18), which endorsed the possibility that the cropmark around St Colman's marked out the boundary of an early medieval monastery, as proved to be the case. Although the imperative driving the present research would have been satisfied with exploring any high-status settlement, the Irish experience showed that monastic sites, although specialist by definition, often conserved informative strata, and therefore might serve the more general aim and serve it well.

The Tarbat campaign was therefore designed with the possibility of a monastery in mind, but without assuming there was one, or indeed that we knew what a monastery of the period looked like, particularly in Pictland. As our project unrolled from 1994, a new group of British monastic investigations, involving both survey and excavation, began to appear in print (Hill 1997; Cramp 2005, 2006a, 2014; Lowe 2006, 2008; McErlean & Crothers 2007; Daniels 2007; James & Yeoman 2008). This work has provided a rich seam of comparative material from which the subject and the present inquiry has benefitted immeasurably. However, when the Tarbat research design was being prepared in 1994, the archaeological landscape looked rather more bleak. Much weight was understandably given to the definitive and predictive power of early texts, in particular Adomnán's *Life of St Columba* (LC) and Bede's *History of the English Church and People* (HE), which allotted decisive roles to the Christian conviction and its missionaries. Similarly the quality and esoteric references of the great cross-slabs, which could be seen as placing their creators centrally in the intellectual forum of the day, could dazzle attempts to detect their more elusive local messages of politics, allegiance

Illustration 1.4
The village of Portmahomack and its beach, looking north (NMRS E98202, Aug 2000). St Colman's Church is the white building, lower right, with excavations in progress. It is located at NGR 915 841

and economy. Textual and art-historical studies, operating at such an assured cultural level, could assume or underplay the other diverse voices bearing on the options of the day.

Discovering the contemporary options and the responses of communities to them is archaeology's metier. But in 1994 it was falling short in three particulars, all of which affected our design. Firstly, the isolated excavation of a site carried a risk of disconnecting it from the wider geography: it required a context in space, in our case provided by a survey of the peninsula and the firthlands. Secondly, it ought not to be assumed that any site was a singular entity to be captured as a 'type' that remained valid over time: the understanding of a monument, however prominent, depended on what had happened before and what had happened since. Thus the research agenda needed to embrace the whole sequence. Thirdly, previous experience had shown that an understanding of the full range of activity required excavation at an appropriate scale. In the case of early medieval sites in Scotland, that scale would need to be large since very little had yet been seen from which to generalise.

These ideas had struck home during the Sutton Hoo Research Project (1983–1991), which immediately preceded this one and had similar aims – to chronicle the thinking of the East Anglian elite at a time of ideological change. Although the main attractions of the place were clearly the monumental barrows, their ships and rich contents, the interpretation was to be greatly affected by what was happening in other cemeteries, in the local valley and the wider region of the kingdom of East Anglia, which thereby became key parts of the project. At the site itself, what went before (the prehistory) and what came after (its use as a place of execution) were to be crucial in placing the barrows in their historical context. Accordingly, the long prelude and the aftermath were integrated into the research design, something regarded at the time as mildly eccentric (Carver 2005a, 13–32). The result was to show that one place can present different faces through the ages, acting as a barometer of exigency and political thought. The net was to be thrown wide at Portmahomack too, and was also rewarded by revealing a succession of different roles. One of these roles was monastic, but it was short lived and its other roles were to be arguably as significant and intriguing. A similar sequence of changing roles was deduced at Whithorn (Hill 1997), and has also been proposed in the post-excavation programme for the site of Flixborough in England (Loveluck 2007).

The third factor affecting the design – deciding how much to dig – was a more technical matter. The principal problem with the understanding of insular monasticism in Scotland, as with the study of Pictish sites more generally, was that they had been

Illustration 1.5
Pictish symbol: the Pictish beast on the Shandwick cross-slab

chance of new discovery is closely related to the risks taken.

It became clear that an excavation on such a scale, supported by guaranteed funding to conclusion, would be beyond the capacity (or prudence) of most conventional research funders. A collaborative partnership was the way forward, with funding at a level that would allow the employment of professional colleagues accustomed to large-scale capital projects. The natural partners here were the three bodies whose interests had already converged on the redundant church of St Colman. Tarbat Historic Trust, representing the locality, had been formed specifically to save and restore the historic church. Part of the mission of Highland Council, the local authority, was to raise the cultural profile of the region, to promote tourism and to underpin education. For the University of York, research interests were paramount but there was also a strong commitment to communicate archaeological findings to the public.

The first requirement was a scoping exercise ('site evaluation' in our terminology, see Chapter 2) so that the assets of the site could be discovered

investigated at such a small scale that no clear idea of their layout and very little of their sequence had emerged. This was particularly true of Iona, where a succession of small trenches had been permitted with little result (reviewed in O'Sullivan J, 1999). Many other examples of investigations at named or suspected monastic sites were also peremptory and uninformative, even when published. It was clear that the strategy at Portmahomack would not be worthwhile unless executed at a scale aimed at understanding its history. Since the cropmark ditch enclosed almost 3 hectares south of the church, an area close to a hectare in extent would be desirable. This in turn would have consequences of time and cost. These factors were important, since the pressure to apply selectivity is just as great in research projects as in commercial archaeology. Funds are limited and sponsors like them to be focused on the anticipated rewards that won the argument for funding in the first place. But, as with all research, the

Illustration 1.6
The Shandwick cross with the Moray Firth behind

Illustration 1.7
Western Europe in the eighth century (after McEvedy 1992), showing groups of religions principally professed: Islamic (hatched), Christian (stippled) and pagan (blank)

and the costs of realising them estimated. Of the three partners, only Highland Council had the resources to kick-start the project and it was thanks to their vision that the evaluation was funded. Encounters with structures and finds of further pieces of sculpture were sufficient to raise expectations of a major discovery and underpin a joint bid to the Scottish Heritage Lottery Fund. The goals and incentives of all three parties were interconnected. Money was to be found to restore the church of St Colman, and to give it a long-term purpose, by turning it into a museum and visitor centre. The archaeological investigation, for its part, would supply the objects and the story to create the kind of unique exhibition that could hope to make such a centre viable.

Results of the fieldwork

The full excavation began in 1997 and was completed in 2007. It comprised the excavation of a large W–E strip of the south field (Sector 1), a large N–S strip of the Glebe Field (Sector 2), a small intervention north of Tarbatness Road (Sector 3) and the interior of the church (Sector 4) (Illus 1.10). Each of these sectors was on land controlled by different owners and contained very different levels of surviving archaeological strata. In Sector 1, there was no stratification above the subsoil, but the area preserved a prehistoric field system and penannular structure, followed by enclosure ditches of the monastic period and the well-preserved footings of a unique bag-shaped building, housing metalworkers.

In Sector 2, the strata was shallow at the north and south ends, but deep and wet in the valley bottom. There were sixth/seventh-century cist burials and settlement at the north end, beside what was then a marsh. In the eighth century the stream was dammed, a pool created and a massive infrastructure laid down, including a paved road, a bridge and boundary walls. It will be demonstrated that the eighth century artisans working beside the road were making vellum. The workshops were destroyed by fire in the early ninth century, but revived after a short interval as a thriving metalworking industry. This disappeared before the tenth century. It re-emerged in the thirteenth century as a medieval village with extensive shell middens, and in the fifteenth as a township with an iron industry.

Under the church in Sector 4 the earliest activity consisted of cist burials of the sixth/seventh century, succeeded in the eighth century by a tightly controlled cemetery of adult men, many with the head-support or head-box ritual. The cemetery was used spasmodially in the ninth to eleventh century, and in the twelfth century the first definable church building (Church 2/3) was erected. It was followed by five others: Church 4 was a reconstruction of the thirteenth to sixteenth century, which provided the building with a belfry and a crypt; Church 5 was the rebuilt church of the Reformation, with a north aisle for the laird; redevelopments of the mid-eighteenth (Church 6) and late eighteenth/early nineteenth century (Church 7) provided the church with numerous additional lofts and entrances to serve its increasing population and its increasingly divided social classes. In 1843 the Free Church was formed in response to an oppressive class structure, and Tarbat Old Church reverted to a reduced pre-Reformation form (Church 8). This was essentially the church that was adapted to house our museum, dubbed the Tarbat Discovery Centre. The three sequences recorded in Sector 1, 2/3 and 4 were validated by stratification and radiocarbon dating and combined in an integrated narrative summarised in Table 1.2.

Publication strategy

The promulgation of these discoveries was at five different levels intended to serve increasingly specialised interests (Table 1.3). The Tarbat Discovery Centre was opened by HRH The Prince Charles, Duke of Rothesay, in 1999 and has continued to welcome members of the public from Europe and beyond. An interim account of the project and its findings was published in 2008 by Edinburgh University Press (Carver 2008a). The detailed accounts of the stratigraphic sequence in each sector, complete with all context, feature and find numbers, were prepared, as is the established Scottish practice, as Data Structure Reports (DSRs). These are accessible, together with the site diary and the full specialist reports, in an online archive (OLA) hosted by the Archaeology

Table 1.2
Summary of findings organised by period. S = Structure

PERIOD	**Sector 1** **South Field**	**Sector 2** **Glebe Field**	**Sector 4** **Church**	**The Peninsula**
0 **Before AD 550**				
Bronze Age		Flint arrowheads	Carved stone ball	*Short cists at Balintore, North Sutor and Balnabruach*
Iron Age		Marsh Charcoal burners' pit		*Long cists at Balintore, Nigg and Balnabruach* *Forts at Easter Rarichie, Tarrel, Lower Seafield and Castelhaven*
PERIOD 1 Fifth/seventh century AD 400–680 ***Estate centre***	*[Period 0 or 1]* *Arable farming* and cultivation Penannular structure S12	*Barrow cemetery* Cist burials *Settlement* S11 roundhouse with hearth Water-management with gulley, cistern, well and fences Plough pebbles (residual)	*Barrow cemetery* Cist burials Plain burials *Settlement* Wood-lined gulley	*Long cists on the neighbouring ridge at Portmahomack*
PERIOD 2 Eighth century *c* AD 680–810 ***Monastery***	*Enclosure* First enclosure ditch S15 Second enclosure ditch S16 *Metal-working (ecclesiastical)* Bag-shaped building S1 Hearth Metal-working in and around S15 Well S8	*Infrastructure* Pool, dam and bridge S7 Road S13 Boundary walls *Vellum working* S9 building with hearth and tools S4 washing tank Yard with hearth and bone pegs	*Cemetery* Head-support and head-box burials *Memorials* Grave markers, sarcophagus, four cross-slabs *Church?* (architectural sculpture)	*The portage?* *Monumental cross-slabs at Portmahomack, Hilton of Cadboll,* *Shandwick and Nigg*
RAID *c* AD 780–810	*No hiatus*	Buildings burnt down Sculpture broken up	*No hiatus*	
PERIOD 3 ***Trading place*** **Ninth/eleventh century** 3A Revival *c* AD 800–900	*Arable farming* S1 re-used as kiln barn S5 Kiln barn	*Metal-working (secular)* Bronze weights	*Cemetery*	*The portage?* *Norse settlement at Cadboll, Arboll, Bindal, Geanies, Shandwick*
3B Abandon *c* AD 900–1050	Disuse of enclosure ditch S16 Last use of flue in S1	Cow burial F304	*Cemetery*	*Hoard of ring-silver and coins deposited north of the church in* c *1000*

Table 1.2 (*continued*)

PERIOD	**Sector 1** **South Field**	**Sector 2** **Glebe Field**	**Sector 4** **Church**	**The Peninsula**
HIATUS *c* 100 years				
PERIOD 4 **Medieval** **Twelfth/sixteenth century** PERIOD 4A Church 2/3 built AD 1100–1200			*Church 2/3* *Twelfth century* Bell-casting pit A single burial (117)	
PERIOD 4B Church 4 built AD 1200–1400	Ploughed fields, rig and furrow	*Village* Residence S17 & fish middens	*Church 4* *Cemetery* Grave cover mid-fourteenth century	*Foundation of Fearn Abbey & Mill*
PERIOD 4C Church 4 refurbished AD 1400–1600	Ploughed fields	*Township* Smithy S18	*Church 4* *Cemetery*	*Chapels and Holy Wells*

Data Service. This archive is free to view and contains the detailed support for every observation and identification made in this book, some of which are published here in a form that is necessarily abridged. The online archive is cited in the form 'OLA 6.1/3.2' (this being a description of the first enclosure ditch in the DSR for Sector 1).

In this book, Chapter 2 presents a description of the design and implementation of the investigation and Chapter 3 a summary of what was found and the overall argument for its phasing and dating. Table 3.1 is a concordance relating events in the three sectors. Thereafter the book follows a chronological course: Chapter 4 describes what happened on the site and the peninsula before the eighth century. Chapter 5 presents the site in its monastic mode (in the eighth century), together with its sister sites on the peninsula. It contains multidisciplinary studies of the cemetery, the sculpture, the evidence for a church, the infrastructure, the vellum workshops, the metal workshops, the agricultural economy and the architecture of the bag-shaped buildings. This chapter ends with a description of the raid that took place in the early ninth century, in which the vellum workshop was reduced to ashes and the principal cross-slabs broken up. Chapter 6 describes the revival that followed, with a new generation of industrial metal-smiths serving new masters. Chapter 7 concerns the site and peninsula in the Middle Ages, an account that includes the 850-year history of the parish church of St Colman. Chapter 8 offers a synthesis of the sequence at Portmahomack, and on the Tarbat peninsula, with a focus on the monastic package and its European significance.

Specialist studies on artefacts, human bone, stable isotopes, starch, animal bone, mammals, birds, fish, shellfish, plants, insects, stone, soils and radiocarbon dating are selectively integrated into the narratives of these chapters. The full specialist reports are contained in the online archive, accessible to all. However, for the convenience of readers, the present volume is provided with a Digest of Evidence which contains inventories and summary reports of the structures, dates, burials, sculpture, and other categories of data that are frequently referred to. Digest 9 is an index to the online archive. All the artefacts and other fnds from the excavation campaign have been declared Treasure Trove and allocated to the National Museums of Scotland, but many of the most important objects have been loaned back to the Tarbat Discovery Centre, where they may be seen. The field records are deposited in the archives of Historic Environment Scotland. Archaeological terms used in the text that follows are listed in the prelims, p xxix.

Changes from earlier publications

A number of interim accounts of the Tarbat sequence have been published over the last two decades (eg Bulletin 1–7; Carver 2004; 2006; 2008a; 2008b; 2008c). These have included some preliminary ideas that have not withstood the test of subsequent analysis, particularly on plants, animals and stable isotopes (Chapter 3). We would not now claim that the Period 1 occupation of the site in the sixth/seventh century was a Columban promotion (cf Carver 2004, 2006), although it seems

Illustration 1.8
Inscribed cross-slab fragment found in the garden wall of the manse at Portmahomack (TR10. NMS 1B286. For details see Illus 5.3.44)

to have acted as a forerunner to what followed. The cemetery sequence has been reworked with additional radiocarbon analysis, showing a clearer division between the Late Iron Age burials (before 700, Chapter 4), and the monastic burials (Chapter 5.2). The case for a Pictish church on the site of the crypt has been revised; an alternative location east of the present building is preferred in Chapter 5.4. The assumption that there was a mill in the monastic phase remains likely but unproven from the excavated evidence (Chapter 5.5). The evidence for the manufacture of vellum and church plate is fully stated in Chapters 5.6 and 5.7. The monastic economy is studied in Chapter 5.8 and a case is advanced for a capitalised system based on cattle hides. Chapter 5.9 enlarges the argument for monastic buildings constructed from turf which combine Iron Age contruction techniques with new architectural ideals. Chapter 6 describes the metalworking production of the ninth century, armed with the large number of crucibles and moulds that have been newly analysed. The importance of this episode has greatly increased with the discovery that the metal craftsmen were making weights, implying regulated trade.

The story of St Colman's Church is revisited and slightly revised in Chapter 7. The vault of the crypt as it survives is medieval, not seventeenth century, and the number of medieval and later churches has been reduced from nine to eight. The medieval village has achieved a new prominence thanks to the recent analysis. Although a medieval church stood at the site of St Colman's from the twelfth century, new analysis has revealed a fishing village next to it in the thirteenth to fourteenth century and an upsurge of activity in the fifteenth century, indicated by a major ironworking centre. Burial returns to the nave of the church in the later thirteenth or fourteenth century, and there is a surge in the fifteenth century, led by a chiefly grave accompanied by a large contingent from western Scotland (Chapter 7). Lastly, the information from the survey of the peninsula up to 2011 has been reviewed and is summarised in Chapter 4 (prehistoric sites), Chapter 5.10 (the Tarbat peninsula in Pictish times), Chapter 6 (in the ninth to eleventh century) and Chapter 7 (in the Middle Ages). The sites and place-names are listed in Digest 8.

The intensive analyses undertaken on the human, animal plant and mineral assemblages, and the radiocarbon dating, has greatly increased the value of all the discoveries. The monastic phase itself is now seen as very short, a century or less, but its range of actvity is better understood. The agricultural economy now plays a central role in the argument for the nature of the monastic phase and its political role. A hiatus can be proposed between all the major periods defined, and there are revealing differences in diet between them. All show a high and increasing rate of human mobility, with the west of Scotland, eastern Britain and Scandinavia contributing to the population.

Overview

The research conducted to date at this focal point of early Scotland has emphasised archaeology's role in discovering and describing change, and occasionally, in explaining it. The people of Tarbat experimented over millennia with different ways of living, influenced by the politics of the day and European thinking of which they were well aware. In the narrative presented here this has been compressed into a sequence of settlements of different character in the same place. Often unfamiliar in their appearance, each of these are major

Table 1.3
Promulgation of results

User	Medium	Responsible body	Contact
Members of the Public	Museum and Visitor Centre at St Colman's Church, Portmahomack	Tarbat Historic Trust	Tarbat Discovery Centre tarbat-discovery.co.uk
Students	Book: *Portmahomack Monastery of the Picts* by Martin Carver	Edinburgh University Press	euppublishing.com
General Researchers	Research Report Illustrated text (this volume)	Society of Antiquaries of Scotland	socantscot.org
Specialist Researchers	Online Archive	Archaeological Data Service (York)	ads.ahds.ac.uk
Specialist researchers of artefacts and materials	Objects in boxes	National Museums of Scotland	nms.ac.uk
Specialist researchers of sites	Records in boxes	Historic Environment Scotland	http://historic-scotland.gov.uk/ historic environment scotland

achievements to which we have been obliged to give currently inadequate names. First an *estate centre*, or with a glance across to Ireland, a 'cemetery-settlement' of the fifth to seventh century (Period 1) hosts a community farming cereals, working iron and burying their dead in cist graves under barrows. This is replaced in the seventh/eighth century by a centre of exceptional cultural prominence. It features a massive new infrastructure with a pool created by a dam, crossed by a bridge serving a paved road. It had a cattle economy. Its workshops were turning out church vessels and vellum for manuscripts and a plethora of ornamental stone monuments were carved, an output as accomplished and informed as any in the Christian Europe of its time. Buried in its cemetery were those responsible: mainly middle-aged men. This settlement, defined by many of its attributes as a *monastery*, lasted little more than a century (Period 2: *c* 680–*c* 820). It was damaged by fire and many of its monuments were destroyed in what can be seen as a Viking raid – or something very like one. But the community rose immediately from the ashes to resume making metal objects, this time with a repertoire of non-ecclesiastical products including weights implying trade. The subsistence of this *trading place* drew again on arable served by grain dryers. In this Period 3 (ninth to eleventh century) Tarbat is seen as situated in a war zone where Norse and Scot disputed for the legacy of the Picts, at the same time as Dane and Saxon were redrawing the territories of Britain further south. As we see it in these excavations, the end of this period (tenth/eleventh century) is possibly the bleakest of any at Portmahomack, marked by the occasional burial in the former monastic

Illustration 1.9
Aerial photograph by Barri Jones and Ian Keillar (1984), showing the enclosure ditch and St Colman's Church. The area enclosed is 2.9ha to the road along the ridge, and 8ha to the Firth

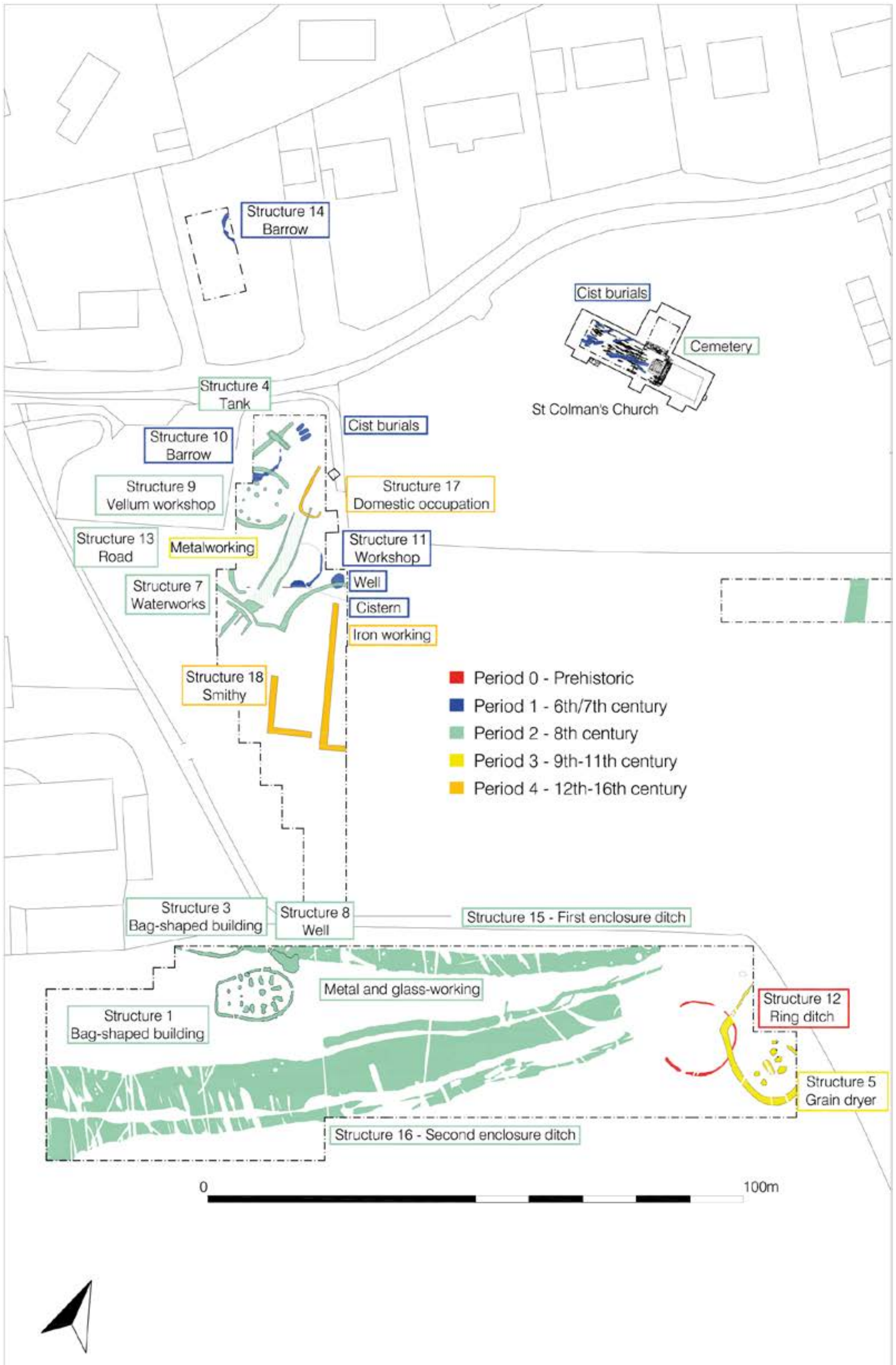


Illustration 1.10
Simplified map of site, showing all structures. The area excavated totalled 0.741ha

graveyard and the deposit of a small hoard of ring silver. Revival came in the twelfth century with the selection of Portmahomack as the site of the parish church, and still more graphically in the thirteenth when the church was extended and provided with a crypt. A village sprung up on the former workshops, piling up shell middens. By the fifteenth century there was a *township* beside the church at Portmahomack with a major iron industry.

Estate centre, monastery, trading place, township – these were prescriptions that matched the exigencies of their age. There were incomers, especially from the west, but what we plan to show here is a story of adaptation and creativity in which the people of Tarbat were always the principal players. The main purpose of the project is to capture the changes and identify the ideologies that drove them.

This book publishes the results of an integrated research project that began in 1994 and was completed in 2012. In the last few years, new research on the Tarbat peninsula has been initiated by the University of Aberdeeen in partnership with Tarbat Historic Trust. This is a welcome departure that will undoubtedly illuminate and enhance the prehistory and proto-history of an exceptional historic environment. We have not attempted to summarise or pre-empt that project here, but its design and preliminary results may be consulted on line at http://www.abdn.ac.uk/geosciences/departments/archaeology/the-northern-picts-project-259.php.

Chapter 2

Description of the Investigation

Principles

The mode of argument adopted by this research project was archaeological. The programme was to begin by selecting an area through *reconnaissance* and then subjecting it to an *evaluation* in which the survival of stratigraphic information was explored, mapped and estimated. If this *deposit model* is successfully composed, it offers an assessment of the likely riches of the site, the preservation and depth of strata, without significant disturbance or damage to the monument. The evaluation then draws up a *research agenda* – what current scholarship would wish to know – and this in turn is matched to the visibility of archaeological traces in the terrain and what additional techniques would be required to see them. The evalution phase also assesses the *social context* of the site – that is the constraints, expectations and concepts of ownership of interested parties, both local and remote. From this preliminary appreciation of the factors, a *project design* is drawn up which hopefully reconciles them all. The design will comprise a *research programme*, including excavation and survey, a *conservation programme*, in which the long-term curation of the site is planned, and a *display programme,* applied to the construction of measures to allow long-term access to the general public. The project design is then sent out for scrutiny by experts and public alike, in other words it is published, and modified in the light of this multi-vocal consultation, before being adopted as the definitive version (here Bulletin 1, OLA 5.1). The subsequent *fieldwork*, *analysis* and *publication* should follow this prescription as closely as possible – not by making a virtue of inflexibility, but because these programmes represent a contract with the rest of society, one intended to win new history in exchange for a diminished resource. In this chapter we shall demonstrate how these principles were applied at Portmahomack, highlighting both achievements and shortcomings (see Carver 2009b for an exposition of the principles in general).

Reconnaissance stage – early finds of carved stone

St Colman's Church or Tarbat Old Church is also known as the White Church, because in living memory it has been protected by white harling (frontispiece). As it stands, the building is essentially a structure of the eighteenth century, and early antiquaries will have encountered it as such. It has a long, narrow nave and northern extension – the 'north aisle'. At the west end is a shapely belfry in blonde sandstone probably created by Alexander Stronach who operated in the seventeenth century. Inside at the east end, accessed by a flight of steps, is a crypt with a barrel vault (Illus 2.2). Although little showed before 1994 that was certainly of an early date, expert visitors over the years had speculated that this crypt was medieval. A Royal Commission investigator in 1966 pronounced the church as essentially eighteenth century, but noted that it incorporated early remains. The addition of a north aisle to accommodate a heritor's loft and burial vault was noted as 'a typical adaptation of a medieval church in Reformation Scotland'. Recording St Colman's Church for the Royal Commission in 1982, Geoffrey Stell warmed to the theme of its earlier history: 'At the east end is what appears to be a genuine late medieval vaulted crypt which takes up one-third of the length of the church' (OLA 5.1/p 37). As part of the investigation undertaken in connection with the restoration and refurbishment of the building, this was shown to be so, and to be one of seven phases of development from the twelfth to the twentieth century (Chapter 7, p 289).

Illustration 2.1
St Colman's Church with belfry, undergoing restoration in 1998

The signal of early medieval activity – that is, activity earlier than the twelfth century – was provided by fragments of sculpture dating to the seventh to ninth century, that were

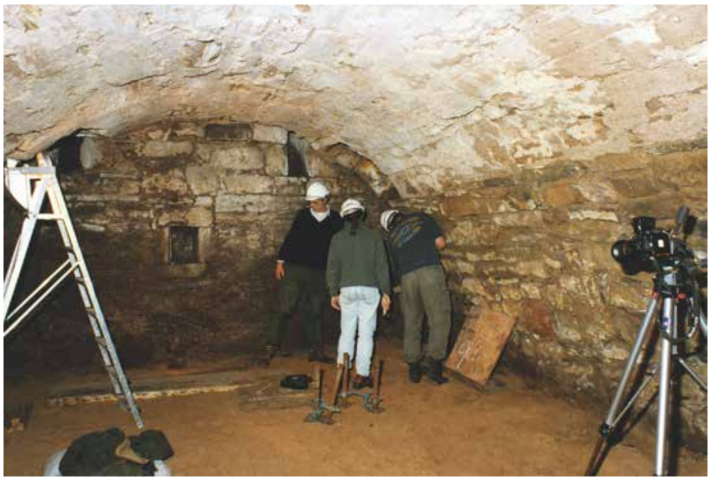


Illustration 2.2
Inside the crypt during recording

seen or found during the late eighteenth to twentieth century in the neighbourhood: in the churchyard, in the boundary walls of church property and eventually rediscovered built into the fabric of the church itself (a catalogue of all sculpture found at Portmahomack numbered TR1–263 will be found in the Digest 5, p D42). Early champions of Pictish sculpture, Charles Cordiner and Charles Petley in the late eighteenth century, John Stuart in the mid-nineteenth and J Romilly Allen and Joseph Anderson at the turn of the twentieth, all came to the Tarbat peninsula and to Portmahomack, and the assets of the area were further enhanced by the observations of several church ministers, the celebrated naturalist Hugh Miller, resident at Cromarty, and his son Hugh Miller Jr. The most important of the chance discoveries proved to be the stone carrying a Latin inscription retrieved from the manse garden wall (p 124; see Illus 1.8; for the chance finds of early sculpture at Portmahomack, see Chapter 5.3, p 123; TR1–16).

A coin hoard and sight of strata in the churchyard

Hugh Miller Jr was present in 1889 to witness a discovery of another kind. On 28 March, during the digging of a grave some few yards from the east gate of the churchyard a 'line of hewn stones' appeared at a depth of five or six feet. From this feature, on the side nearest the church, and apparently from some crevice in the masonry, came 'several pieces of old silver'. A month later, the minister, the Reverend Donald Macleod, caused an opening to be made in an adjacent space among the gravestones, in order to continue the investigation so far as the crowded memorials of the churchyard would permit (Miller & Macleod 1889, 314). The location would appear to have been on the inside of the churchyard wall and north of the east end of the church, at nearly the highest point in the vicinity. The line of masonry was rediscovered at about five feet from the surface as thin flagstones. It ran E–W and was coincident with the old churchyard wall which had been moved some thirty-five years before (*c* 1854). After digging down to a depth of nearly seven feet, the excavator threw out a spadeful of earth and pieces of stone, together with three more silver coins, including a penny of the English King Edgar (AD 959–975). More silver was found when adjacent graves were dug in 1892. The eventual find consisted of thirteen coins, including ten of the Frankish king Louis le Bewgue (846–879), and four silver penannular armlets. The latter were also coinage, the Viking 'ring money' of the day, and the collection is likely to have been buried around AD 1000 (Graham-Campbell 1995, 143–4; four armlets and six coins survive in the National Museum, Acc nos IL 272–81). Two penannular armlets from Tarbat were shown to the Antiquaries in 1892 (PSAS 26 (1892), 60; Miller & Macleod 1889; Grieg S 1940). A Roman coin was found at a similar location near the churchyard gates. It was described as a fairly worn *antoninianius* of Tetricus II, AD 270–273/4 possibly minted

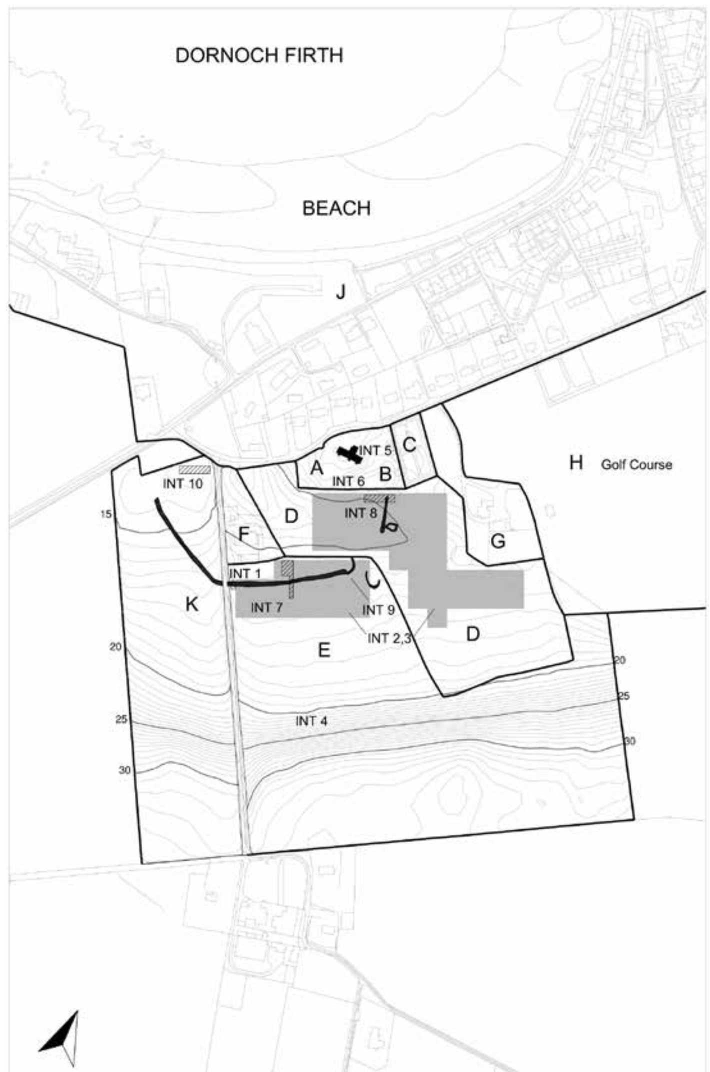


Illustration 2.3
Map showing location of zones (A–K) and interventions relating to the evaluation phase

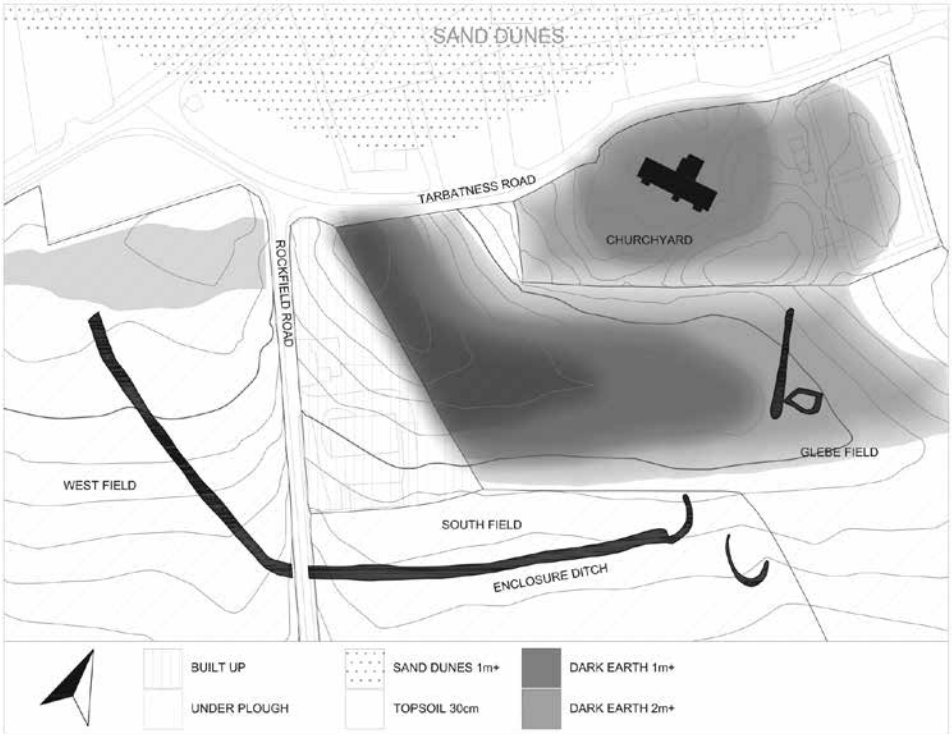


Illustration 2.4
Deposit model of the central and northern parts of the site as indicated by the evaluation

some silver coins. Near the manse (500 yards ESE from the church) a layer of charcoal was reported, four feet down (Miller & Macleod 1889, 317). The hill carrying the church of St Colman had thus accumulated up to two metres of humic soil over white sand. While much of these strata were due to burial, some settlement traces had survived of a kind that would be encountered in the present campaign further down the hill in Sector 2. They were here identified as shell middens and ironworking of a Late Medieval village (Chapter 7, pp 311–16).

Cropmark enclosure

The cropmark around the church of St Colman was seen and photographed by aerial archaeologists Barri Jones and Ian Keillar in the summer of 1984 (NMR no NH98SW0042, NGR 25 915 840; Harden 1995; see Illus 1.9). It took the shape of a three-sided curvilinear rectangle, with the open side towards the Dornoch Firth. It was one of a number of cropmarks recorded by Jones and Keillar at Trier (Robertson 1983; NMR no NH98SW0043; NGR 23 914 840).

On the occasion of the 1889 discoveries, Miller made some useful observations on the character of the strata: 'In this excavation, and in other graves of the churchyard, the earthy mould in which the interments are made is found to extend to a depth of from 7 to 8 feet below the present uneven surface, resting on white sand. The bottom of this considerable growth of mould [earth] probably represents … the original surface of the ground, the native soil of which, in so bleak a spot, was doubtless very thin … Over considerable spaces of the churchyard, some thirty paces from the east and west gables [of the church], the spade of the grave-digger passes through a layer of shells of edible species … The date of this early occupation it is impossible exactly to fix.' He also noted that 500 yards ENE from the church in 1889 was a heap of heavy slag from bog iron, together with some remains of an old forge round which older people said they remembered finding

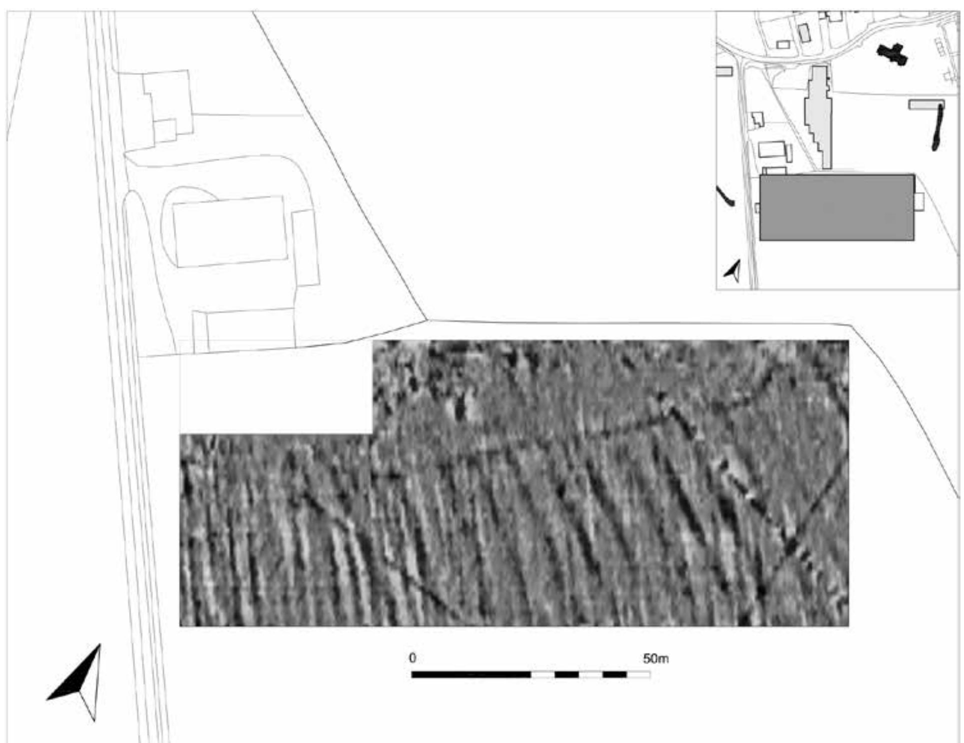


Illustration 2.5
Geophysical survey in Sector 1

Illustration 2.6
Horizon mapping in Sector 1, over the line of the second enclosure ditch S16, and the area of the possible internal bank (foreground)

as part of their survey of the Moray *laigh* (fertile plain) across the Moray firth to the south (Jones et al 1993). It lay in an unusual position for a fortification, between two ridges of high ground, and was immediately reminiscent of the enclosure surviving in a similar position at Iona. This type of earthwork had for some years been defined as 'a monastic vallum' (Thomas 1971, passim) seen as marking out a protective or a symbolic enclave, and an association between the enclosure and an early monastery was also assumed at Portmahomack. However, in very few cases had any of these structures been well dated to the early medieval period. From a practical point of view, the Tarbat 'vallum' was poorly sited for effective defence, but its location was well placed to collect water drained from the upslope and so supply the settlement it enclosed.

Test trench across the enclosure

The enclosure ditch at Portmahomack was tested by Jill Harden on commission from Tarbat Historic Trust in 1991 (Int 1; Bulletin 1; Harden 1995). The test trench was sited at the west end of the southern run of the enclosure where it met the Rockfield road (Illus 2.3); it measured 4m × 10m, stepped in to 1.50m × 8.75m (at a depth of 0.80m) for safety reasons. The enclosure ditch had been cut through sand and into hard pink clay-sand giving a profile with a maximum width of 7.2m at the top, sloping down on both sides to a flat bottom 2.6m across; the depth of the ditch at this point was recorded at *c* 2.20m below the current ground level (or 1.40m below subsoil level). The earliest deposit encountered within the ditch consisted of a laminated peat deposit (L2) that had the appearance of having accumulated slowly and intermittently and in the presence of water. Samples taken from this layer gave three radiocarbon dates between the second and sixth century AD (Harden 1995, 226). These results sufficed to show that the cropmark was a significant feature and had been in existence in the early medieval period. More than 100m of the ditch system was subsequently examined (see Chapter 5.5, p 178 and OLA 6.1).

Evaluation stage 1994–1996 – deposit modelling

The full evaluation programme began in March 1994 with the support of Highland Council, its objective to prepare a *deposit model*, assess the *research agenda* and establish the *social context* (see above). The procedure for deposit modelling was to provide, at first hand, but if possible non-destructively, a clear view of the archaeological strata that had survived and to assess its ability to address the main questions on the research agenda. The resulting models take the form of maps showing the depth of strata and how far they are likely to have been truncated, distorted or disturbed (see Carver 2009b for examples).

Preparatory to deposit modelling, the area of interest was divided into zones, since the choice of techniques depended on current usage of the land (lettered A–G on Illus 2.3). Zone A was the church of St Colman, then redundant. Zones B and C comprised the churchyard and its modern extension at that time protected from excavation – other than grave digging. The Glebe

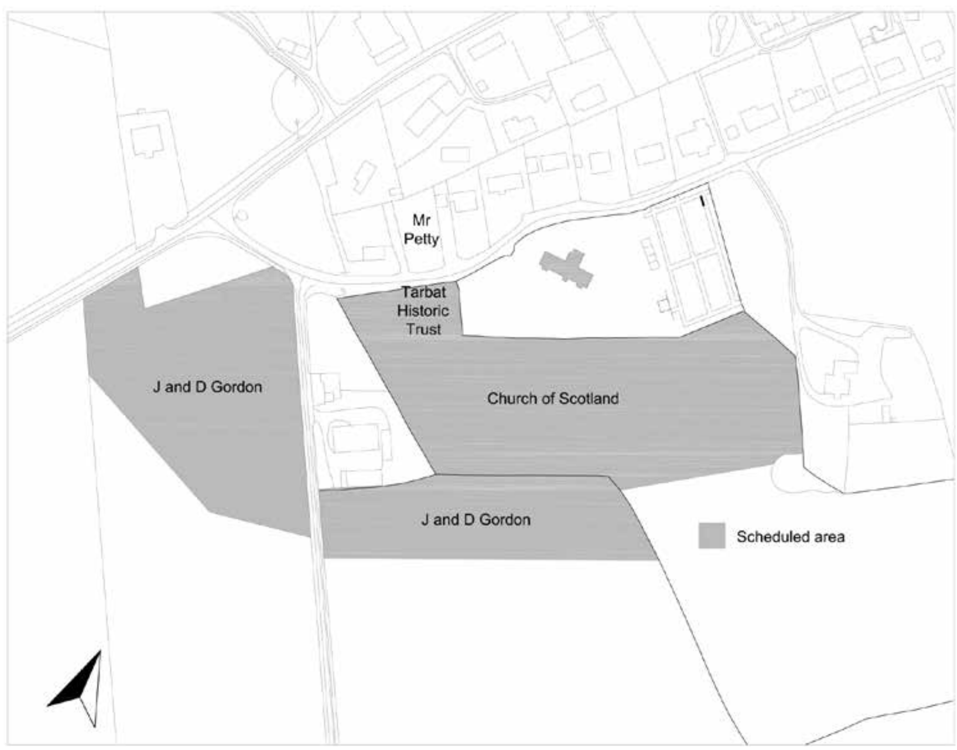


Illustration 2.7
Landowners and Scheduled area

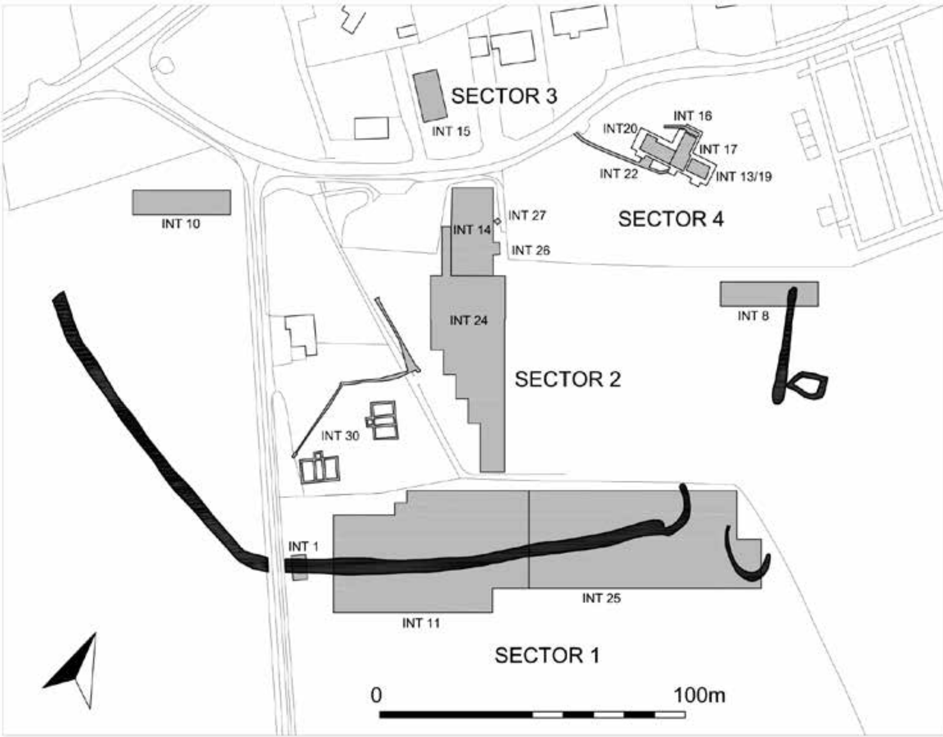


Illustration 2.8
Project Design, showing the four sectors and interventions involving excavation. The area excavated was 0.741ha, about 20% of the enclosed area

Field (Zone D), and the south (Zone E) and west fields (Zone K) were routinely under the plough, although sometimes used to graze cattle. Zone G was a private property, formerly the manse. Zone H was a golf course and Zone J the built up area on the dunes leading down to the sea.

Four bundles of techniques were applied – topographic, geophysical, test trenching and surface mapping – using fourteen interventions (=Int; for a full list of interventions, see Digest 1). The local topography was captured in an intensive contour survey (Int 4 and 6), showing that the enclosure ditch lay across a valley between two ridges, the more northerly carrying the church and churchyard (Illus 2.4). There was no visible stream running in the valley, but the lie of the land suggested it would flow west and then north across a low point in the ridge towards the firth. The tenant farmer complained about a perennial wet patch at the point where the slope and the waterway changed direction. This would be explained in due course as the site of an underground dam built to make the monastic pool. Geophysical surveys, which included magnetometry and resistivity (Int 2 and 3), were mainly effective in mapping the rig and furrow in the south field (Illus 2.5). Ground-penetrating radar (Int 9) was applied to the churchyard without successfully profiling the subsoil horizon. The memorials in the churchyard were also mapped (Int 5; Illus 2.21, p 27).

A second stage of deposit modelling used three test trenches (Int 7, 8 and 10) to examine strata in the south, Glebe and west fields (Zones D, E and K). Int 8 and 10 showed black soil lying deep over features cut into white sand, but little sense could be made of them at that point. Int 7 was located to investigate a cluster of anomalies located by magnetometer survey; retired farmer Duncan Johnson, living locally, had noted the same area as one where stone was often pulled up by the plough. This test trench would contact the structure to be known as *S1* (also S1; Carver 2008a, 27–8). As is often the case outside towns, the trenches generally gave a poor return, offering little more than relative depth to subsoil and the presence of undated features. The third and the most effective stage employed a technique of examining the surface of the buried archaeology under ploughsoil pioneered at Yeavering ('primary horizontal sections'; Hope-Taylor 1977, 32–4) and developed at Sutton Hoo ('Horizon mapping'; Carver 2005a, 43–7). The ploughsoil is first surveyed for surface finds (very few in this case) and then stripped off by machine to 'Horizon 1'. The strata between the ploughed soil and the surface of the undisturbed archaeology ('Horizon 2') is removed by a trowelling line, enhanced by spraying with water and then viewed and photographed from a tower prior to mapping, a process known as 'strip and map' (Illus 2.6). Large areas of the south field (Int 11) and the Glebe Field (Int 14) were explored in this way during the evaluation phase. The work could be spread

Illustration 2.9
The eastern end of the enclosure ditch S16 seen as a parch mark in Sector 1

Illustration 2.10
Field school tuition (left) trowelling (right) recording

over more than one season by covering the cleaned surfaces with polythene and backfilling, a procedure dubbed 'strip, map and wrap'. Some surfaces were uncovered and re-covered several times, a crop being taken off in between seasons without impedance to the farmers or damage to the archaeological deposits. In the south field, the operation revealed the remains of the bag-shaped building S1; in the north of the Glebe Field, the pebble surface adjacent to the vellum-washing tank, S4. The significance of these features was sufficiently clear to provide a basis for the project.

It should be emphasised that this method is more reliable and no more damaging than fieldwalking and geophysics as a way of testing plough-damaged sites, where features are dispersed over wide areas. It requires a tower, a water supply and a volunteer workforce, and, in the case of research projects at least, this aligns with the relatively modest funding packages generally available at the evaluation stage. There is no compulsion to excavate the area that has been mapped, since the process is benign and intact strata are not disturbed. The information retrieved is invaluable in addressing the principal task of project design, namely that of deciding where and how to excavate.

At Portmahomack, the site surveys and strip-and-map operations, combined with observations made before 1994, gave a reasonably coherent account of what lay in store. The enclosure ditch was a major feature that could be used to define the nucleus of early medieval settlement; features belonging to structures of likely Pictish date had survived directly under medieval and later ploughsoil in the south field and at the north end of the Glebe Field; there were deep deposits in the centre of the Glebe Field, well out of reach of modern ploughing, where waterlogging was a possibility. A mantle of dark soil, up to two metres deep and cut by successive graves, lay over white sand in the churchyard. These graves had disturbed a large number of carved stones that could be stylistically dated to the eighth century. It could be said

Illustration 2.11
Bag-shaped building S1 under excavation. The post-pits have been recorded and the perimeter wall (F40) is being dissected

that a Pictish settlement, with monastic associations, was present underneath St Colman's Church and in the land in the valley to the south of it. It remained to see how much of it would need to be, could be, or should be, brought to light.

The research agenda

The research agenda was deliberately left broad in the design phase (see Chapter 1, p 21). In the research environment of the early 1990s, the unearthing of almost any settlement in the Pictish mainland would be welcome, if dug to a large enough scale and in enough scientific detail. Although they remain traditional starting points in early medieval Scottish research, neither historical nor art-historical knowledge was given a determinant or even a guiding role in the strategy. The principal goal was to map an early medieval settlement and anchor it in history by chronicling the story of the site both before and after the Pictish period. Buildings, burials, monuments, industries, the environment and the agricultural economy were given equal billing, since these things were equally unknown. The visibility of features was predicted to be good, and accessible near the surface. However, the evaluation did not fully anticipate the depth of strata at the west end of the Glebe Field, where there was a large pond buried under a metre of ploughsoil and the strata on its north side proved to assume levels of urban complexity.

In addition to the demands of the research community to see a Pictish settlement on a large scale, and to demonstrate the existence of a Pictish monastery, there was an urgent desire in Scotland to chronicle the sequence of an early medieval church. The present church could have occupied the site of any Pictish predecessor, of which there were then no excavated or standing examples (Hughes 1970; Fernie 1986; Morris C 1989; Foster, forthcoming). Furthermore, since the surviving church was part medieval, its comprehensive restoration presented an opportunity to examine its fabric, layout and burial ground from the twelfth century to the twentieth.

The research agenda therefore demanded as full a picture as possible of the settlement in time and space, the detailed dissection of any monastic phase, and the comprehensive story of the church on its present site. Excavation survey and analytical programmes would be designed with these goals in mind.

The social context

The ethical considerations to be taken into account in the design of an archaeological investigation are no longer merely desirable, but contingent. A site is always in someone's purview, regarded as someone's legacy, subject to concerns of assumed as well as legal local ownership. At a superficial level, these concerns are those of the landowners, since the character of their property is about to change. At another level, the archaeology is the concern of the state, whether the land is protected or not, since the state represents the long-term well-being of the unborn and has a duty to protect their interests. But there is a third level too: the stake that a great many people believe that they hold in the territory and its past, whether they were born there, have a house in the area or take their dog for a walk on its footpaths. An archaeologist cannot simply get

Illustration 2.12
The area of Sector 2 under excavation, looking north

Illustration 2.13
Excavation at the north end of Sector 2, looking north, showing the pebble surface of road S13 in Period 3 (F18)

Illustration 2.14
The central part of Sector 2 under excavation, looking north, showing road S13 (centre), boundary wall F149 (foreground, right), overflow culvert (foreground, centre) and the bridge (foreground, left)

permission from the landowners and the local authorities and then drive a trench through a site, even if commissioned to do so by the state agency. Contrary to the traditional viewpoint (still regrettably widespread), archaeological excavation requires a lengthy and continuous process of consultation and consensus with all interested parties.

At Portmahomack the landowners were the Gordon family, who farmed the south and west fields, the Church of Scotland who leased the Glebe Field to tenant farmer Billy Vass, Highland Council, responsible for the churchyard and Tarbat Historic Trust who had purchased 0.15ha of the Glebe to build their car park, as well as being owners of the church building itself (Illus 2.7). The Gordons put the relevant piece of the south field into 'set aside', thus providing the archaeological team with land to excavate and a campsite; the friendship and support of a family so widely respected in the area proved invaluable. The Church of Scotland was a more distant but eventually compliant landowner, and in spite of the inconvenience of having a large part of his land turned over and put back every year (for which he was compensated), their tenant farmer Billy Vass remained a stalwart supporter throughout the campaign.

Highland Council was both a partner and a major sponsor (see p xi), priming the evaluation and grant-aiding both the excavation and the museum display. The council's long-term aim was to promote the development of a centre that would raise the profile of Scottish history, both as an educational asset and as a magnet for tourism, with consequent improvement in the prosperity of the area. The long-term prosperity of Easter Ross depended largely on farming; the other principal trading industries, salmon farming and North Sea oil were in trouble in the early 90s: Norwegian salmon farmers were creating a very competitive market, and the manufacture of drilling rigs had been increasingly outsourced to the detriment of Nigg Yard. Carrying out archaeological research in an area of endemic unemployment requires diplomacy of a sophisticated kind, in which the support of Highland Council was crucial.

The Trust assumed the responsibility for representing public interests in the project, but in reality neither they, nor Highland Council, had that power. In the churchyard for example, permission to excavate a trench to lay service cables to the museum was given by both the Council and by the Church of Scotland, acting through the Trust. When the work of digging the trench started it was soon evident that these permissions, though necessary, were by no means sufficient. A Scottish cemetery is owned by the descendants of those buried there, burial places being allocated as *lairs*, zones intended to receive the bodies of family members when their time came. In theory the geography of these lairs was known but in practice their borders were vague. Permission to insert the Trust's service trench (which was not

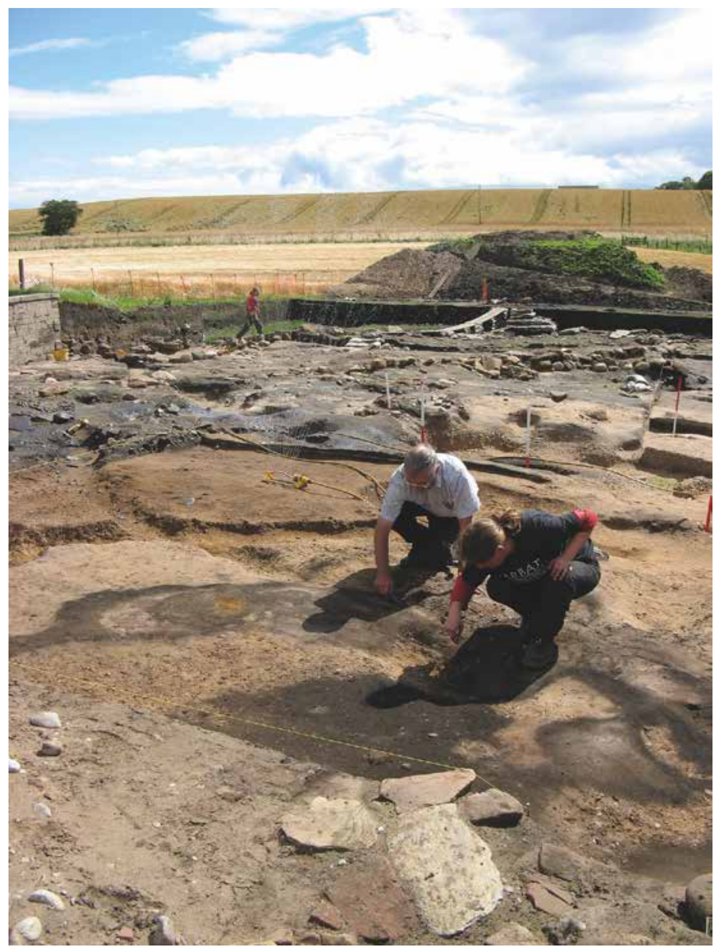


Illustration 2.15
Definition of Period 1 features beneath the Period 2 vellum workshop

part of the archaeological programme) had to be re-sought through a process of soliciting support from local elders and opinion formers, and advertising in shops and on local radio, otherwise objection was likely from visiting lair owners resident outside the region, as indeed happened. The service trench (Int 16) was aborted and restarted on a new route (Int 22), which had had a more carefully negotiated consensus (Carver 2008a, 31).

The Tarbat Historic Trust was an independent-minded organisation with its goals set firmly on the business of restoring St Colman's Church. The priorities and values of Highland Council (tourism and amenity) and the University of York (research) were different again. But the three partners learnt from each other and eventually formed an effective and professional alliance. The viability of the project required a continual round of visits, meetings, public presentations and hobnobbing in public houses, almost akin to electioneering, to win the goodwill of the people of the village and the peninsula. There was also a wider constituency to woo – other archaeologists with an interest in the period and in seeing it well served. These legitimate concerns were addressed in the first place by publishing and widely circulating the project design in advance (Bulletin 1; OLA 5.1), secondly by giving a series of seminars and public lectures (around a dozen a year) and thirdly, towards the end of the campaign, by convening four advisory site meetings from Ireland, England and Scandinavia to help understand what had been found and help design the programme of post-excavation analysis (below, p 30).

Illustration 2.16
Proving the sterile subsoil, beneath the vellum yard

Project design

The research agenda, deposit model and the study of the social context, products of the evaluation, were fed into the project design to create programmes of research, conservation and display. These programmes were published in 1995 (Bulletin 1; OLA 5.1) and updated in 1999 (for the display, OLA 4.4), in 2002 (for completion of the excavation, OLA 4.3.1) and 2007 (for post-excavation, OLA 4.3.2, 4.3.3). The first of these was the most important because it announced the project and sought consensus for it within the ethos of multi-vocality (Carver 2011, 143).

The research programme was planned to operate at three levels: excavation at Portmahomack, survey on the Tarbat peninsula and at its principal sites, and study of the Moray Firth area. The previous experience of early medieval excavations in Scotland, particularly that applied to monasteries, had been more damaging than productive because these had been undertaken at too small a scale to address the research questions (p 6). A scale appropriate to match the questions would require a large area, since the main element missing in the understanding of monasteries was the layout of the activities within them, and the consequent geographies of power, ritual and economy. On the other hand an excavation that was too large could be unethical (because prodigal), costly and risked remaining unfinished. The location of

Illustration 2.17
Recording a N–S profile through the west side of Sector 2 (Int 14), from the sand subsoil at the base to the present day

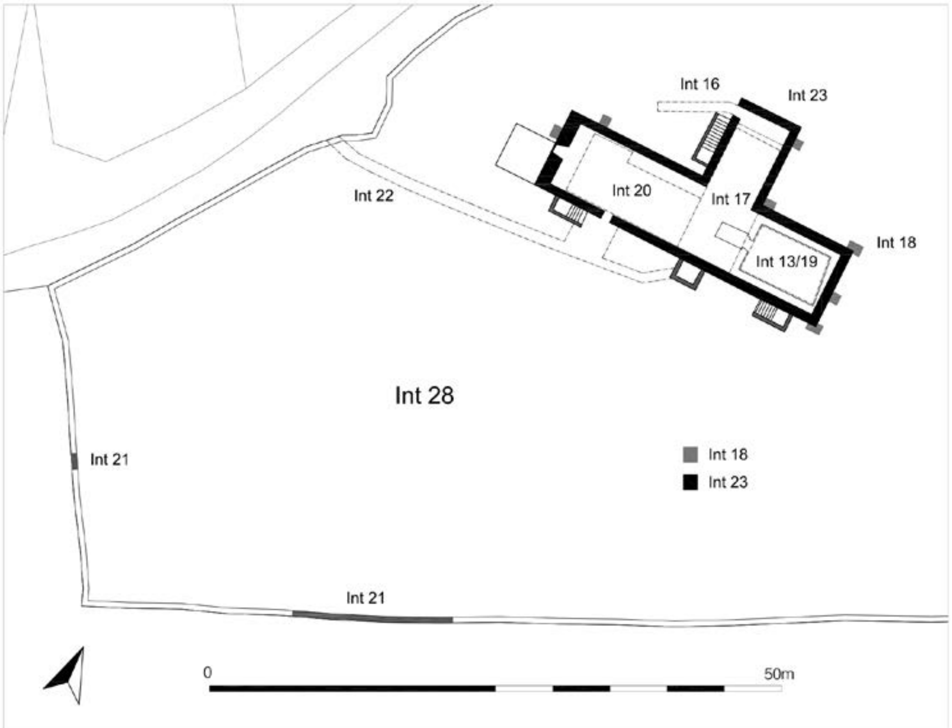


Illustration 2.18
Interventions in the church and churchyard

Sector 3 on the north side of Tarbatness Road did not form part of the original design; it was a response to a chance opportunity to excavate in advance of the building of a bungalow.

Included in the programme were investigations on the Tarbat peninsula, focused on the known Pictish and prehistoric sites, and on defining the portage. The design also outlined its ambitions to explore the wider Firthlands. These are described below (pp 28–9).

the present church of St Colman, and the area marked out by the enclosure ditch, gave prime indications of the probable focus. The church was to be completely restored and refitted as a museum; it would therefore be the subject of a detailed investigation in advance of redevelopment. The churchyard itself was a no-go area (see above), but in any case was much disturbed by graves and liable to produce a sequence that was largely unreadable. The area within the enclosure at the greatest distance from the church was likely to have been used for industrial purposes as demonstrated at Hoddom (Lowe 2006). The area in the centre of the Glebe was wet, and should be included for that reason. The inclusion of an area outside the enclosure ditch was desirable since it should allow the identification of any prehistoric settlement superseded by the monastery. To ensure an understanding of sequence in what was predicted to be a shallow stratification, it was essential that these areas be joined up.

These factors led to the design for a planned excavation as laid out in Illus 2.8. The area inside and outside the enclosure ditch would be totally excavated to record the occupation before and after it was constructed (Sector 1). A broad transect across the valley would be totally excavated to connect the events in the south field with those on the crest at Tarbatness Road (Sector 2). It would be taken as near as was legitimate to the church on its hill. To tell the story of a north-east Scottish parish church, the interior would be completely excavated subject to the safety of the building (Sector 4). With only minor adjustments and exceptions, these were the areas subsequently opened and largely excavated to subsoil.

Implementation of the programme

Each operation within or without the four sectors was recorded as a numbered *intervention* (Illus 2.8) (Int) (see Digest 1). The basic unit of record in each intervention was the *context* (C), a set of materials defined as a belonging to a single deposit. Subsets of contexts were retrieved as samples or artefacts (collectively *finds*) for assessment and further analysis. Where appropriate, sets of contexts were further defined as *features* (F), usually, but not invariably, indicative of deliberate human activities. Exceptionally, sets of features were further defined as *structures* (S), normally restricted to pieces of major planned engineering. A list of structures is given in Digest 2. Thus in Sector 1, Intervention 11 (Int 11), the bag-shaped building numbered as structure S1 had a central hearth, feature F65, with a deposit of burnt material context C1141, which included a bronze fragment, 11/3391 (for the principles, see Carver 2009b, 138–42).

The ground was examined at a level of intensity appropriate to the opacity of the strata and its rewards, with a series of procedures known as Recovery Levels (Carver 2009b, 124–9). As a broad generalisation, the topsoil was removed by machine (Level A), cleared by shovel (Level B), defined by trowel (Level C), and prepared for recording with trowel and brush (Level D). Exceptionally complex features (such as graves and hearths) were studied using micro tools (Level E) and features requiring laboratory study were lifted and taken off site (Level F). The level applied was noted on the context and feature records, which were proformae filled in by hand. These stated the location, geometry, stratigraphy and content of each unit, and had space for sketches and comments. All survey was photographic and digital; that is, the appearance of contexts, features and structures was photographed and their extent recorded as sets of coordinates measured with a TST (Total Station Theodolite), the lines connecting the points joined and smoothed by eye on site. Directors, supervisors and recorders responsible for each area were required to keep journals. The daily tasks and the participants themselves were also recorded over the years by photography and video (OLA 3). In this way the changing opinions of the more vocal participants were potentially captured, although they usually had less eventual relevance than the professional record.

Sector 1

Sector 1 was laid out along the enclosure ditch seen in the air photograph (Illus 1.9) and located on the ground through a parchmark (Illus 2.9). The subsoil was a sharp, silty sand about 50cm deep overlying pink stony clay-sand. All archaeological features were cut into the sand subsoil and overlaid with ploughsoil 30cm deep. The ploughsoil was surveyed by surface collection and metal detecting, which produced some medieval and modern pottery and a scatter of metal finds. It was further tested in a control area of 80m² in the north-west corner of Sector 1 where underlying features were expected, with a programme in which the ploughsoil was removed by trowel in 5cm spits to see how far the results from field-walking matched the whole content of the ploughsoil. The results of this test area demonstrated that few finds were present in the ploughsoil with the exception of the bottom 5–10cm overlying features cut into the subsoil. The ploughsoil was then largely removed to this depth using a back-acting mechanical excavator fitted with a wide toothless ditching bucket (ie at Level A). The remaining 5–10cm of ploughsoil was removed by shovel (Level B) and trowel (Level C) with all finds being three-dimensionally located. The surface of the subsoil was then carefully cleaned by trowel (Level D; Illus 2.6).

Illustration 2.19
Recording and excavating in St Colman's Church during its restoration

For recording purposes, the exposed surface was divided into *modules*, measuring 4 × 8m, this being the area that could be cleaned to its optimum contrast within a weather window, which in this part of the world could be maintained for about two hours before rain on the one hand, or sun on the other, again obscured the surface. Once cleaned, each module was photographed from a tower using a medium-format camera, and all contexts were then numbered, and mapped using a Total Station Theodolite. Contexts and features were investigated, in most cases, at Level D. All Level D contexts were bulk sampled and proportions of the deposits sieved, but further sampling strategies were developed in pursuit of particular questions, such as the vegetation in the primary filling of the enclosure ditch (p 280). Level E recording was applied to the post-pits of S1, its hearth and storage pit, and to the secondary infilling of the first enclosure ditch which had captured part of a seventh/eighth-century metalworking area (p 215). All finds, including animal bone, were plotted in three dimensions (see for example Illus 5.8.1, p 223).

Sector 1 measured 140 × 40m and was mapped by the field team with the aid of students from Britain and abroad attending a series of field schools (1994–2000) (Illus 2.10). The whole area was mapped at Horizon 2, and all feature groups that were defined were sample-excavated including the enclosure ditches, which were sampled in 5m lengths. Int 25, the eastern part of Sector 1, including buildings S5 and S12, was both mapped and largely excavated by field-school students (1997/8). The more complete and complex structures, such as the eighth-century S1, the bag-shaped building, were dissected mainly by the professional field team (Illus 2.11).

Sector 2

Horizon mapping was applied to Sector 2 (1996/7) which revealed features at or close to the surface (Illus 2.12). At its north end (Int 14), these were a stone-lined trough S4 and a road S13 (both belonging to the eighth-century Period 2), while further down the slope, later levels survived, such as the resurfaced road of Period 3 (Illus 2.13). Considerable help in managing the excavation strategy at the north end was given by a trench against the east baulk, excavated to house a heating oil tank for the church (Int 26). Dug in 1998 this latter showed the rich stratification that lay in store and provided invaluable guidance over the next eight seasons. Recognising that the trough (S4) was a surface survival of an early period, the director (JGL) kept the north end in abeyance while the later infilling of ploughsoils in the centre (Int 24 N) was removed by a large workforce of professional fieldworkers, students and volunteers (1997; 2000). This process, colloquially called 'debrowning', eventually revealed the outlines of the boundary walls, pool and the dam, the components of the monastic water-management system S7 (Illus 2.14). This area in the centre of Sector 2 became the scene of a relentless search for elements belonging to a mill. Its lower parts were laced with drains from various periods, indicating the effort of generations of farmers to remove the water which was being impounded by the deeply buried and long-hidden dam (see Chapter 5.5, p 193).

From 2003–7, the emphasis was on the sixth- to eighth-century sequence in the northern part of Sector 2 (Int 14). Here the stratigraphy was complex, being composed of myriad layers, interrupted by the landmark horizon of a fire ('the primary burning') that had involved most of the area (Chapter 5.11, p 256). The excavation of features and contexts was undertaken at Levels D and E with intensive sieving and frequent bulk sampling with the resulting residues being magnetically scanned for metalworking debris. The strata in the southern half of Int 14 was found to be particularly challenging and so was investigated using a system of quadrants, in which contiguous modules were stratigraphically excavated in plan against narrow standing baulks between each module. This proved helpful in maintaining a coherent record of the sequence composed of innumerable microstrata, by providing a control over deposit definition in plan, and allowing for micromorphology sampling across deposit interfaces (Digest 7.5). The Period 2 levels at the south end of Int 14 were also subject to chemical sampling over a 20cm grid. The purpose was to map the zones dedicated to different kinds of metalworking, but these later became evident from the hearths and the samples were not used. In 2006 and 2007 the sequence was lengthened by the discovery of three cist burials at the north end of Int 14 and the definition of elements of settlement preceding the monastic developments of the eighth century (S10, 11) (Illus 2.15). The area of the dam and putative mill (S7 in Int 24 N) was revisited in 2007, and both here and over most of Int 14 the excavation reached the undisturbed subsoil and tested it thoroughly (Illus 2.16).

As well as investigative sections cut during the study of features (such as the enclosure ditches), a section was cut through the pond fill and into the marsh below, and the primary standing sections of the east and west edges of the excavations provided a profile through the whole deposit running approximately N–S (Illus 2.17; Chapter 3, p 43). However, the overall sequence in Sector 2 was determined by stratigraphic analysis (see Illus 3.13) and anchored in time with thirty-five radiocarbon dates (Digest 3).

Illustration 2.20
Investigations in St Colman's Church:
(a) excavating medieval burials;
(b) recording a wall elevation;
(c) recording strata

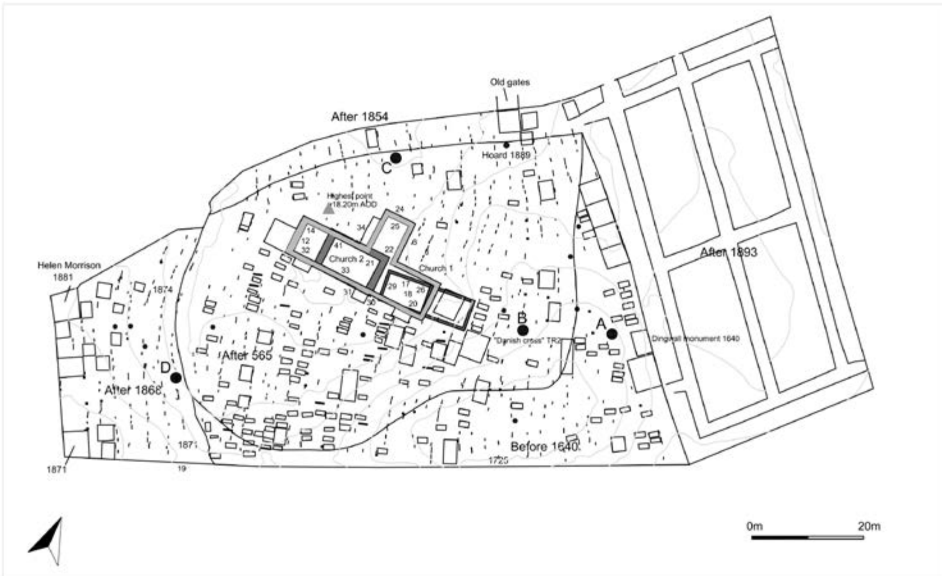


Illustration 2.21
Recording memorials in the churchyard

Sector 3

The land on the north side of the ridge, between Tarbatness Road and the beach was designated as Sector 3. In practice the only viable access to strata in this area was a building plot owned by Mr and Mrs Petty, and only one intervention was undertaken (Int 15 in 1996). This was an enlarged test trench, running north-west and measuring 16 × 8m (Illus 2.8). The deposit proved to consist of dunes, renewed up to historical times by windblown sand. However two fragments of ditch circles were defined within the dunes (S14, p 46), and the area had been used to quarry sand in the Middle Ages (OLA 6.2/3.5.2).

Sector 4

The investigation of St Colman's Church (Sector 4) took place between 1996 and 1997 in nine interventions as opportunity allowed (Illus 2.18). The redundant church, including its crypt (Int 13, 1992–5) was first cleared of a large amount of debris, including pews and coffin bearers. Archaeologist Jill Harden, assisted by local volunteers, recovered fragments of Pictish sculpture, lithics, coins, a bone stylus, a range of personal items of relatively recent date and the bones of mammals, birds and fish amongst the debris in the crypt (Int 13; OLA 6.3.1/3.6.8). A trench cut to take services to the church (Int 16, 1996) was aborted after encountering recent burials (see above), but early burials were contacted too, together with two simple scratched cross grave markers (TR24, 25). The replacement service trench, following the line of the path (Int 22, 1997) encountered a curving boundary wall that formed the early boundary of the churchyard (OLA 6.4/2.1.2). Inside the church the investigation began in 1996 with a transect across the nave into the north aisle (Int 17). This showed that the north aisle was largely occupied by a central burial vault and the tomb of the seventeenth-century minister William Mackenzie.

Encouraged by Trustee Anna Ritchie, this was felt sufficiently promising to request that full excavation of the nave be funded in advance of the refurbishment of the church as a museum (Illus 2.19). This could potentially deliver a long sequence from Pictish times to the Reformation, something that had yet to be fully achieved for any Scottish church. Accordingly in 1997, this main excavation was carried out (Int 20), together with the complete excavation of the crypt (Int 19). At the same time, after the harling had been removed, a number of test pits were dug by the architect Fred Geddes (Int 18) and a detailed record of the building was made by Fred Geddes and the buildings archaeologist Martin Jones (Int 23; OLA 6.4).

Within the nave was a sequence of 187 burials, beginning in the sixth century with thirteen full or partial long-cist graves and continuing in the seventh to ninth century with fifty-eight male burials, twenty of them employing head-support stones. The remaining, later burials had a normal demographic profile of men, women and children, and were mainly clustered in the fifteenth century (Illus 2.20). The excavations also exposed eleven sculptural fragments that had been incorporated into the church walls and foundations, and five of which were extracted: the so-called Dragon Stone or Apostle Stone was removed from the vault in the crypt (TR20), a rectangular grave marker (TR21) and a sarcophagus lid, the 'Boar Stone' (TR22) from the foundation of the north wall of the medieval church, a rectangular grave marker from the foundations of the south wall of the nave (TR33) and a fragment from the foundations of the external stairs of the north aisle (TR34) (see Chapter 5.3; Illus 5.3.1). Integrating the below-ground and above-ground evidence resulted in the definition of seven phases of church building dated from the twelfth to the nineteenth century (Chapter 7). The existence of fabric belonging to a church of the Pictish period remains probable, but unproved (Chapter 5.4, p 168). The churches, burials and other features were woven into an integrated sequence supported by radiocarbon dates and Bayesian analysis (Chapter 3, p 33; Digest 3; OLA 6.3.2).

Recording of the churchyard memorials

The memorials in the Portmahomack churchyard were mapped, numbered and provided with written and photographic records as part of a long-term community project initiated in 1998 (Int 28; Illus 2.21; following Willsher 1985). This was designed to provide researchers with a history of the burial ground (see Chapter 7, p 323) and visitors with a database of those commemorated at Portmahomack. Inscribed memorials outside the church relate particularly to the eighteenth to twentieth century. Inside the church, there is a seventeenth-century memorial to William Mackenzie (see above, p 27), two seventeenth-century cartouches of 1623 and a nineteenth-century memorial to the minister William Forbes. Fragments of a seventeenth-century tombstone were noted in the blocking of the south door of the nave (TR16). Two medieval grave covers were also located: one incised with AMRM and long-sword and dated to the fourteenth to fifteenth century was incorporated in a flagstone floor at the west end; the other with a floriate cross and dating to the mid-fourteenth century remains in situ outside the east wall of the crypt (Chapter 7, p 294; Digest 5.2). The varied investment in the type and quantity of carved stone memorials over the thirteen centuries threw an intermittent light on the varying social and intellectual context in which they were made (Carver 2005b).

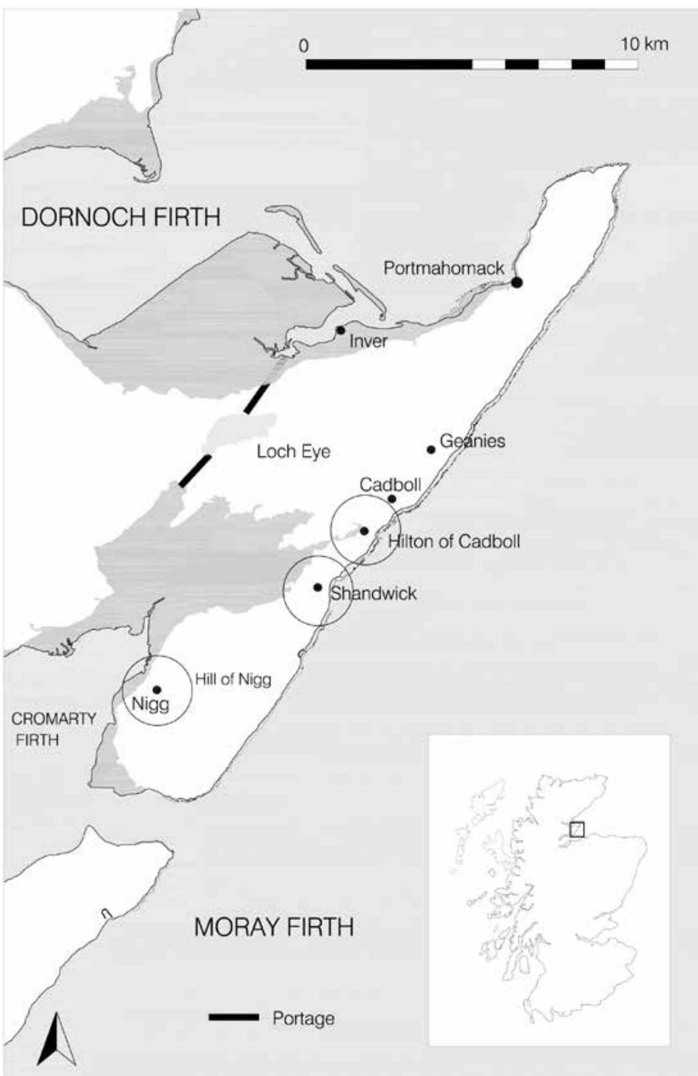


Illustration 2.22
Peninsula survey area and target sites

Investigations on the peninsula

The Tarbat peninsula was the hinterland for the Portmahomack settlement and provided its immediate geographic and chronological context. Accordingly, a programme of investigation was prepared that attempted to synthesise the prehistoric, early medieval and medieval periods in the area embraced by the three Firths (Dornoch, Moray and Cromarty) (Illus 2.22). The principal sources were the National Monuments Record and a number of local studies containing primary information, particularly *Origines Parochiales Scotiae* (cited as OPS, 1851–5), Miller Jr 1889, Watson 1904, Macfarlane 1906–8, ONB1907 (with the OS *Object Name Books*), Baldwin 1986, Gordon & Macdonald *c* 1988 and the three *statistical accounts* (cited as FSA 1791–9, NSA 1845 and TSA 1951). These were culled for early sites and the candidates mapped. There were no certain Neolithic or Bronze Age monuments, but a number of burials had been encountered of which some may have featured a short cist. Most were long cist and thought to belong to the Iron Age or Pictish period. There were fortified enclosures at Tarrel and Easter Rarichie, and a possible broch at Lower Seafield (Chapter 3, p 61; Digest 8).

The principal sites of the Pictish period were Portmahomack, Hilton of Cadboll, Shandwick and Nigg, where monuments of the eighth century had been recorded, or were still in situ (Chapter 5.10). The medieval period saw castles erected at Cadboll, Loch Eye, North Sutor and Ballone, and as many as sixteen churches, with numerous wells and possible hermitages. The main ecclesiatical establishment was the Abbey of Fearn, active in the area from 1227 and credited with major landscaping and drainage operations (Chapter 7, p 318).

The research programme on the peninsula developed by addressing five themes. The *portage* suggested by the place-name *Tairbeart* (p 247) was investigated by assessing likely routes between the estuary at Inver (now a bombing range) and the Bay of Nigg, via Loch Eye. Experiments designed to gain insights into the earlier landscape included the virtual raising of the sea level to the 10m (30ft) contour and comparing the land so inundated to the early maps and travellers' tales (Carver 2008a, 173–88; Chapter 5.10, p 246). *Burial sites* on the peninsula were researched using earlier sightings and assessed by Graham Robins (in Carver 1998b) and again by Nicky Toop in 2011. Among these were several cist graves sighted during a watching brief at Balnabruach on the coast south of Portmahomack in 1992–3. The human bone collected then was located and analysed, giving radiocarbon dates in the third century BC to sixth century AD (Chapter 4, p 75).

It was noted that the burial sites and the medieval chapels appeared to cluster at Portmahomack, Hilton of Cadboll, Shandwick and Nigg, already known as the most likely Pictish centres and implying a longer pre- and post-Pictish importance. These were also places that had beaches suitable to land on. It was therefore planned that Hilton, Shandwick and Nigg should be incorporated into the Tarbat Discovery Programme. At Hilton of Cadboll, a full evaluation of the site of St Mary's Chapel north of modern Hilton was undertaken by the Tarbat team at the invitation of Jane Durham (a Royal Commissioner with local roots), an invitation endorsed at a community meeting at Balintore in April 1997. The work was commissioned by Tain and Easter Ross Civic Trust, and included surveys and a study of the St Mary's Chapel site (where the Hilton stone had stood in the eighteenth century). The report identified the chapel site as lying in the deserted medieval village of Cadboll Fisher, although with a possible Pictish predecessor; it gave recommendations for the research and conservation of the site and the creation and erection of a replica by Barry Grove (at an estimated cost of £6000) (see Carver 1998b reproduced at OLA 8.2; see also summary in James et al 2008, 391–8; and here Chapter 5.10).

Apart from the creation of a replica, these recommendations were not taken up, and later in 1998 there was an exploratory excavation by Historic Scotland at the west end of the chapel site, the purpose of which was to find the lower part of the Hilton stone, which it succesfully did (James et al 2008, 8). In 2000, the replica carved by Barry Grove was erected, at which point discussions came to a head on what should be carved on its defaced (front) side (p 255). This prompted a further excavation in 2001 which defined the context of the lower part along with *c* 7,500 fragments belonging to the defaced cross-slab (James et al 2008, 75; here Chapter 5.10, p 252). The discovery of the lower part led to a confrontation over ownership of the two main surviving parts of the Hilton stone, leaving the larger part in the National Museum and the base in a community centre in Balintore. At the time of writing the two parts have yet to be reunited (an academic study of the social context was included in James et al 2008, 232–69).

The Tarbat team went on to explore the site at Shandwick by geophysical survey, but without useful result. At Nigg, the area north-west of the church was mapped by contour survey. The tree cover concealed a promontory with re-entrants either side leading to the firth (p 248). In 2010, an application to construct a windfarm on the Hill of Nigg prompted an archaeological evaluation by CFA Archaeology, but this was carried out at too low an intensity to test for the presence of early occupation.

In general, archaeological investigation on the peninsula, other than at Portmahomack, has been piecemeal or low-tech up to 2013. However, the preliminary survey undertaken within the Tarbat Discovery Programme did demonstrate the high potential of the peninsula, not only in providing a context for the discoveries at Portmahomack, but of the medieval and pre-medieval period in the firthland region. This potential is currently being addressed by the University of Aberdeen (see p xii).

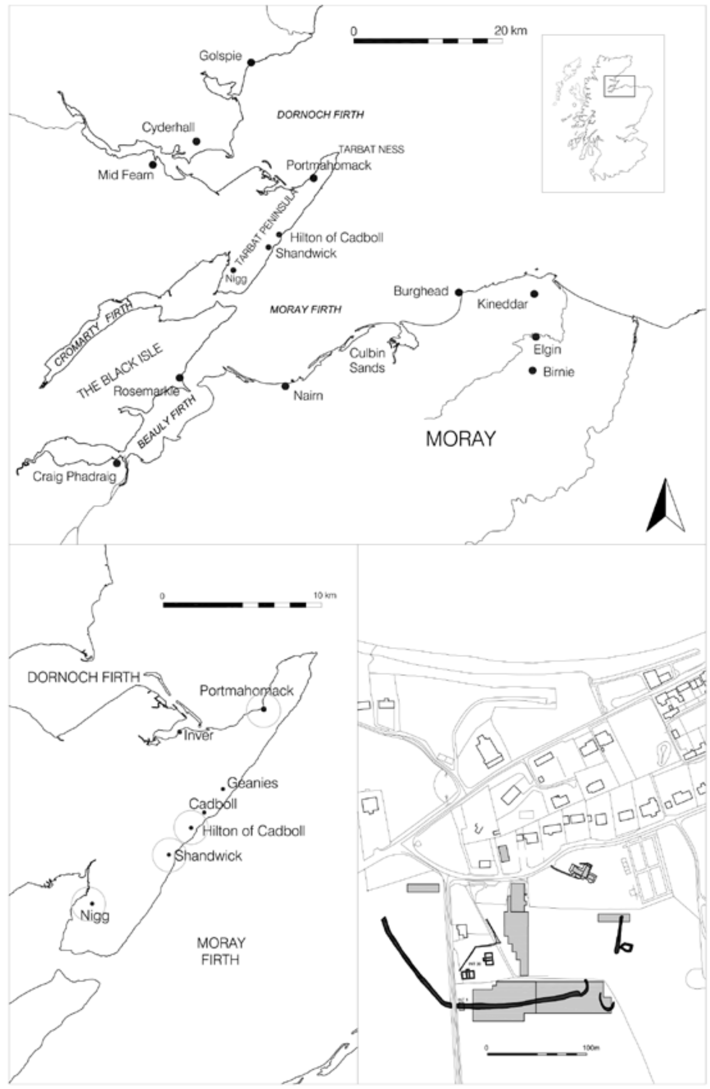


Illustration 2.23
The Moray Firth area – the geographical and cultural context for the Tarbat peninsula

Exploration of the Firthlands

The original project design included not only investigations on the peninsula, but an exploration, or at least an appreciation, of the maritime region of which it was the central place (OLA 5.1; Bulletin 1 (1995) Fig 2; Illus 2.22). In this way it was intended that the site, the peninsula and the Firthlands should act as nested perspectives that would reinforce each other (Illus 2.23). In the event it was judged improvident, if tempting, to divert resources even to the most enticing sites in the neighbourhood (for example Golspie, Mid Fearn, Craig Phadrig, Culbin Sands). A study of the Firthland area in the ninth to eleventh century was undertaken for the Groam House Lecture of 2007 (Carver 2008b), and the discussion of each period has striven for a sense of the wider context in the chapters that follow. Nevertheless the Moray Firth region still awaits its full appreciation as a theatre of confrontation with Scandinavia comparable to that in Wessex, and a geographical key to early European history of equal importance to the Oslo fjord, Mälaren, the Danish archipelago or Kiel Bay.

Design for analysis and publication

In the summer of 2007, during the last season, four invitation seminars were held on site, attended by a total of thirty-three senior academics from Ireland, England and Scandinavia (Illus 2.24; and see credits). Fieldwork was completed in late August and the design for post-excavation analysis and publication was presented a month later. In 2008 a preliminary account of the history of the project and its results was published (Carver 2008a). This short book functioned both as an interim report, a basis for justifying analysis and publication, and a platform to raise support for them. In 2008 and 2009, assessments were sought from specialists in the analysis of artefacts and environmental material, and a revised project design for the full programme issued in 2009 (OLA 4.3.3). In 2010 to 2012 Data Structure Reports (DSRs) were prepared for all sectors, these being fully illustrated texts that describe the history of excavation and argue for the resulting sequence (OLA 6.1, 6.2, 6.3). These documents, mandatory under Historic Scotland's funding system, provided the stratigraphic platform for subsequent interpretation.

Illustration 2.24
Academic visitors in 2007: (a) Hampus Brink, Chris Morris, Stephan Brink, Neil Price, Sally Foster, Nancy Edwards, Rod McCullagh, Linda Richards, Chris Lowe, Mark Hall, Raymond Lamb, Julian Richards, MOHC; (b) Julia Smith, Lesley Abrams, Thomas Clancy, Alex Woolf; (c) (foreground) Heather King, Betty O'Brien, Niall Brady; (d) Rosemary Cramp

Illustration 2.25
Tarbat Discovery Centre, interior, prior to opening

Conservation programme

During the fieldwork, excavation areas were protected by fencing, and wrapped and backfilled off season. The south field was set aside by the farmers, and allowed to re-vegetate naturally. The Glebe Field was actively farmed throughout the fieldwork campaign and crops taken off the buried site without palpable damage. Following the end of fieldwork, all areas were backfilled, and levelled off by machine. The north end of Int 14, which lies within the property of Tarbat Historic Trust, is now grassed over.

In 2002, as the character of the site became more certain, negotiations began to have it put under the protection of the Scottish state. In 2010 the site was scheduled and management agreements put in place that allowed the farmers of both properties to continue farming without harming the remaining archaeological deposit.

Presentation to the public

Since the construction of a museum formed part of the integrated project, very preliminary arrangements for the eventual display of the results of the excavations were included as part of the original management plan in 1995 (OLA 5.1). The tripartite agreement that had secured Heritage Lottery funding (see p 7, above) required the Trust to open the site to the public and generate revenue as soon as possible. The church restoration, the museum design and the archaeological excavation, including mitigating excavations within the church (Sector 4, above), all began together in 1996.

The museum design, undertaken by Higgins Gardner (London), proposed the division of the church into six parts: on the ground floor a reception and shop at the west end, general orientation in the nave, a strong room for the display of irreplaceable ancient artefacts in the north aisle and an exhibition space dedicated to local history on the raised dais at the east end (Illus 2.25). The Laird's Loft and the western gallery were connected with a mezzanine

By March 2012, specialist studies had been delivered which covered the coins, glass, stone objects, pottery, metalworking (OLA 7.1), human remains, animal remains, plant remains, geology and thirty-five radiocarbon dates (OLA 7.2–7.6). The sequences in all sectors were revisited and revised, leading to the final version to be presented in the next chapter. Detailed studies were made of the early Pictish period (Chapter 4), the cemetery (Chapter 5.2), the sculpture (Chapter 5.3), the evidence for a church (Chapter 5.4), the crafts and industries (Chapter 5.6, 5.7), the agricultural economy (Chapter 5.8), the buildings (Chapter 5.9), the peninsula in Pictish times (Chapter 5.10), the raid (Chapter 5.11), the early Norse period (Chapter 6) and the medieval church and village (Chapter 7). These accounts are supported by a Digest of Evidence to be found on pp D1–D158. All factual statements made in this book are underpinned by primary data summarised for all sectors in an online archive (OLA: http://ads.ahds. Access as http://dx.doi.org/10.5284/1031216).

Illustration 2.26
HRH Prince Charles, Duke of Rothesay, opening the centre, 1999

corridor and used for meetings, films and children's activities. This layered display successfully set out to address international interest in the research project, casual visitors on holiday and the local residents and their schools with equal friendliness and flair. Furthermore, the restoration respected the memory of the original use of the building, by using display panels showing the development of the church building, with early wall lines marked on the floor with brass strips, by restoring the wall memorials and cartouches of the seventeenth to nineteenth century and especially by dedicating the crypt as a discrete space redolent of its ancient use as a reliquary and pilgrim destination (p 321). The restored church, with its new museum, was formally opened in the spring of 1999 by HRH The Prince Charles, Duke of Rothesay (Illus 2.26).

The problem with this otherwise excellent design was that it had to be contrived before the excavation was concluded (in fact the latter had another eight years to run). At this stage, the interpretation of the site as a monastery was by no means firm, and, although the excavation of the church itself had yielded a crop of fine sculpture (p 123), the best finds connected with the monastic crafts were yet to come. The Heritage Lottery funding regime required that money be dispensed in lump sums, and the exhibition was erected as a result of a one-off cost heading. Nevertheless, thanks to the energies of the Trust, especially under its new chairman Tony Watson, money was later found to refresh the display and update it in sympathy with the discoveries made on site.

Meanwhile, visitors to the excavations were welcomed, come rain, come shine, from 1994 to the completion of the field campaign in 2007 (Illus 2.27). Many of these visitors naturally asked whether the remains of the Pictish monastery could be conserved and displayed in situ. This proved impractical. The original structures were made in dry-stone walling, or rubble and turf with timber uprights, most of which had been destroyed by fire, damaged by later occupation or decayed almost beyond detection. Accordingly the stone footings of the monastic infrastructure, including the road, dam and boundary walls, remain buried in situ. Their display was not an option, although reconstruction of selected buildings remains an interesting, instructive and potentially entertaining possibility. The Trust was, and is, relentless in its maintenance and enhancement of an increasingly famous exhibition. At the time of writing, the entryways to the car park, churchyard and church have been furnished with graphic panels and talking posts. For visitors lingering today before a peaceful panorama comprised of cottage gardens, open fields marked by hedgerows and seagulls following a distant tractor, these devices help to offer a hint of the massive and widely renowned establishment that had once adorned the site in the eighth century and in greater part still lies beneath it.

Illustration 2.27
Public visitors viewing the excavation in 2007

Chapter 3

The Outcome

Introduction

Fieldwork at Portmahomack and on the peninsula ran from 1994 to 2007, and post-excavation analysis from 2007 to 2013. It was always a principle of archaeological engagement, as practised by the authors, that a project must have a design and a programme of work, and when that programme is complete the project stops and is reported. At this moment it enters the public domain and takes its place, for better or worse, on the international stage. It is worth reiterating this principle, since many of our visitors and friends, including the Trustees and even some professional archaeologists, expressed dismay that the project followed the logic of its own design and terminated, instead of continuing to look for more discoveries. Readers may feel the same way. However there is little doubt that conforming to a pre-agreed programme is the only ethical procedure for archaeology and underpins any respect we merit from other professionals. The downside of this principle is the discomfiture of leaving problems unsolved, as we must. This project opened a new view of the early medieval period in Scotland, but its limitations will be acknowledged and discussed in the chapters that follow.

The design of the project and the history of the investigation were summarised in the last chapter; a summary of the results is presented in this one. The excavation was deployed in four *sectors* that were spatially detached from each other (Illus 3.1). Here we present the structures, features, activities and assemblages recovered in each sector and the argument for placing them in a dated chronological order. This is followed by a brief account of the findings of the scientific analysis of the human, artefactual, faunal, vegetable and mineral parts of the *assemblage*. Lastly, there is an overview of the results of *survey on the peninsula* and a concordance of events at Portmahomack and beyond, designed to provide a 'road map' to the narrative as a whole (Table 3.1, see end of chapter).

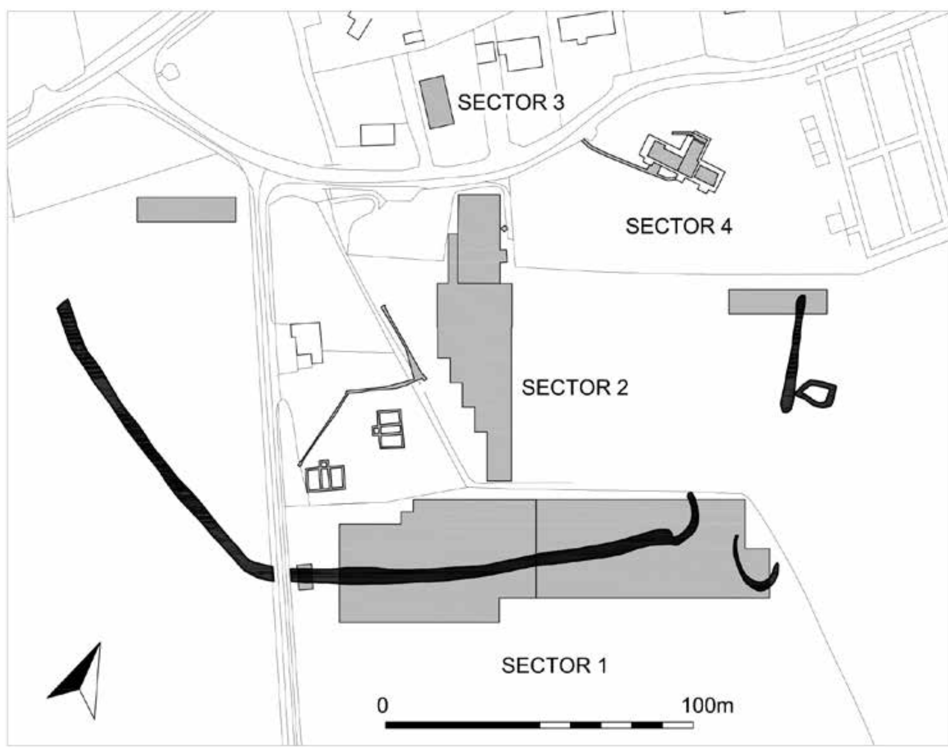


Illustration 3.1
The sectors investigated

Chronology

The first chronological tool employed was the stratigraphy. This was strong in Sectors 2 and 4 and is presented in its entirety for both sectors in OLA 6.2.2 and 6.3.2, and in summary form in Illus 3.13 and 3.21. Summaries of the stratigraphy will be found below, but having the complete sequence to hand helps give transparency to sometimes unfamiliar material and detailed argument. This stratigraphic sequence was supported or qualified by seventy-two radiocarbon dates supplied through the good

Illustration 3.2
Master plan of Sector 1

offices of Historic Scotland (see Digest 3.2). These have been primarily used to provide spans of 95% probability, even if the spans were sometimes broad. In a few cases, a series of contexts could be dated that were stratigraphically consecutive, for example five burials in the later medieval cemetery. These offered an opportunity for Bayesian refinement. Bayesian analysis was also applied to provide spans for periods and any proposed hiatus between them. Where these differed from the conclusions of the stratigraphy, the latter was given primacy (see below, p 66). A third source of chronology was provided by datable objects, present in all periods and most sectors to a greater or lesser degree.

Having taken account of the possible residuality of objects or radiocarbon samples, evidence from each type of dating was reconciled to give the best fit for each sector. The dating evidence is presented together in Table 3.1 (p 68), which provides the master chronology across all three sectors. This will be found at the end of the chapter. The sequences in all three sectors laid alongside each other offer an overall narrative for the site. This was summarised in more general terms in Chapter 1 (Table 1.2).

Excavation sequences by sector

South Area, Sector 1 (OLA 6.1)

The overall geography of Sector 1 as excavated can be seen in Illus 3.2. The large enclosure ditch proved to be one of two; the shallower and earlier was defined to the north, and this has been called the *first enclosure ditch* (S15), as opposed to the *second enclosure ditch* (S16), which was the feature located by air photography (see Chapter 2, p 19). At the west end, north of S16, was the *bag-shaped building*, S1, which began life as a metal workshop and later served as a kiln barn. S3 was the south wall of a structure that resembled S1 in form, but the little of it that lay within the excavation area was poorly preserved. S2 and S6 were slight rectilinear features, each eventually determined as being neither early nor a structure. S8 was a *well* adjacent to S1. Beside it to the east was an area of the backfilled *first enclosure ditch* (S15) that had captured part of a *metalworking zone*. On the east side, the second enclosure ditch terminated in a butt-end. South of the enclosure here were S12, a small *penannular enclosure* and (cutting it) S5, a partially defined *bag-shaped building*. Widely distributed over the excavated area in its earliest phase were parallel scratch-plough marks or ard marks, which represented a widespread episode of scratch ploughing preceding the medieval rig and furrow (Chapter 4, p 93).

The sequencing of this sector relied on stratification, horizontal association and radiocarbon: the ard marks had cut through a podzol, a grey sand with a characteristic composition that also helped to label some of the earliest contexts. Both enclosure ditches (S15 and S16) cut the scratch-plough-mark system (Illus 3.3). Bag-shaped building S1 respected enclosure ditch S16. Metalworking debris found within S1 was paralleled in the top backfill of enclosure ditch S15. Bag-shaped buildings S1 and S3 were set in echelon. Bag-shaped building S5 cut pennanular structure S12, which in turn stood at the limit of the scratch ploughing. The rig and furrow overran both enclosure ditches. Radiocarbon dating proved helpful in phasing S1 and S5 (Table 3.1). Taken together, this information was used to generate a period plan for Sector 1 (Illus 3.4).

Period 0/1 – before the late seventh century

The penannular S12 was spatially associated with the widespread scratch-plough cultivation (they were mutually exclusive), but the plough marks produced no assemblage, no plough pebbles, and no radiocarbon dates. The plough marks were cut by both enclosure ditches, S15 and S16; preceding S15, the plough marks and S12 could be therefore be seen as belonging to Period 0 (pre-sixth century), but could equally belong to the early developments of Period 1. The absence of prehistoric pottery (from any sector) raised some doubts about the features encountered in Sector 1 belonging to a prehistoric settlement (Period 0). The *first enclosure ditch* (S15) could belong to Period 1 on the grounds that it was superseded by another (S16, securely in Period 2) on a similar line, although enclosing a larger area. The verdict given in Chapter 4 is that both enclosure ditches belong in Period 2, with the plough marks and S12 either in Period 0 (prehistoric) or more probably in the early part of Period 1 (fifth/seventh century).

Illustration 3.3
Scratch-plough marks cut by the first enclosure ditch S15

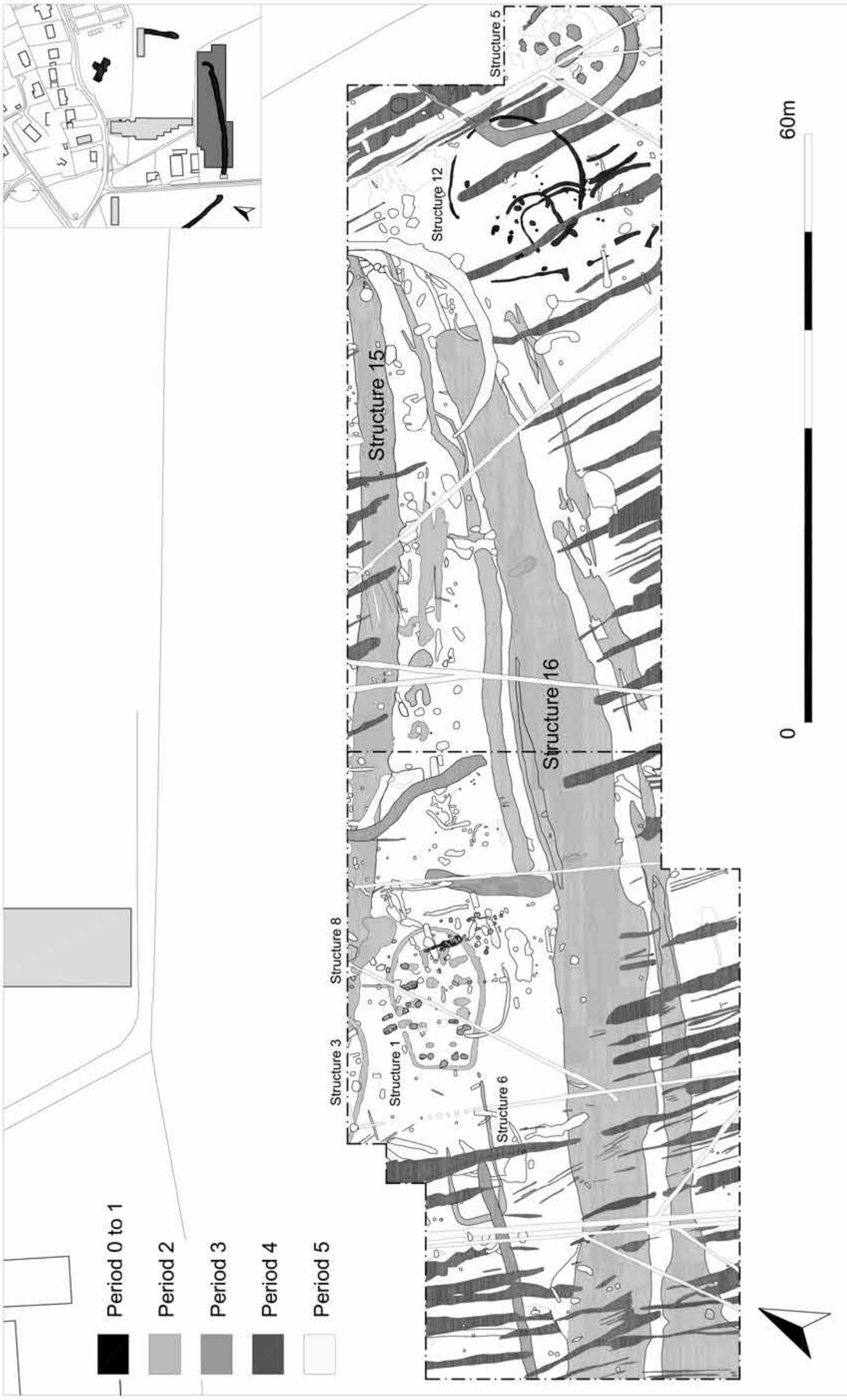


Illustration 3.4
The sequence in Sector 1 by period

Period 2 – eighth century

The *first enclosure ditch* (S15) was located along the northern edge of the sector and when excavated proved to be over 1.80m wide and up to 1.30m deep. Excavation conditions were often difficult due to groundwater, and profiles had sometimes to be determined by auger. The first enclosure ditch appears to have had two phases: initially V-shaped with a narrow flat bottom, it developed with a gentler slope to the north. This may have been a recut, or a wear pattern caused by access to water, perhaps by cattle. However there was no lining and it collapsed easily and could not have functioned as a water carrier. There was no direct dating evidence for the construction of the first enclosure ditch. It was later than the ard marks (Period 0 or 1) and earlier than the craft debris found in its final fill (below). It could therefore be Period 1, but it more probably initiated Period 2 on the basis of its similarity to its successor (Chapter 5.5).

The *second enclosure ditch* (S16) was cut through sand subsoil into the pink stony clay-sand that lay beneath. Examined at two points (in addition to Int 1, p 4), the depth of the ditch was *c* 1.6–2.0m below ground level. Where the profile of the ditch was intact, it appeared to have a relatively wide flat-bottomed base 2.6m across with possibly stepped sloping sides widening to a maximum width of *c* 7.2m. Inside and on the shoulders of the ditch there were traces of a wattle fence, probably designed to revet the upper (sand) shoulders. A radiocarbon date obtained from the wattles was 670–890 cal AD (Table 3.1). There was probably a bank implied by upcast eventually returned to the ditch, but its footprint was elusive. The ditch is thought to have functioned as a collector and distributor of water (Chapter 5.5).

A *craft area* had been located over the western end of the refilled first enclosure ditch, near the point at which it vanished under the north baulk of Sector 1. The evidence took the form of a cluster of crucible and mould fragments, indicating the working of precious metal, glass and enamel, and included an opaque white glass stud and a blue glass stud inlaid with silver wire. There were associated scoops and hollows and some post-holes, but these were not resolved into convincing structures. This activity area had survived because it had sunk into the dished backfill of the first enclosure ditch, taking it out of the reach of later ploughing. The inference is that it was a part of a craft zone that was originally more extensive. There were no radiocarbon dates, but the debris as a whole belongs to products of the eighth century (Chapter 5.7).

The *bag-shaped building*, S1, was the most intact early structure recovered in the campaign (Illus 3.5, 3.6). It consisted of a set of post-holes with post-pads designed to support a roof, and a trench filled with cobbles designed to support a wall. There was an entrance on the north side, a hearth at the origin point of the east semicircle and a contemporary pit containing metalworking debris. Radiocarbon dates obtained from the hearth were 690–940 cal AD on calcined animal bone and 670–870 from a charred hazelnut shell. The evidence for the involvement of S1 in glass- and metalworking is presented in Chapter 5.7, and the architecture of the building is discussed in Chapter 5.9. To the north of S1, the small and poorly preserved part of S3 examined suggests that it was a building of similar kind (Chapter 5.9). S1 and S3 also became the focus for the distribution of large quantities of animal bone (Chapter 5.8).

Immediately east of S1 and S3 was a plank-lined *well* S8 (Illus 3.7, 3.8). The original construction consisted of a large circular 'bowl' measuring 3.0m in diameter narrowing to 2.30m at its base. It was cut *c* 0.30m into pink clay-sand, to a total depth of 1.20m (OLA 6.1.1, 51). Within the portion of the feature that is likely to have experienced the fluctuations of the water table, a small component in the sticky clay fill was recognizable as wood and interpreted as the remains of timber plank lining. It saw extensive use, creating an access lobe to the north-east. In Period 2, this well is considered to have served the metalworkers (see Chapter 5.7, p 211).

Both the *bag-shaped building* S1 and the *well* S8 proved to have a second phase of development assigned to Period 3.

Illustration 3.5
S1 with the post-holes excavated, looking west. The well S8 is under excavation to the right. In the background, the archaeological campsite and offices (left) and disused farm buildings (right)

Period 3 – ninth to eleventh century

S1, which saw metalworking in Period 2, was adapted to new use in Period 3 (Illus 3.6). It was rebuilt with double post-holes suggesting increased load bearing, and thus an upper floor; a lined flue was admitted through the south wall, which included a reused rotary quern fragment. It is argued that these provisions indicate its use as a kiln barn (Chapter 6, p 276). Carbonised grain from the flue gave a radiocarbon date of 1020–1210 cal AD. S1 was eventually dismantled, some posts removed while they were still sound.

S8 was also modified in Period 3, with stones piled around the well pit, a long channel developed to the north-west and the whole was ultimately backfilled with black sand (Illus 3.7).

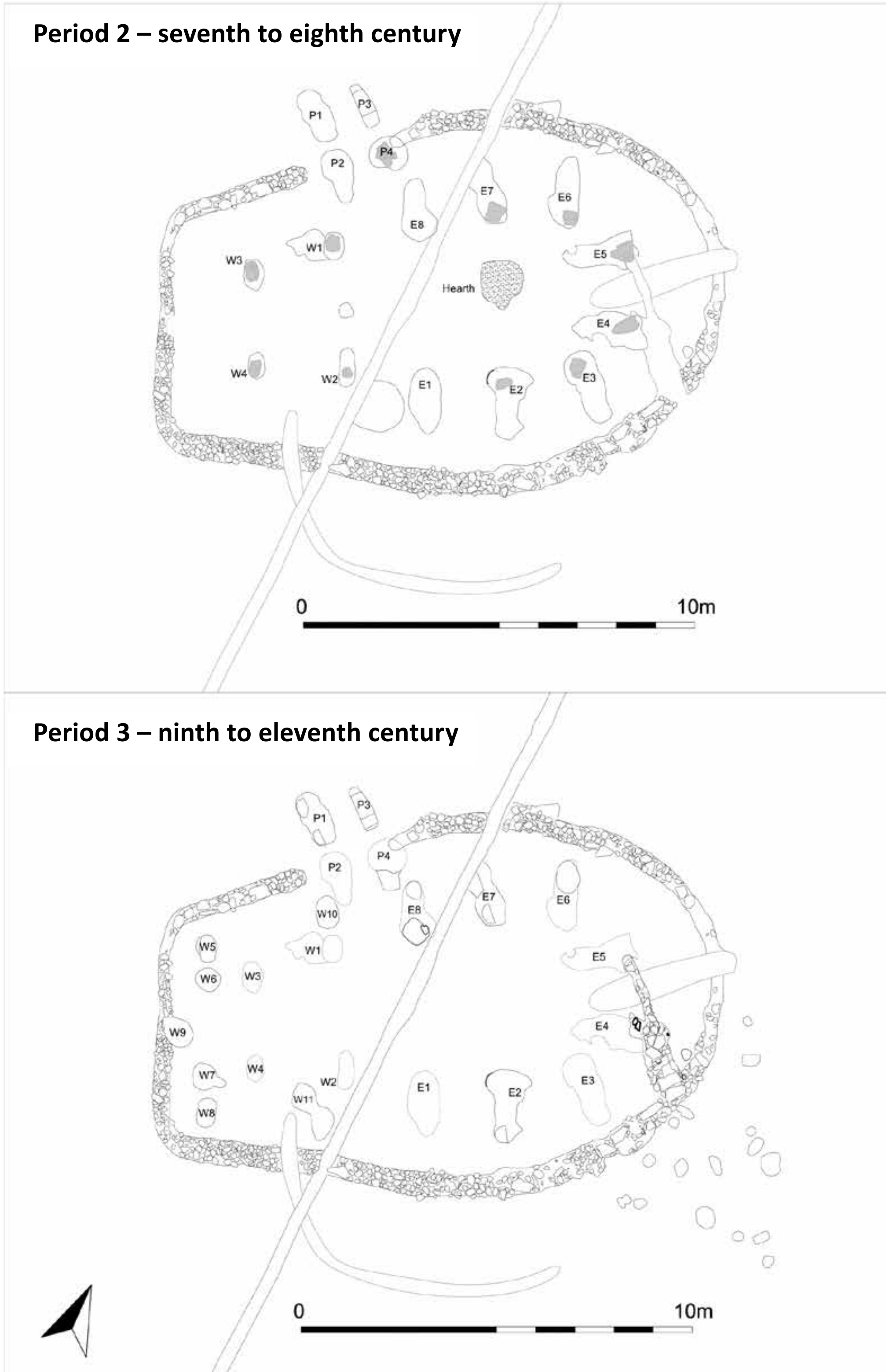


Illustration 3.6
S1 in its two phases, Period 2 (above) and Period 3 (below)

Illustration 3.7
S8, before and during excavation

The modification of the structure may have been prompted by the silting up of the main bowl, possibly hand in hand with the decay of the original plank lining. The form and function of S8 in Period 3 was uncertain but it continued to give water (Illus 3.8).

The building at the east end of Sector 1, S5, which was concerned with crop processing, gave a radiocarbon date from its central hearth 680–900 cal AD and from its enclosing ditch of 890–1030 cal AD. Enclosure ditch S16 may have been disused as early as 680–940 (determined from twigs in its fill). Along the enclosure ditches, subsidiary leats were dug, or developed, carrying water north towards the valley. One of these (F18) was disused after 780–1020 cal AD (Chapter 6, p 280).

These dates imply that the rebuilt form of S1 and the well S8, the kiln S5 and the second enclosure ditch were in use in Period 3 and were concerned with farming grain. They were slowly abandoned in the later part of this period, from the tenth into the eleventh century (Chapter 6, p 281).

Period 4 – twelfth to sixteenth century

The lowest layers contained in the second enclosure ditch were peaty, probably formed when the water had stopped flowing. In one place, the ditch had been rapidly backfilled with branches and tree stumps, followed by soil and clay-sand. A sherd of Scottish Redware (thirteenth to fifteenth century) was found in the final fill. This pottery also occurred in the plough furrows that ran over the backfill (Chapter 7).

Period 5 – seventeenth to twentieth century

The area remained in agricultural use in post-medieval times. A large number of ditches, including cobble drains, were laid in a N–S direction. These may have been intended to relieve puddling caused by the now buried enclosure ditches, but local opinion also suggested that they provided a system of water collection for the early modern village of Portmahomack.

Central area, Sector 2 (OLA 6.2)

The three parts of Sector 2 were very different in their surviving stratification (Illus 3.9). Early features at the *north* end were near the surface: they included a stone-lined tank (S4) and two areas used for vellum-working (S9 and its yard), beside a paved road (S13). In the *centre*, deposits lay deep over the stone foundations

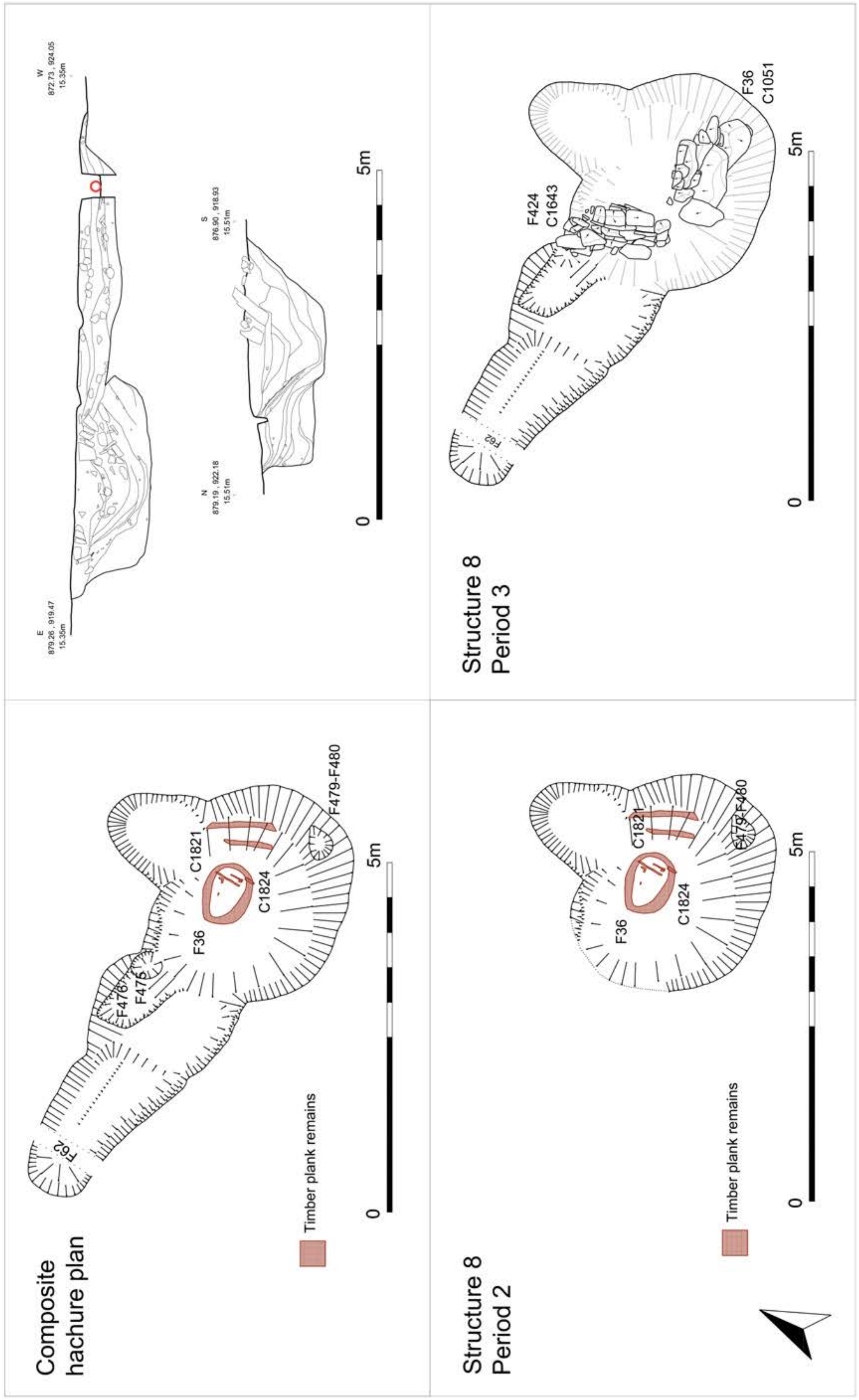


Illustration 3.8

S8: (a) composite plan (b) section (c) in Period 3, wood-lined well (d) in Period 3, with stone lining

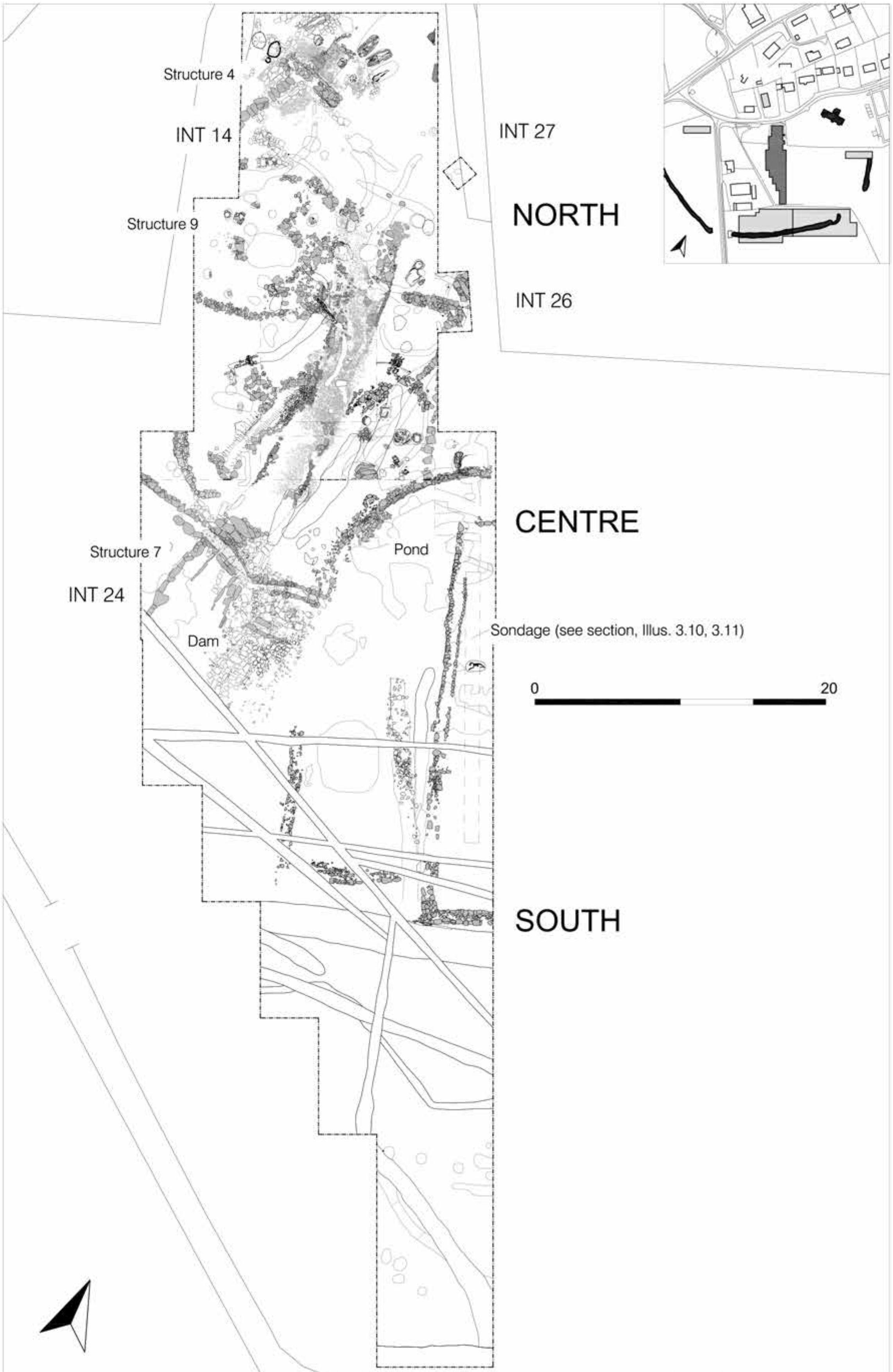


Illustration 3.9
Master plan of Sector 2

of boundary walls, road, bridge and dam (S7). In the *south*, the area was laced by working agricultural drains. The lowest part of the site was the west side, centre. Here the dam acted as a subterranean plug, impounding water coming from the east and creating a wet patch. Excavation was possible with constant pumping, and subsoil was reached and confirmed beneath the bridge. Removing the dam completely during the excavation was inadvisable, since it would have altered water retention over a considerable distance eastwards, affecting farmers and the golf club (Illus 2.3).

The sequence through the pond and into the marsh beneath it was captured on the east side in a 20m-long sondage (Illus 3.9 (location), 3.10, 3.11). Here it proved possible to chronicle the plant

Illustration 3.10
Sondage through the east side of the pond

and insect signatures from the Iron Age marsh through to the final backfilling of the pool in Period 3 (Digest 7.4) (for a N–S profile across all Sector 2 see OLA 6.2, Fig 5). The central area of Sector 2 resembled urban strata in its complexity, as illustrated by an E–W profile (Illus 3.12). An abridged version of the stratigraphy is included here for ready reference (Illus 3.13).

Period 0 – before the mid-sixth century

The subsoil was proved over about 50% of Int 14, along the west baulk (Illus 2.16), in a trench through the pond base and in the area of the dam and bridge S7. The subsoil consisted of sand and turf layers at the north end and hard gravelly sand in the valley bottom. A stream (now underground) ran westwards along the valley. Marsh deposits had formed at the stream edge, together with natural peat that gave radiocarbon dates spanning 770–380 cal BC. A dozen flint implements were found, ranging from the Mesolithic to the Bronze Age in date, but without a significant distribution pattern. The only sign of settled activity was a pit containing charcoal (F573), probably the remains of charcoal-making clamp. It was dated 130–380 cal AD (Chapter 4, p 75).

Period 1 – mid-sixth to late seventh century (Illus 3.14)

The earliest features at the north end of Sector 2 were three long-cist graves, aligned NNE–SSW (heads to the SSW), dated fifth to seventh century and contemporary with the earliest burials found under the church (Sector 4, below). One of these, Burial 188, was crowned with a mound and close to a ditch. There were curvilinear ditch segments both to the north (S14) and south (S10) of these burials. The interpretation of these cist graves as belonging to a barrow cemetery was enhanced by the detection of a burial cluster (possibly in a mound) under the church (see below) and a post-War air photograph that showed ring ditches in the area on the crest overlooking the firth (see Illus 4.11).

The first sign of residential occupation was a circular structure, S11, with a central hearth (F535). Fragments of slag, a whetstone, a blade and deposits of ash from the hearth and its surroundings indicated a metalworking site. Key finds were iron dress pins and a gilt-bronze roundel from a sixth/seventh-century horse bridle, comparable with one from Sutton Hoo. East of S11 was a network of water-management facilities, including a wicker-lined well (F527) connected to a cistern and a gulley in use at the same time as the hearth. Further south, a number of W–E gulleys and a wattle fence suggested delineation of the settlement area from the marsh. Radiocarbon dates were obtained from the burials (430–610 cal AD and 540–650 cal AD), from the wicker lining of the well F527 (600–675 cal AD), and a charred hazelnut shell from the final use of the hearth F535 (640–770 cal AD) (Chapter 4).

Period 2 – eighth century (Illus 3.15)

A spread of sterile windblown grey sand (C3537) may imply a short hiatus after Period 1. The redevelopment that then followed in Period 2 was the most significant seen at Portmahomack. Spreads of clayey silt (eg C2809) were used to consolidate the ground at the pond's edge, while the ground to the north was levelled in preparation for workshops and a road. Stratigraphically, the *road with its ditches* (S13), the *boundary walls, the dam, the bridge* and *pool* (S7) were all of one build, and inferentially of a single integrated design (Chapter 5.5). The *tank* (S4), *workshop* (S9) and the *yard* that lay on the west side of the road were also of contemporary build and use and interpreted as a craft area dedicated to the production of vellum to make books (Chapter 5.6).

Each of the major structural areas experienced episodes of individual biography. There were two decommissioned inlet channels into the tank S4, but this is not thought to have indicated any change of its use, interpreted as for washing or preserving hides. The hearth in S9 had two phases (F495/F529). The industrial activities generated a large amount of ash, which

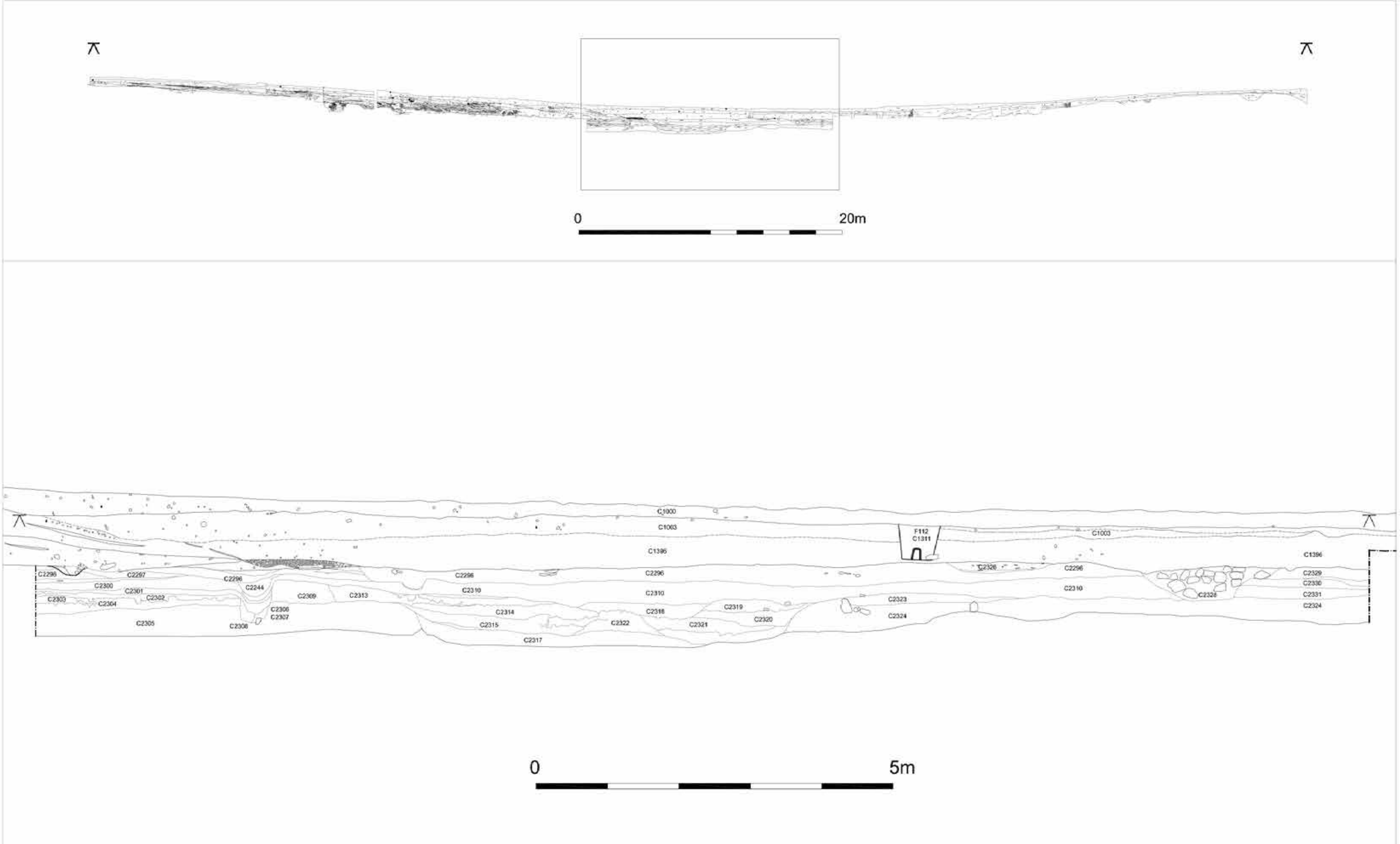


Illustration 3.11
Extract from the N–S profile through Sector 2, showing the sequence in the pool

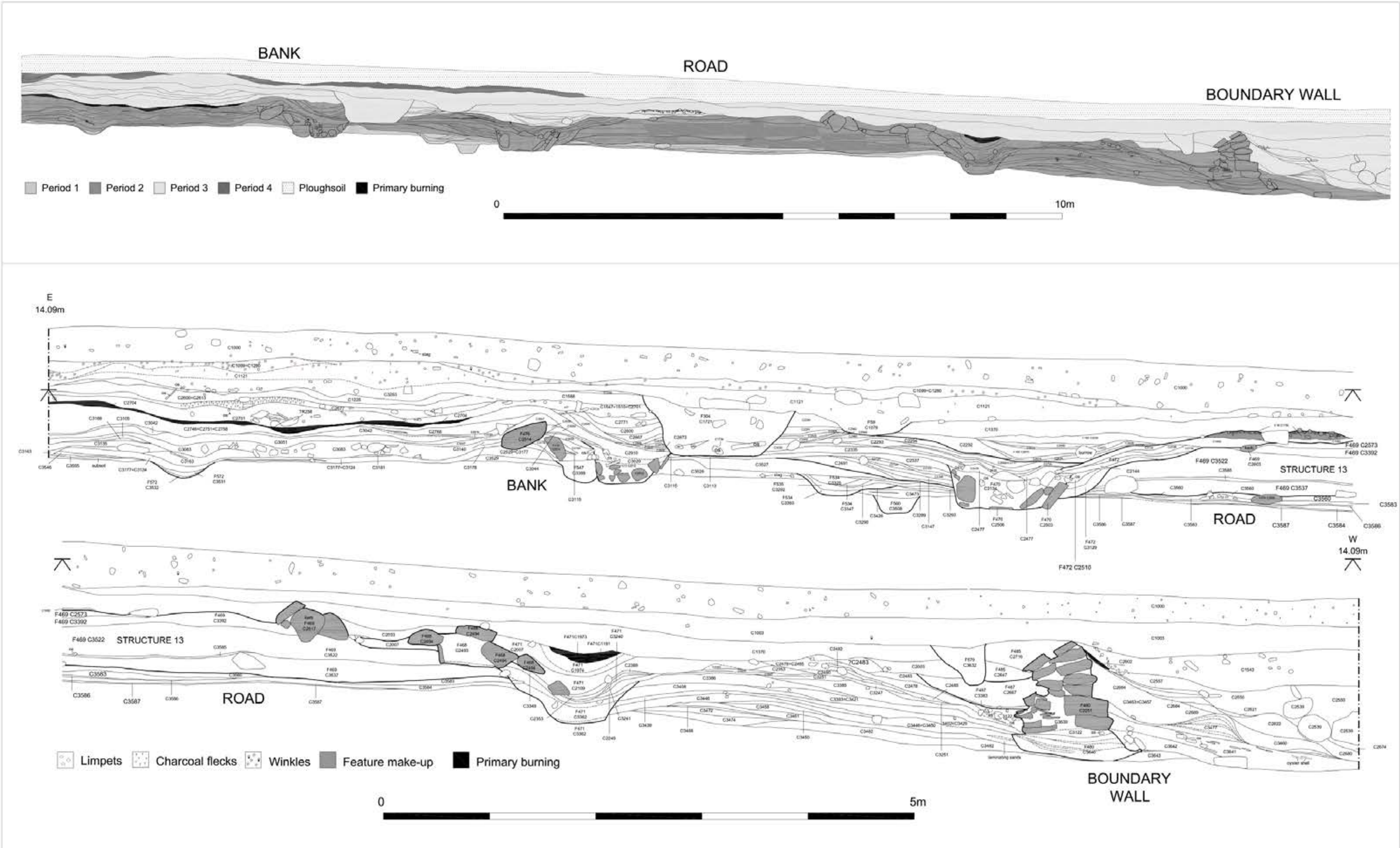


Illustration 3.12
E–W section through the central area of Sector 2 showing the road (S13) and the boundary wall F480

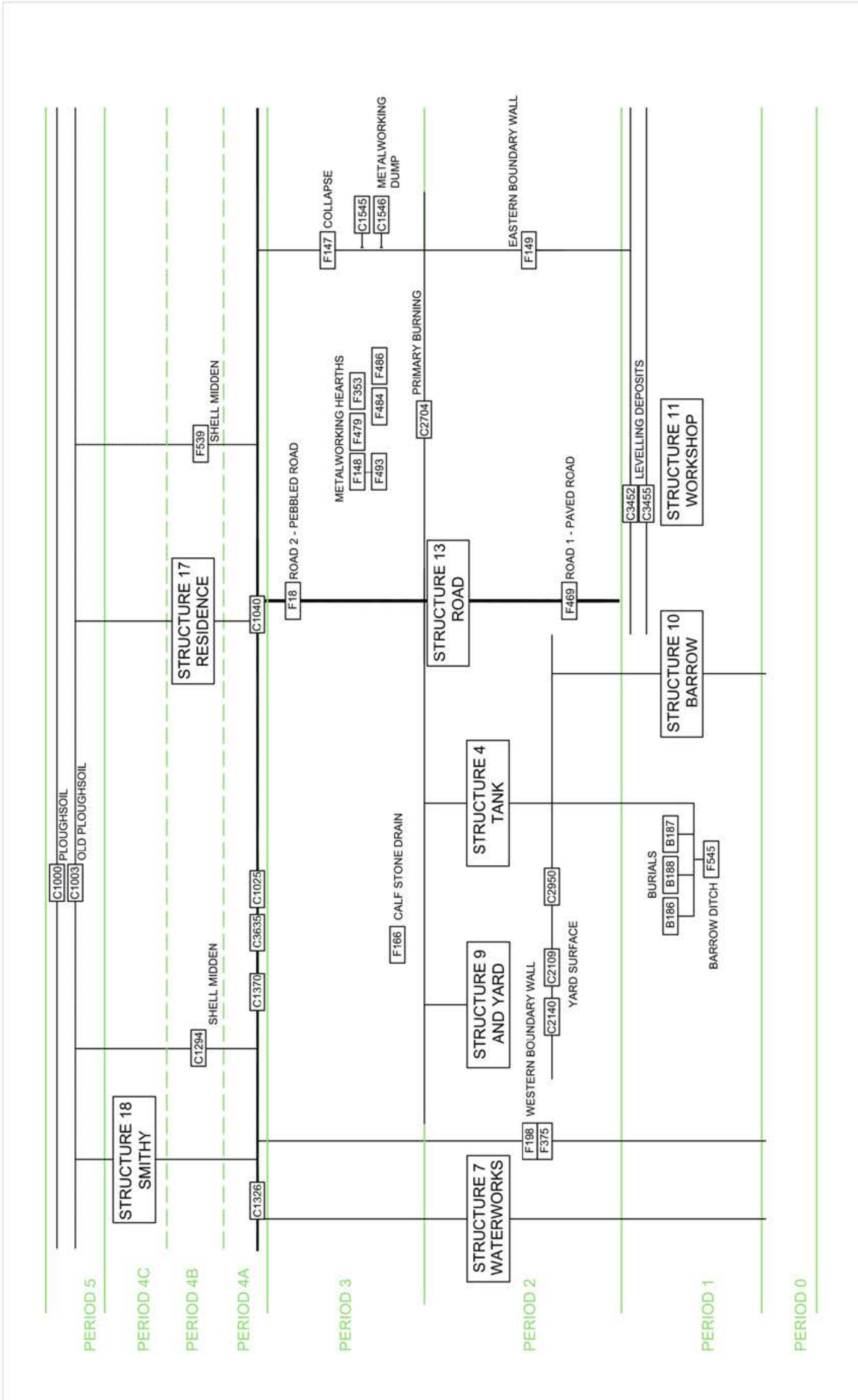


Illustration 3.13
Summary stratigraphic diagram for Sector 2

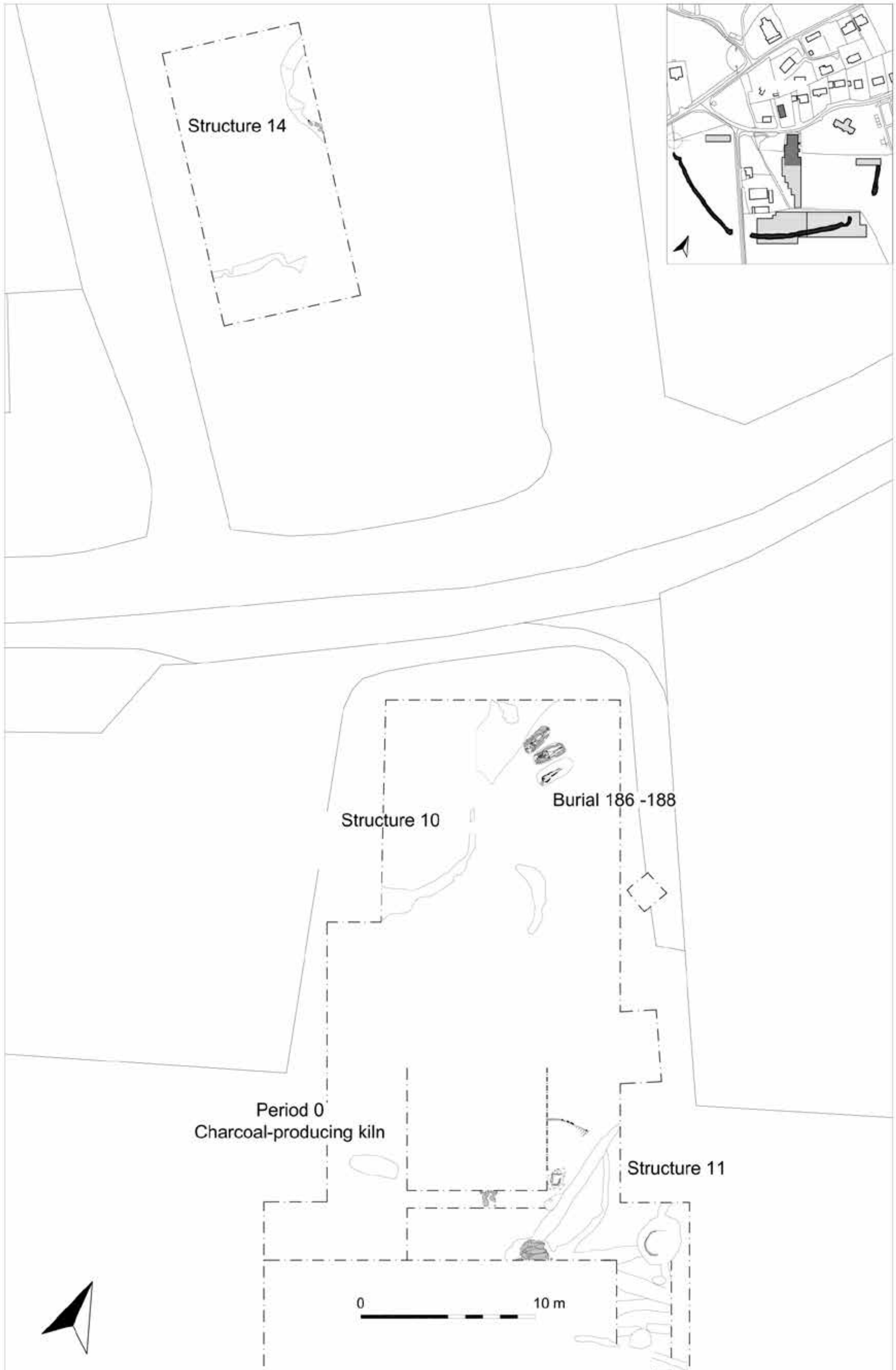


Illustration 3.14
Period 1 features in Sectors 2 and 3

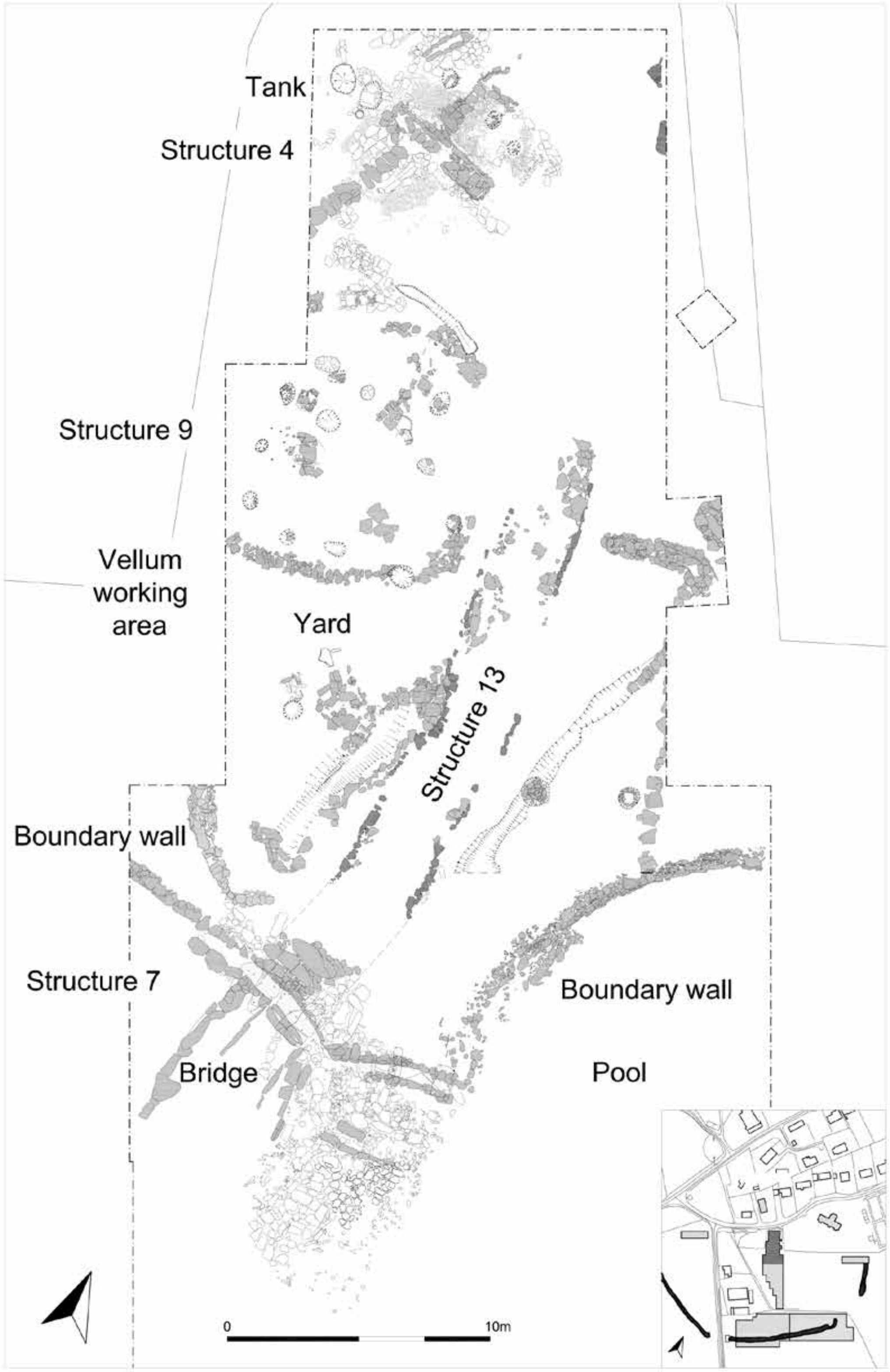


Illustration 3.15
Period 2 features in Sector 2

built up the ground level at the south end. Ashy silts had been used to patch the road, and spilled into the roadside ditches. Both the roadside ditches were originally lined with timber and designed to canalise water down the hill towards the pool. The west ditch F471 was provided with a stone baffle (F533) and the east ditch F472 with a stone-lined pit F470; these were probably measures designed to assist drainage as the ditches became choked with ash. There was a large assemblage of animal bones and a good sequence of plants. These are combined with the evidence from stable isotope analysis (see below) to report on the subsistence and economy (Chapter 5.8). The form of S9 recalled that of S1, the bag-shaped building in Sector 1, but it had survived less well. Its architectural feasibility is discussed in Chapter 5.9 (p 242).

Illustration 3.16
Excavating pieces of broken sculpture over the layer of burning that terminates Period 2 (Sector 2)

The water management complex S7 consisted of a dam (F440) constructed of stone rubble above a clay dump, crossed by one, or possibly two overflow culverts F431, F432. Where the road ended there were massive capstones over the culvert F431, a wall F394 and a setting of large stones on edge (F577). These are thought to have been elements of a bridge, crossing the outflow from the pool. The disposition of the pool and dam generated strong expectations of a mill, but no traces of a penstock, a wheel pit, a wheel, paddles or millstones were found. A dry-stone wall bounded the pool to the east and north (eastern boundary wall, F149) and another ran northwards on the west side of the road (western boundary wall, F480). These boundary walls and the road were connected to the dam and bridgehead, leaving little doubt that pool, road, dam, bridge and boundary walls came into being at the same time (Chapter 5.5).

There were eight radiocarbon dates placing the activities in this period between 590 and 810 cal AD (see Digest 3). The earliest deposit in the pool (C2296) was dated 590–760 cal AD and animal bone under boundary wall F480 was dated 640–770 cal AD. Bayesian analysis gave a start date between 645 and 685 (at 50% certainty). A broad bracket for the start of development in Sector 2 is taken as between AD 660 and AD 700, abbreviated to '*c* 680' (Table 3.1). The six dates from the workshop were very close to each other (640–780) suggesting a short life for the monastery.

The end of Period 2 was marked by a major fire, followed by the deposition of numerous pieces of broken sculpture (Illus 3.16). The fire horizon ('primary burning') was signalled by a series of brightly coloured ash layers at the same stratigraphic level lying over the northern area (Int 14) and extending southwards down to and over the boundary walls (Chapter 5.11). The sculptural fragments (over 200 of them ornamented) were scattered in and around the eastern roadside ditch F472, and over the boundary walls both east and west, where they had sunk beneath the water or into soft mud. A large piece was found on the far side of the west boundary wall F480, other large fragments over the eastern boundary wall F149, one adjacent to the mouth of culvert F431, and another at the east limit of the terrace, where it had sunk to the level of Period 1 well F527. Burning affected S9 and S4, and together with a layer of windblown sand within S4 marked the permanent loss of interest in vellum production.

Radiocarbon determinations gave a variety of dates for the fire, partially dependant on what was dated: burned oak timbers (from Int 26), 330–550 cal AD; a hazel stake (F490), 400–570 cal AD; burned wattle from the east terrace wall (F483/2584), 610–690 cal AD; charred wattle (C2704), 650–810 cal AD; latest deposit in the pond (C2296), 650–840 cal AD. The date from the most contemporary context (the charred wattle) is unfortunately very broad, but the event should have take place before AD 810. A stick pin (24/4576) from C1878 underneath one of the destruction layers (C1662), serves to draw the episode into the ninth century, as does the sculpture buried in Sector 2, which was generally not weathered and should date to the late eighth to early ninth century AD (Chapter 5.3, p 166). It will be argued in Chapter 5.11 that the raid took place between AD 780 and AD 810.

Period 3 – ninth to eleventh century (Illus 3.17)

Events assigned to Period 3 in this Sector focus on a metalworking industry that arose on the remains of the burnt out workshop (Period 3A). The smithing hearth F148 (last use dated 660–880) was carefully dissected, showing that its stratigraphic position followed closely on the primary burning. The technology of the industry resembled that practised in Period 2, but the crucibles were larger and the products more secular. Among the finds associated with this industry were a smith's hammer, a carnelian cabochon, stone moulds, a fire-gilding mortar, a silver-gilt copper-alloy stud and a painted pebble. Major deposits of crucibles, moulds and slag were recovered

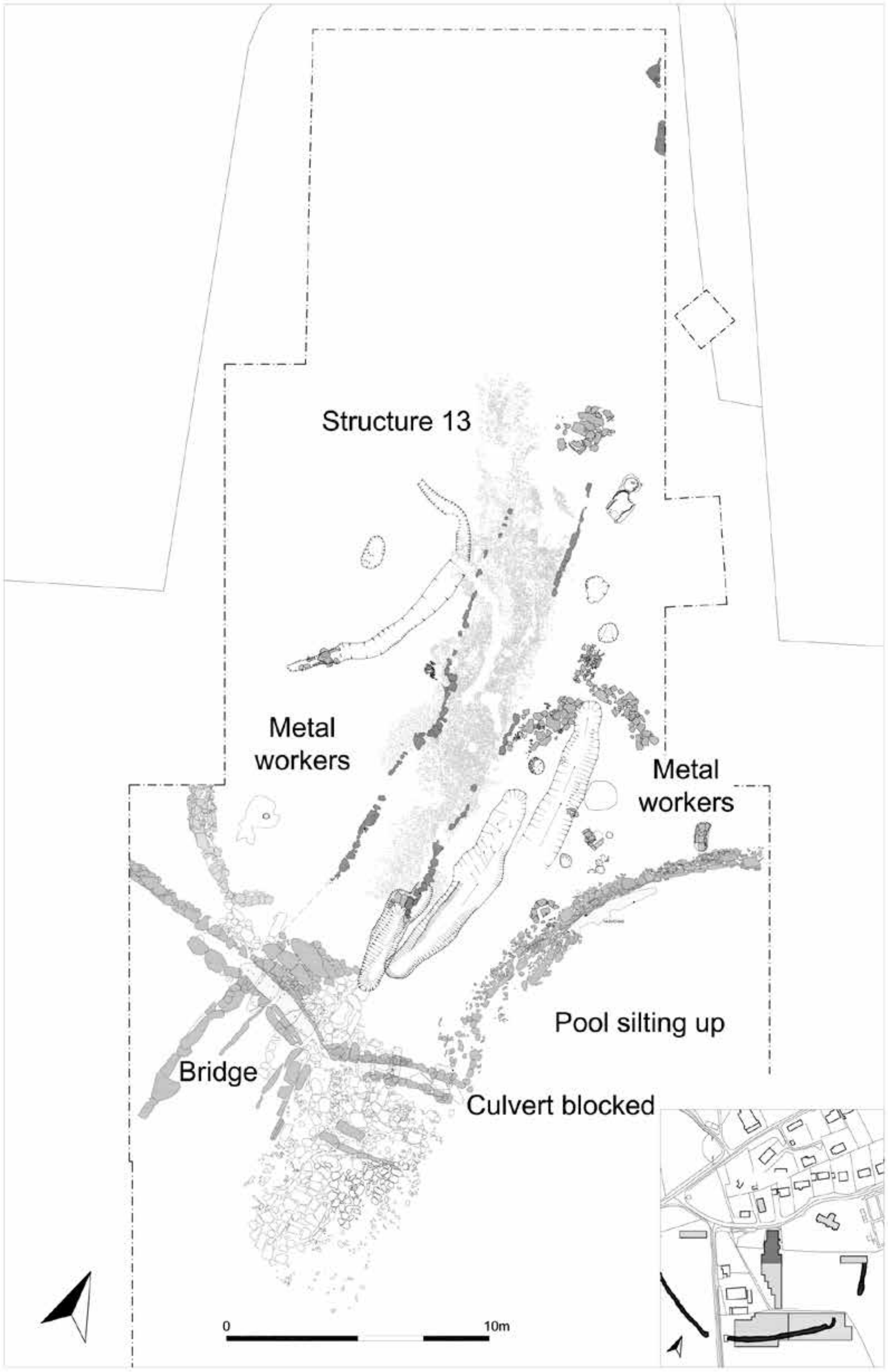


Illustration 3.17
Period 3 features in Sector 2

Illustration 3.18
Period 4 features in Sector 2

from the far side of boundary wall F480 and from the pool beside boundary wall F149. Among these the most significant were moulds used to make bronze weights, implying trade. It could be concluded that the pool continued to hold water. However, at a given moment the overflow culvert F431 was blocked, suggesting that attempts were being made to conserve the level of the water impounded, and subsequent deposits within the pool showed that the area was drying out. The road S13 remained in use but was resurfaced with small pebbles (Illus 2.13).

The end of Period 3 is marked by a blanket of grey sterile silt (C1121), which also overlay the road. A butchered cow buried in a pit cut into the Period 3 metalworking horizon gave a radiocarbon date of 820–1020 cal AD. There is no medieval pottery from contexts certainly within Period 3, which should therefore have ended before the twelfth century. In the overall chronological model (Table 3.1), the metalworking technology and radiocarbon dates place the industry between 780 and 880 (Period 3A), and this was followed in Sector 2 by a lengthy period of disoccupation, 880–1050 (Period 3B).

Period 4 – twelfth to sixteenth century (Illus 3.18)

The chronology of Period 4 in Sector 2 was divided in to three. Period 4A, assigned to the building of the parish church in the twelfth century, saw very little activity in Sector 2. The coin series indicated two later periods of occupation with a gap between them: from the thirteenth century to *c* 1350 (Period 4B) and from *c* 1450 to *c* 1550 (Period 4C) (Digest 6.11). These reflected the two main periods of settlement in Sector 2.

Features in the north that had cut the blanket of grey silt over the pebbled road of Period 3 included a well (F13), an oven (F3) and numbers of gulleys and post-holes that were interpreted as marking up the footprint of a dwelling, S17. In the centre, the infilled pond was overlaid by spread middens, containing quantities of shells and fishbones. Both residence and middens were associated with Redware pottery suggesting a date in the thirteenth/fifteenth century (Period 4B).

In a second development, post-dating the residence and middens, Sector 2 was given over to iron-working. A smithy (S18) was built in the central area, and ironworking spread widely beyond the sector: quantities of slag were found in Int 8 to the east and reported under the churchyard (Chapter 2, p 17). Dating evidence from coins, medieval pottery, horseshoes and a leather spur strap with fleur-de-lys mounts suggested a fifteenth/sixteenth-century date (Period 4C). By Period 5 (seventeenth to twentieth century), the land in Sector 2 had been given over to agriculture (Chapter 7).

Across the Road: Sector 3 (OLA 6.2/2.2, 3.5)

An opportunity to investigate the built-up area on the dunes to the north of Tarbatness Road was presented by a vacant plot opposite the end of Sector 2. An intervention 8 × 16m (two modules) was excavated to natural subsoil at *c* 14.5m AOD (Illus 3.19). Two early features here took the form of shallow gulleys, one of which (S14) was a segment of a ring ditch (above). An air photograph dated 1945 showed a large number of ring ditches in this area (Illus 4.13). For this reason S14 is tentatively interpreted as a barrow and included in Period 1 (Chapter 4). Stratigraphically later activity in Sector 3 was expressed by a large numbers of pits, which appeared to have been dug to extract the clean sand of the dunes. The presence of Scottish Redware dated these to the Middle Ages; they were perhaps connected with the building of the later medieval church (Period 4) (Chapter 7).

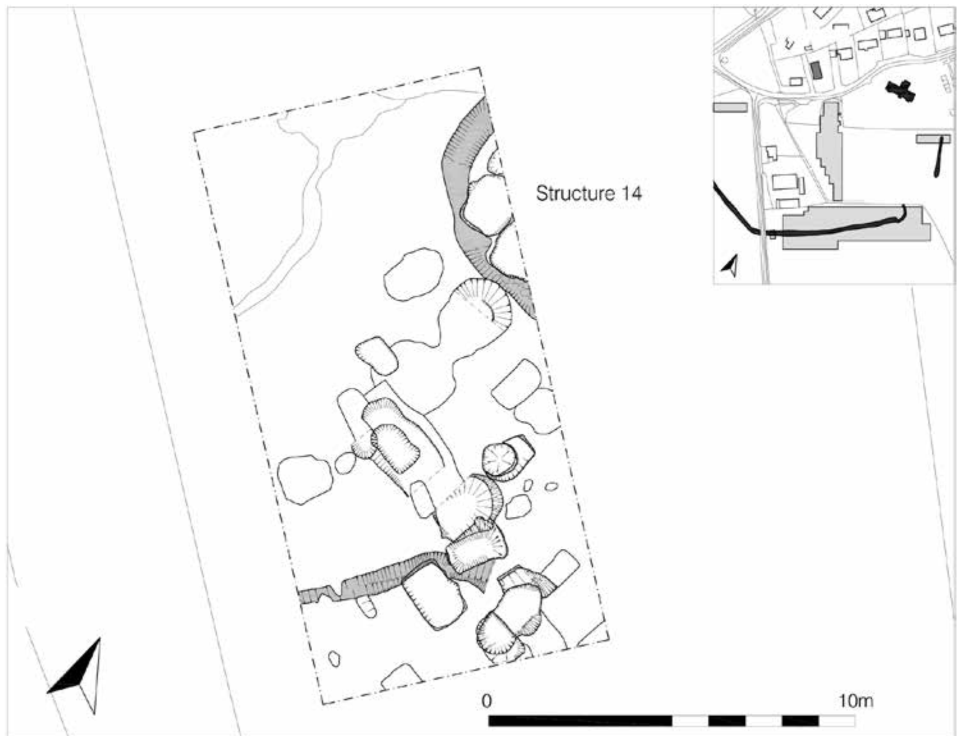


Illustration 3.19
Master plan of Sector 3

The Church area: Sector 4 (OLA 6.3) (Illus 3.20)

Excavations in the church took place in the north aisle (Int 17), the crypt (Int 19) and various trenches and sondages outside the church in association with its restoration and connection to the main services (Int 16, 18 and 22; Illus 2.18). However the principal stratigraphic sequence came from excavations in the nave (Int 20) where some 200 burials and other features were defined. The resolution of this sequence was aided by certain horizons indicating construction or disuse, which also assisted in making connections with the architectural sequence obtained by analysis

Table 3.2
Sequence in Sector 4* [after Fraser & Munro 1988, with additions]

Period	Date	Burials	Church	Memorials	* Documentary
1	*c* 550–680	Period 1 long cists	–	–	Columba in north-east Pictland Colman at Lindisfarne
2	*c* 680–810	Period 2 burials	Church 1 [?]	Grave markers and standing cross slabs	710 Nechtan expels Columban clergy Curatan active in Easter Ross
3	*c* 820–1100	Period 3 burials	Church 1 ruinous [?]	Broken cross slabs	Vikings active in Orkney and Sutherland 1035 Battle of Torfness
4A	*c* 1100–1200	Burial 117	Church 2/3 built	Some sculpture incorporated in foundations	
4B	*c* 1200–1350	thirteenth/ fourteenth-century burials	Church 4 and crypt built	Grave slabs at west and east end	1220 Abbey of Fearn founded 1255 a parish church at Portmahomack 1274 Revenues assigned to a Canon of Fearn
4C	1450–1620	Vault inserted in crypt fifteenth/sixteenth-century burials			Church burnt Relics of St Colman in the crypt at Tarbat *c* 1560 Reformation
5	1623–1756	Cartouches of James and Jeane Cuthbert 1623 William Mackenzie, Minister buried in North Aisle (1642) Vault in North Aisle	Church 5	Memorials in the churchyard	1626–8 Parishes of Fearn and Tarbat separated 1690 Revolution settlement. St Colman's under local control George Cromartie heritor 1709 x 1728 Construction of the Manse 1721 Church ruinous 1739 Church very ruinous
5	1756–1800		Church 6	Memorials in the churchyard	1756–1762 Church rebuilt Bell refounded 1780–5 major repairs. N aisle lengthened by 10 feet
5	1800–1843	Memorial to William Forbes 1841	Church 7	Memorials in the churchyard	1804–7 Churchyard wall built
5	1843-1946		Church 8	Memorials in the churchyard	1843 The Disruption 1853 Congregation numbers 85 1856 Extensive repairs recommended 1868 Churchyard extended 1893 Churchyard extended 1928 Church transferred from heritors to Church of Scotland 1946 Church declared redundant

of the building fabric (Int 23). On this occasion, therefore, the sequence below ground and that above ground were integrated, and anchored in real time with thirty-one radiocarbon dates, mainly on human bone (Stratigraphic diagram for Sector 4, OLA 6.3.2). The sequence is summarised in Illus 3.21 and see Table 3.1 for the dates. The later parts of the sequence could also be aligned with the history of the church recorded in documents (Table 3.2).

The cemetery was stratigraphically continuous from Period 1 to 3, sixth through to eleventh century. Burials assigned to Period 1 (there were sixteen) employed either the cist or the simple burial rite. Those of Period 2 and 3 (fifty-eight) were head-support or head-box or simple burials. Of these, seventeen could belong to

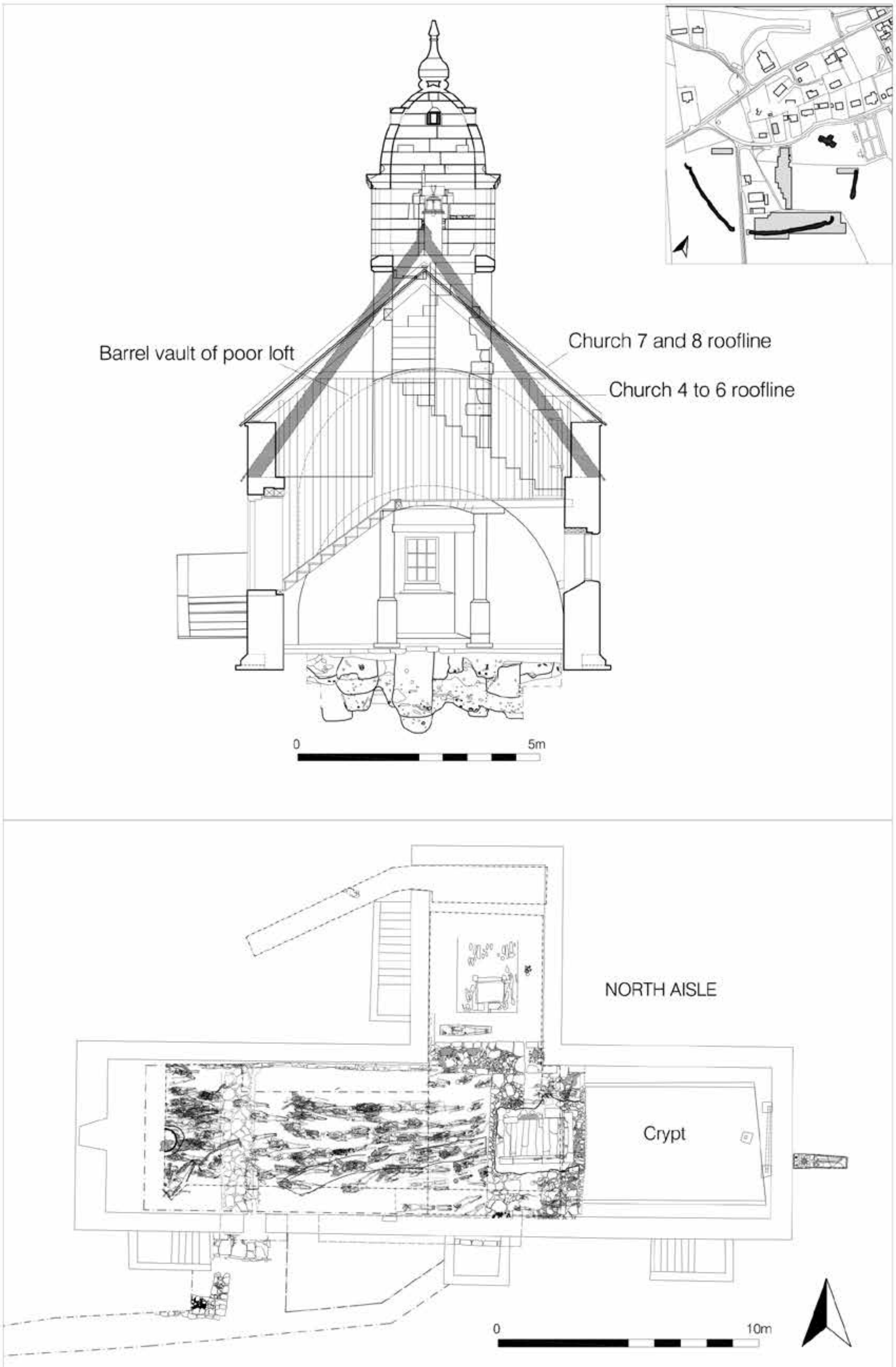


Illustration 3.20
Investigations in Sector 4, showing a section N–S through the church and the area excavated

Table 3.3
Distribution of the major primary assemblages

	Sector 1	Sector 2/3	Sector 4
Period 0/1		Lithics Human remains Iron-working slag Plant remains (hearth) Plant remains (marsh)	Human remains Burnt grain (F129)
Period 2	Moulds, crucibles Glass, slag Plant remains (enclosure ditch)	Vellum manufacture Plant remains (hearth) Plant remains (pool) Animal bone Winkles and whelks	Human remains Carved stone
Period 3	Burnt grain Animal bone	Moulds and crucibles, iron-working slag Animal bone	Human remains
Period 4		Fish and shellfish, fishing equipment Iron-working slags Grindstones Coins Pottery Rotary querns	Human remains Coffin wood Woollen hose Leather shoes Window glass Pottery Carved stone Coins
Period 5			Human remains

the later Period 3 (ninth to eleventh century). In Period 4A, just one grave was recognised as belonging to the twelfth-century parish church (Church 2), while burial in the nave of Church 4 started in the late thirteenth or fourteenth century (Period 4B). Most of the medieval burials could be placed by stratigraphy and radiocarbon in Period 4C, the fifteenth to sixteenth century. After the Reformation, burial inside the church was rare, although a minister, William Mackenzie, was buried in the north aisle in 1642. Stratigraphically, cist graves had primacy (Period 1), followed by head-support or head-box burials in Period 2 and 3. Those of medieval date (Period 4) included examples with shrouds and wooden coffins (Illus 3.22c).

The evidence for a church in the Pictish period (Church 1, Period 2) was elusive (Chapter 5.4). The first well-defined church was Church 2 in the twelfth century, which was developed as Church 3 and 4 during Period 4 (Illus 3.23). These were followed by post-medieval (Period 5) Churches 5 to 8, terminating in 1999 when the building became a museum (Chapter 7).

Period 1 – sixth to seventh century

Period 1 burials were cut through a posolized buried soil (C1383). Sixteen burials were assigned to this period, of which twelve were long cists. Six of the persons were males, four females, and six indeterminate. The orientation was generally NE–SW. A tightly bunched group in the south-west corner of the excavation was of three females, one possible female, one male (Burial 162), an adult and a possible sub-adult. These rose above the contemporary ground level and are proposed as being inside or forming a mound. The only other Period 1 feature was a ditch (F129), timber lined and containing burnt grain. Radiocarbon dating shows that none of the certain cist graves or the ditch was later than AD 690 (Chapter 4).

Period 2 – eighth century and Period 3 – ninth to eleventh century

There was stratigraphic continuity between the fifty-eight burials interred between Period 1 and Period 4, which shared an age/sex profile (middle-aged men) and a burial rite (head-box). These burials had cut cist graves and were cut by the foundations of the first medieval church (Church 2). They had been formally laid out in four or more rows, orientated E–W, while the more easterly burials adopted a more ENE–WSW alignment. There was a dense cluster in the north-west corner of the excavation area, which included the latest burials. Of fifty-eight burials, seventeen had stone slabs either to the side or on top of the head (head-support and head-box burials; see Illus 3.22b). There were fifty-four identified males, one female, one probable female, one ungendered adult, and one child. Twenty-eight of the males and one of the women (67%) had died at ages of forty-six and over, five of them over sixty. This was a highly unusual population profile, dominated by mature males (Chapter 5.2, Table 5.1).

It is likely that it was these burials that had been served by at least fourteen grave markers that had been disturbed and reused by later church builders (Chapter 5.3). There was probably a church in Period 2 but its presence was inferential: some pieces of sculpture appeared to be architectural, and the alignment of the east wall of the crypt and of the more easterly Period 2 burials suggested the stance of a building somewhere to the east. The various possibilities are considered in Chapter 5.4.

Of fifteen radiocarbon dates on Period 2/3 burials, nine had terminal dates in the ninth century or earlier and were assigned to Period 2. Three of the other six (Burials 147, 158, 159) had end dates in the tenth century, and three others (Burial 111, 136, 156), the latest in the stratigraphic sequence, were interred after 970 (Table 3.1). Out of the seventeen stratigraphically latest burials, all respected the rows except Burials 147, 136, 156 and 111. The implication is that the majority of the Period 3 burials were interred in the ninth century (coeval with the Period 3A metalworkers in Sector 2), and only a few others were added

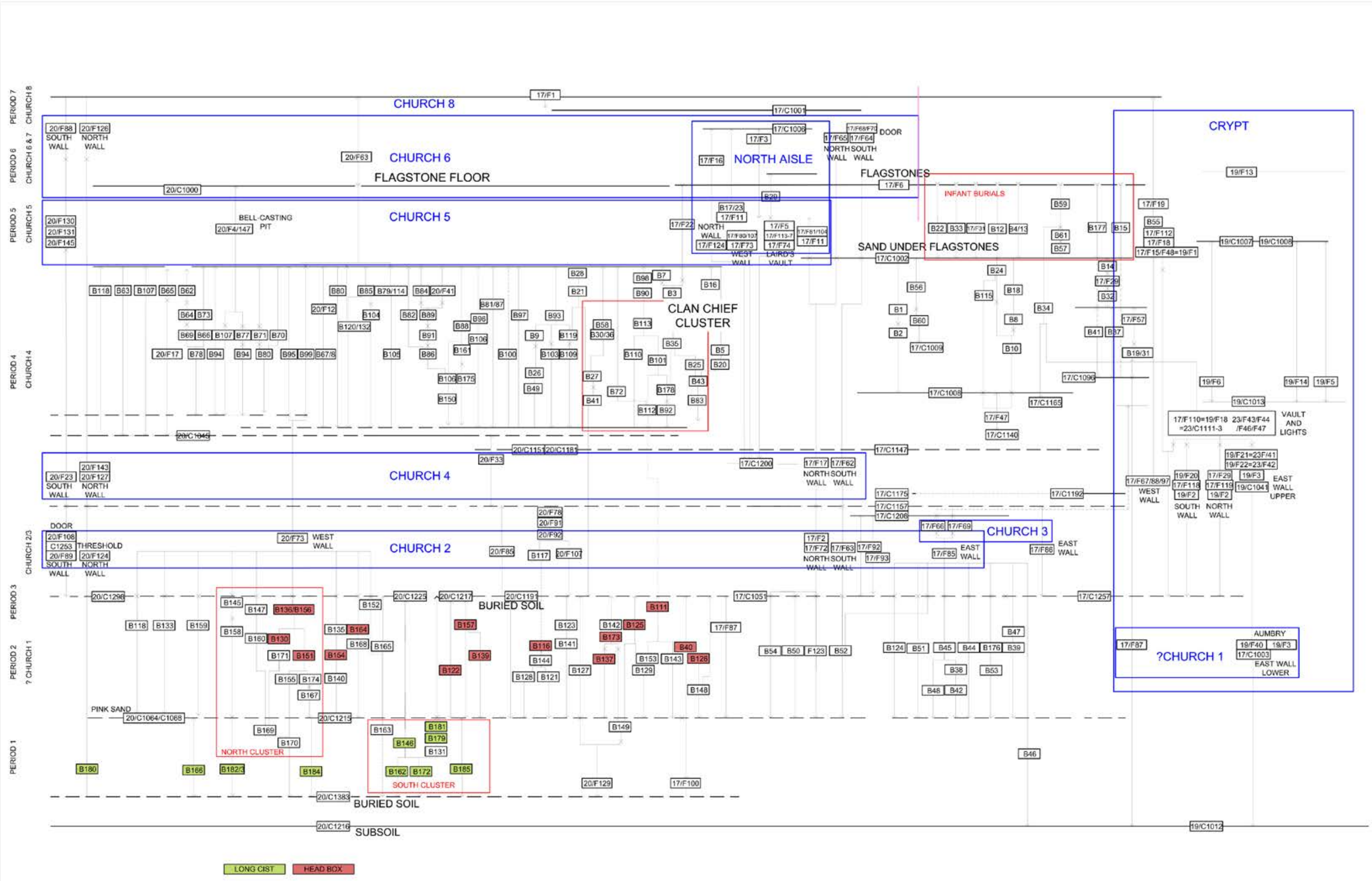


Illustration 3.21
Summary stratigraphic diagram for Sector 4

Illustration 3.22
Types of burial: (a) long cist under excavation in the nave (Burial 172); (b) head-box Burial 40; (c) coffined Burial 21

intermittently over the tenth, eleventh and twelfth centuries (Chapter 6).

Period 4 – twelfth to sixteenth century

The first medieval church, Church 2 was a rectangular foundation of cobbles surmounted with sandstone ashlar, of which the east and west walls, and part of the north wall, were recorded (Illus 3.23). A rectilinear chancel was appended to the east end to give Church 3. Six pieces of ornamented Pictish sculpture were incorporated into the foundations, which show them to be later than the eighth century. A single male burial (117) was interred in Church 2/3. He had died of a violent blade attack from behind and was laid with his head to the south-west at a date between 1150–1270 cal AD. A bell-casting pit (dated 1040–1260 cal AD from charcoal) was located centrally to the foundations. Architectural analogies for Church 2/3 would place it in the twelfth century (Chapter 7).

Church 4 represented a major rebuilding, assigned to the thirteenth century. The west end was extended to house a belfry and the east end to provide a crypt. The exterior walls were embellished with a chamfered plinth course at knee height. The crypt was excavated at the east end and provided with four vertical walls, of which the east wall, on a different alignment, was perhaps adapted from an early church (Chapter 5.4). The first medieval burials followed in the nave. The crypt had been commissioned by the mid-fourteenth century when a grave covered by a stone slab with a floriated cross carved in relief was placed against the exterior of the east wall.

Scorch marks from a fire were recorded on the east and west walls of the crypt, following which a barrel vault was inserted. A majority of the eighty-eight Period 4 burials were cut into a mortar floor (C1175) laid following the fire, and sealed by a flagstone floor. Most burials were orientated E–W, twenty-five had coffins, ten had shrouds, and three had both. There were thirty-nine males or probable males, twenty-four females or probable females and three undetermined adults, eighteen children, three infants and one juvenile. A group of high-status males occupied a prime position opposite the entrance to the crypt, the central coffin being occupied by two males accompanied by four additional skulls (Burial 30/36). A total of twenty-one infants were clustered near the crypt entrance, a group possibly augmented in Period 5. Associated objects place most of the graves in the fifteenth to sixteenth century. Burial 43 included low boots and woollen leg hose of the early fifteenth century and Burial 24 included two billon pennies of James IV dated 1500–1520.

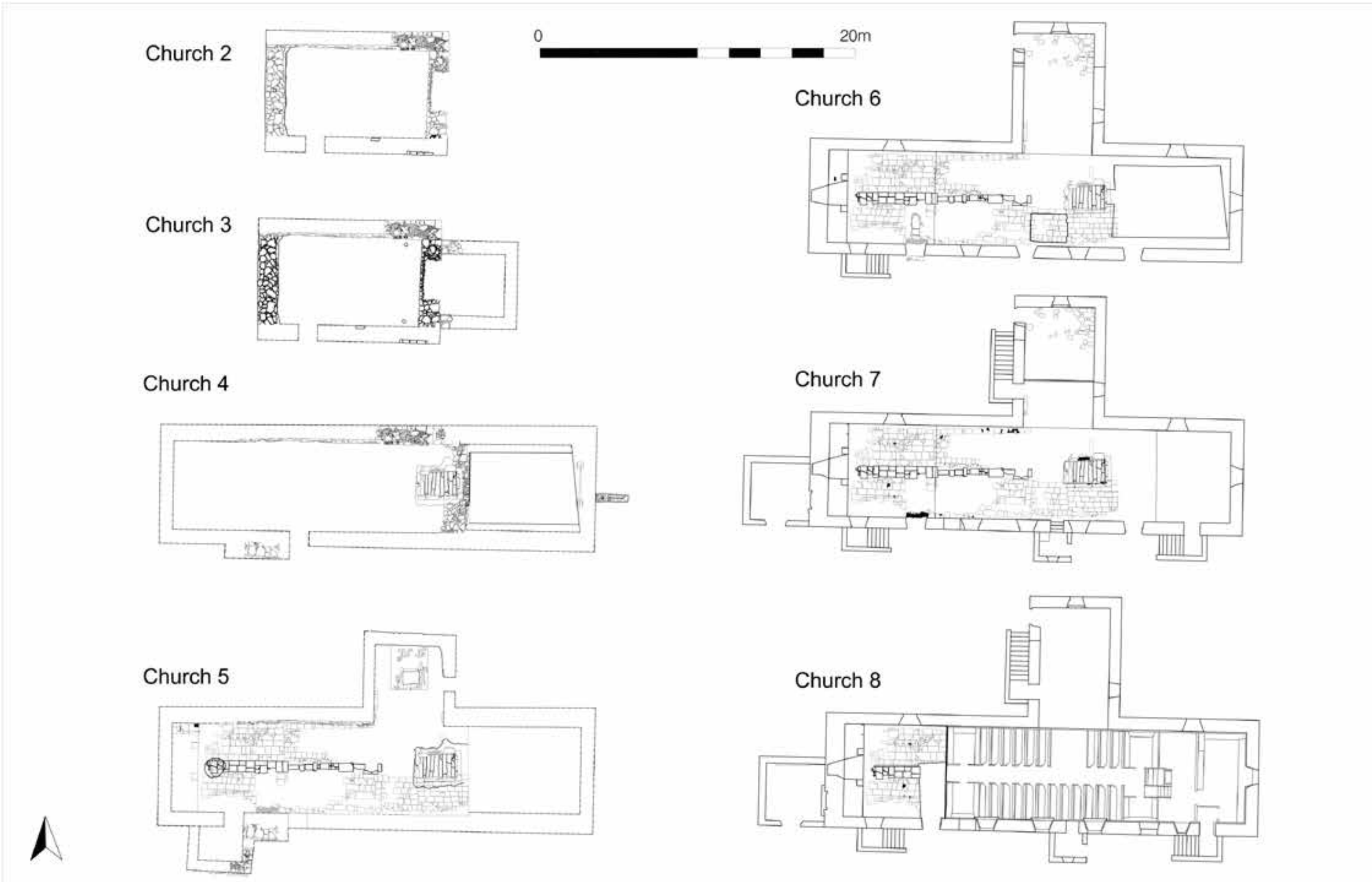


Illustration 3.23
Plans of Churches 2–8

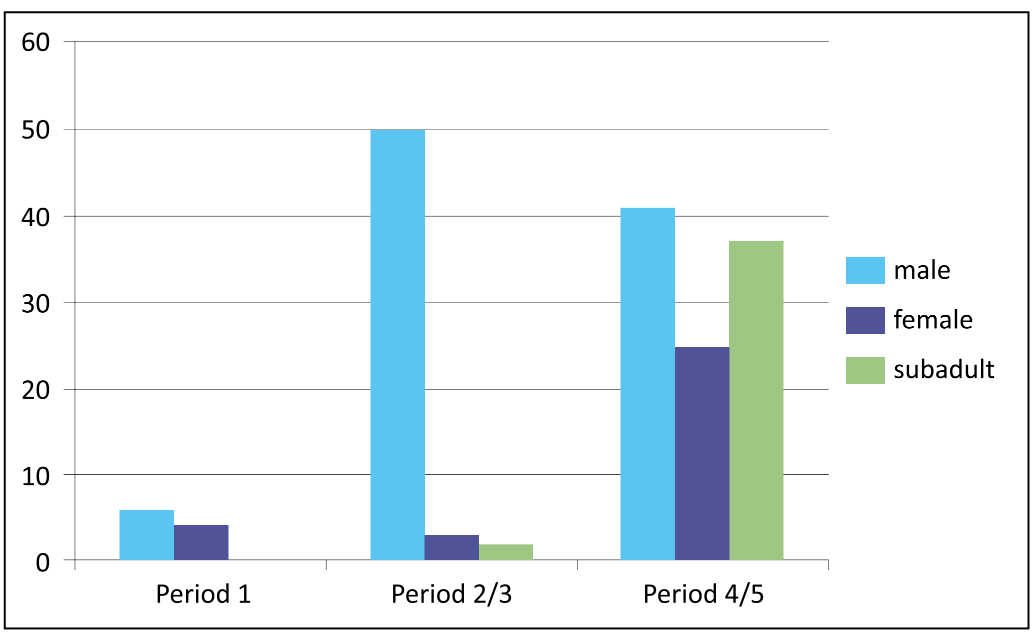


Illustration 3.24
Differences in population, Periods 1, 2/3 and 4/5 (King)

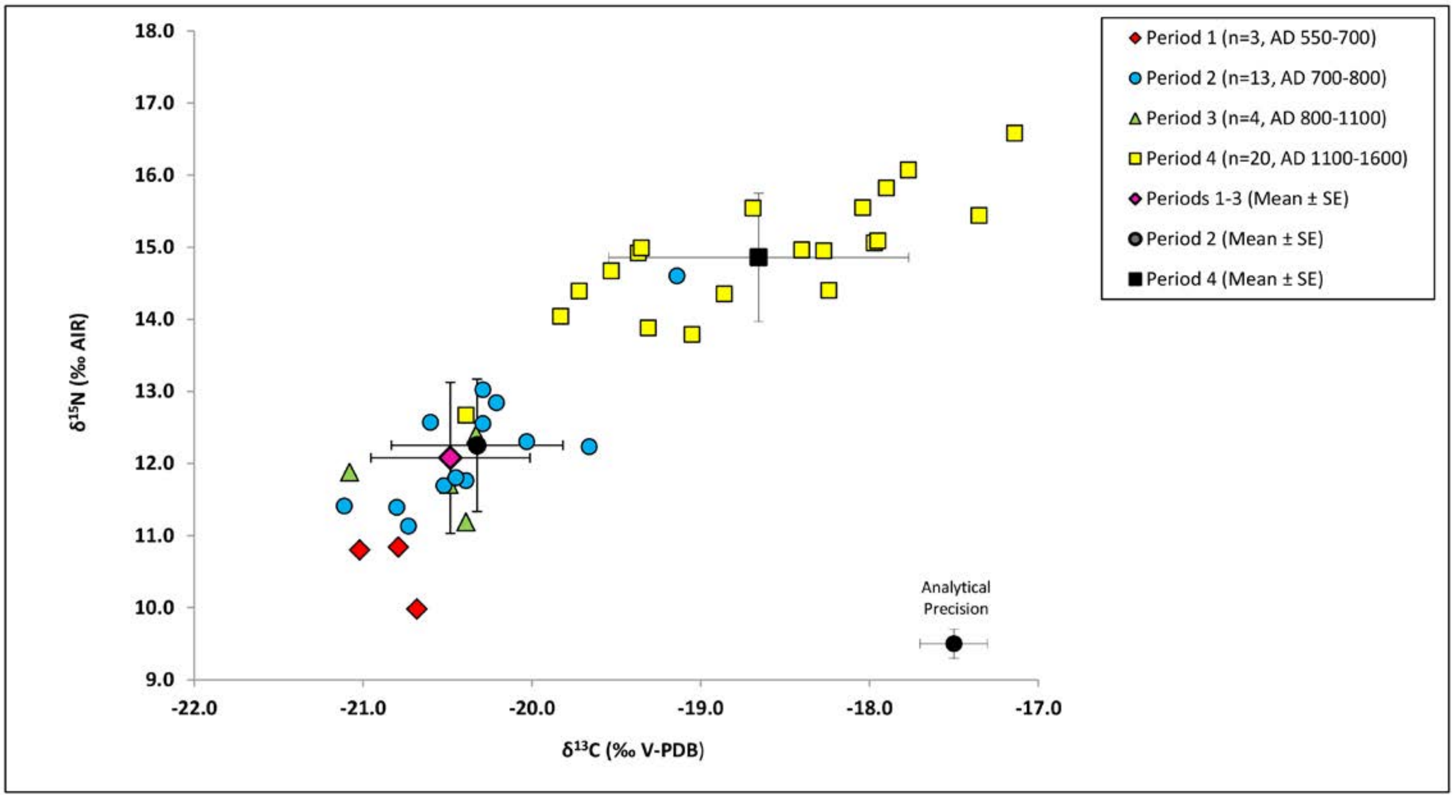


Illustration 3.25
Differences in diet, Periods 1–4

Correlation with events in other sectors places Church 2/3 in Period 4A (twelfth century), which has no dated activity in Sectors 1 and 2. The construction of Church 4 and its crypt and return of burial is contemporary with the rise of the village in Sector 2 and ploughing of Sector 1 (Period 4B, thirteenth/fourteenth century). The surge of burial in the nave of a refurbished Church 4 coincides with the township and its ironworking industry in Sector 2 (Period 4C, fifteenth/sixteenth century) (Chapter 7).

Period 5 – seventeenth to twentieth century

The Reformation arrived at Portmahomack in the later sixteenth century, and its effects were felt in the early seventeenth. These included a redesign of the church to create Church 5 (1623–1756). Interior space was reorganised to suit the new liturgy: the congregation now faced the south wall, where a pulpit was built. On the north side an annexe (the north aisle) was added which provided a family vault in the centre of the aisle and a privileged burial place for William Mackenzie, minister, who died in 1642. The floor was paved with flagstones, sealing a coin of James VI dated 1623. Two memorials built into the north aisle were also dated 1623.

Church 6 (1756 to *c* 1800) represents a rebuilding following a well-documented state of disrepair in the first half of the eighteenth century. A new stone belfry, constructed in the mid–late eighteenth century, adorned the west end, the north-aisle roof was raised to make room for an upper floor (the 'Laird's Loft') and galleries were built at the east and west ends to provide additional seating for a growing community. The crypt was now used as a fuel store. The erection of stone memorials within the churchyard burgeons during this period.

Church 7 represents refurbishments from 1800 to 1843, in which year the church was largely abandoned by its congregation in favour of the newly created Free Church.

Church 8 (1843–1946) saw the small surviving congregation seated in box pews and returned to their former E–W orientation, with the preacher on a dais at the east end. The north aisle was boarded up and the crypt finally disused.

An abbreviated integrated sequence for Sector 4 is presented in Table 3.2, from which it can be seen that the site of the church provides an effective theatre of social commentary over a span of some 1,400 years.

Assemblage

Artefacts

The assemblages included a wide range of artefacts and animal, mineral and vegetable remains, but they were not evenly distributed (Table 3.3; Digest 6). A silver *sceat* was the only pre-medieval coin (Digest 6.2). *Metalworkers* were encountered in a modest form in Sector 2, Period 1, where they are seen as a secular prelude to the monastic craftsmen of Period 2 who in their turn left a rich legacy of moulds, crucibles and slag in Sector 1. The output of these latter workshops is argued to be ecclesiastical (Chapter 5.7). The metal-smiths of Period 3 were evident in Sector 2, where they also left a well-preserved assemblage of crucibles, moulds and tools. The techniques practised were similar to those of their antecedents, but the output had changed to pins, finger rings, brooches and weights (Chapter 6). Ironworkers occupied Sector 2 in the fifteenth century (Period 4), possibly engaged in making weapons. They produced a dense and widespread consignment of slag (Chapter 7; Digest 6.9). *Vellum-working*, deduced from iron tools, bone pegs, pebbles and ash occurred in Period 2, Sector 2 (Chapter 5.6). *Carved stone* reached its apogee in Period 2 (Chapter 5.3), but there were some examples of monumental carving in the medieval period too (Period 4; Chapter 7). *Coins* and *pottery* occur in this region only from the thirteenth century, and were found in the church and in the residential and midden areas of Sector 2 (Digest 6.14, 6.18). The church also produced some *coffin wood* and a burial with preserved *woollen hose* and *leather boots* (Digest 6.19, 6.16, 6.17; Chapter 7).

Human remains

Human bone was preserved in five groups: in Period 1 there were three burials in Sector 2, and sixteen in Sector 4, the site of the future church (Digest 4.1). The remaining four groups were excavated inside the nave of the church: fifty-eight (predominately adult males) in Period 2 and 3, eighty-eight (men, women and children) in Period 4 and three in Period 5. The main basis for comparison was thus provided by Period 2/3 (eighth century, interpreted as monastic) and Period 4 (medieval, interpreted as parochial). The *anatomy* of all burials was examined for age, sex, health, trauma and disability (Sarah King and Shirley Curtis-Summers, Digest 4.2). *Stable isotopes* of carbon and nitrogen were studied to deduce diet (Shirley Curtis-Summers, Digest 4.3), and of oxygen and strontium to deduce childhood provenance (Lauren Walther Digest 4.4). *Starch* extracted from calculus also provided an indication of which foods were being eaten: they featured oats, wheat, barley and beans (Table 3.4; Becca Walters Digest 4.5).

There were dramatic differences between the Period 2 and 4 populations. The Period 2/3 group was dominated by adult males in comparison with the more normal age and sex profile seen in Period 4 (Illus 3.24). The Period 2/3 and 4 populations differed greatly in their diet, the earlier consuming meat but no fish and the later with a broad pattern of foodstuffs including deep-sea marine fish (Illus 3.25). The mobility of the Tarbat population was quite unexpected. After the sixth century, only 18% of the people tested were local (five out of twenty-seven), the rest being immigrants (Table 3.4; Illus 3.26). During Period 2, when the community was ostensibly monastic, three out of seven were local, two were immigrants from elsewhere in eastern Britain and two were immigrants from Scandinavia. None was from the west coast. On the other hand after the raid, from the ninth century to the sixteenth century, everyone tested was an immigrant bar one (Burial 117). Eight came from western Britain and five from elsewhere on the east coast. This might appear counterintuitive, since the historical model would expect immigrants from the west to be powering the monastic movement, and the medieval inhabitants to be thoroughly entrenched in the locality. However, the Period 1 and 2 provenances accord well with a Pictish origin for the Tarbat monasticism (see p 255). By contrast the medieval sample was mainly of the fifteenth century and later,

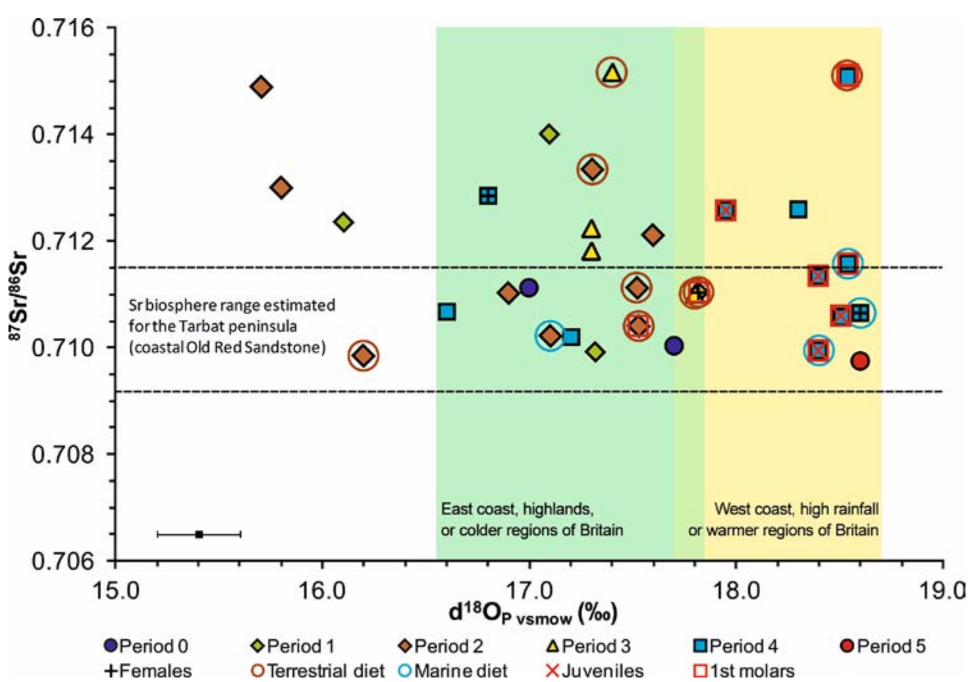


Illustration 3.26
Differences in childhood home, Periods 1–5

Table 3.4
Summary of results of starch analysis
(adapted from Walters in *Digest* 4.5)

Period	Burial	Starch source
1	Burial 149	undetermined
2	Burial 127	oat or wheat
	Burial 144	barley
4	Burial 100	oat or wheat
	Burial 91	beans
	Burial 16	oat, wheat and beans
5	Burial 88	oat or wheat

when pressure was being felt from the Western Isles (Chapter 7, p 319). The latest western family to dominate Easter Ross was the Mackenzies, and the latest isotope measurement corroborates a western origin for the Rev William Mackenzie who died in 1642 (above).

The Late Iron Age/early Pictish (Period 1) population is presented in Chapter 4, the late Pictish (Period 2) is discussed in Chapter 5.2, and the medieval in Chapter 7. For Period 2, the stable isotopes of carbon and nitrogen are combined with evidence for diet from animal and plant remains to underpin a study of subsistence and economy (Chapter 5.8).

Animal bones (after Krish Seetah Digest 7.1)

Of the bones that underwent full analysis, 15,629 (93%) of the fragments were recorded from Sector 2. Here the largest assemblage was from Period 2 (7820), then Period 3 (3863), then Period 4 (3372) and lastly Period 1 (303). The Period 2 assemblage was not only the largest but had also the most secure contexts and so attracted the most intensive analysis (Chapter 5.8). Nevertheless, it was possible to make useful comparisons between periods. Among the domestic species, cattle is dominant throughout, although there is a slight proportional increase in numbers from Period 1–3, and subsequent decrease in Period 4. This is matched by a reduction in numbers of pig, and an increase in the numbers of ovicaprids in later periods (Table 3.6). As compared with English sites, the representation of sheep/goats is relatively low, showing a slight increase only in the medieval period (Period 4). When positive distinction was made between sheep and goats, the identification was always goat. The proportion of pigs declines steadily.

The occupants had access to a wide range of animals and birds in all periods (Table 3.7). The Period 2 community was hunting red deer and roe deer, trapping wild geese and capercaillie and acquiring plenty of seals, with some whale and dolphin (Chapter 5.8). In comparison, Period 4 saw a large relative increase of horse and dog and cat, an increase in chicken at the expense of goose and an increased cull of whale and dolphin (Chapter 7).

Table 3.5
Summary of results from Oxygen/Strontium isotope analysis
(adapted from Walther et al in *Digest* 4.4)

Period 1	**Source**	**Provenance**
0	Balnabruach A	East Britain (local)
	Balnabruach C	East Britain (local)
1	Burial 170	Local
	Burial 172	*Western Britain*
	Burial 186	Britain
	Burial 187	East Britain
2	Burial 54	Local
	Burial 127	Local
	Burial 129	*Scandinavia*
	Burial 130	*East Britain (not local)*
	Burial 140	*East Britain (not local)*
	Burial 144	Local
	Burial 153	*Scandinavia*
3	Burial 147	*Western Britain*
	Burial 158	*East Britain (not local)*
	Burial 111	*East Britain (not local)*
	Burial 156	*East Britain (not local)*
4	Burial 16	*Western Britain*
	Burial 30	East Britain (not local)
	Burial 35	*Western Britain*
	Burial 36	*Western Britain*
	Burial 41	*Western Britain*
	Burial 62	*East Britain (not local)*
	Burial 86	*Western Britain*
	Burial 88	*Western Britain*
	Burial 110	*Western Britain*
	Burial 117	Local
	Burial 119	*Western Britain*
5	Burial 17 (W Mackenzie)	*Western Britain*

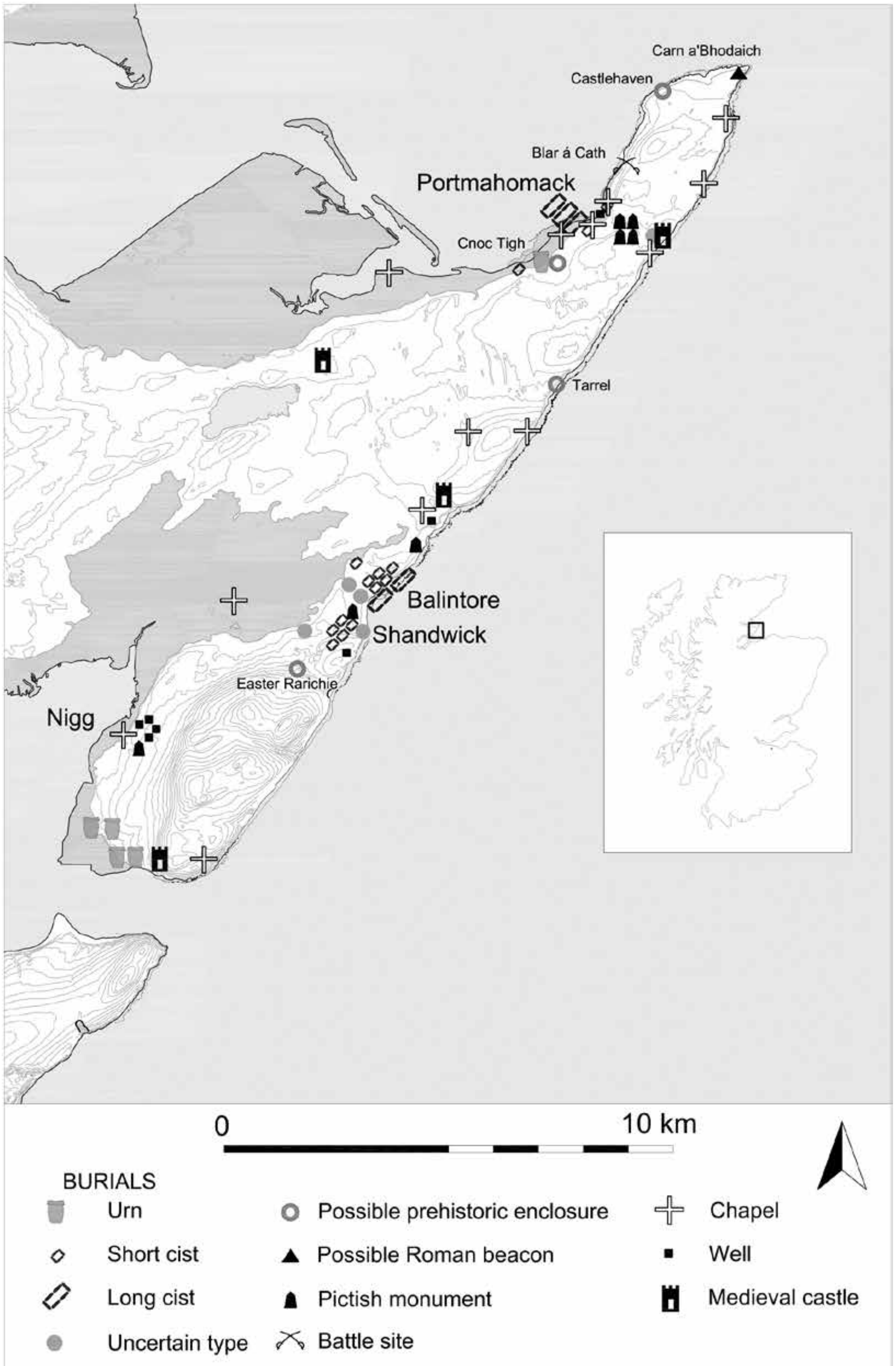


Illustration 3.27
Multi-period sites on the peninsula

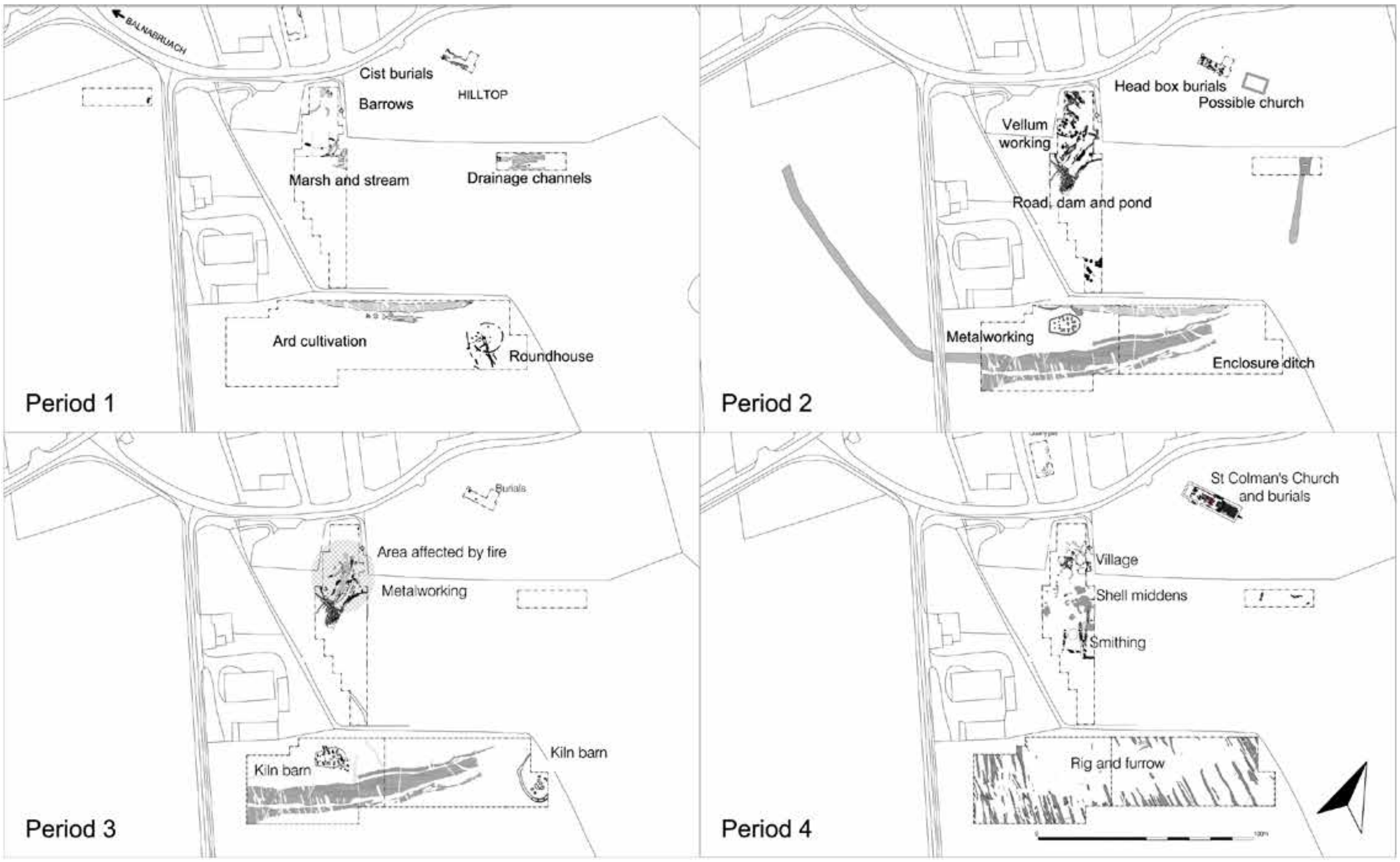


Illustration 3.28
Summary of major structures across the excavated sectors in Periods 1–4

The use of calves to make vellum was evident in the assemblage (Chapter 5.6). There was a sufficient number of calves for the purpose, but in general the cattle were being kept into adulthood. As well as supplying milk, the adults were also being eaten and it is likely that their hides were being made into leather.

In Period 2 there was also a widespread use of animal bone as fuel ('bone coal'). As well as being found incinerated in Sector 2, there was a significant assemblage of fragmentary cattle bone (96%), focused on the hearth in S1 apparently in use by metal-smiths. The industrial scale of the use of the cattle bone as fuel

Table 3.6
Numbers of domestic animals represented by period

Period 1		Period 2		Period 3		Period 4		
SPECIES	%NISP	MNI	%NISP	MNI	%NISP	MNI	% NISP	MNI
Cow	67.11	8	75.69	102	79.06	56	58.57	87
Pig	20.13	3	12.60	41	10.28	13	6.41	12
Ovicaprid	4.70	1	3.31	6	4.51	6	8.85	15
SUM of raw NISP fragment count and MNI for food domesticates ONLY								
Σ	**137**	**12**	**2770**	**149**	**1497**	**75**	**1301**	**114**

Table 3.7
Numbers of animals of all species represented by period

	Period 1			Period 2			Period 3			Period 4		
SPECIES	NISP	%NISP	MNI	NISP	%NISP	MNI	NISP	%NISP	MNI	NISP	% NISP	MNI
Cow	100	67.11	8	2289	75.69	102	1261	79.06	56	1032	58.57	87
Pig	30	20.13	3	381	12.60	41	164	10.28	13	113	6.41	12
Ovicaprid	7	4.70	1	100	3.31	6	72	4.51	6	156	8.85	15
Horse	–	–	–	3	0.10	–	16	1.00	–	174	9.88	–
Dog	–	–	–	62	2.05	–	8	0.50	–	198	11.24	–
Cat	–	–	–	2	0.07	–	1	0.06	–	8	0.45	–
Fox	–	–	–	22	0.73	–	1	0.06	–	8	0.45	–
Wolf	–	–	–	1	0.03	–	2	0.13	–	1	0.06	–
Hare	–	–	–	–	–	–	–	–	–	1	0.06	–
Cervid	–	–	–	2	0.07	–	–	–	–	–	–	–
Red deer	1	0.67	–	44	1.46	–	22	1.38	–	24	1.36	–
Roe deer	2	1.34	–	21	0.69	–	7	0.44	–	5	0.28	–
Otter	–	–	–	5	0.17	–	–	–	–			–
Chicken	1	67.11	–	5	0.17	–	6	0.38	–	8	0.45	–
Anser sp.	–	–	–	24	0.79	–	4	0.25	–	4	0.23	–
Raven	–	–	–	1	0.03	–	1	0.06	–	–	–	–
Razorbill	–	–	–	–	–	–	7	0.44	–	–	–	–
Gull	–	–	–	2	0.07	–	–	–	–	–	–	–
Cygnus sp.	–	–	–			–	1	0.06	–	–	–	–
Shag	–	–	–	11	0.36	–	–	–	–	–	–	–
Gannet	–	–	–	1	0.03	–	–	–	–	–	–	–
Redshank	–	–	–	–	–	–	–	–	–	1	0.06	–
Curlew	–	–	–	–	–	–	–	–	–	2	0.11	–

Table 3.7
Numbers of animals of all species represented by period (*cont.*)

	Period 1			Period 2			Period 3			Period 4	
SPECIES	NISP	%NISP	MNI	NISP	%NISP	MNI	NISP	%NISP	MNI	NISP	% NISP	MNI
Capercaillie	–	–	–	2	0.07	–	–	–	–	–	–	–
'Wader'	–	–	–	–	–	–	–	–	–	1	0.06	–
Whale size	–	–	–	2	0.07	–	4	0.25	–	7	0.40	–
Porpoise / dolphin size	–	–	–	1	0.03	–	1	0.06	–	7	0.40	–
Seal	8	5.37	–	44	1.46	–	10	0.63	–	7	0.40	–
MMU	–	–	–	2	0.04	–	3	0.12	–	6	0.34	–
ULM	82	30.37	–	1368	28.15	–	732	28.23	–	775	26.87	–
UMM	38	14.07	–	429	8.83	–	261	10.07	–	329	11.41	–
USM	–	–	–	1	0.02	–	–	–	–	–	–	–
UUB	1	0.37	–	35	0.72	–	5	0.19	–	17	0.59	–
UUF	–	–	–	1	0.02	–	–	–	–	1	0.03	–
UUM	33	10.89	–	2960	37.85	–	1270	32.88	–	488	14.47	–
	Σ NISP = 303			Σ NISP = 7820			Σ NISP = 3863			Σ NISP = 3372		

Species percentages are out of 149 (P1); 3024 (P2); 1595 (P3) & 1762 (P4). Element percentages (MMU, ULM, UMM, USM, UUB, UUF) are out of 270 (P1); 4860 (P2); 2593 (P3) & 2884 (P4). UUM percentages are out of 303 (PI); 7820 (P2); 3863 (P3) & 3372

Table 3.8
Sources of bones from Sector 1 relating to Periods 2 and 3
(Source Seetah Catalogue OLA 7.3.1.2)

Context	Period	Cow	Pig	Sheep/g	Other
1250 craft working in S15	2	18	12	6	1 Red deer 1 Seal
1733 S1 Post-hole F455	2	36	1	3	
1209 S1 post-hole F149	2	2	–	–	
1179 S1 post-hole F128	3	25	2	–	
1180 S1 post-hole F129	3	76	1	–	
1207 S1 Pit F147	3	29	3	–	
1237 ditch F165	3	26	–	–	
1026 ditch F18	3	4	–	–	
1480 S1 area		66	–	–	
1823 S1 area		14	1	–	
s/Total S1					
in Period 2		38	1	3	
s/Total S1					
S1Period 3		130	6	–	
s/Total area S1 residual		110	1	–	
s/Total S1		278 (96%)	8 (3%)	3 (1%)	
s/Total S15		18 (50%)	12 (33%)	6 (17%)	
TOTAL		296 (91%)	20 (6%)	9 (3%)	

finds a contrast in the other well-defined assemblage from Sector 1, that found with metal-smiths' debris in a hollow in the filled-in ditch S15. Here the signature was more domestic (cattle 50%, pig 33%, sheep/goat 17%; see Table 3.8).

Fish and Shellfish (Matilda Holmes Digest 7.2, 7.3)

Winkles and whelks were collected by Sector 2 artisans in Period 2, where they were being burnt for lime (Chapter 5.6). Shellfish were abundant in the middens of Sector 2 in the medieval period (thirteenth to fourteenth century), where they were most probably being collected for food (Chapter 7). The fish-bone assemblage comprised a few small samples from Period 1 to 3 features, and a considerable assemblage from the middens in Period 4. This latter included flatfish (plaice, halibut and possibly dab), conger eel, haddock and saithe, all of which could be caught from close to the shoreline, as well as herring, cod, and pollack which would require expeditions further out to sea (Chapter 7).

Plant and insect remains (Allan Hall & Harry Kenward Digest 7.4)

A wide variety of samples was collected including spot finds of charcoal and uncharred wood, and other charred and waterlogged plant material. The environmental sequence was charted through the successive layers that formed the marsh and the pond that succeeded it in Sector 2, Periods 0–2. Evidence for the use of turf as a building material and heather and straw as a roofing material came from Period 1 (ditch in Sector 4) and Period 2 (hearths in Sector 1 and 2). Samples from the second phase of S1, and from S5 in Sector 1 (both Period 3) confirmed an association with cereals. Samples from S16 the enclosure ditch in Sector 1 demonstrated its disuse through Period 3 and 4.

Overall, evidence for plant foods at Tarbat was limited (Digest 7.4). Although cereal grains were quite frequently encountered, in some cases in moderately high concentrations, the grains were more usually scattered in ones or twos through many of the samples. The records for wheat, with a single exception, and for rye, are all from Period 1 deposits. Rachis fragments from samples from the Period 1 ditch (F129) have allowed us to show that free-threshing hexaploid wheat, barley and rye were all then being exploited. The cereals from the later periods (after 700 AD) were barley, with (occasionally) oats. Rye is perhaps the more likely crop to have been grown successfully so far north.

The insect assemblages reported here, though for the most part limited by sample size and/or quality of preservation, offer evidence (primarily through records of dung beetles and the chafer *Phyllopertha horticola*) for grazing land at various stages through the period of occupation of the site, especially Period 2. The insects proved a useful indication of when the pond had finally dried out.

Micromorphology (Claire Ellis, Digest 7.5) was also important in determining deposit formation, confirming that undisturbed subsoil was reached in Sector 2, north and centre (beneath the pool and bridge). The investigation mapped a site-wide prehistoric podzol (in all Sectors), and identified the nature of the intermediate layers that terminated Period 1 in Sector 2, the first enclosure ditch in Sector 1, and the end of the Period 3 occupation in Sector 2. These were mainly windblown deposits, each representing a brief hiatus in the sequence (Chapter 4, p 99; Chapter 5, p 260).

Survey on the Peninsula (Illus 3.27)

Initial surveys mapped the possible prehistoric, Roman and medieval sites already known on the peninsula, together with the likely Norse and Pictish place-names (Digest 8). In the prehistoric period there appeared to be at least four forts and three main burial areas (Bronze Age to Iron Age) on the peninsula (Chapter 4). In the Pictish period, the sites of Hilton, Nigg and Shandwick were places of importance in addition to Portmahomack, as their great cross-slabs signify. Preliminary site surveys were undertaken at each of these (Chapter 5.10; Chapter 2, p 28). Place-names imply some post-Pictish activity by Norse settlers at Cadboll, Bindal, Geanies, and Arboll – all good farmland. In the Middle Ages, the peninsula was well colonised, with Fearn Abbey as the new cult centre and castles on the cliffs. There were numerous chapels and wells and half a dozen likely harbours (Digest 8; Chapter 7).

Possible portage routes were reconnoitred. The more convincing of these climbed the rise above Loch Inver, crossed Loch Eye and then descended via Fearn Abbey to the Bay of Nigg. The latter part of this route had been canalised to drive the Fearn Abbey mill. The portage would have been more worthwhile if the sea level was higher, and hypothetical landscapes were drawn which showed the coastline at the 10m mark (Illus 3.27). This received some justification from early maps, which implied a more extensive Bay of Nigg (see Chapter 5.10, Illus 5.10.2). Such a portage, if it existed, would probably not have survived the improvements, reclamation and soil dumping owed to the Abbey of Fearn (Chapter 7), and its heyday would be in the later first millennium (Chapter 5.10).

Chronological concordance between sectors

The evidence for the sequence and the use of space obtained from each Sector has been integrated across the site, to produce a general concordance. The research from the survey on the peninsula was also broadly phased and incorporated into each period. The events assigned to each chronological period have been reconciled in Table 3.1 (Illus 3.28 for a visual summary of events at the site).

In Sectors 2 and 4 the sequences were deduced from the stratigraphy, dated artefacts and radiocarbon dates. There were strong sequences in Sector 4, where more than 100 burials could be ordered stratigraphically, of which thirty-one were radiocarbon dated, and in Sector 2 where a stratigraphic sequence with sixteen usable radiocarbon dates was interrupted by a widespread burning horizon. Sector 1, with six usable radiocarbon dates and little stratification, was less certainly ordered. Having taken account of the stratified relationships within sectors, the lack of them between sectors and the evidence for hiatus, Bayesian analysis was applied to give its own probable limits for the start and end date of each period and the likely intervals between them. On this basis the periods were modelled as follows (Digest 3.1; probability 95% except as indicated).

With regard to the intervals between periods, the results of this analysis were qualified by the specialist as follows: 'It should be noted that based on the radiocarbon data alone, there is no clear evidence for a hiatus between any of the periods. The calculation of the difference between the end probability for one period and the start of the next always begins in the negative, which indicates the possibility for no hiatus' (Table 3.9). The estimates have therefore been refined where they are complemented by securely dated stratigraphic events. The adopted dates are shown in the left hand column of Table 3.1.

A start date for the Period 1 cemetery between AD 525–600 is compatible for the cist burials in both Sectors 2 and 4. In the Sector 2 settlement, the well (F527) had been constructed before AD 680, and the wood-lined ditch on the hilltop (F129) had received discarded barley before AD 660. All the dated samples in the period that follows have dates starting after AD 640 or 650. There are small-scale interruptions represented by windblown sand in Sector 2 (C2353; Digest 7.5) and possibly the pink sand horizon in Sector 4 (C1064). If these are witness to a hiatus it will have been considerably less than eighty-five years. There is no sign of vegetation growth and the interval is assessed as one to five years. Support for this comes from a start date for Period 2 as AD 645–685 (at 50%). The adopted date for the end of Period 1 and the beginning of Period 2 is placed at *c* AD 680.

All the major structures of Period 2 appear to have been constructed at the same time, and all the radiocarbon dates are compatible with a span between AD 680 and 780, including the enclosure ditch and S1 in Sector 1, the vellum-working, the boundary ditch (F480) and all the infrastructure that is attached to it (road, culvert, bridge, dam, pond) in Sector 2

Table 3.9
Limits and intervals determined by Bayesian analysis

	Sector 1	Sector 2	Sector 4
start: Period 1		cal AD 525–650	cal AD 420–600
end: Period 1		cal AD 635–730	cal AD 645–725
Hiatus		Up to 85 years (68%)	Up to 55 years (68%)
start: Period 2	cal AD 610–780	cal AD 645–685 (50%) or cal AD 735-765 (45%)	cal AD 670–760
end: Period 2	cal AD 700–840	cal AD 710–780	cal AD 690–790
Hiatus	Up to 60 years (68%)	5–150 years (68%)	[none]
start: Period 3A	cal AD 740–880	cal AD 735–965	cal AD 720–895
end: Period 3B	cal AD 1025–1250	cal AD 775–1130	cal AD 1025–1175
Hiatus			Up to 110 years (68%)
start: Period 4			cal AD 1085–1245
end: Period 4			cal AD 1470–1690

and the burials of Sector 4. Activity in Sector 2 is brought to a sudden end by an extensive fire, which is argued from stratigraphy, radiocarbon, sculpture and other artefacts to lie between AD 780 and 810 (see Chapter 5.11). This allocates a maximum span of little more a century *c* AD 680 to *c* 810 to the life of the monastery.

No stratigraphic hiatus was observed in the Sector 4 cemetery or following the fire in Sector 2. Period 3A begins with the onset of metalworking which is immediate (hearth F148); but on typological grounds this metalworking is unlikely to have endured beyond the ninth century. This suggests Period 3A could be confined to *c* AD 780 to *c* 880. It is argued that the Period 3 burials in the church belong to the same period, bar a few spasmodic late interments in the tenth and eleventh centuries (see above). The conversion of S1 into a kiln barn in Sector 1 belongs to the same period, although its last use is later than 1020 showing it as an enduring feature within an increasingly empty landscape.

The interval between Period 3A and 4 is the one where a hiatus of up to a century is reasonably certain. Period 4 falls into three sub-periods that correlate well across all three Sectors, using pottery and coins in Sectors 1 and 2 and radiocarbon dating in Sector 4 (the church). The first medieval church (Church 2) is built in Period 4A, and such activity as there is remains focused there during the twelfth century. In Period 4B the building of the new church (Church 4) coincides with the rise of a medieval village in Sector 2 and the arrival of the refounded Fearn Abbey on the peninsula. In Period 4C (fifteenth/sixteenth century) an increased frequency of burial in the church coincides with the development of the metalworking township.

In order to breathe as much life as possible into this narrative, we have chosen to present it in four chapters in chronological order, gathering all the evidence together that bears on each topic in each period. Chapter 4 describes the events of the fifth to seventh century (Period 1), seen as relating to an aristocratic estate centre or cemetery-settlement. Chapter 5 presents an establishment of the long eighth century, interpreted as a monastery, with studies on its burials, the sculpture, the elusive church, the infrastructure, vellum manufacture, precious metalworking, the economy, building methods, the peninsula and a Viking raid (5.1–5.11). In Chapter 6, events of the ninth to eleventh century (Period 3) are collected and assessed. In Chapter 7, the course of the Middle Ages at Portmahomack is described and a tailpiece takes the story of the church up to the present day (Periods 4 and 5). The essential evidence of specialists is placed to hand in the Digests, while the full database and history of the project is available on open access in the online archive at the Archaeological Data Service (Digest 9).

In each of these chapters an attempt is made to put the events into historical context, both on the peninsula and further afield. Chapter 8 reviews the trends between periods, and between regions, hoping to show how the changes captured here raise Portmahomack and Pictland to the rank of significant players in the wider European story.

Table 3.1
Chronological concordance for Periods 1–4
The radiocarbon dates given here are drawn from *Digest* 3.1 and 3.2 and are at 95%, unless indicated. Bayesian projections are in italics. The alphanumeric prefixes refer to dated material in stratified sequences (A1, A2, . . .)

Defined Period	Sector 1 [South Field]	Sector 2 [Glebe Field]	Sector 4 [Church]	The Tarbat Peninsula
PERIOD 0 **Before AD 550**				
Bronze Age		Flint arrowheads	Carved stone ball	*Short cists at Balintore, North Sutor and Balnabruach*
Iron Age **third/fifth century**	*Ring ditch S12* *Ard cultivation* *(or Period 1)*	Earliest marsh C2310 [S-13264] **770–400 BC** Earliest marsh C2310 [S-14990] **720–380 BC** *Charcoal Pit* F573 [S-33422] **170–380**		*Long cists at Balintore, Nigg and Balnabruach* *Forts at Easter Rarichie, Tarrel, Lower Seafield and Castelhaven* *Burials at Balnabruach* Balnabruach A [S-13257] **410–230 BC** Balnabruach B [S-13261] **240–420** Balnabruach C [S-13282] **260–530**
PERIOD 1 Late Iron Age **fifth/seventh century** AD 400–680		*Start: 525–650* *Cemetery* Cist Burial 186 [S-13256] **420–610** Cist Burial 187 [S-33416] **540–650** S14 barrow (Sector 3) S10 barrow *Settlement* S11 workshop Hearth F535 in S11 [S-33420] **640–770** Well F527 [S-33421] **610–680** Marsh Stake in marsh F436 [S-13277] **640–770** *D1*. Latest marsh C2296 [S-14989] **600–760** *Flat-headed pins (fifth/ sixth century)* *Copper-alloy disc (sixth/ seventh century)* *Plough pebbles* *End 635–730*	*Start: 420–600* *Cemetery* Cist Burial 162 [O-13483; S-13255] (mean) **430–575** Cist Burial 172 [O-9699; S-37079] (mean) **570–650** *A1*. Plain burial 170 [S-33413] **580–660** *A2/B1*. Plain burial 169 [S-33412] **610–680** Plain burial 163 [O-13484] **640–690** Cist (?) Burial 146 [S-37078] **660–780** *Settlement* Ditch F129, with grain [S-13263] **540-660** *End: 645–725*	*Burials on the ridge above the Firth*

Defined Period	Sector 1 [South Field]	Sector 2 [Glebe Field]	Sector 4 [Church]	The Tarbat Peninsula
HIATUS *1–5 years*				
PERIOD 2 Monastic **eighth century** AD 680–810	*Start: 610–780* *Infrastructure* First enclosure ditch S15 Second enclosure ditch S16 Stake in enclosure ditch [O-10159] **670–890** *Bag-shaped building S1* Last use of hearth in S1 phase 1, F65 [S-2621] **700–940;** [S-33415] **670–870** *Bag-shaped building S3* *Well S8* *Metal-working in and around S1*	*Start: 645–685/735–765* *Infrastructure* Pool, dam and bridge S7 Road S13 *Boundary walls* *D2*. Animal bone under boundary wall F480 [S-13266] **640–770** *D3*. Earliest pool C2296 birch twigs [S-14994] **590–760** *Vellum workshops* *S4 tank* *S9 yards* *D4*. Hearth in yard F445 **640–770** *D4.* Bone pegs in yard F393 [S-13267] **640–770** *D4*. Butchered bone C2335 [S-13265] **650–780** Hearth in S9 F495 [S-13581] **650–780** *D4.* Stake by dam F404 [S-13276] **650–780** *D4*. Bone row C2000 [S-13271] **660–810** *Sceat* of **715–735** (F185)	*Start: 670–760* *Cemetery with grave markers* HS burial 128 [O-13487/fish] **640–770** *A3*. Burial 171 [S-33414/fish] **660–850** Burial 165 [O-13509] **650–780** Burial 129 [S-33404] **670–880** Burial 153 [S-33410] **650–780** Burial 144 [O-13488/fish] **680–890** *A4*. Burial 130 [S-33405] **660–780** *B2*. Burial 160 [O-13486/fish] **680–880** HS Burial 116 [O-13489/fish] **680–880** *Cross-slabs, grave markers, sarcophagus* *Crosses A–D* **late eighth-early ninth century**	*The portage?* *Monumental cross-slabs at Portmahomack, Hilton of Cadboll, Shandwick and Nigg mid-eighth-ninth century*
RAID 780-810	 *End: 700–840*	*Burnt workshops* Timber 26/C1030 [O-9664] 330–550 (Prob. *c* 800: old wood) Hazel stake F490 [S-13273] 400—570 (Prob. *c* 800; old wood) Wattle on terrace F483 [S-13274] 610–690 (Prob. *c* 800; old wood) *D5*. Burnt wattle C2704 [S-13275] **650-810** Sculpture broken up **after late eighth-early ninth century** *End: 710–780*	*Conjectural victims of raid* Burial 158 [GU-9296] **680–900** [Blade wound, healed] HS Burial 152 [GU-9297] **780–1000** [Blade wound, fatal] *End: 690–790*	

Defined Period	Sector 1 [South Field]	Sector 2 [Glebe Field]	Sector 4 [Church]	The Tarbat Peninsula
HIATUS *1–5 years*				
PERIOD 3 **ninth/eleventh century** 3A Resurgence *c* 780–900	*Start: 740–880* *Farming* S1 re-used as kiln barn S5 Kiln barn Disuse of Enclosure ditch F132 [GU-3265, 6, 7] 140-410, 250-530, 350-580 (secondary peat deposit) Last use of S5 Hearth in S5 F13 [S-13283] **680–900** Willow twigs from disuse of enclosure ditch F132 [S-13286] **680–940**	*Start: 735–965* *Metal-workers* *D6* Metal-working hearth F148 [S-13281] **660–880** *D7*. Latest deposit in pool C4863 [S-14995] **650–840** Crucible and mould typology, **before *c* 800** Culvert F431 blocked	*Start: 720–895* *Cemetery* *B3*. Wicker Burial 147 [O-13485/fish] **720–960**	*The Portage?* *Norse settlement at Cadboll, Arboll, Bindal, Geanies, Shandwick*
3B Abandon 900–1100/1150	Backfilling of tributary ditch F18 [O-9662] **790–1020** Backfill of ditch around S5 [S-13284] **890–1030** Last use of flue of S1, F79 [S-13285] **1020–1210** *End 1025–1250*	Disuse of Road 2: Cow burial F304 [S-13282] **830–1020** *End: 775–1130*	*A5*. HS Burial 136 [S-33406] **970–1040** Burial 156 [S-33411] **970–1040** *C1*. HS Burial 111 [S-33402] **1020–1170** *End: 1025–1175*	*Hoard of ring-silver and coins deposited north of the church in c 1000*
HIATUS *c* 150 years 1000–1150			*up to 110 years*	
PERIOD 4 **Medieval twelfth-sixteenth century** PERIOD 4A Church 2/3 built 1100–1200 AD			*Start: 1085–1245* *Church 2/3* **twelfth century** Bell casting pit F107 [O-10536] **1040–1260** *Aquamanile* Burial 117 [GU-9298] **1150–1270** [Blade wound, fatal]	*Parish churches founded c 1170*
PERIOD 4B Church 4 built thirteenth to fourteenth century	*Ploughed fields* Pottery **thirteenth/fifteenth century**	*Residence S17 and fish middens* Coins **thirteenth century–*c* 1350** Pottery **thirteenth/fifteenth century**	*Church 4 and crypt built* Burial 112 [S-33403/fish] **1280–1420** Burial 110 [O-13490/fish] **1290–1410** Burial 113 [O-13491/fish] **1290–1430** [blade wound, healed] Grave cover **mid-fourteenth century**	*Fearn Abbey founded c 1235*

Defined Period	**Sector 1 [South Field]**	**Sector 2 [Glebe Field]**	**Sector 4 [Church]**	**The Tarbat Peninsula**
PERIOD 4C Church 4 refurbished fifteenth to sixteenth century	*Ploughed fields*	*Smithy S18* Coins ***c*1450–*c*1550** Pottery **fifteenth–sixteenth century**	*Church 4* *Fire; Addition of vault to crypt* Burial 30/36 Burial 101 [S-33401/fish] **1440–1630** Burial 90 [O-13521/fish] **1460–1660** Burial 98 [S-33400/fish] **1420–1620** Burial 97 [O-13762/fish] **1440–1640** Burial 43 Boots of early fifteenth century *End: 1470–1690*	*Church burnt* c *1485*

Chapter 4

Foundations (Periods 0–1, to *c* AD 680)

Introduction

'Foundations' in the sense employed in the title of this chapter refers to the activities defined under and around St Colman's Church before the Portmahomack monastery became a going concern in the seventh to eighth century. It gathers together all the pre-seventh century evidence recovered in the area excavated and what was known about the prehistoric presence on the peninsula at the time the project was completed (in 2012; see Chapter 1, p 13). The verdict will be that the peninsula was active in the Bronze Age and Iron Age, especially as a burial place, but at Portmahomack a cemetery and settlement are first established in the fifth to seventh century. The materiality of the cemetery and the settlement is secular, and neither overtly Christian nor specifically monastic. However, the cemetery location and the approach to metal manufacture suggest that Periods 1 and 2 were connected: the Period 1 occupants were intellectually, technically and chronologically implicated in what was to come.

Reference will be made to the topography of the Portmahomack site in the following terms (see Illus 4.1): the 'hilltop' refers to the raised beach on which the church of St Colman now stands (Sector 4); the 'crest' is the shoulder of land that stretches westward, where the Tarbatness Road now runs; on its north side are the 'dunes' (Sector 3), sandy hummocks dropping down to the beach; to its south is the 'marshy ground' where the stream ran and the pool was later formed (Sector 2); further south is the flat land that was long cultivated (Sector 1).

Period 0 (before the sixth century) is represented by stray finds of the Neolithic and Bronze Age and a burial at Balnabruach. Assigned by radiocarbon dating to Period 1 (sixth/seventh century) is a *cemetery* of long-cist graves consisting of three burials excavated at the north end of Sector 2 and sixteen burials excavated on the hilltop within St Colman's Church. Additional evidence suggests these to have been part of a larger barrow cemetery strung along the crest. The *settlement* consists of a circular building (S11) with an industrial hearth and water-management scheme, situated in Sector 2 and a ditch containing burnt grain in Sector 4 (F129). Either contemporary with this settlement or belonging to an earlier one in Sector 1 is a large expanse of parallel scratch-plough marks, without plough pebbles, served by a penannular structure (S12).

A general chronology for the site was developed in Chapter 3 (Table 3.1). Table 4.1 gives a summary of the dated features and finds relating to Periods 0 and 1.

Period 0 to the sixth century AD

The land

The natural subsoil is at its highest recorded point at 17.4m AOD under St Colman's Church (OLA 6.3/3.1.1), whence it slopes westward to 15.4m at the north end of Sector 2, then falls south to 11.50m in the valley bottom, and rises again to 15.10–15.52m over the flat cultivated area to the south in Sector 1. On the hilltop, the natural deposition sequence was (from the bottom): white sand subsoil, weathered subsoil surface, buried soil and turf line, and podsolized buried soil. Analogues of these layers were also identified in the south-west churchyard, with the surface of the subsoil at *c* 16.6m (OLA 6.3/3.1.1).

In Sector 2 (north end) the subsoil was overlain directly by a shallow sequence of deposits consisting of small irregular hollows presumed to be natural in origin, overlain by alternating deposits of sand and turf lines. Further down the slope the subsoil had become a more robust mixed gravelly sand, overlain by episodes of consolidation represented by three turf lines or buried soils interleaved with accumulating sand deposits (Illus 4.2; Digest 7.5). As they approach the valley floor, these deposits were increasingly overlain by a 'proto-marsh' deposit, consisting of clean sand with a component of organic material, topped by laminated convoluted buff sand and black silt deposits that represented the margins of the stream-eroded area (OLA 6.2/3.1.1).

The earliest peat in the valley floor (C2310) was radiocarbon dated 720–380 cal BC and shows little trace of human occupation, although there may have been grazing mammals nearby, perhaps deer: it was dominated by plants of marsh and fen, primarily the hypnoid mosses *Drepanocladus*, *Cratoneuron commutatum* and *Scorpidium scorpioides*. Other plant taxa persistently present or recorded in significant numbers were lesser spearwort (*Ranunculus flammula*), toad rush (*Juncus bufonius*) and spike-rush (*Eleocharis palustris*). The presence of waterside insects, such as *Chaetarthria seminulum* was consistent with deposition in a shallow wet feature with enough standing water to provide habitats for caddis flies and water beetles such as *Coelostoma orbiculare*. There were also indications of organisms living in terrestrial habitats nearby. In this latter category, beetles such as *Aphodius* (but also several other taxa) pointed to the presence of herbivore dung in the vicinity (Hall and Kenward in Digest 7.4).

On the far south side of the stream, in Sector 1, the surface of the subsoil (at between 15.10 and 15.52m AOD) was covered

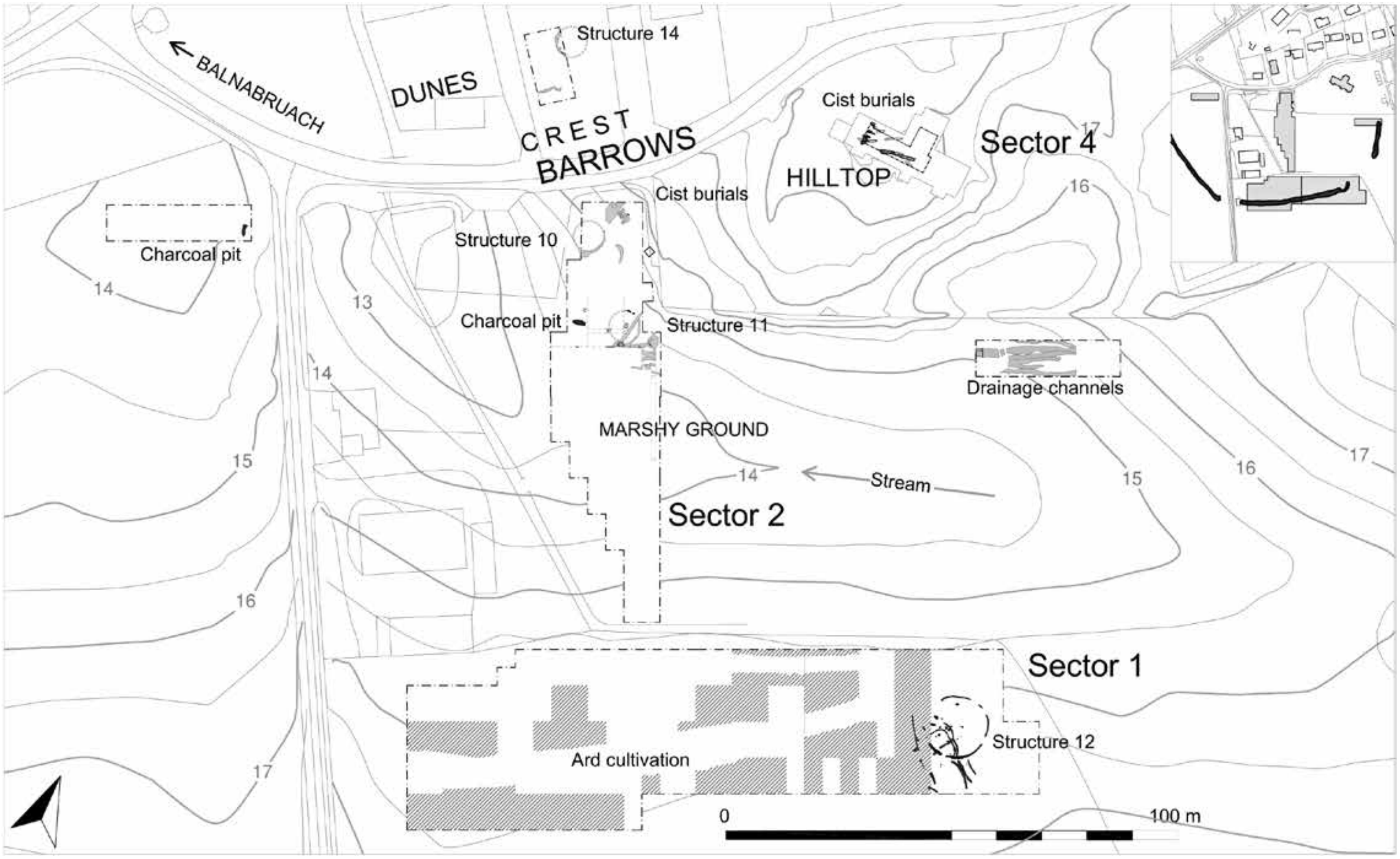


Illustration 4.1
Topographical map of the site, showing sectors and features and structures of Period 0/1

with a podzol that survived up to 100mm thick in places. This could be identified with the podzol seen in Sector 4, and similarly was without traces of human activity. The Sector 1 podzol had however been ploughed (see below).

Neolithic and Bronze Age artefacts

The presence of occupation during the Neolithic-Bronze Age is suggested by a small assemblage of lithic material – scrapers, a knife and arrowheads – a carved stone ball and a number of trough querns. The lithic assemblage, all residual in strata of early medieval or later date, includes artefacts of flint, quartz and chert. A range of tools was identified, including two Mesolithic-Neolithic blades, three scrapers of the late Neolithic to Bronze Age, four Neolithic leaf-shaped arrowheads and a late Neolithic-Bronze Age tanged arrowhead (see Digest 6.1). A waste assemblage indicative of the manufacture and curation of tools was also present, including four cores and nearly fifty flakes, debitage and chips. In addition, a number of flints were recovered during clearance of the crypt of the church: a knife, four flakes and a piece of debitage. The assemblage of prehistoric implements is small but sufficient to indicate hunting and processing of hides, with a likely focus for activity provided by the natural freshwater stream/marsh area. Distinct from this prehistoric group, a small group of debitage from Period 2 occupation layers is thought to relate to fire lighting in the historic period (Rowe in OLA 7.1.3.1).

A carved stone ball was recovered residually from the rubble infill of the seventeenth-century steps to the crypt. The ball has been identified as a six-knob type with nose-shaped interspace dating to the Early Bronze Age (Marshall Type 4c; Marshall 1977; 1983). A very wide range of functions, most of them symbolic, has been proposed for these objects, and their distribution may imply regional affiliations (Edmonds 1992). However, the portable, durable and appealing nature of the balls implies high mobility and survival; finds in primary contexts are rare. It may not be entirely coincidental that the distribution of these collectable items maps onto Pictish territories (Illus 4.3).

Querns

Four fragments of trough querns were recovered from Sector 2 in Period 2 (1), Period 4 (2) and Period 5 (1), in each case reused as building stone (Digest 6.1). A fifth (noted by Close-Brooks, 1984b, 288) was removed from the churchyard wall and is now on display in the church, while a fragment of saddle quern was found in the ploughsoil of the west field by metal-detectorist Michael Gallon in 2005. Stone selected for the trough querns tended to be geologically old – granite, gabbro, metamorphic gneiss and syenite – present on the peninsula as glacial erratics. That the most complete example was recovered from a wall of nineteenth-century date is testament to their indestructible character. Close-Brooks' survey of early querns in Scotland listed six trough querns, five of which were recovered from contexts of reuse in stone-built structures, including a Beaker cist in Angus and chambered cairns on the Black Isle (1984b, 282–9). These examples endorse a date of origin for trough querns in the Neolithic-Bronze Age period, while also demonstrating their potential for re-employment as building material, if not for grinding grain, over the course of millennia.

Middle Iron Age

Three articulated burials were encountered during a watching brief by Highland Council during the replacement of mains water in Balnabruach, which is located a few hundred metres south-west down the coast from Portmahomack. The remains of a total of seven individuals were later identified osteologically among the bone assemblage, one of which (Burial A) was in a short cist and radiocarbon dated to 410–230 BC. This burial of Middle Iron Age date is part of a burial ground that was to spread along the coast and endure until Period 1 at Portmahomack (see pp 99–102 below).

Two isolated charcoal-burning pits were located near the stream edge (Illus 4.1). That in Sector 2 (F573) was an elongated sub-rectangular pit (Illus 4.4), with a primary fill of a thick deposit of roundwood charcoal lining its base and sides. A date of AD 130–380 was obtained from a piece of birch charcoal with about forty years' growth (from which the ten outer growth rings were selected for dating) and a layer of windblown sand marked its final disuse. The feature is identified as the remains of a charcoal-making kiln, perhaps for the production of fuel for ironworking. Within Int 10 a number of anomalies were defined that may represent similar activity: post-holes and charcoal-lined pits. One of these (F15) consisted of an elongated sub-rectangular cut into subsoil, lined with a distinct deposit of pure charcoal.

These pits are comparable in form and content to some found on the line of the M4 in Ireland, as at Hardwood 2, which have given radiocarbon dates from the Late Bronze Age to the eleventh century AD. These are also interpreted as pits for making charcoal perhaps as precursors to episodes of ironworking (Illus 4.4; Carlin 2008, 88–91; Kenny 2010). The earliest known Scottish iron-smelting furnace lies across the Moray Firth at Forres, is radiocarbon dated to 198 BC–AD 49 and 370 BC–AD 17 (Coleman & Photos Jones 2008, 15) and joins emerging evidence for the nature and organisation of Iron Age smithing practice in the north-eastern Highlands (Cressey et al 2011, 22–4; McDonnell 1998, 150–62). Much of the material from F573 comprised bark with tarry deposits on outside surfaces, consistent with the idea that this was deliberately made charcoal, since tars would tend to be concentrated in the enclosed environment of a charcoal clamp. It raises the possibility that pitch was also being produced, as a primary product or a by-product of the charcoal, which in turn implies an application to boat building (Hall in OLA 7.4.1/C3536).

Illustration 4.2
Section through the deposits in the valley relating to Period 1 (prior to the monastic development). Turf lines and buried soils are interleaved with windblown sand

Taken together these dispersed contacts suggest hunting expeditions in the Neolithic, some burial in the Bronze Age and Middle Iron Age, with charcoal burning in or before the fourth century AD. All the evidence comes from the raised beach at the north end of the site, the area nearest to the sea.

Period 1 mid-sixth to later seventh century

Period 1 is defined on the hilltop by a group of cist burials and a ditch with a deposit of burnt grain. On the crest, the period is marked by three cist burials within a bank-and-ditch enclosure. Downslope near the stream was a round building (S11) with

Table 4.1
Chronological for Periods 0–1
(extracted from Chapter 3, Table 3.1)

Defined Period	**Sector 1 [South Field]**	**Sector 2 [Glebe Field]**	**Sector 4 [Church]**	**The Tarbat Peninsula**
PERIOD 0 **Before AD 550**				
Bronze Age		Flint arrowheads	Carved stone ball	*Short cists at Balintore, North Sutor and Balnabruach*
Iron Age **third/fifth century**	*Ring ditch S12* *Ard cultivation* (or Period 1)	Earliest marsh C2310 [S-13264] **770–400 BC** Earliest marsh C2310 [S-14990] **720–380 BC** *Charcoal Pit* F573 [S-33422] **170–380**		*Long cists at Balintore, Nigg and Balnabruach* *Forts at Easter Rarichie, Tarrel, Lower Seafield and Castelhaven* *Burials at Balnabruach* Balnabruach A [S-13257] **410–230 BC** Balnabruach B [S-13261] **240–420** Balnabruach C [S-13282] **260–530**
PERIOD 1 Late Iron Age **fifth/seventh century** AD 400–680		*Start: 525–650* *Cemetery* Cist Burial 186 [S-13256] **420–610** Cist Burial 187 [S-33416] **540–650** S14 barrow (Sector 3) S10 barrow *Settlement* S11 workshop Hearth F535 in S11 [S-33420] **640–770** Well F527 [S-33421] **610–680** Marsh Stake in marsh F436 [S-13277] **640–770** *D1*. Latest marsh C2296 [S-14989] **600–760** *Flat-headed pins (fifth/sixth century)* *Copper-alloy disc (sixth/seventh century)* *Plough pebbles* *End 635–730*	*Start: 420–600* *Cemetery* Cist Burial 162 [O-13483; S-13255] (mean) **430–575** Cist Burial 172 [O-9699; S-37079] (mean) **570–650** *A1*. Plain burial 170 [S-33413] **580–660** *A2/B1*. Plain burial 169 [S-33412] **610–680** Plain burial 163 [O-13484] **640–690** Cist (?) Burial 146 [S-37078] **660–780** *Settlement* Ditch F129, with grain [S-13263] **540-660** *End: 645–725*	*Burials on the ridge above the Firth*

evidence for metalworking, and a number of pits, wells and cisterns serving a general theme of water management. Burials and organic matter relating to these features were radiocarbon dated between 550 and 700 (Table 4.1).

The cemetery

Burials on the hilltop (Sector 4)

Period 1 burials excavated within the confines of the later church (Sector 4) were usually cut through a podsolized buried soil above the sand subsoil (OLA 6.3/3.1.1; App. C; here Illus 4.5). The burial rite, exclusive to this period, was extended supine inhumation (one prone burial was an exception), within a long cist of stone slabs. Old Red Sandstone slabs generally lined all four sides of the grave, but not the base. Some had a slab lid that rarely survived intact, but did survive occasionally in a collapsed and fragmentary state.

A cluster of six burials including five long cists was defined in the south-west corner of the excavated area in the church comprising (in stratigraphic order) Burial 162 under 146; 172 under 146 and 131; 131 (without cist) under 179 under 181 (Illus 4.6). Burial 162 has the earliest carbon date (AD 430–575) and the lowest height at 16.6m AOD. Burial 146 has the latest carbon date (AD 660–780). Burial 181 was a small cist containing no bones and was possibly the burial of a child. It was the latest in this local sequence, and the highest to survive at 17.6m AOD. The cluster thus comprised three female burials, one male burial, a further adult and a possible child, and their close proximity implies a family group. Given a height difference of one metre between the highest and lowest members of the cluster, and a time duration of at least a century, the cluster would appear to have focused on a mound that was revisited by additional interments, or was created by them. Burial 182, also with a cist, was an outlier to the immediate east. Other plain burials follow this orientation towards the putative mound (Burials 166, 185, 186) (Illus 4.7). The same alignment is shared by Burial 149, in which some stones of a slab lining survived. Burial 149 cut a timber-lined ditch, containing grain (F129), which is dated to the sixth/seventh century and so was contemporary with at least some of the graves (see below). No barrow ditch was defined in the narrow and highly congested south-west corner, where access was also impeded by the standing church walls. But the disposition of the Period 2 burials implies a mound that was still visible in the eighth century, and may have facilitated the continuity of burial on the hilltop (Chapter 5.2, p 108). Burials assigned to Period 1 are summarised in Tables 4.2 and 4.3 (see Digest 4 for data on all burials).

Burials on the crest (Sector 2)

Three burials were excavated (more accessibly) on the crest in the north-eastern corner of Sector 2 (Table 4.3; Illus 4.8: Burials 186, 187, 188; OLA 6.2/3.2.1; App C). Burial 186 (F515) contained a broken and collapsed lid, recovered as three slabs of Old Red Sandstone, beneath which lay an articulated skeleton, extended, supine, and orientated SSW–NNE (Illus 4.8a, b). The head lay facing to the south, the arms had been positioned to the sides and the legs were crossed at the feet. The protection of the cist had resulted in excellent preservation and the skull including cheek bones, rib cage and pelvic girdle remained extant, the right hand lay palm down and the left lay palm up, slightly cupped with the thumb across the palm. The relaxed positioning of the body suggests that it was not confined by a shroud or winding cloth when interred. The sides of the cist were also defined at this level and were made of eight upright slabs, three to each side and one each at the head and feet; the slab that had previously formed the head end of the cist had slipped and rolled to the south.

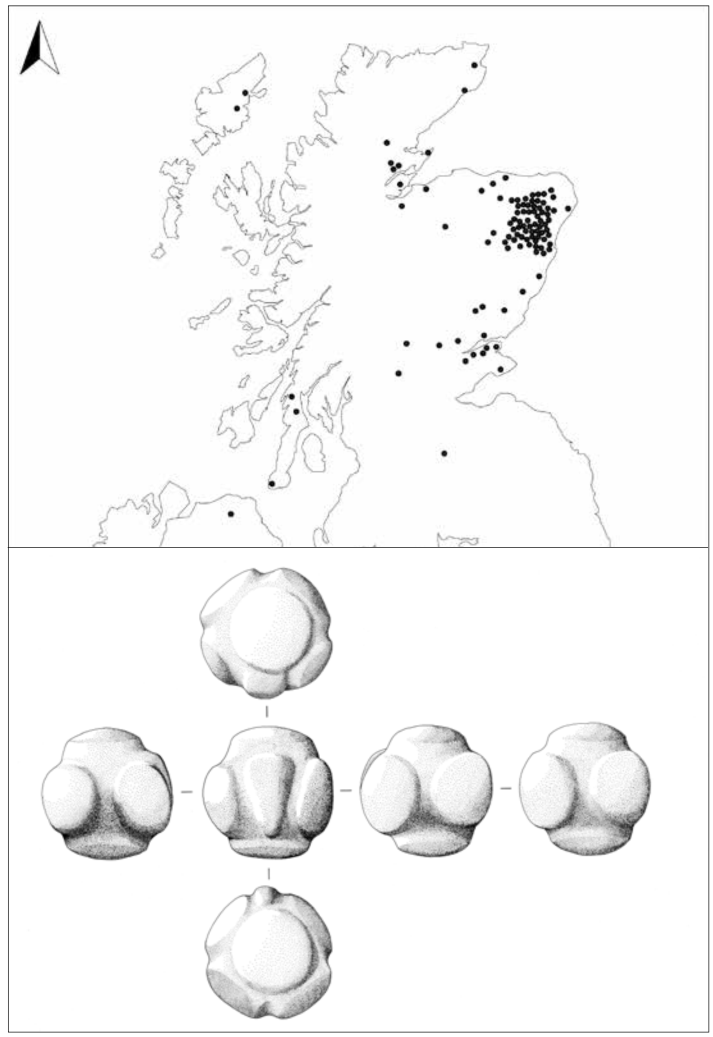


Illustration 4.3
Carved stone ball 20/366 (below) and distribution of the type (after Marshall 1977, 1983)

Osteological analysis of the individual identified a male aged forty-six years or older (Digest 4).

Burial 187 (F516) lay 0.10m to the north of Burial 186 and was first seen as a sub-rectangular cut visible against the stained and variable subsoil as a bright yellow sand backfill, although its edges could only be followed intermittently. It was a deep

Table 4.2
Period 1 burials in Sector 4
(extracted from *Digest* 4.1)

No.	Type	Occupant	Stratification	Location [height AOD]	Analyses	Date
46	Cist represented by side slab at lower right leg, oriented W–E	Adult, probable male, extended/ slightly flexed, supine. Height 1.72m/5' 8"	heavily cut away by later graves	lay at east end of area of intervention Sacrum – 16.8 Tibia – 16.9		
131	Simple; extended, supine, unfurnished, oriented broadly W–E	Female, 46–59 years	cut by cist Burial 179 and truncated by unknown agent, disappeared beyond western and southern limits of intervention	Grave cut 16.9–17.2		
146	Possible cist represented by side slab at right lower leg and part lid fragment over left leg; extended, supine, oriented WSW–ENE	Female, 26–35 years, represented by legs only. Height 1.6m/5' 3"	Cut cist Burial 172, later truncated to west by bell casting pit 20/F4	Tibia – 17.02		AD 660–780
149	Cist represented by side slabs down to upper leg; extended, supine, oriented WSW–ENE	Male with blade wound, 60 years+	cut into Period 1 ditch 20/ F129 = 17/F100, cut by Period 2 head-box Burial 125	Skull – 16.9 Sacrum – 16.7	Fractured R.ribs, Poss Neoplasm (R.Orbit), OA, DJD, SN, Dental, Maxillary Sinusitis	
162	Cist represented by side slabs down to lower leg and partial lid over upper torso; extended, supine, oriented WSW–ENE	Adult male. Height 1.68m/5' 6"	disappeared beyond western limit of intervention, cut cist Burial 146	Tibia – 16.6		AD 430–575
163	Simple; extended, supine, probably shrouded, oriented W–E	Male, 36–45 years. Height 1.74m/5' 9"	collapsed into underlying Period 1 cist Burial 162 when lid gave way	Sacrum – 16.8 Tibia – 16.7	**Local**	AD 640–690
166	With sandstone cist side slab, oriented SW–NE	Adult, probable female represented by right arm and part right torso. Height 1.54m/5' 1"	truncated by Period 2 Burial 155	Grave cut – 16.6–16.9m		
169	Simple; extended, supine, oriented W–E	Male, 26–35 years. Height 1.76m/5' 9"	post-dated Burial 170, in dense north-west zone, disappeared beyond western limit of intervention	Sacrum – 16.9 Tibia – 16.9		AD 610–680
170	Simple; extended, supine, oriented W–E,	Male, 26–35 years	early, deep burial in dense north-western zone	Skull – 16.9 Sacrum – 16.7 Tibia – 16.7	Calculus, Fracture (L.clavicle), SN, Neoplasm?	AD 580–660
172	Full long cist of side slabs with possible collapsed lid fragment, extended, supine, oriented SW–NE	Female, 46–59 years. Height 1.6m/5' 3"	post-dated by Burial 131 and cist Burial 146, later disturbed by Period 5 20/F4 = F147 bell pit and partially redeposited therein	Skull – 16.9 Sacrum – 16.7 Tibia – 16.8	**Migrant from the west** OA: L5-Sacral r.facet, L.knee, poss granuloma	AD 570–650

Table 4.2
Period 1 burials in Sector 4 (*cont.*)

No.	Type	Occupant	Stratification	Location [height AOD]	Analyses	Date
179	cist represented by two side slabs down to knees, extended, prone, oriented W–E	Adult	cut Burial 131, later truncated by unknown agent and overlain by cist Burial 181, disappeared beyond western and southern limit of intervention, left *in situ*	Top cist sides – 17.21 Grave base – 16.91		
180	long cist of side slab and part lid, extended, supine, oriented W–E	Adult	disturbed while semi-articulated possibly by cist collapsing, recorded during underpinning of church, remains *in situ*	Grave cut 17.0–17.4		
181	Stone slabs packed with cobbles of possible small cist, oriented N–S	?child burial	disappeared beyond western limit of intervention, cut Burial 131 and truncated cist Burial 179	Grave cut 17.3–17.6		
182/3	Cist of side and end slabs (assigned Burial 182), oriented broadly SW–NE	no skeleton preserved although body stain recorded within cist backfill (assigned Burial 183)		Grave base 16.8–17.0		
184	Cist of part side slab, likely oriented SW–NE	Not known	heavily truncated by later graves, disappeared beyond northern limit of intervention	Slab 16.8–17.0		
185	Cist of part side slab		cist surviving repeated truncation by later graves	Slab 16.8–17.2		

Table 4.3
Period 1 Burials in Sector 2

No.	Type	Occupant	Analyses	Date
186	Cist; lid broken into three; extended, supine, orientated SW–NE	Male aged 26–35 years. Height 1.7m/5' 7"	**Not local** **Terrestrial diet** Spondylolisis(L5), L.Os acromiale, Entheses	420–610
187	Cist with lid and sides packed with beach cobbles; supine extended oriented SW–NE	Male 36–45. Height 1.8m/5' 10"	**Not local** **Terrestrial diet** Spina biffida occulta, L&R 5th MT fracture, Periostitis (R.Ulna)	540–650
188	Supine inhumation oriented SW–NE	very poorly preserved remains of an adult, probable male	SJD(?): C2	

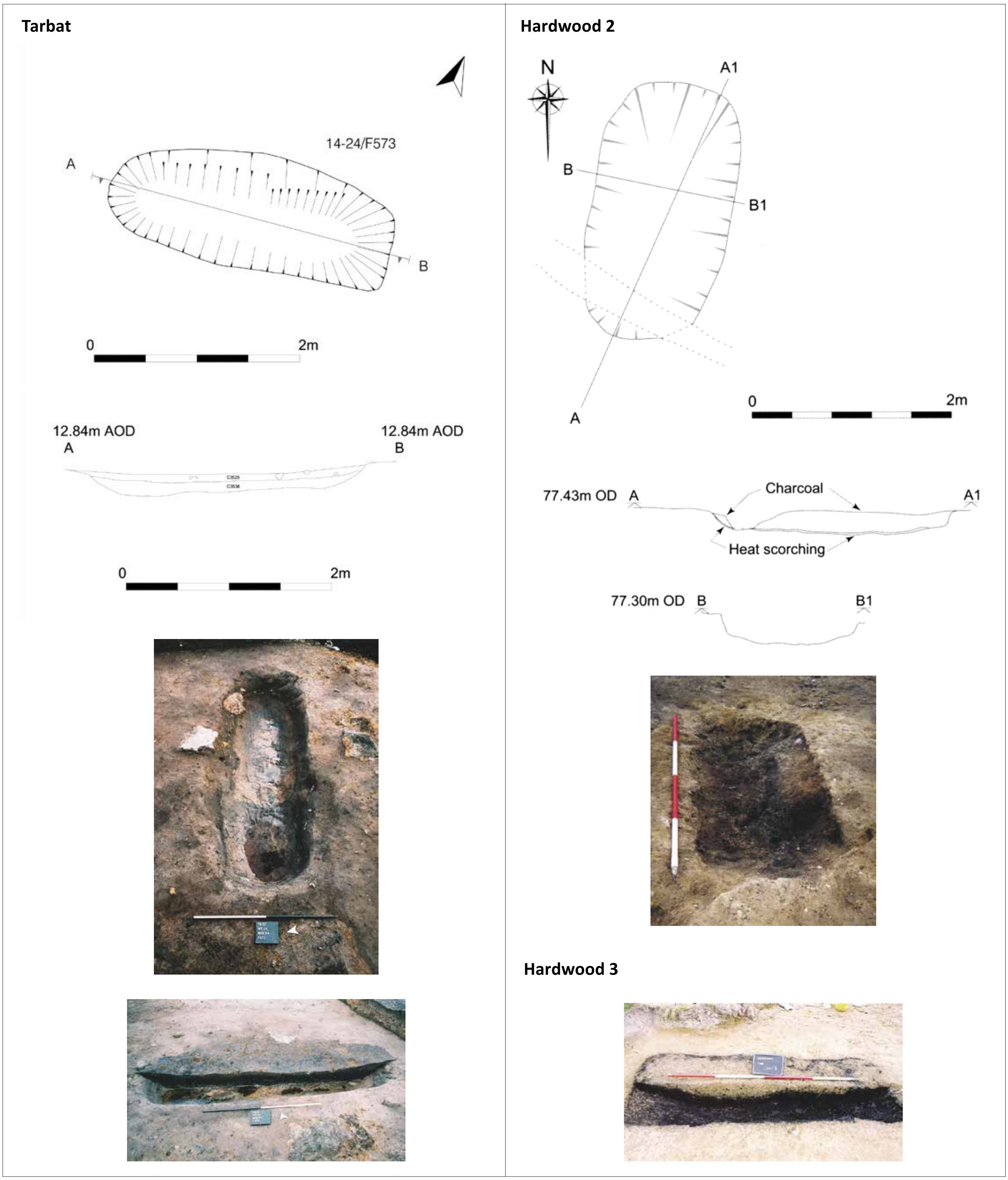


Illustration 4.4
(Left) Charcoal kiln and section (Sector 2; F573); with a comparison (right) from Harwood 2, Ireland (Carlin 2008, Illus 5.1a and Illus 5.8c, courtesy of Archaeological Consultancy Services Ltd and Neil Carlin)

straight-sided grave preserved to a depth of *c* 0.9m (Illus 4.8b). Fallen into the grave was a cist lid made of three large unworked seaworn slabs of red sandstone that had split along bedding planes, fragmented and dipped into the underlying cavity. Their removal revealed the cavity to have filled only slightly with percolating sand and the skeleton lay relatively undisturbed within an inner cist of split sandstone slabs, packed behind with rounded flat beach cobbles; the cist lid appeared to have relied only on the inner stones for support. Excavation of the skeleton revealed a supine extended adult inhumation oriented SSW–NNE. Covering the skull, torso and lower abdomen was a fungal mould which had resulted in poor bone preservation in those areas; elsewhere bone preservation was good. The skeleton lay tightly within the carefully built cist and in places appeared constrained by its narrow width, particularly around the shoulder area. The legs were crossed at the feet and flush with the grave end, which had apparently never been furnished with a stone. Osteological analysis identified a male aged twenty-six to forty-five years.

Burial 188 (F517) lay 0.20m to the south of Burial 186 (Illus 4.9). The grave was identified as a sub-rectangular cut, visible as a bright yellow sand backfill against a more variable dull yellow subsoil. Excavation of the grave backfill revealed a large sub-rectangular grave with near-vertical sides and the very poorly preserved remains of an adult supine inhumation oriented SSW–NNE. The skeleton had been reduced to brown sand stains in most areas, although the shape of limbs and the form of individual bones were sometimes betrayed by an iron-pan crust. Only parts of the skull, the cervical vertebrae, the distal femora, patellae and proximal tibiae were preserved and recoverable; osteological analysis identified an adult of undetermined sex. The burial position could nonetheless be discerned and appeared to have consisted of the arms crossing slightly at the abdomen, legs straight with the feet together and the head leaning slightly to the south.

Burial 186 and Burial 187 (males) were radiocarbon dated as AD 430 to 610 and AD 540 to 650 respectively (95%) (see Table 2). It is likely that all three individuals had been interred by the early to mid-seventh century.

Ditch and bank

A short surviving length of ditch *c* 2.60m wide and oriented NNE–SSW, was defined on the north-west side of this group of three burials (Illus 4.9; F545). An excavated section revealed that, following initial excavation, the ditch had been left open for a period, marked by the accumulation of windblown sand, with tumbling and collapsing sides. Following erosion, the ditch was backfilled from the east though not comprehensively, and apparently with the original upcast which appeared to have been used for the make-up of an adjacent bank. The feature persisted as a consolidated turf-lined earthwork of a shallow ditch and bank. This horizon was overlain by a thin layer of clean redeposited bright yellowish-brown sand subsoil, which, significantly, merged with the redeposited subsoil backfill of Burial 187 and indeed, was indistinguishable from it. It would appear that this grave was excavated while the ditch lay open. The shared stratigraphic horizon of ditch and grave and the tightly spaced burial group suggest a deliberate association. Although little was seen of the ditch, later heavily truncated, its width implies a quantity of quarried sand and its location a structure appropriate to the graves – perhaps a round or square barrow, with which they were covered or to which they were later added.

Illustration 4.5
Cist Burial 172, excavated in the south-west corner of the nave

On top of the cut for Burial 188 there survived the remains of a small earth mound covered with a series of flat sandstone slabs with a possible small post-hole at the eastern end (Illus 4.10). These are interpreted as constituting a deliberate grave marking, and add to the evidence that a mound was associated with these graves. The implication of the relative heights is that the monument had been visible during the subsequent layout and construction of the

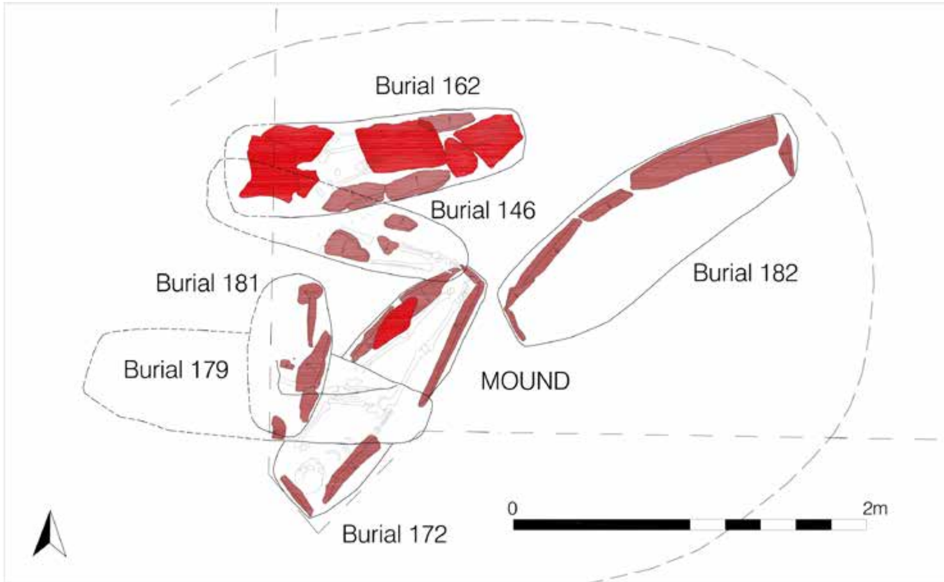


Illustration 4.6
The cist burial cluster at the south-west end of the excavated area ('South Cluster'). Burial 162 and Burial 172 are the earliest, followed by 146, 179 and the child 181

adjacent Period 2 tank (S4) and road (S13). Thus it may be that both this group and the 'cluster', suggested as being beneath a mound in Sector 4 (above), represent similar memorial structures. If so, it would be possible to envisage an origin for the Period 1 cemetery as a series of cist graves under barrows (for the type see Ashmore 1980; Close-Brooks 1984a; Wedderburn & Grime 1984; Alexander 2005).

Some support for this suggestion is offered by a vertical aerial photograph taken in 1945, which shows a group of circular features in the land north of the Tarbatness Road (Illus 4.11). These vary in diameter from less than 3m to over 8m, and are set in rows across the line of the crest. Lines of later paths cross the area, one directly emanating from the wicket gate to St Colman's Church. These features are unlikely to have remained above ground, or they would have been recorded, and were probably then showing as parchmarks. The date was 31 August and the average temperature was the hottest for the war years (Marsh 2011; Perry M 2006, 7). By 1994, this area of land had been completely built over, apart from the narrow strip that became Int 15 (Sector 3). To our knowledge, no identification has been suggested for these features and there is no information implying that stone slabs or skeletons were encountered during building along the Tarbatness Road (McCullagh & Wood 2010). The features resemble ring ditches of different sizes and recall barrow cemeteries of the Bronze Age or later. As such they link discoveries made both to north and south of them (at Balnabruach and Chapel Hill, see below, p 100).

Other structures in the burial zone

Within Int 15 (Sector 3) on the beach side of the crest, two curvilinear gulleys were identified and excavated (OLA 6.2/3.2.2; Illus 4.12). The more southerly (F5), heavily truncated, had been cut directly into the powdery sand subsoil and varied along its length in width and depth, with two sterile pebbly-sand backfills that yielded a little animal bone and a fragment of iron. The other (F34, S14) was better defined and consisted of a segment of curvilinear ditch running broadly north to south with curves at either end, trending towards a possible circular form. The ditch was backfilled with sterile sand; a group of stones within the backfill positioned at the southern end were recorded as possible post-packing. S14 was an indication of a circular ditched enclosure about 7m in diameter. It lay close to the possible barrows shown on Illus 4.11, and may itself have signalled the remains of a barrow ditch.

Lying still further south, curvilinear ditch F559, designated as S10, was defined following the removal of a buried soil associated with Period 2 occupation (Illus 4.12). It was oriented broadly NE–SW, opening onto a wide flat base on the down slope to the south (OLA 6.2/3.2.2). With a stepped profile and initially filled with windblown sand, S10 may have functioned as a drain or eaves-drip of a small roundhouse *c* 7m in diameter. However its location close to the burial zone and its dimensions again raise the possibility that this was a ditch that had been dug to create a small mound and left open. The central area, where a hearth or burial would have been situated, was obscured by the outflow from S4. The proposal that these trace structures belonged to burial mounds has the spatial logic of separating the barrow cemetery on the crest from the more sheltered valley by the stream, the site of the circular feature S11, which had a central hearth and was more certainly a building (below). These traces encourage the view that there was a prehistoric cemetery along the shore ridge overlooking the Portmahomack bay, to which sixth/seventh-century cist graves under mounds were

Illustration 4.7
Cist burials in Sector 4, showing the cluster/mound at the west end, and the location of ditch F129

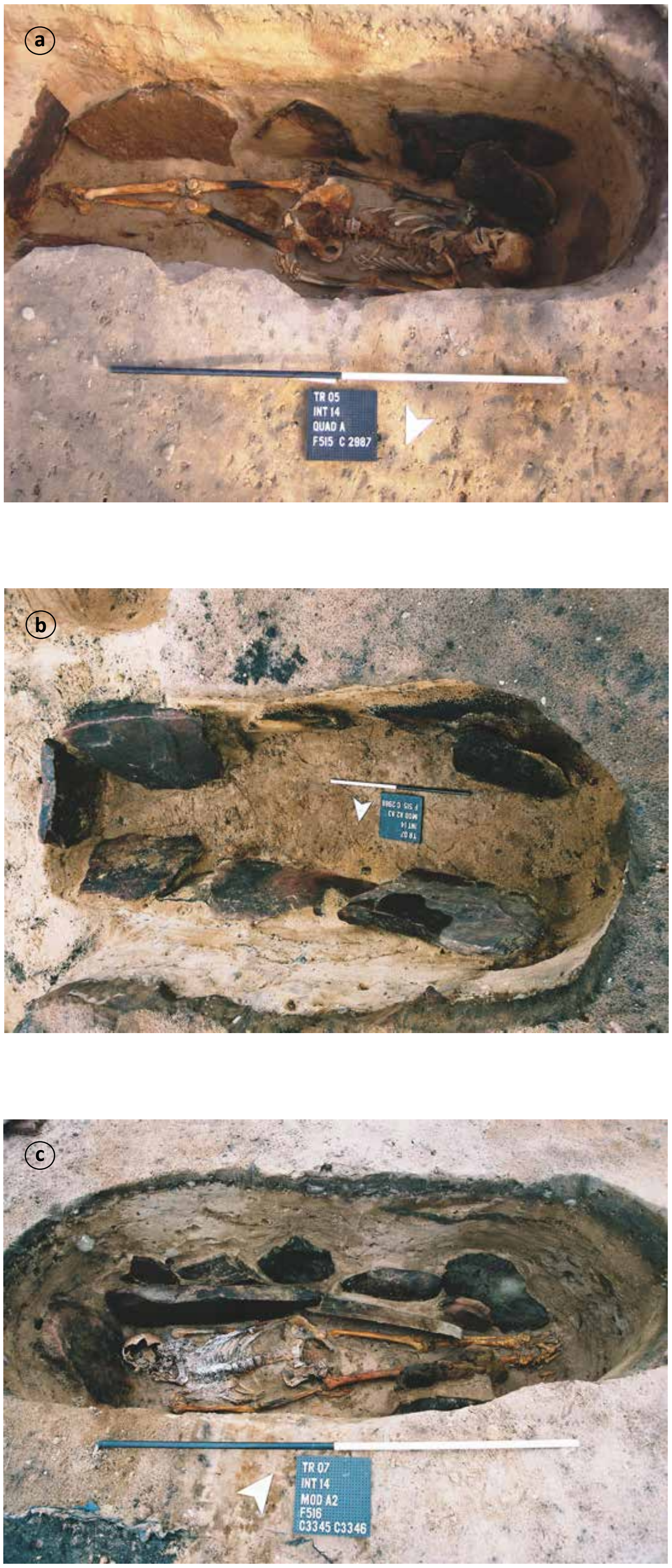


Illustration 4.8
Cist burials in Sector 2: (a) Burial 186, adult male in cist grave; (b) Burial 186, showing the cist; (c) Burial 187, adult male in cist grave

added, these in turn guiding the subsequent interments of the eighth century.

Evidence for diet from carbon/nitrogen isotopes (Curtis-Summers OLA 7.2.2.1)

Three Period 1 burials were examined for their diet using isotope signatures of carbon and nitrogen (Burials 166, 169 and 172). The isotope values of these individuals suggest that they were consuming a similar range of foods to the monks who succeeded them in Period 2; that is a terrestrial, high protein diet. One adult male (Burial 169) had slightly lower $\delta^{15}N$ values than that of the later Period 2 group, although not of sufficient magnitude to suggest a difference in trophic level.

Table 4.4
Evidence for childhood provenance from Oxygen and Strontium isotopes (Period 0 and 1) (Walther OLA 7.2.2.2]

Period 1	Source	Provenance
0	Balnabruach A	East Britain (local)
	Balnabruach C	East Britain (local)
1	Burial 170	Local
	Burial 172	*Western Britain*
	Burial 186	Britain?
	Burial 187	East Britain

Six burials were examined for their provenance, using oxygen and strontium isotope signatures. While the two Middle Iron Age individuals (and Burial 170) were of local extraction, three of the four occupants of graves belonging to the sixth/seventh century were more exotic. Burial 172 came from west or central Britain and Burial 186 and 187 were probably from Britain but not of local origin (Digest 4.4).

There was much variety in this small sample of the sixth/ seventh-century population at Portmahomack. It included men (nine), women (four) and one child; age indications ranged from the empty grave of a child to a sixty-year-old somewhat battered warrior with a blade injury (Burial 149). There was a man of unusual height (Burial 187 at 1.8m) and a woman of 1.54m (Burial 166). The four persons examined had a terrestrial high protein diet. Out of another four, tested for childhood origin, only one was raised locally, although all had grown up in Britain.

Status and religious affiliation

At Whithorn, Peter Hill decided that his lintel graves (cist burials) were lower status than his log coffins, on the grounds that the former are easier to assemble (1997, 70). At Portmahomack the cist graves provide an obvious contrast to simple graves (where the use of timber is not suspected), and the association with

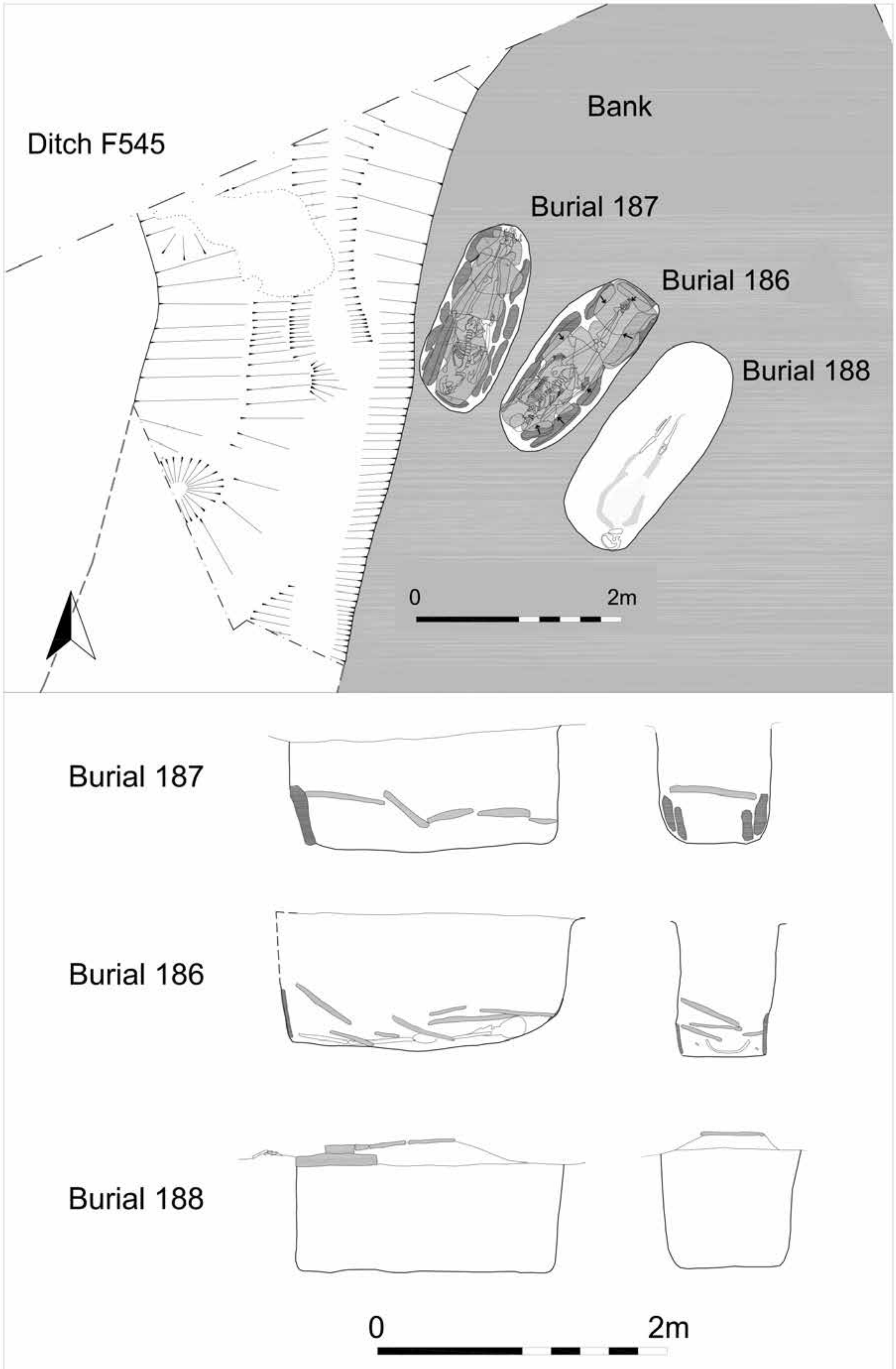


Illustration 4.9
Plan of burials in Sector 2, showing ditch (F545) and location of bank above, profiles and sections of burials below

Illustration 4.10
Relict mound above Burial 188

burial mounds endorses the assessment that, relatively speaking, these are special investments.

A Christian affiliation with cist burial has been argued on the doctrinal grounds that the body is to be resurrected on the last day and should be protected in the meantime – thus the need for robust slabs (Smith 1996, 28; Ó Carragáin, T 2010b, 219). Others see the practice of inhuming the dead in cists under low mounds and cairns as a north British tradition with its roots in the Roman period (Loveluck in Daniels 2007, 187; Maldonado 2011, 95–8). The dates of the Portmahomack cist burials would seem to detach them from being the necessary consequence of a known Christian mission.

In general, the prominent situation of the burials at Portmahomack in Period 1, the use of mounds and the high protein diet suggests that those commemorated may be assessed as high status. As for religious alignment, it has been argued elsewhere that burial rites do not neatly align with 'Paganism' and 'Christianity,' but neither do they mean nothing (Carver 2001; 2010). Allowing that the burial parties have agency, burial rite reports ideological allegiance, but the ideology itself may be local or ephemeral or presently unknown. Changes in burial rite imply changes in thinking, which in this case occurred in the early first millennium when the cist-grave cemetery was established and again in about 700, with the change to head-support burial argued as characteristic of the Period 2 monastery (Chapter 5.2).

The settlement

Environment

Signs that the marshy ground south of the burial ground in Sector 2 was subject to a human exploitation were evident from surviving peat in the valley (C2296), which made its latest appearance between radiocarbon dates AD 600–760 and most probably before 700 (p 68). This peaty stratum appears to provide a snapshot of the valley bottom as it was drying out. There were plants typical of disturbed places and weeds of cultivation, such as annual nettle (*Urtica urens*), docks (*Rumex*), fat hen (*Chenopodium album*), chickweed (*Stellaria media*), corn spurrey (*Spergula arvensis*) and wild radish (*Raphanus raphanistrum*). The presence of heather, especially as charred fragments, together with scattered charred grains and chaff fragments from barley (*Hordeum*) point to human actvity. There were indications in the beetle fauna for the presence of artificial habitats (via *Falagria* or *Cordalia* sp. and *Gyrohypnus ?angustatus*). At least four kinds of fly puparium were present in this assemblage, too, perhaps adding to the evidence for detritus from human occupation. It should be noted, however, that the only strongly synanthropic insect was the spider beetle *Tipnus unicolor*, a species generally associated (in modern contexts) with damp old buildings. Although some of the wetland plant taxa from the earlier phase persist, and there are occasional records of waterside beetles, the moss flora is very depleted in the upper part of the peat and the taxa present are not the fen/marsh plants of the earlier period (see p 73 above). The insect fauna is increasingly dominated by terrestrial taxa, especially grazing land mammals (Hall & Kenward Digest 7.4, C2296).

Structures

The micromorphology sequence obtained from beneath the later road (S13) sets the scene for the development of the Period 1 settlement (Illus 4.13). The area was a sand dune overlaid by windblown sand and ash with no evidence for the in situ growth of vegetation. The ash was derived from either a grass-rich turf, or more likely a thin peat that had developed upon a silt/sand-rich substrate. The relative scarcity of ash rich in biogenic silica may also be a function of the carrying capacity of the wind, ie it was too strong to deposit the finer ash. The presence of very small fragments of bone, possible coprolite and a rounded clast of burnt clay suggests that the source of the ashy components of the deposits may have been a midden heap onto which domestic and industrial waste was being dumped (Ellis in Digest 7.5).

Evidence for occupation to the south was grouped as S11 and consisted of a slight terrace bounded by a curvilinear ditch (F547) enclosing a hearth (F535) and a slag pit (F560), both these signalling industrial use (Illus 4.13). During the life of the hearth, a complex of freshwater collection features was constructed, represented by a downslope ditch (F534), gulleys (F526 and F572), a stone-lined cistern (F530), wicker-lined well (F527) (see Period 1 in stratigraphy for Sector 2 in Ilus 3.13). Within this group, F526, F527 and the F435 feature group clearly predated the construction of the Period 2 eastern boundary wall F149.

The size of S11 was inferred from the curving gulley, the edge of a terraced platform and a cluster of stones (F578) each of which was roughly equidistant from a central hearth (F535) ringed by stake-holes (Illus 4.14). The implied diameter of the building is 7m. No ring of posts or stakes was recorded, implying that the wall of this small building or shelter was constructed entirely in turf.

Industrial activity

Within S11, the hearth (F535) consisted of a sub-rectangular cut into subsoil against which was set a sandstone slab and cobble kerb (Illus 4.15). Three sides of the hearth each consisted internally of a single upright stone achieving the required depth. The northern side, however, was different and consisted of three courses with an integral void at hearth-base level, while externally the construction cut had a more gentle gradient. This void within the stone make-up appeared to have been deliberate and would have allowed air into the hearth at a low level, possibly aided by bellows; a sole upright sandstone slab to the immediate north of the feature may have provided bellows support. Adjacent to the void, the initial hearth fill consisted of a pale yellow, oxidised ash deposit, which appeared to have been created in intense heat. Surrounding the hearth was a series of stake-holes, which were identified externally on all sides of the feature, although represented only by a single example on the north side. Thus it is possible that the hearth was fitted with a stake-and-turf cover, incorporating an air supply from the north, which would have enabled the creation of high temperatures as well as funnelling smoke.

Adjacent to the hearth was a slag pit (F560), also contained within S11 (Illus 4.16). Measuring 1.30 × 0.60m and containing a single concreted slag-rich fill, the pit was contemporary with the early use of the hearth and also associated with ironworking. The hearth and the pit between them produced just over 2.3kg of undiagnostic iron-smithing slag, together with dense slag that indicates that secondary smithing was probably being undertaken. Other slags recovered from Period 1 backfills and layers included four smithing hearth bottoms (Spall & Mortimer in Digest 6.9).

The use of the hearth endured: a new lining overlay the earlier kerb make-up and thus presented a three-sided hearth, open to the south. Notably, evidence for the hearth having been cleared out from the south was manifest as a mixed clayey-silt ash and charcoal deposit that had the appearance of representing a general mixture of cleaner homogenous ash fills. The fuel used by the hearth contained heather roots and peat turves with traces of barley grains and charred hazel nutshell (Hall in Digest 7.4). This implies lower temperature activities such as secondary smithing. A charred hazelnut shell was submitted for radiocarbon dating and returned as AD cal 640 to 770 (see p 42). Although this is a broad date range, the stratigraphy indicated that the use of the hearth was contemporary with, or pre-dated, the use of the wicker-lined well

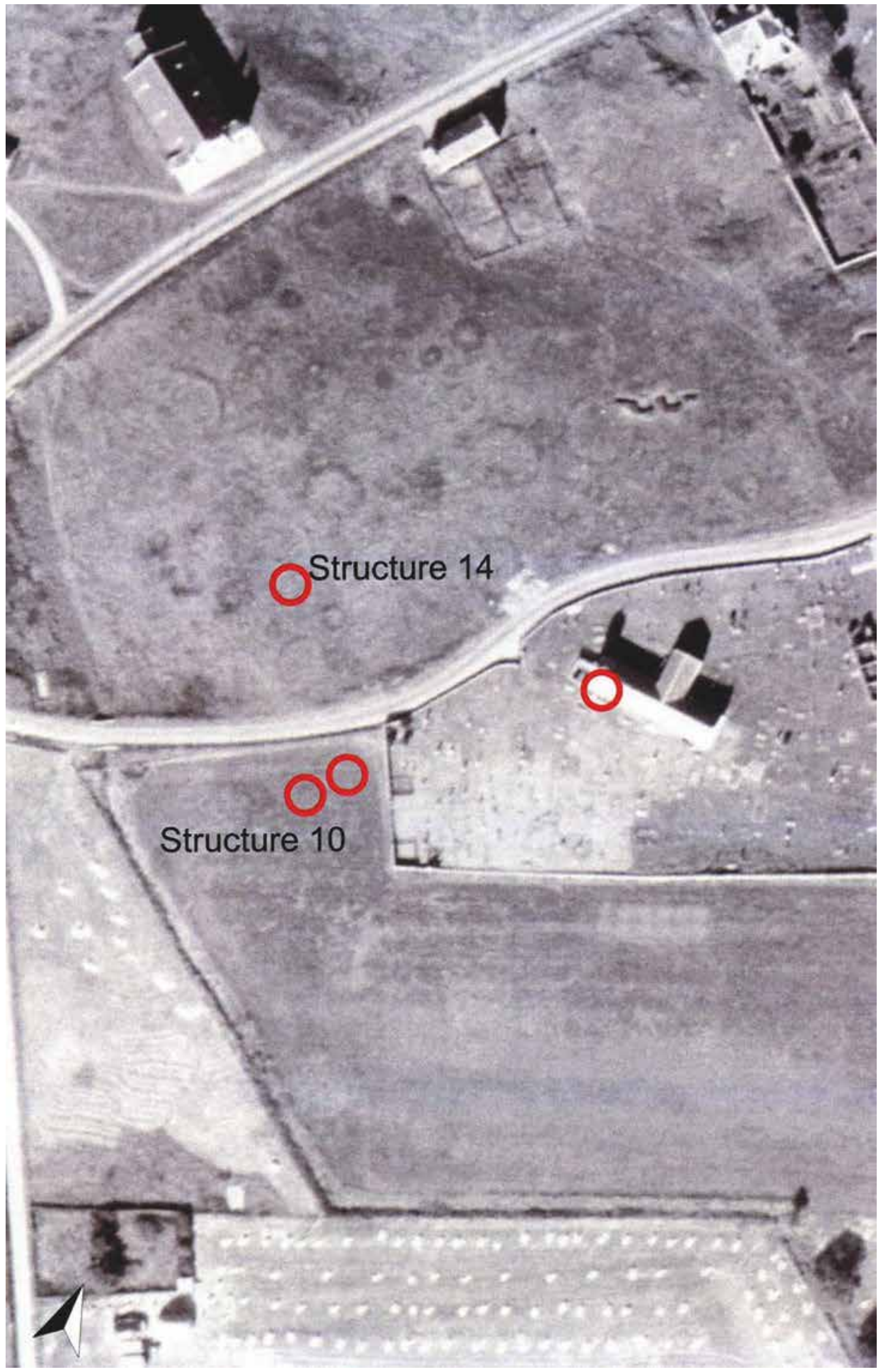


Illustration 4.11
Possible round barrows seen north of St Colman's Church, Portmahomack in 1945
(RCAHMS 106G/UK751 flown 31 Aug 1945)

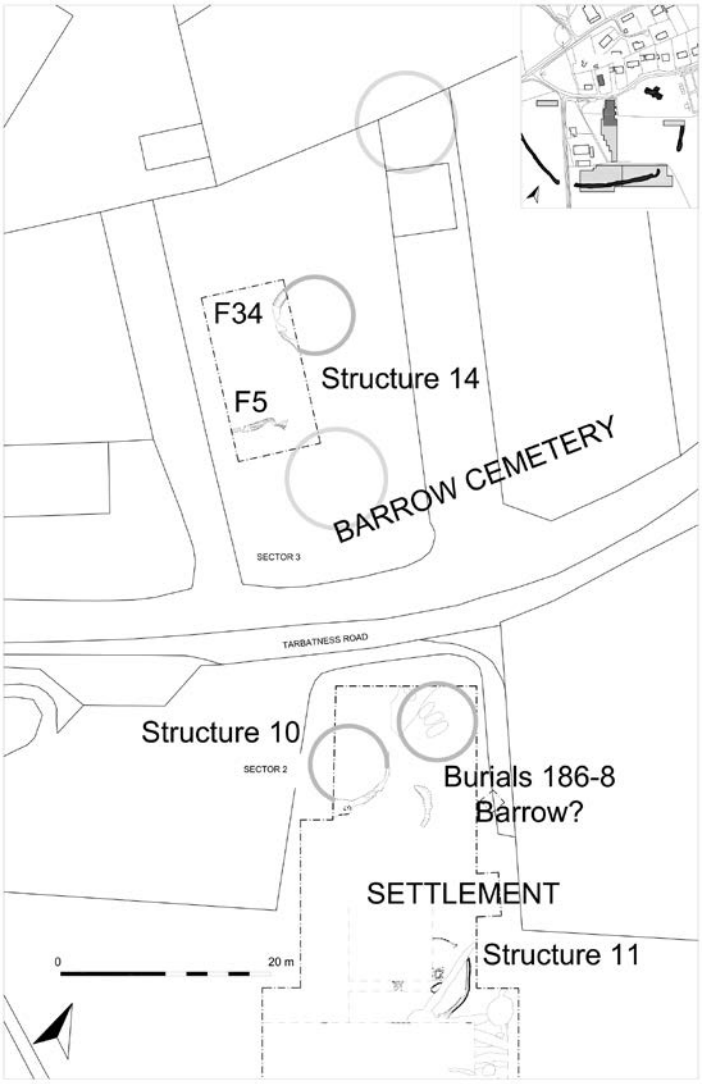


Illustration 4.12
The locations of possible barrows in Sector 3 and at the north end of Sector 2, including S10 and 14

(F527), which was measured at AD cal 610–680, allowing both in the seventh century (below).

Concurrent with the use of the hearth, a number of deposits were allowed to build up within the small terrace cut into the natural slope defining the north side of the working complex, partially levelling it. Nearby, a buried soil appeared to have functioned as the working surface for the early occupation of S11. It contained a number of slag fragments and small iron objects including a possible knife blade, nail or pin fragments and a whetstone.

Water management

During the life of hearth F535, a series of measures were put in place dedicated to the collection or management of fresh water. The gulley of S11 (F547) had an erosion pattern suggesting that it had intercepted and emptied water towards the marsh; after an initial episode of silting it was comprehensively backfilled. A gulley F534 then cut across gulley F547 and ran past the hearth in a south-westerly direction. Ditch and hearth were in use together until their upper fills intermingled, as the section across them shows (Illus 4.17). Ditch F534 was destined to collect water as well as evacuate it, since it fed a stone-lined cistern F530 (Illus 4.18). The basal fill of the ditch F534 was dark and greasy, suggesting a wooden lining as noted in the contemporary ditch on the hilltop (F129, below) and pre-echoing a technique that would be applied to the roadside ditches of the Period 2 monastery in the same place (p 48).

Further east was a wicker-lined well (F527) (Illus 4.13, 4.19). The preserved wickerwork lining protected an area *c* 1.0m in diameter and survived to *c* 0.50m high where the feature penetrated deep into the water table, bottoming on a horizon of running sand. The construction cut, wider than the wicker lining,

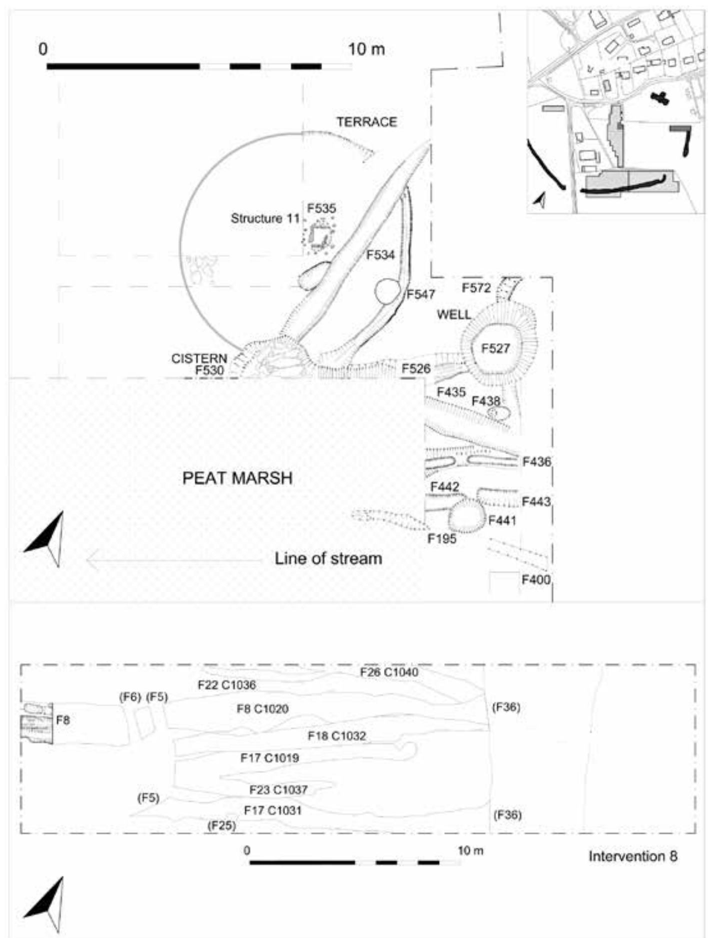


Illustration 4.13
The settlement zone near the stream. S11 and well F527 stand north of the marshy stream bed. The edge of the marsh was managed with fences (and possible gateways), and canalisation of water. This begins upstream to the east in Int 8 (below)

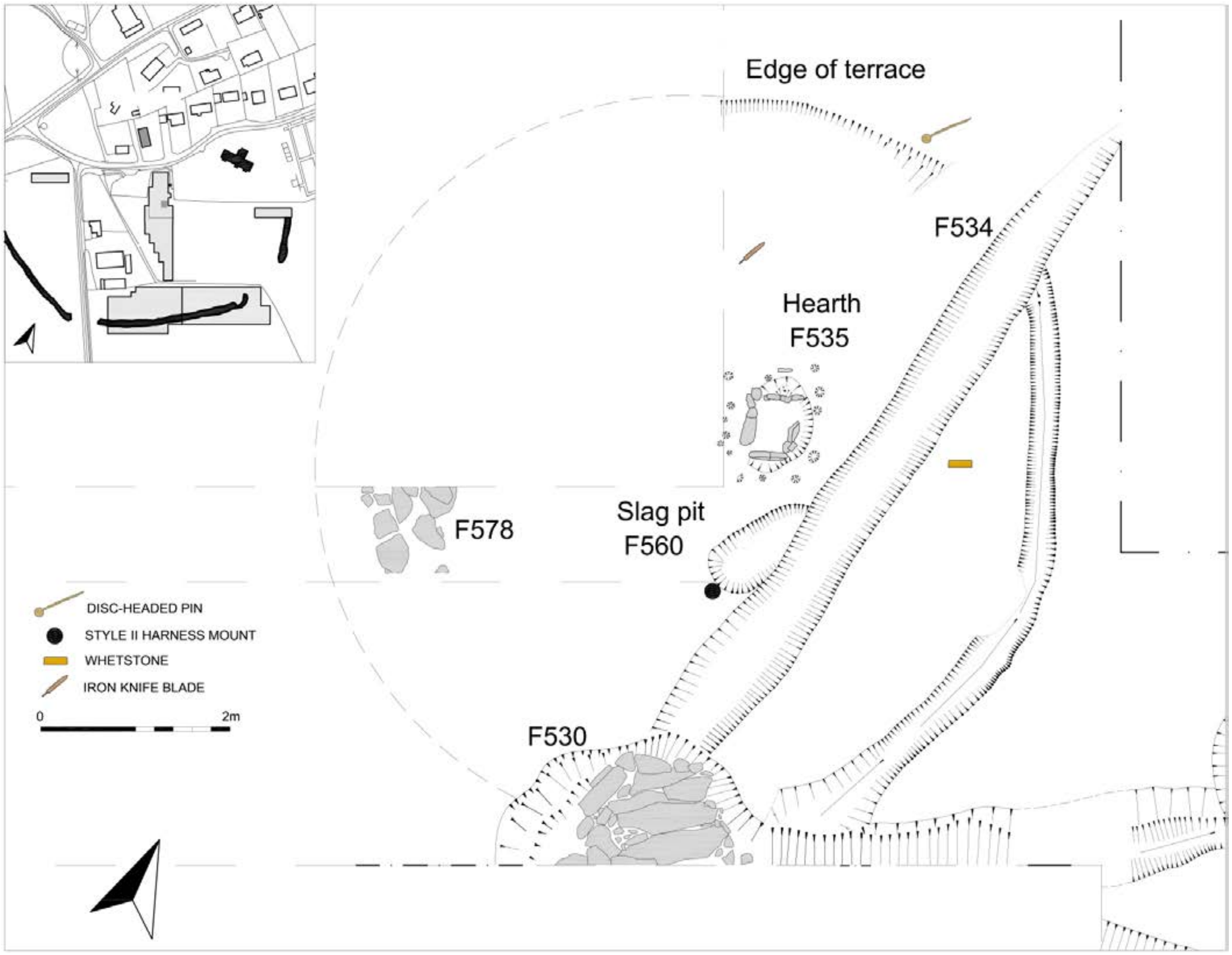


Illustration 4.14
S11, with hearth F535 and slag pit F560, showing findspots of associated finds. Cistern F530 and feeder F534 are later additions. The cistern is also connected to well F527 via culvert F526

had been backfilled with redeposited sand. During the excavation, the feature filled quickly with water and its sides became unstable, collapsing partially on the east side. A sample of the wicker lining was nevertheless recovered and a rod identified as willow of about fourteen years' growth was selected for radiocarbon dating which returned a date of AD 610–680. The well had three feeders or overflows one of which (F526) connected to the cistern (F530) (Illus 4.13). Thus well, cistern, downslope gulley (F534) and hearth belonged at one point to an integrated design in which the industrial activity around the hearth was linked to a wider system geared to the collection and storage of freshwater.

A number of gulleys, a small pit and a post-hole located in the valley floor were associated with this design (F435; F436; F438; F439; F441–F443; Illus 4.13). These features were excavated directly into Period 0 strata at the peaty fringe of the valley floor and may represent attempts to canalise water or erect fences protecting the settlement area from the marsh. A wicker hurdle indicated by willow stakes had been erected along the line of silted up channels, returning a radiocarbon date of AD 630–780 (F436). The hurdle, together with two comparable and parallel features further south, had gaps aligned with each other as though providing a passage from industrial area into marsh. Outside the excavated area to the east, these features were echoed and continued in the evaluation trench Int 8 in the form of a series of parallel gulleys. The respective AOD heights from Int 8 in the east to the Int 24 group show a fall from *c* 14m (at Int 8) to 12.6m AOD (at Int 24).

The ditch on the hilltop (Sector 4)

A single non-burial feature was defined in the area of the burial ground at the top of the hill: a ditch 0.75m wide and running

Illustration 4.15
Hearth F535 at Phase 1, inside S11. The void designed to introduce a draught shows in the centre of the north side (on the left)

broadly W–E (Illus 4.20; 4.21; F129; for location see Illus 4.7). It was traced for 8m and proved to consist of a narrow, steep-sided, linear cut deep in sand subsoil. The base of the ditch was recorded at between 16.0–16.15m AOD with a surviving maximum depth of *c* 0.55m. The fill system of the feature began with an initial slumping of sand edges, followed swiftly by the insertion of a lining, part wooden and part sandstone slabs. When sampled and processed by flotation, the lower fills were found to contain a quantity of burnt rye, wheat and barley. A carbonised barley grain was radiocarbon dated to AD 540–660. This deposition was followed by an episode of collapsing edges of sterile sand, followed by another deposit of dark organic material, which also produced charred cereals identified as wheat, barley and rye (p D142). Subsequent fills consisting of redeposited sand and gravel subsoil appeared to derive from the excavation of graves nearby (OLA 6.3/3.1.2). The grain was charred, implying redeposition after a fire or an accident during processing. The heights of the ditch base vary by only 0.15m along an 8.0m excavated length, discouraging its interpretation as a drain. As well as a wood lining, it may have had a wooden lid, so raising the possibility that grain was stored, steeped or allowed to germinate in a contained space. However the mixture of rye, barley and wheat and the presence of grains and rachis (ear stalk) fragments, as well as material derived from turf, suggest that it may be burnt debris from a straw-and-turf roof (Allan Hall in Digest 7.4). The implication is that a Period 1 structure stood east of the first cist graves, and the ditch was backfilled during clearing up or renewal. It does not need to have been a building as such; Scottish traditional constructions include the 'fale dike', a turf wall with a turf or thatched coping that ran alongside a field boundary or ditch (Walker & McGregor 1996, 22). Structures made largely of turf are suggested as plausible components of the Portmahomack repertoire (see Chapter 5.9, p 228).

The crops represented in the ditch were rye, barley and free-threshing hexaploid wheat. The presence of wheat is significant because its occurrence at this date is rare in Scotland. At the Anglian monastic site of Hoddom, Dumfries and Galloway, wheat was thought to have been imported (Lowe 2006, 195); here however, the presence of rachis argues for on-site cleaning. Oats, a staple at Hoddom, were not certainly identified at Portmahomack. The fill also included burnt turf, charcoal and fuelash slag (Digest 7.4; F129). The ditch on the hill signals the existence of a grain-processing station beside the barrow cemetery and associated with the settlement. The ditch itself may have been used to hold water, or to canalise it towards the industrial area down the slope. The traces of barley grains in four samples from the hearth of S11 (F535) and from an adjacent dump of spent fuel might represent material from straw, or accidental burning of grain intended for food, in the hearth. Charred hazel nutshell was present in three samples in this group. The barley and the timber-lined ditches provide some connection between the industrial area and the grain processing on the hilltop.

Illustration 4.16
Slag pit, F560

Assemblage from the settlement

Status objects

An iron dress pin with a disc head was found beside the northern terrace edge of S11 (Illus 4.14); a further example was recovered from Period 1 strata and three others including a copper-alloy example with crescentic head and octagonal shank, were recovered residually, but almost certainly emanated from Period 1 (Illus 4.22;

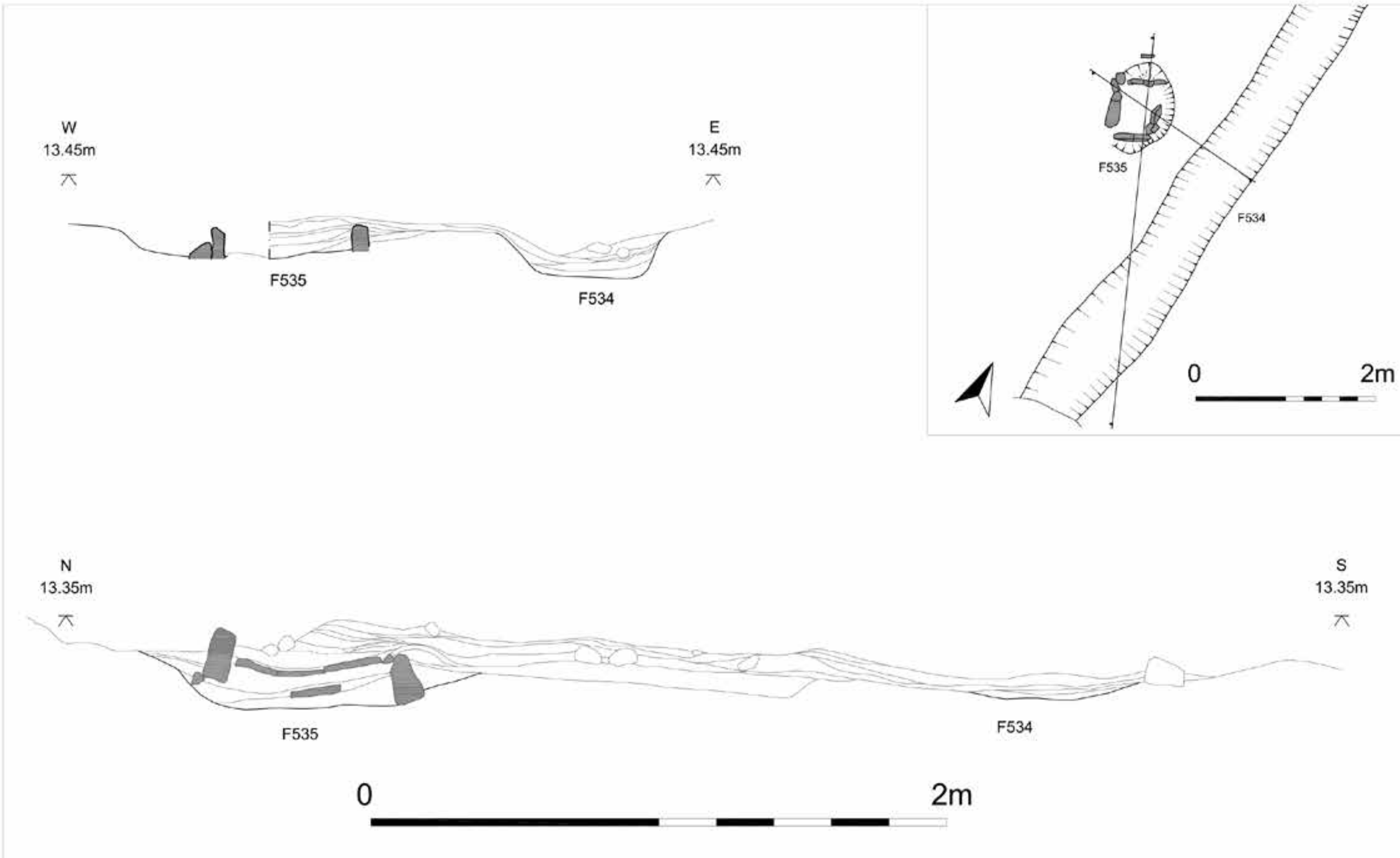


Illustration 4.17
Sections through hearth F535 and gulley F534

see Digest 6.1 'Dress pins'). A trample layer near pit F560 yielded a circular gilded copper-alloy disc bearing intricate Style II triple-strand interlace (14/4548) identified as a sixth/seventh-century harness mount (Illus 4.23). These two object types provide useful indications of the status and date of the occupants of the Period 1 settlement.

Iron and copper-alloy pins with disc heads are found all over Britain, varying from plain examples dating to the fifth/seventh century to the grand silver-gilt decorated oval disc head from Brandon of the late eighth (Webster 2012, 139). The more collectable examples tend to be of silver or copper alloy, those of iron being corroded or discriminated against by detectorists. The type derives from Roman exemplars, initially made for the hair but from the fourth century more appropriate to dress (Laing & Longley 2006, 145). A bronze pin from the fort at Newstead dated AD 80–180 offers a close parallel to Portmahomack (Curle 1911, pl. xcii no 15). Their successors flourished in fifth/sixth-century Scotland as 'hand pins' also presumably intended to fasten clothing rather than hair (Alcock 2003, 311–12). Of the thirty-six pin moulds found at the Mote of Mark, two are for pins headed with a flat disc (Laing & Longley 2006, 143). Copper-alloy flat disc pins are found in Anglo-Saxon cemeteries in seventh-century graves ('Kingston disc-heads,' Ross 1992), for example in graves 132 and 158 at Buckland Dover (Evison 1987, 175, 325, 333; dated 650–675 and 675–700 respectively). Copper-alloy disc-headed pins similar to those from Portmahomack have also been found at the seventh-century settlement at Chalton, Hants (Champion 1977, 369). Examples in iron are less common: there is a reasonably close parallel from grave 369 at Morningthorpe Norfolk (Green et al 1987, 330; Ross Type XXII; 1992; Fig 5.19b). It was 120mm long and occurred with an annular brooch and a Roman penannular brooch in a female grave, presumably dug in the fifth or sixth century (Green et al 1987, 143). More closely related to Portmahomack are the iron 'stick pins' recorded in Whithorn's Period 1 (*c* 500 to *c* 730 AD), one with a flat crescentic head (Hill 1997, 418, Fig 10.97, 41.14).

The Portmahomack terminal disc presents a packed interlace of triple strand serpentine bodies. It finds a parallel in a find from 1929 at Dunadd, which Thomas (1990, 19) identified with the face of a Frankish disc brooch. The sixth/seventh-century Irish Sea exchange regime with France, proposed by Thomas, reaches at least as far as Craig Phadrig, near Inverness, so a Frankish import on Tarbat Ness would not be out of the question. Lane & Campbell (2000, 246) compared the Dunadd disc with Sutton Hoo and proposed it as a piece of Anglo-Saxon aristocratic horse gear. At Mote of Mark, moulds were found that also cited the patterns of

Illustration 4.18
Cistern F539 (right) fed by gulley F534, draining water down the slope. The gulley to the left belongs to the Period 2 roadside ditch

the Sutton Hoo bridle (Laing & Longley 2006, 71, 148–9). The disc from Dunadd (30mm dia), the Mote of Mark moulds (30mm dia) and Portmahomack disc (25mm dia) do indeed recall the bridle disc at Sutton Hoo, in size, form and style (Illus 4.23). The best

Illustration 4.19
Wicker lining of well, F527

Sutton Hoo exemplar is the upper terminal (35mm dia) on the cheek piece of the bit of the bridle of the Mound 17 horse. The face of this disc also carries interlaced triple-band serpentine animals, thought to represent the best of Style II ornament in East Anglia. The Sutton Hoo bridle was manufactured in the later sixth century and deposited around 600–620 AD (Evans 2005, 227, 230, 234; Carver 2005a, 490).

The lower terminal of the Sutton Hoo bridle bit is a decorated axe-shaped 'pendant'. Endorsement that the Scottish discs are likely to come from bridles, and that these may also be made in Scotland, is given by the moulds at Mote of Mark, which include an example of the diagnostic axe-shaped terminal as well as two roundels (Laing & Longley 2006, 71, 148–9). The nature of the Anglo-Saxon and north British interaction implied by these objects is unlikely to be a simple import/export relationship involving the objects as commodities. Intrusive 'Germanic' styles have been seen among the moulds found at Dunadd: bird-headed brooch terminals and three-piece buckles, a *pressblech* mount and a gold-and-garnet stud. 'Celtic' objects are represented by panelled terminals and a hanging-bowl escutcheon. The occurrence of the two classes of object suggests 'a physical context where Celtic artisans were engaged in both copying and transforming the decorative style of imported Germanic metalwork' (Campbell & Lane 1993, 57). The Hillquarter saddle mount from Ireland gives further evidence for a shared equestrian 'language' (Kelly 2001). Bridle parts have now been recognised widely in sixth/seventh century Britain, implying interaction at least at aristocratic level (Dickinson et al 2006).

It is reasonable to look for Roman, Anglo-Saxon and Irish connections in the metalwork of the fifth/seventh century in Scotland, and to attribute them to cultural survival, trade or reworking by itinerant smiths. In this context, it would be worth also drawing attention to the British as inheritors of Iron Age and Roman practice and as potential players in both manufacture and elite expression (Alcock 2003, 124; see also Chapter 5.3, passim for references in stone carving). However, like the sculpture that was to follow at Portmahomack, these Period 1 objects are not ethnically diagnostic. It may be that art and craft enjoyed a more fluent network than ethnicity, in the manner of a higher language, shared especially among those of similar rank. Although not gender specific, the Portmahomack bridle mount and iron pins fit well with a sixth/seventh century insular equestrian class of which both sexes were members. In this, the Portmahomack settlement evidence aligns with the rank and sex of its contemporary and adjacent cist burials.

Plough pebbles

Plough pebbles were found in Sector 2, although always residually. These small pebbles are inserted into the coulter of a wooden plough to protect it from erosion by the soil, and they are recognisable by being flattened on one side. At Whithorn they were recovered from fifth- to ninth-century contexts and associated with plough marks of the mid-ninth century (Hill 1997, 80, 464–6). All the examples at Portmahomack were found in Period 2 contexts in an area coincident with the north edge of the marsh (the foundation raft of the Period 2 S9 yard

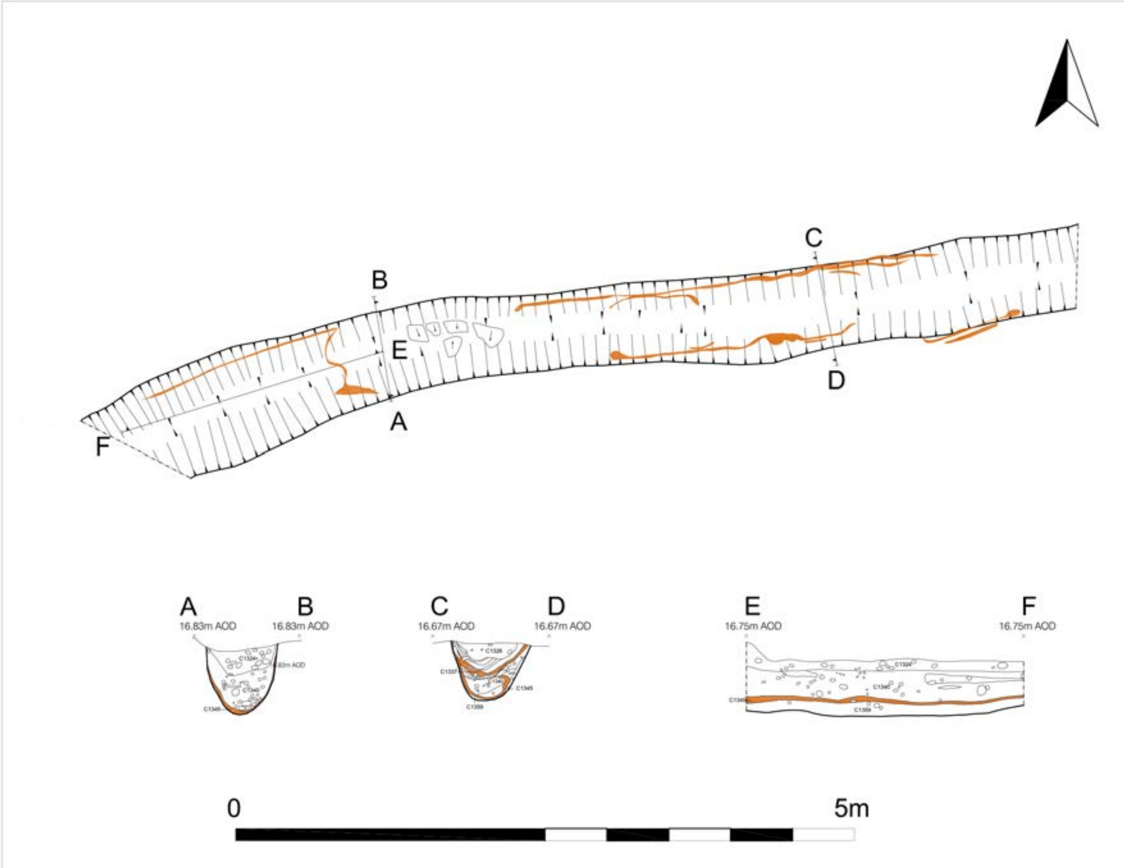


Illustration 4.20
Wood-lined F129, plan and sections

wall within the Period 2 boundary wall and in early Period 2 deposits on the east side of Sector 2). Here the array of residual pebbles is compelling (Illus 4.24). As built, the east boundary wall was flanked by a wicker hurdle found charred in situ and associated with a collapse deposit of possible turf and burnt hurdle. This deposit, and deposits associated with the Period 2 burnt destruction, yielded twenty-two plough pebbles, many of which were sooted and heat blackened. The distribution of pebbles close-by the later pool hugs the wall markedly with two examples tumbling into Period 3 metalworking dumps over the wall.

The distribution could imply that the northern slope of Sector 2 was ploughed using plough pebbles, but the excavated area produced no plough marks or environmental evidence for cereals, and was occupied by graves and an industrial area from the seventh century at latest. It is argued in Chapter 5.5 that the buildings and infrastructure of the monastery (Period 2) employed walls compounded of stone cobbles and turf. The close association between the plough pebbles and the boundary walls suggests another explanation, namely that they arrived in turves cut from an area that had been previously cultivated using pebble-studded plough soles (see below). As such, the pebbles predate Period 2 and belong to a Period 1 episode of cultivation.

Cultivation and settlement in Sector 1

There was widespread evidence for cultivation in Sector 1, where parallel scratch-plough marks and a podzol layer were extensively mapped (OLA 6.1/3.1.1; Illus 4.25; and see Illus 3.3 and Illus 5.9.6 for other sightings). The scratch-plough marks (ard marks) were generally visible as thin, grey-sand-filled interruptions in the yellow-sand subsoil, orientated broadly N–S and wavering slightly in their course, sometimes cross ploughed E–W (see Illus 3.5). The multiplicity of marks made it hard to determine any regularity but the lines were narrow, sinuous and rarely more than 15cm apart. A grey podzol covered the subsoil over much of the sector, but its relationship with the ard marks was equivocal. While the ard marks were generally seen to cut through the podzol and into the subsoil, in places the podzol also masked the ard marks, especially at the western end of the sector, where it was found to measure up to 0.10m in places. Thus the podzol might have been pre-existing and owed to a previous episode of cultivation, or it may have formed as a result of the (over) cultivation that produced the parallel ard marks. Features which may represent boundaries or drainage ditches were glimpsed in areas of thinner podzol, namely three extremely truncated gulleys, one possibly set with posts, filled with grey sterile sand (OLA 6.1/3.1.1; and see Illus

Illustration 4.21
West-facing section through the fill of wood-lined gulley F129

4.25). Plough marks were absent from the modules of the eastern 20m of Sector 1. Later ploughing was heavier in this area and will have affected both the survival of the ard marks and of the features assigned to S12.

Structure 12

The podzolic soil and the ard marks appeared to respect an area to the east, occupied by a penannular gulley with a number of associated if irregular features (S12) (Illus 4.26; OLA 6.1/3.1.2). S12 was defined by a curvilinear gulley (F31) marking out a circular form enclosing an area *c* 14.0m in diameter. The arcs of gulley incorporated five breaks: two apparently deliberate, one at the north-eastern arc and a more substantial gap at the north-western side corresponding with the position of six post-holes. Three further breaches were due to truncation by later features: one at the southern side coincides with the position of a medieval plough furrow and two on the east side clearly result from the foundation trench of S5 (p 280). Investigation of the two termini of S12 revealed straight, steep profiles suggesting genuine butt-ends rather than gradual truncation, implying a wide western entrance, more appropriate to a shed or store or an unroofed pen. The fills of the termini consisted of grey or brown sterile sandy silts reminiscent of the ard marks and podzol, often containing stones but without clear evidence for posts. Within the perimeter and mostly on its western side were twelve probable post-holes, with no obvious spatial pattern. Three contained packing stones, and these together with two more lie on a circle appropriate to a ring of support posts, about 8.5m in diameter.

To the immediate south and west of S12 were several rectilinear and curvilinear features or parts of features, without diagnostic shape or backfill. Their characteristics were consistent with fences or other surface structures contemporary with S12. The location of F94, F83 and F79 would be appropriate to fence lines separating S12 from the cultivated area (see Illus 4.26).

Contexts for cereal production in Period 1

No datable artefacts, such as pottery, plough pebbles or ard points, or material suitable for radiocarbon dating, were recovered from the extensive excavation in Sector 1. S12 is unconvincing as a dwelling, having no hearth or regular post ring. Even if there were no upper floor, most roundhouses, even turf houses of any size, would be expected to have a ring of post-holes for roof support (Harding 2009, passim). S12 does not closely resemble the roundhouse of the Middle Iron Age brought to light by

Illustration 4.22
Examples of iron dress pins. For dimensions see Digest 6.1

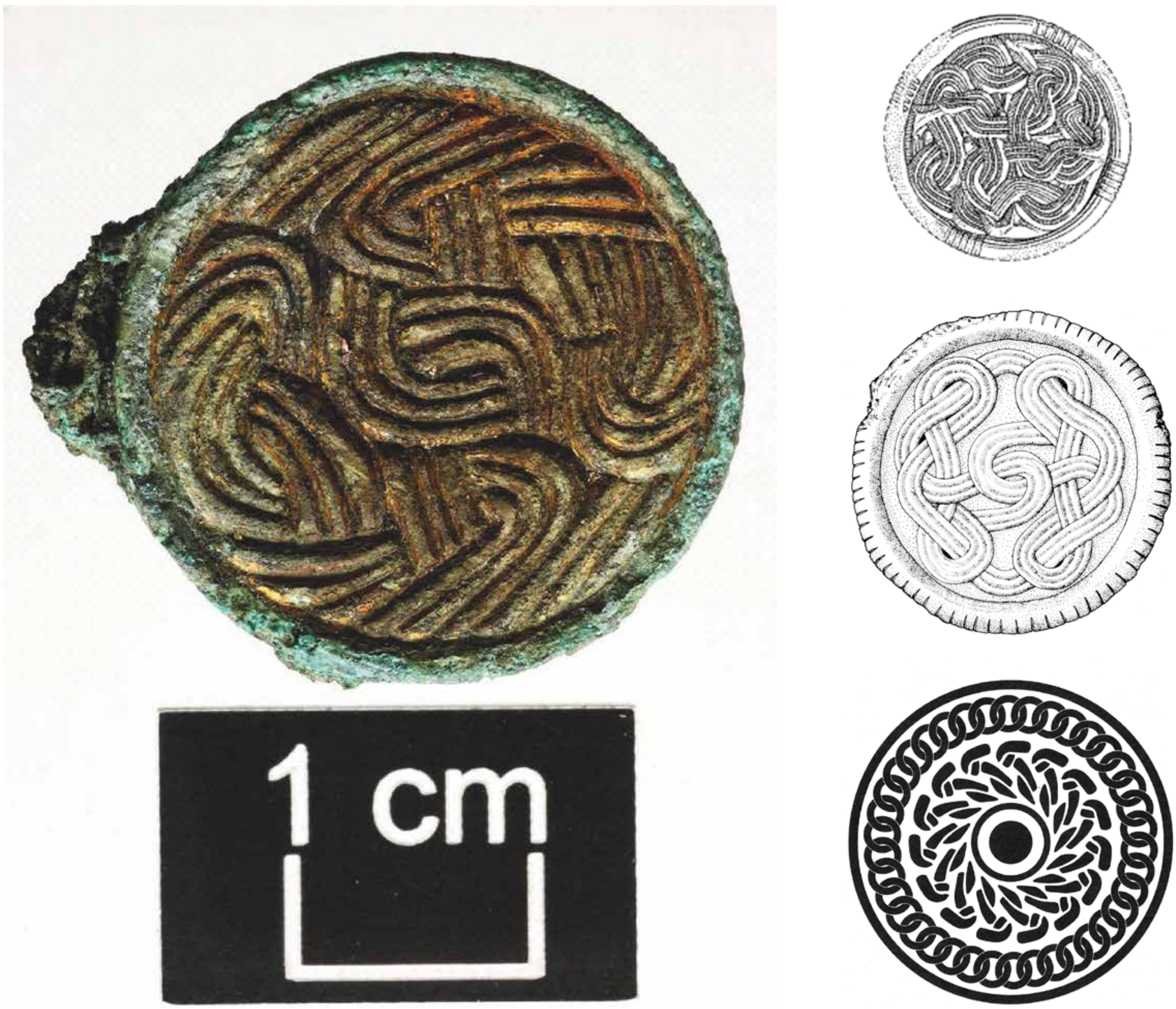


Illustration 4.23
Mercury-gilded, leaded bronze Style II harness mount (14/4548) with comparative objects from Sutton Hoo Mound 17, Dunadd and Mote of Mark (from mould) (Carver 2005, 490; Lane & Campbell 2006, 246; Laing & Longley 2006, 149)

Fraser Hunter across the Moray Firth at Birnie (2007), nor the roundhouses in southern Pictland, thought to continue in use well into the first millennium AD (Harding 2009, 186). The example in Sector 2 (S11) shows that a round building relying on turf would be a feasible structure of the sixth/seventh century at Portmahomack (see also Chapter 5.9). However in their surviving state, neither appear as robust structures. S12 might have served as a pen for stock, or a makeshift grain store where four-posters were clad by a turf barrier. Significant in this respect is its location on the edge of a cultivated area.

The marks left by cultivation are also chronologically equivocal. Ard marks have been recorded in association with a managed Bronze Age ploughsoil around Old Scatness Broch, Shetland, where micromorphological analysis detected the addition of domestic waste, primarily peat-fuel ash and animal bone, to the arable soil (Simpson et al 1998, 111; Plate 2; Guttmann et al 2004). A Bronze Age economy was defined at Achany Glen in the second and first millennium BC, where the plough print was corded rig, narrow spade-dug cultivation ridges set 1 to 1.5m apart. Ard marks at Achany Glen were principally assigned to two

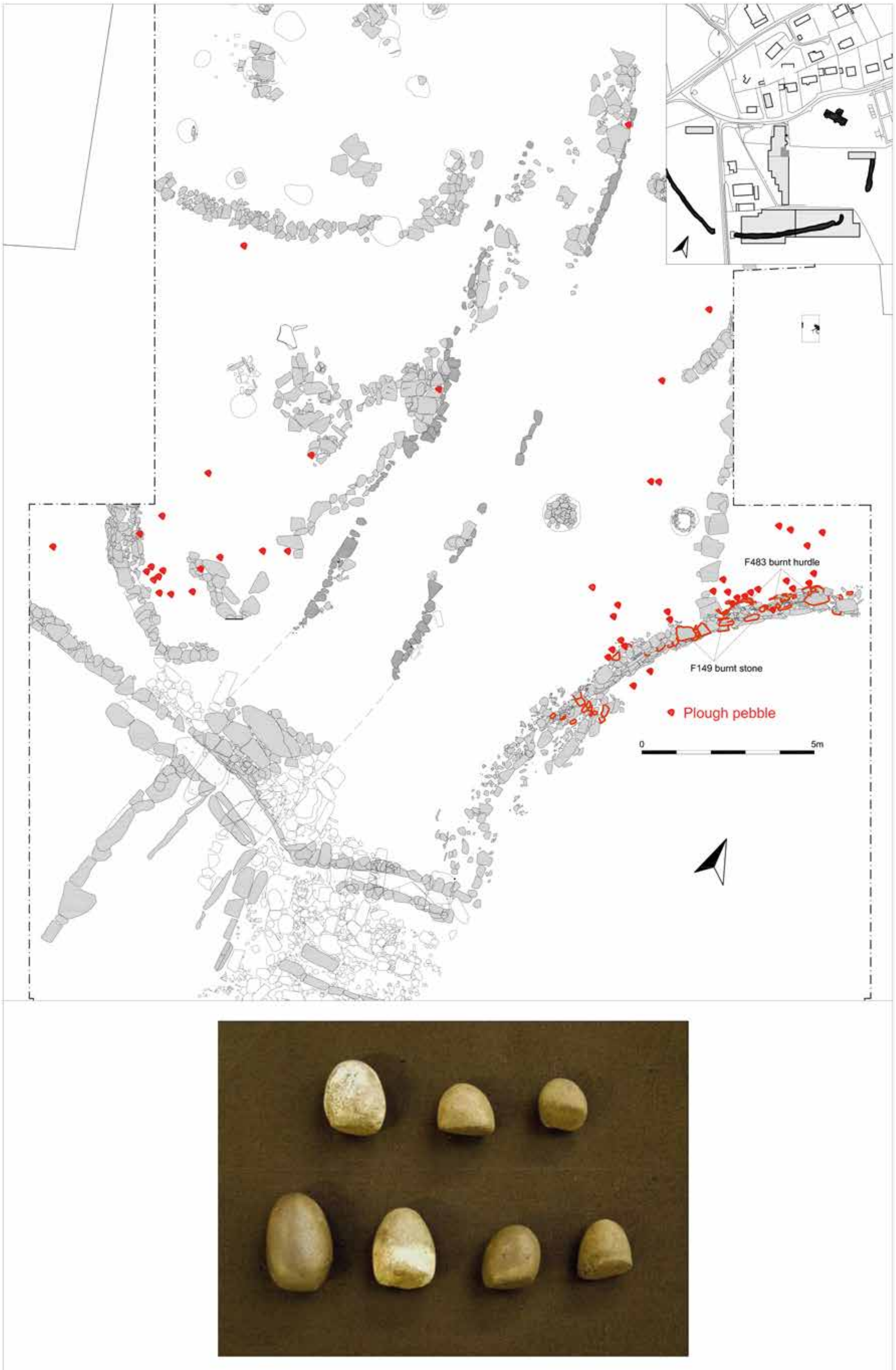


Illustration 4.24
Examples of plough pebbles and their distribution (red symbols)

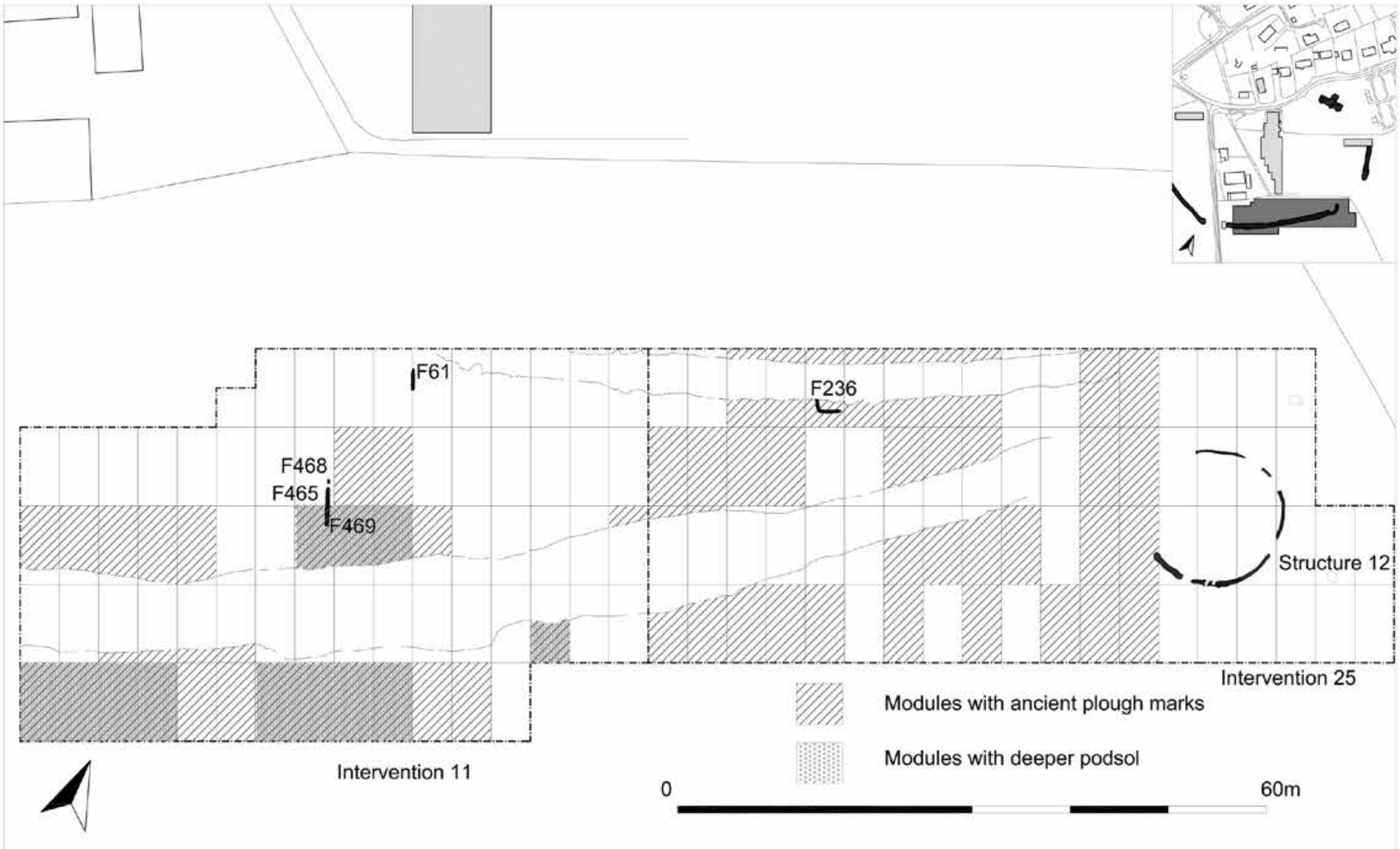


Illustration 4.25
Map of Sector 1, showing penannular structure S12 and areas with podzol, scratch-plough marks and truncated gulleys

radiocarbon periods: third to second millennium BC and first millennium AD. The latter showed as well-preserved ridged fields with ridge spans between 0.8 to 1.5m overlying earlier buildings. Excavated examples indicated that an initial ploughing in two directions at right angles, which densely scored the subsoil, was followed by lighter ploughing in a single direction (NE–SW). The initial marks are read as a first cross-ploughing designed to break the land into manageable pieces (McCullagh & Tipping 1998, 158–9). Such a scheme would also provide an opportunity to cut, lift and stack turf for future use elsewhere, while the stripped land is then put under the plough.

In his survey of first millennium farming, Fowler emphasises that the ard and the heavy plough continued side by side in Britain from the Roman period to the Norman (2002, 184–6). The heavier wooden ploughs have a sole that bumps along the ground, a coulter to cut the sod and a mould board to turn it. Characteristic of these ploughs in the north are pebbles set into the base of the plough to reduce wear on the wooden sole. When found, discarded, the pebbles are worn down into a characteristic convex surface marked with parallel striations. Such 'plough pebbles' turn up in early historic and later contexts (they 'must in general be early medieval': Fenton 1999, 30). The Portmahomack plough pebbles from Sector 2 (above) are all of the gently rounded form and so derive from a mould board or sole rather than having protected the axles of wheeled ploughs.

At Whithorn, sixty-one plough pebbles were securely associated with plough marks of the late fifth/early sixth century, and the discard of another 100+ was detected through the seventh century. They were missing from eighth-century strata, but showed up again as 50+ examples in a distribution coincident with plough marks of the mid-ninth century (Hill 1997, 80, 464–6). In this latter case, the plough marks are thin, parallel, sinuous and adjacent, as at Portmahomack. Hill attributes these plough marks, and the use of plough pebbles, to a mould-board plough (Hill 1997, 190–1). Presumably the same arguments apply to the fifth/sixth-century ploughing, which is described as 'sporadic and oriented north-east/south-west' (ibid, 80), although these plough marks are also represented as making a criss-cross pattern (ibid, 76; Fig 3.5). Hill identified the pebbled mould board and wheeled plough as part of a package of exotic technologies and ideas introduced to Whithorn in the late fifth century and proposes an association between plough pebbles and early *monasteria* in Scotland (Hill 1997, 28; Hill & Kucharski 1990). However, in spite of intensive and repeated trowelling (at Level D, p 24) no plough pebbles were retrieved from Sector 1, so the association of such a package with this extensive system of cultivation remains tenuous.

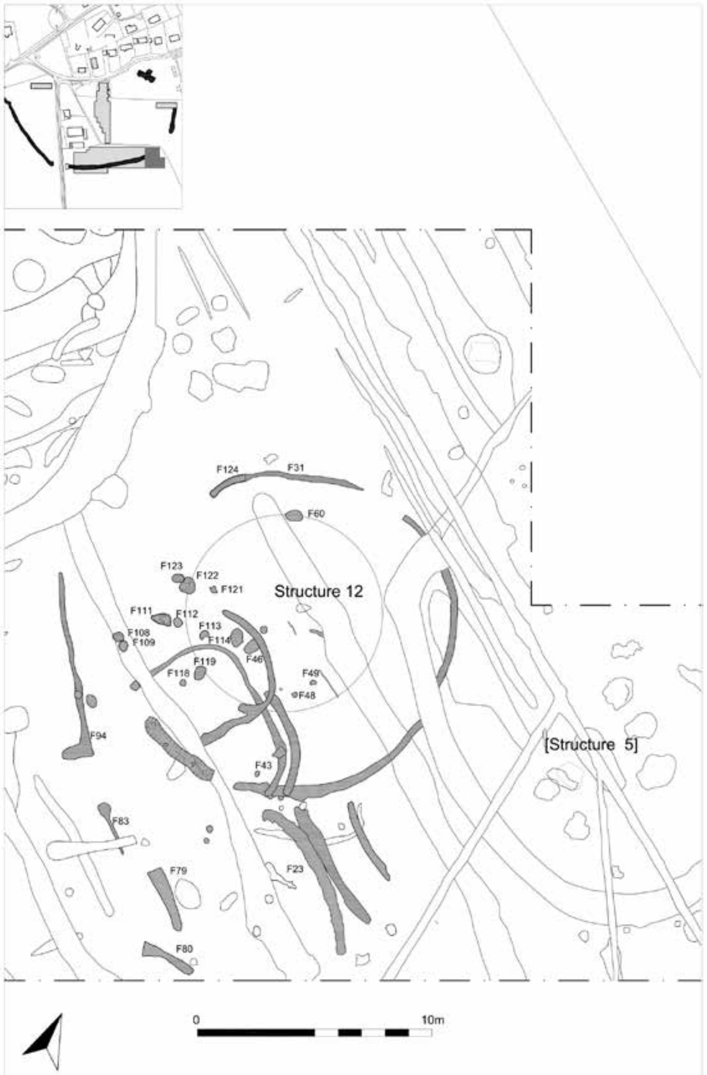


Illustration 4.26
Plan of S12, and associated features

The Period 1 settlers had access to rye, barley and wheat (see above) but there is no direct evidence of how it was ground. Barley could be pulped by pounding it with a mallet in a 'knocking stone' (Fenton 1999, 102–3), but 'saddle and trough querns … were used to grind barley and wheat, at first, and then rye and above all oats *from the period of the Romans* when these two crops first appeared' (ibid, 105–6; our italics). The rotary quern was added to the technology in the first millennium BC, although at Portmahomack the examples of rotary querns are all medieval (p 313).

There are reasonably strong connections of date and diet between the grain processing on the hill and the industrial area and indeed the cemetery. The fifty-three plough pebbles were residual as found in and around the Period 2 boundary walls. The plough marks in Sector 1 were presumably made by a wooden implement. It is not excluded that plough-pebble technology superseded an earlier system but it did not do so there. Nevertheless, as it stands, the cultivation defined in Sector 1, the plough pebbles from Sector 2 and the grain deposit found in Sector 4 have little to relate to at present, apart from each other. They converge on the fifth/seventh century, a period of some 150 years in which it may have been possible to cultivate some land with a wooden ard, cultivate other parts with a pebble-studded mould board, grow rye, barley and wheat and process and consume it elsewhere in the vicinity.

The animals exploited in Period 1 were cattle, pig and ovicaprid, red deer, roe deer and chicken. The only sea creature present was the seal. The percentage profile of domestic animals was similar to Periods 2–3, with cattle in the majority, but the numbers of identifiable bones (303) and the number of species identified were very small compared with what was to follow in the same excavated area (Chapter 3, Table 3.7; Seetah in Digest 7.1). By contrast, it was noticeable that evidence for cereal cultivation

Illustration 4.27
Selected place-names on the Tarbat peninsula

at Portmahomack was strong in the sixth/seventh century (Period 1). The eighth century (Period 2) appears to be largely dependent on cattle and other stock. The evidence for an eighth-century mill is inconclusive at best (p 193). In Period 3, structures and plant remains suggest a return of arable cultivation in Sector 1. An argument can therefore be assembled that the principal subsistence shifted from cereal cultivation at its inception (Period 1) to cattle and dairy products (Period 2) and back to cereals (Period 3) (pp 225, 276).

The end of the Period 1 settlement

The first enclosure ditch in Sector 1

Within Sector 1, an early post-ploughing event was the excavation of a large ditch, measuring between *c* 3.0m to *c* 4.0m wide (S15; Illus 3.2). The ditch was located at the northern limit of the Sector, and was visible for a total length of *c* 25.0m from the north-west corner of Int 11 to the north-east corner of Int 25. This ditch (S15) clearly cut through the podzol and ard marks (Illus 3.3). In turn, the ditch was cut by features and structures assigned to Period 2, notably the well S8 and the bag-shaped building S3, and in its backfilled state was to receive material from the Period 2 metalworkers (Chapter 5.7). It is therefore an acceptable candidate for Period 1, and raises the possibility that the settlers by the marsh threw out a southern boundary at this point. However, the ditch S15 was superseded by another (S16) slightly further south but on the same alignment and similar in form, which was certainly part of the monastic infrastructure of Period 2 (p 186). For this reason it is argued that the ditch S15 more properly belongs to Period 2, where it represented a first exercise in marking out the monastic precinct (see Chapter 5.5).

Disuse of Period 1 features

The S11 hearth, adjacent wicker-lined well and a wattle fence line, together with the timber-lined ditch F129 on the hilltop have been argued to be in contemporary use and share date spans in the seventh century (at 95%, see Table 4.1). The ornamental bridle mount and the iron pin found in association with S11 also conform to a sixth/seventh century circulation. Perhaps the most helpful of the radiocarbon dates show that the well was constructed between 610 and 680, the hearth was last used after 640 and grain was left in the hillside ditch before 660. All the certain cist graves were interred before 690. An end to Period 1 activities in the second half of the seventh century seems to provide a good fit. The Bayesian calculation put the end of Period 1 between 635 and 730, and proposes a hiatus of up to eighty-five years before Period 2 begins; however, the same analysis offers a start date for Period 2 between 645 and 685 (at 50%) (Digest 3.1).

The stratigraphy would place the end of Period 1 and the beginning of Period 2 in fairly close proximity. The disuse of Period 1 features in Sector 2 was often marked by the deposition of a homogenous sterile grey sand. It was identified beneath the Period 2 road, S13, and encountered widely in Int 24 and in the evaluation trench Int 8. It was recorded as being *c* 0.25m at its deepest and became increasingly thin until it petered out midway up Sector 2 (north). This wide-scale deposition was identified by micromorphology as windblown sand (Ellis in Digest 7.5). This might have been the result of a passing storm or of a turf-stripping operation that bared the subsoil surface. In either case it suggests only a brief hiatus between Period 1 and the major development that was to follow. Given that all the dated events of Period 2 in Sector 2 occur after 640–660, we have placed the transition between Period 1 and Period 2 as lying between 660 and 700, abbreviated as *c* 680.

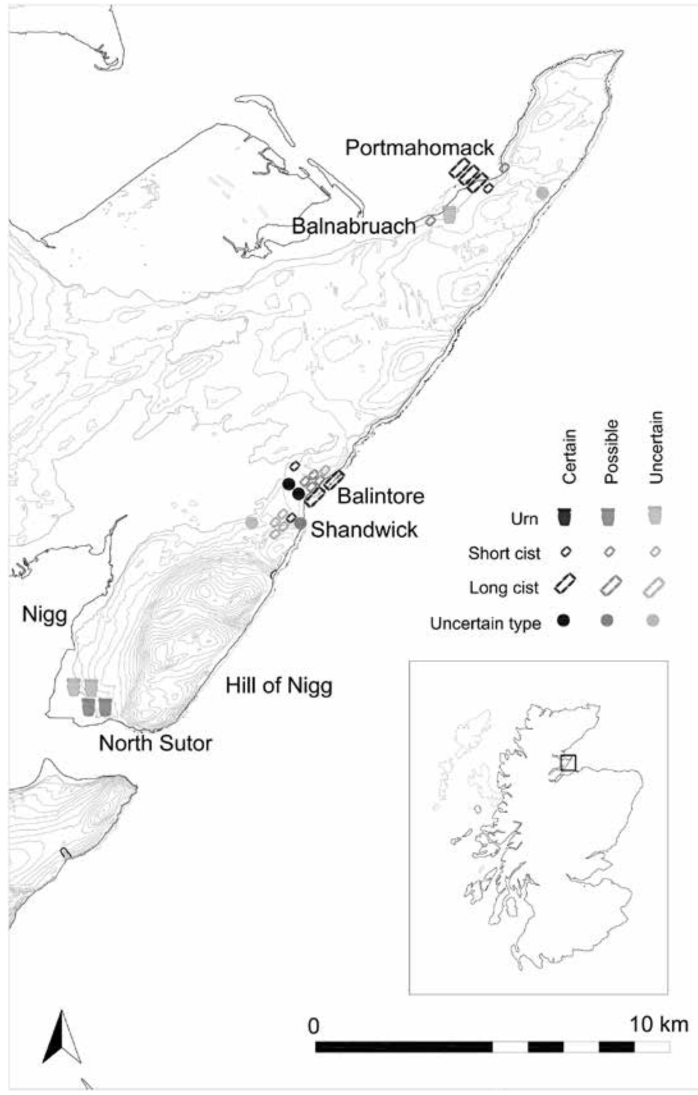


Illustration 4.28
Map of prehistoric burials on the Tarbat peninsula

The Period 1 occupation comprised a cemetery of cist graves, a settlement producing iron objects and an economy in which cereals played a prominent role. It dated from *c* 550 to *c* 680 and was replaced rapidly by a new infrastructure and regime but retained some practical continuities, leaving the nature of the transition uncertain. This will be discussed at the chapter's end. The task will be made easier by examining what we know of the context provided by the peninsula and the environs as a whole. The features of the sixth/seventh century and earlier at Portmahomack are difficult to put into context at present owing to the low levels of fieldwork in the region – although this is about to change (see comment on p 334). Here we offer a review of the immediate landscape, restricted to information and observations collected during the life of the project (up to 2012).

The Peninsula and the Firthlands in Prehistory

The Tarbat peninsula is a ridge of land running from the Hill of Nigg (Binn Nig, 205m) in the south-west to Tarbat Ness in the north-east, via a chain of small eminences at Geanies (80m), Meikle Tarrel (65m), Seafield (37m) and Brucefield (55m) (Illus 4.27). This ridge is connected to the mainland by a neck of land between Inver Bay and Nigg Bay. Given the large areas of low-lying sandbanks that surround both bays, the stable isthmus is probably confined to land that lies today above the 10m contour, that is between Hill of Fearn and Newton, about 4.5km as the crow flies. Half of this isthmus is occupied by Loch Eye.

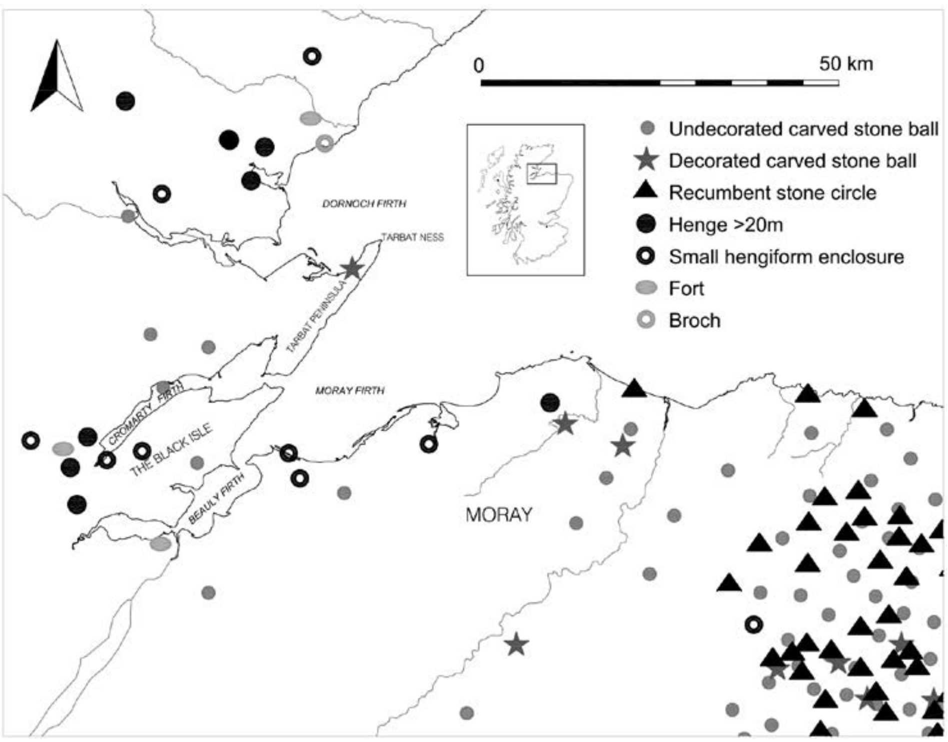


Illustration 4.29
Map of prehistoric sites in the Firthlands

The peninsula was fortunate to be included in one of the earliest detailed place-name studies (Watson 1904, repr 1996; here Digest 8). The great majority of place-names identified by Watson were Gaelic in their earliest form, and thus likely to represent retrospective naming in the ninth century and later; examples are Rhynie (G. *ràthan*: little fort) and Dallachie (G. *loch an dàilich*: loch of the meetings). However four '*Pit*' names have been noted: Pitculzean in Nigg, Pitcalnie in Nigg, Pitkerrie in Fearn, and Pitmaduthy in Logie Easter (Fraser I 1986, 26–7, Fig 2.4). These should indicate properties that had once been in Pictish hands. Norse words name several '*eith*' places referring to the isthmus (including Loch Eye) and the landing places of Cadboll and Shandwick. The name Tarbat (G. *tairbeart*: a crossing) implies a portage, and using the lie of the land it is easy to envisage a hypothetical route from Inver Bay to Nigg Bay via Loch Eye (Illus 5.10.1). This would enable travellers to take a short cut from the Cromarty to the Dornoch Firth, saving much time and danger, either by carrying the boat or by transferring boat to boat at each bay. There is some support for this configuration of the landscape, and for the portage route, from the medieval documentation (see Digest 8 and Chapter 5.10, p 246).

As a generalisation, activity of the first millennium AD and before congregates at the landing places of Portmahomack, Balintore/Shandwick and Nigg. The prehistoric sites identified with reasonable certainty comprise burials and forts.

Burials on the peninsula (research by Nicola Toop, see OLA 8.7 for the full report)

Human remains have been encountered casually in many locations on the peninsula and its environs, but the absence of artefacts or scientific dating makes attribution to a precise period problematic. Burial types are sometimes too readily assumed from casual encounters with fragments of pottery or slabs of stone, and indeed it is no simple matter if the observation in question was made while digging a drain with a mechanical excavator. With these caveats in mind, the map of sighted burials (Illus 4.28) distinguishes between *certain* (archaeologically recorded, certain identification); *possible* (archaeologically recorded but with insufficient remains to make a secure identification, or a description sufficient to allow an informed identification); and *uncertain* (ambiguous descriptions, or poorly located accounts).

Three main clusters of burial can be identified: the first on the west coast at Portmahomack/Balnabruach, a second on the east coast at the Seaboard Villages, in particular Balintore, and third on the south coast in the area of Nigg and the north Sutor. This distribution may owe something to building development in these areas, but it is probably not wholly unrepresentative, since extensive ploughing would have resulted in the discovery of more slabbed graves had they been there in any quantity.

Portmahomack/Balnabruach group

Balnabruach, 600m west of St Colman's Church, is the site of a concentration of burials in both long and short cists. In 1992, a watching brief on the course of a pipeline by GUARD identified a shell midden, a Bronze Age short stone cist containing a body, probably male aged seventeen to twenty-five (Burial A), and a long cist with an extended skeleton N–S with another E–W above it (Burials B and C). The records from this watching brief have been re-examined (with thanks to Dorothy Low, see OLA 8.5) and the skeletal materials were analysed by Daphne Lorimer (OLA 8.3) and radiocarbon dated within the Tarbat programme (Table 3.1*;* Digest 3.2). Burial A (NH 9100 8410), encountered in isolation, was represented by the disturbed human remains of a young adult male associated with slabs interpreted by the archaeological contractor as the remains of a short cist. Bones were radiocarbon dated to 410–230 cal BC, placing them in the Middle Iron Age. Approximately 150m to the west (at NH 9084 8408) three burials were excavated (B, C, D) later shown to comprise at least six individuals: a female oriented N–S (B), accompanied by bones of another female (Bi), and above these a young male oriented W–E (C). Associated with Burial C were the remains of a young adult female (D), a female aged thirty to thirty-four (Di) and a mature adult, possibly male (Dii) (see OLA 8.5). Burials B and C returned similar radiocarbon dates (Burial B: AD 240–420; Burial C: AD 260–530). The Balnabruach group of cist graves would appear to belong to a cemetery active in the late first millennium BC into the early first millennium AD, by which time cist burial had begun at Portmahomack.

To the south of Balnabruach, a 'cist' was found during land reclamation 160m west of Castle Corbet in 1865 (NH 900 832; RCAHMS Site 94). It contained a cremation and small 'urn'. To the north of Portmahomack, at Chapel Hill, burials were discovered before 1845 'deposited within rough flags of freestone'. Suggestions have been made that these would have been associated with a chapel alleged to have stood at the site (NH 916 845; NH98SW 6; NSA xiv 460; *OPS* 1851–5, ii, 434; Davidson 1946, 27). However, an earlier date for the burials might be suggested by the fuller description, 'several chests of freestone flags were dug up a few years ago … each chest contained an entire skeleton … and from the position of the bones it appeared that the bodies had been doubled' (NSA xvii inv, 461). The 'doubling' of bodies may refer to crouched burials, implying an Early Bronze Age date. The Portmahomack cist burials and mounds of the Late Iron Age (sixth/seventh century) thus represent the latest development of a long tradition of burial around the Portmahomack bay. The burials all occur in the coastal zone, between sea level and *c* 15m AOD.

Balintore group

A second concentration of burials lies on the east coast, in the area now known as the Seaboard Villages (Robins in Carver 1998b). A number of the reported burials occurred in association with two landscape features: Bruchal Mhor, a sand hill also known in local folklore as 'Ghost's Hillock', and Slochd Geal, the 'White Pit', the location of which is not clear but which is positioned by locals near Harbour View. Both landscape features were removed in the late 1930s to make way for housing. In 1935, two cists containing crouched burials were discovered on the north-east side of the mound Bruchal Mhor at NH 8619 7552 (reported by a local informant in 1972). Two years later, excavation of foundations on the south-west side of Bruchal Mhor also revealed an inhumation,

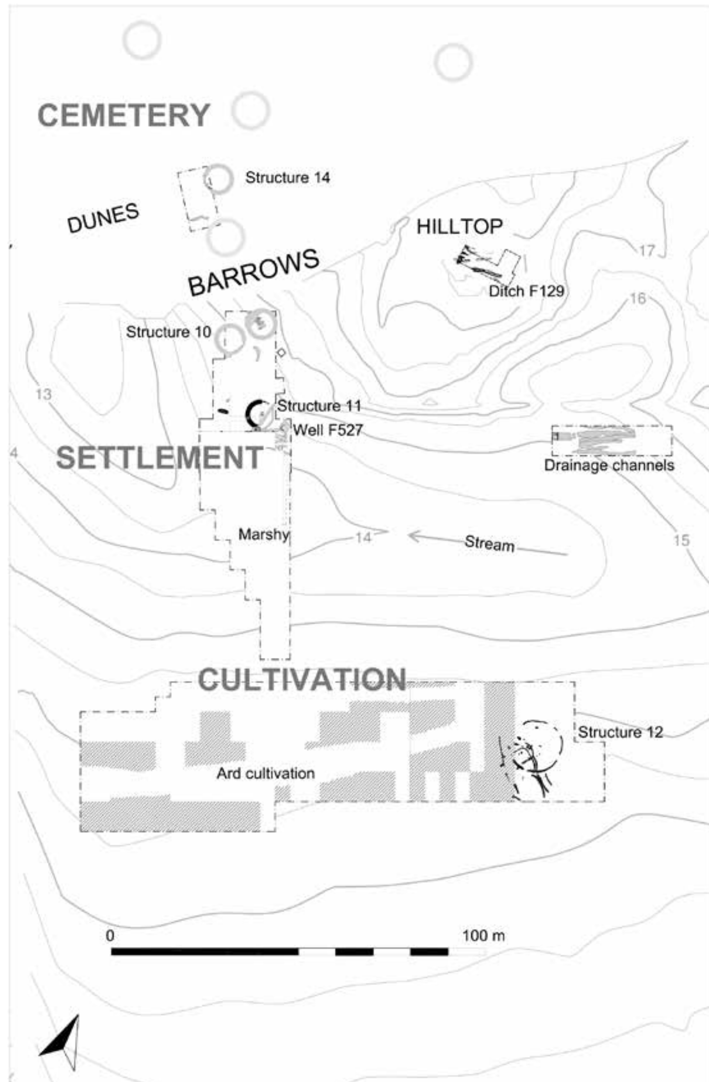


Illustration 4.30
Layout of elements of the sixth/seventh-century estate centre contacted at Portmahomack

reported to have been in a 'stone coffin' which possibly refers to a cist (NH 8617 7549). The levelling of the mound in 1937 to make way for housing was said to have revealed a number of human bones, including an inhumation 'surrounded by stone slabs' with 'flints or sharp stones found with it' (not securely located). During building in 1938–9, 'skulls and other bones were found' (Davidson 1946, 26). A report by a local informant stated that a team from the University of Aberdeen excavated the site and revealed thirteen extended skeletons, but as yet no information has been forthcoming to substantiate this. A sinuous form is depicted on the Ordnance Survey editions of the 1890s and early 1900s, which may represent this mound.

At Bank Street, Balintore excavators of a well in 1932 encountered a small stone-lined grave with skull and bones 'all bunched up'; the description might suggest a short cist with crouched inhumation (NH 8639 7570). A short distance to the west, excavation of a sewer in *c* 1950 contacted a cist containing bones, again recorded as a short cist (NH 8626 7563). Inland from Bank Street, a short cist was identified in 1976, measuring 0.92m by 0.45m and containing the remains of two individuals – a primary adult inhumation and a secondary child. Six vertical slabs formed the cist, containing the earlier, primary adult burial; a layer of collapsed slabs may have formed an early lid, over which the remains of a child were interred, possibly covered by a secondary lid. Extended inhumations were also recorded archaeologically in 1982 to the east of Balintore (NH 8660 7580). Two extended burials, orientated SW–NE were identified during excavation of a sewer, covered with flat slabs. A third skull was also recovered. All three individuals were identified as female.

At Shandwick, a local informant described the find of a short cist containing a single crouched inhumation during excavation of a service trench in 1945 (NH 8558 7465). The burial was apparently left in situ, and the informant believed there to be a further four or five examples in the vicinity, represented by large horizontal slabs. The burial is likely be that referred to in an account of 1961 which recorded a find in 1954 as a 'stone coffin' containing a 'skull and other human bones', at almost the same grid reference (NH 8555 7465) (RCAHMS 1979, no 111). The name of the Shandwick cross-slab, Clach a Charridh, has been translated as 'stone of the grave plots', and the historic Ordnance Survey marks a 'Burying ground' at the site (NH 8556 7473) (see Digest 8). At the site of the medieval chapel at Shandwick, a possible burial ground is represented by finds of human remains in an area now represented by the edge of a quarry (NH 8582 7453). Bones were discovered at the site during 1939–1945, when stone from the chapel was used to build the RNAS Airfield at Loans of Rarichie.

South of Shandwick, at Easter Rarichie Farm, a further cist burial was reported beneath a large sandstone slab measuring 1.5 × 1 × 0.3m, found during ploughing. No bone or associated artefacts were reported, but a hint of a burial ground is provided by a field listed by Watson as '*Ron a'chlaidh*', or graveyard field. Watson (1904, 57) states that 'the plough … formerly used to strike the gravestones, but these are now removed', suggesting a more extensive burial ground (Digest 8). Further up the coast is Cnoc Dubh, Ballone where there was a reference to 'stone coffins' in 1904 (NH98SW 2; Canmore 16643); this might refer to later sarcophagi, or cists, but without further information this cannot be known (Watson 1904, 48).

Nigg Group

A third focus for burial on the peninsula is hinted at by records of possible cremation burials and cists at Nigg, although none has been verified archaeologically. At Balnabruach, Nigg, a cist was reported to have been found under the west gable of a cottage in 1922 (NH 794 698); four other cists were apparently opened at the same time in the vicinity of a hollow known as Poll na Marie. In 1945, two 'clay vases' were recovered during excavation of a service trench in the bank surrounding the house (NH 7945 6987). Together, the evidence suggests a possible Bronze Age cemetery focused at Nigg. A 'rude undressed stone' is said to have stood in Nigg churchyard in 1835, suggesting a ritual focus for the burials (RCAHMS no. 120, NH 804 717). The new statistical account for 1845 reported the discovery of two crude burial urns, found *c* 1820–1823 in 'a bank of blown sand directly under the northern Sutor'. The sand, partially removed by storms, overlaid a deposit of animal bones. One urn was filled with ashes and half-burned bones, the other with bits of a black bituminous-looking stone resembling jet, which had been made into beads and 'little flat parallelograms perforated edgewise, with four holes apiece' (NSA 1845; Miller Sr 1835). Visiting in 1972, the OS placed the site at NH 800 691. This has echoes of a burial of the Beaker period.

Forts

Two forts are marked on the OS map on the north lower slope of the Hill of Nigg, at Easter Rarichie. The more westerly labelled 'dun' is at 841/737; the more easterly ('fort') is at 834/736. This latter is referred to as Easter Rarichie (Canmore 15300), and described as a multi-period, multivallate fort, with an inner enclosure on its summit that may be a dun. As seen in 1972 and 1981 it consisted of three ruinous walls and two outer ramparts, enclosing an area about 67 × 50m. The inner enclosure is defined by a wall 3.5m thick and 17.5m in diameter, interpreted variously as a hut circle or a dun. Hut circles were suggested 50m SE of the fort but not substantiated (Canmore 15301). Rarichie is later mentioned as a landholding of the early Earls of Ross, thus it is not excluded that the site was, or became, a twelfth to thirteenth-century castle (see Chapter 7, p 288).

Other possible enclosed sites include Tarrel dun at 904 803, where the bank measures up to 3.7m in thickness and encloses an area about 9.5 × 6.7m (Canmore 15642). The remains of what may have been a broch stand on a tongue of raised beach 650m SW of Lower Seafield (RCAHMS Site 184). At Castlehaven there is said to be a promontory fort with D-shaped enclosure, which gave its name to the harbour (RCAHMS Site 180). This exiguous evidence suggests a Late Iron Age presence on the peninsula, probably within the first millennium AD.

Tarbat Ness is a natural landmark for navigators, and would probably have been used by the Romans, who sailed round the island after Agricola's campaign and named the inhabitants of Easter Ross '*Decantae*'. Although recent researchers have claimed a Roman military presence in the Moray Firth region, in the form of camps (Jones et al 1993), substantiated Roman traces on the peninsula are rare. The Carn a'Bhodaich at NH 9469 8759 was the supposed site of a Roman beacon (NSA 1845, 14, 460, 15v). The third statistical account reported a Roman camp on the Black Moor about one mile from Tarbat Ness (TSA 1957). A fairly worn *antoninianus* of Tetricus II, AD 270–273/4 minted at Trier was found near Tarbat Old Church (RCAHMS no NH98 SW00 43). The current archaeological indication is that Middle Iron Age settlement gave way to Late Iron Age/early Pictish in the fifth century without Roman intervention.

Overview

The coast of the peninsula has thus attracted burial from the Early Bronze Age, through the Iron Age and into the Pictish period. The clustering of prehistoric burial at points where there is access from the sea, and where there are detachable slabs of rock, has a pragmatic rationale, as well as a long ideological ancestry from Brittany to Orkney (Cunliffe 2008, Ch 6; 2013, Ch 6; in Scotland, Driscoll 1988). The celebrated 'Queen of the Inch' with her ten-row necklace of Whitby jet was interred in the early second millennium BC on the island of Inchmarnock, later to become an equally celebrated eighth-century monastery (Lowe 2008, 62–5). The Bronze Age burials on Tarbat are likely to have coalesced into three cemeteries, each with a lengthy period of use. In the nineteenth century, a cemetery of short cists was encountered at Alness, a short boat trip from Nigg in the Cromarty Firth, during the construction of a railway line to the distillery at Dalmore cemetery. There were eighteen cists in two groups, featuring two burial rites: inhumation, succeeded by cremation. The inhumations were crouched, with a leaf-shaped blade, jet beads and a stone bracer among the grave goods; while from the cremations came pottery and a bronze blade (Jolly 1880). This provides an inkling of what might lie hidden at North Sutor and Balnabruach.

Retrospective indications of early centres and practices may also be discerned in the medieval period (see Chapter 7, p 336). Of all the Ross-shire parishes, those of the Tarbat peninsula, and Nigg in particular, claim the largest number of chapels and wells (Watson 1904 [1996], 54). While a recent views of 'holy wells' in Ireland had suggested they were a post-Reformation phenomenon, evidence from Struell shows that some were at least medieval and could be early Christian or earlier, potentially providing important foci for pre-Christian as well as Christian worship (references in McCormick F 2009; see Chapter 7, p 318).

Firthlands

In spite of its central location, the Tarbat peninsula participates in the prehistoric landscape of the Moray Firth coastlands to a very modest degree (RCAHMS 1979; Illus 4.29). The regional sequence of prehistoric burial was normally inhumation until 1800 BC, cremation from 1800–1000 BC, no burials between 1000 BC–AD 200 (only scattered bone), and extended inhumation in cists from *c* AD 400 to AD 600 (Ashmore 2003; Maldonado 2011, 82ff). Historic Scotland's radiocarbon-dating programme has rewritten the story of burial rite in the first millennium, and disqualified the determinant chronological status of the cist itself: long cists are no longer necessarily Christian, nor short cists necessarily Bronze Age. The use of short cists is occasionally found in northern England and Eastern Scotland into the third to fourth century AD (Ashmore 2003, 39). The long cist appears between the first and fourth century, before the traditional dates of Christianisation (Ashmore 2003, 40). However, there is a rapid rise in the use of long cists, cairns and mounds from around 400 AD (Maldonado 2011, 1, 98, 123, 127), and there is therefore still a case for noting an ideological change from the fifth century, conventionally labelled as the transition from Middle Iron Age to the Late Iron Age or Pictish period. The net change is from a lingering use of cremation and the short cist, scattered bones in settlements and bones buried in former settlements, to the more regular use of inhumation, long cists, cairns and mounds, round and square (Maldonado, ibid; see Winlow 2011 for a useful review of Pictish period burial rites on Tayside).

We argue above (p 87) for the presence of a Pictish barrow cemetery on the crest at Portmahomack. The location recalls that at Redcastle, where the cemetery 'developed linearly along the edge of the raised beach and was bounded on the landward side by the paleochannel' (Alexander 2005, 108). The cists in mounds, which in our case arrive in the fifth or sixth century, point to a new direction even while they make references to the practices of the past (Maldonado 2011, 82–9). Before the Late Iron Age, the emphasis on the peninsula would appear to be on coastal burial, with three main centres where mounds would have stood on the skyline, associated with landing places. Combined with the activities at Portmahomack, this indicates a surge in activity in the Late Iron Age. Here, one or more burial groups, perhaps under mounds, had been installed on the crest by the sixth century, using the high-investment burial rite of cists composed of large slabs topped with an earth mound. These are elite memorials, and celebrate both men and women, but are not specifically Christian. The latest of them is erected in the seventh century. At the least, the relatively sparse footprint of early prehistoric settlement encourages the view that Period 1 is a new beginning and the features encountered could all belong to it. The chapter ends by considering this hypothesis and its significance.

Interpretation of the Period 1 occupation at Portmahomack

The defining characteristic of the Period 1 occupation is that it constitutes both a settlement and a cemetery that are in the same place and coeval between the fifth and the seventh century (see above, p 76). The cemetery on the crest overlooking the firth contained cist burials of men, women and children under mounds. The settlement by the marsh featured ironworking, iron dress pins and horse gear. The people had a diet high in protein and consumed wheat and barley. There were fields in the vicinity, one in the south (Sector 2), which may not have still been active and another using plough pebbles that is unlocated. On this reading the Period 1 occupation divides the occupied land into three: a barrow cemetery on the crest, an industrial zone by the stream and a grain-production site somewhere on the productive land to the south (Illus 4.30). The Period 1 community can also claim relatively high status in its burials (above, p 86), its mobility, its iron production, its access to resources and the hints of the presence of an insular equestrian class with a potentially wide range of contacts. The metal-workers are not likely to have operated without patronage. On the other hand, it is true that the identification of all seventh-century sites in Britain tends to rely on the occurrence of high status finds (Crone 2000, 166).

One of the more celebrated rewards of the archaeological campaigns carried out by the Irish National Roads Authority was the first sighting of a new kind of occupation provisionally termed 'cemetery-settlement' or 'settlement-cemetery' (Kinsella 2010, 124; Ó Carragáin, T 2009; O'Sullivan & Nicholl 2010; O'Sullivan et al 2014, 306–12). These are settlements with a contemporary and adjacent communal burial ground. They exhibit a variety of enclosures and buildings. Prominent activities are the processing of crops (eg Raystown, Co Meath; Seaver 2006) and industrial activities, particularly ironworking (eg Lowpark, Co Mayo; Wallace & Anguilano 2010). Animal bone assemblages suggest funeral feasting in addition to more routine consumption. The burial ground is often enclosed and situated at the centre of the site as at Carrigatogher, Co Tipperary. Many of the sites appear to start with the burial ground in the fifth century (O'Sullivan et al 2014, 311), which in Ireland raises expectations that the cemetery-settlement emerges with St Patrick. However, Ó Carragáin notes that churches are largely absent from these sites and that their affiliations may be Christian or pagan or at least not determined, rather 'engaging with the new religion on their own terms' (2010b, 219). Cemetery-settlements seem not to turn into monasteries – the ecclesiastical sites are new foundations that run in parallel with them through the seventh and eighth century, neither having a monopoly in commemorating the dead. A significant interpretation, also owed to Ó Carragáin, is that the cemetery-settlement is essentially a family establishment, losing its primacy in the Viking Age to communal places of burial (2010b). It is not until the eighth century that 'burial near the saints becomes an acceptable substitute for burial among the ancestors' (O'Brien E 2009, 150).

Authors presenting the new work in Ireland emphasise the variety of settlement and burial options that have been revealed and warn us against devising too-rigid classifications to cope with them (O'Sullivan et al 2014, 312). Nevertheless, the Irish cemetery-settlement offers us a useful model for Period 1 at Portmahomack: a family estate with its own cemetery, productive farmland, ironworking, high-status metalwork and no obvious religious allegiance. What became of the occupants?

The Period 1 to Period 2 transition

The transition between the family estate of Period 1 and the monastery of Period 2 shows both continuity and change. The people of Period 1 are already members of an 'insular' community. The cemetery maintains its location on the crest and hilltop, and the new burials of Period 2 defer to the existing mounds (p 106). But cist burial is replaced by head-support burial, and the family groups by a community of men only. The technique of timber-lined drains is still practised, but is now at the service of paved roads. The manufacture of secular objects for high-status men, women and children gives way to specialist Christian sculpture and books. Arable produce is replaced by an emphasis on cattle. The time frame of Period 1 is consistent with Columcille's journey up the Great Glen in 565 AD, but there is no specific symbolic marker we might call on to indicate that his journey reached Portmahomack. The provenance of some of the individuals in the Period 1 burials is British, and there is only one from the west coast. The findspots of TR24 and 25, simple scratched crosses on unworked stones, while not precise, may possibly be located in Period 1 strata (OLA 6.3/3.2.1). Thus it is not excluded that the Period 1 activity at Portmahomack represents a pioneering early Christian collaboration of the sixth and seventh century, but its expression is far from that of the conventional Christian repertoire and very far from the monastic extravagance of Period 2. The interpretation lies open. This may be what a sixth/seventh-century Columban community looked like; or it may be an elite group that is about to be replaced, lose its initiative to a different power group, or themselves convert to an agenda we can more easily recognise as monastic.

As the story of this site unfolds, we will be drawing attention to a number of occasions on which the cultural material seems to reflect not a replacement or displacement of the occupants but a change in their mentality. Reduced to essentials, a high-status traditional burial ground and associated settlement with no clear ideological affiliation was exposed to new thinking in the later seventh century and replaced suddenly by an all-male college displaying extravagant Christian symbolism. This is certainly the result of intrusive new politics. But it may also be what happens when successful local leaders grant land to make a monastery.

Chapter 5

The Pictish Monastery (Period 2, *c* AD 700–*c* AD 800)

5.1 Introduction and Summary

The developments of the late seventh/early eighth century, which begins our Period 2, required high investment and affected every part of the Portmahomack site (Illus 5.1.1) and much of the peninsula (Illus 5.1.2). On the hilltop (Sector 4), a new and more intensive phase of burial in the *cemetery* began with an emphasis on head-support graves (Chapter 5.2). The burials and the central ritual space were marked out with *carved stone memorials*, ranging from simple grave markers to grand cross-slabs, of which over 260 pieces survive (Chapter 5.3). Some of the burials appear to have been aligned on a *church,* which was not seen, but inferred to have stood adjacent to the east wall of the crypt (Chapter 5.4).

Outside the ritual centre, the site was equipped with a well-designed and integrated *infrastructure* (Chapter 5.5): a turf and stone *dam* was built N–S across the valley which impounded water in a *pool* some 50m across; a *culvert* canalised the water that overflowed across the dam, and guided it downhill to the sea. A paved and kerbed *road* (S13) led from the crest downhill across the valley; there was a *bridge* where it crossed the outflow from the pool, incorporating the overflow culvert, capped in giant blocks of stone (S7). The site as a whole was bounded by two successive *enclosure ditches* (S15, S16).

The sloping ground either side of the road was protected from flooding and erosion by *boundary walls* (east and west). It was on this ground that the *northern workshops* were laid out (Chapter 5.6). The craftsmen here were dedicated to the production of vellum as a writing membrane for books, and their industry was sited in a workshop (S9), with a stone-lined tank for processing skins to the north (S4) and a yard to the south. Further south across the pool and within the enclosure ditch were the *southern workshops* (Chapter 5.7), centred on a bag-shaped building (S1) and dedicated to manufacturing objects from silver, bronze and glass. Part of the debris from the outdoor workspace was captured through being dished into the disused first enclosure ditch (S15). The settlement had an economy largely based on cattle (Chapter 5.8) and had ingeniously adapted locally sourced materials to construct its buildings (Chapter 5.9) as well as to supply its workshops. On the peninsula, new centres were established at Hilton of Cadboll, Shandwick and Nigg. A portage is likely to have been activated and selected landing places were marked by large carved stone monuments (Chapter 5.10).

We argue that this establishment was a monastery on the basis of the form and content of its cemetery, its numerous memorials, the particular stone carrying a Latin inscription, the infrastructure, the manufacture of writing membrane and ecclesiastical vessels, the diet, the architecture and the contemporary and related centres on the peninsula. It appears to have ended with some violence in an incident that resulted in a site-wide fire and the breaking up of Pictish monuments (Chapter 5.11). This began the post-monastic phase of Portmahomack's history (Chapter 6).

Dating – start

Following the stratigraphic end of Period 1 in Sector 2, a layer of windblown sand was deposited which is thought to have been prompted by the stripping of turf (p 187). Radiocarbon dates modelled eleven stratified Period 2 contexts as being deposited within the range *c* 650 to 780 (Digest 3). A porcupine sceat was recovered from a pit cut through the road, S13, suggesting that the monastery was active or under construction by AD 715 to 735, the date range for the coin (see Digest 6.2).

Within Sector 4, the Period 2 burials were identifiable during excavation primarily as graves that were truncated by, or lay below the depth of, the foundations for the medieval Church 2 (p 106). As shown in the stratigraphic model (Illus 3.21), an intermittent horizon of pink sand also served to indicate the start of this stratigraphic phase. Radiocarbon dated burials were modelled as lying between *c* 670 and 790, providing a good concordance with Sector 2 (Digest 3). The period is notable for its preponderance of head-support burials (small stone slabs inserted in the grave, usually near the head), and this rite also continued at a lower level of intensity into Period 3.

Dating – end

A raid, strongly evident in Sector 2, marked the stratigraphic end of Period 2. The raid was signalled in Sector 2 by an extensive fire, which destroyed the standing structures, and the dumping of broken up sculpture, datable to the late eighth/early ninth century. Radiocarbon and typological modelling would place this event after 780 and before 810 (see Chapter 5.11).

On this basis, the monastery was founded between 670 and 735, and the monastic experiment ended between 780 and 810, abridged here to *c* 680 to *c* 810. It had lasted for less than a century.

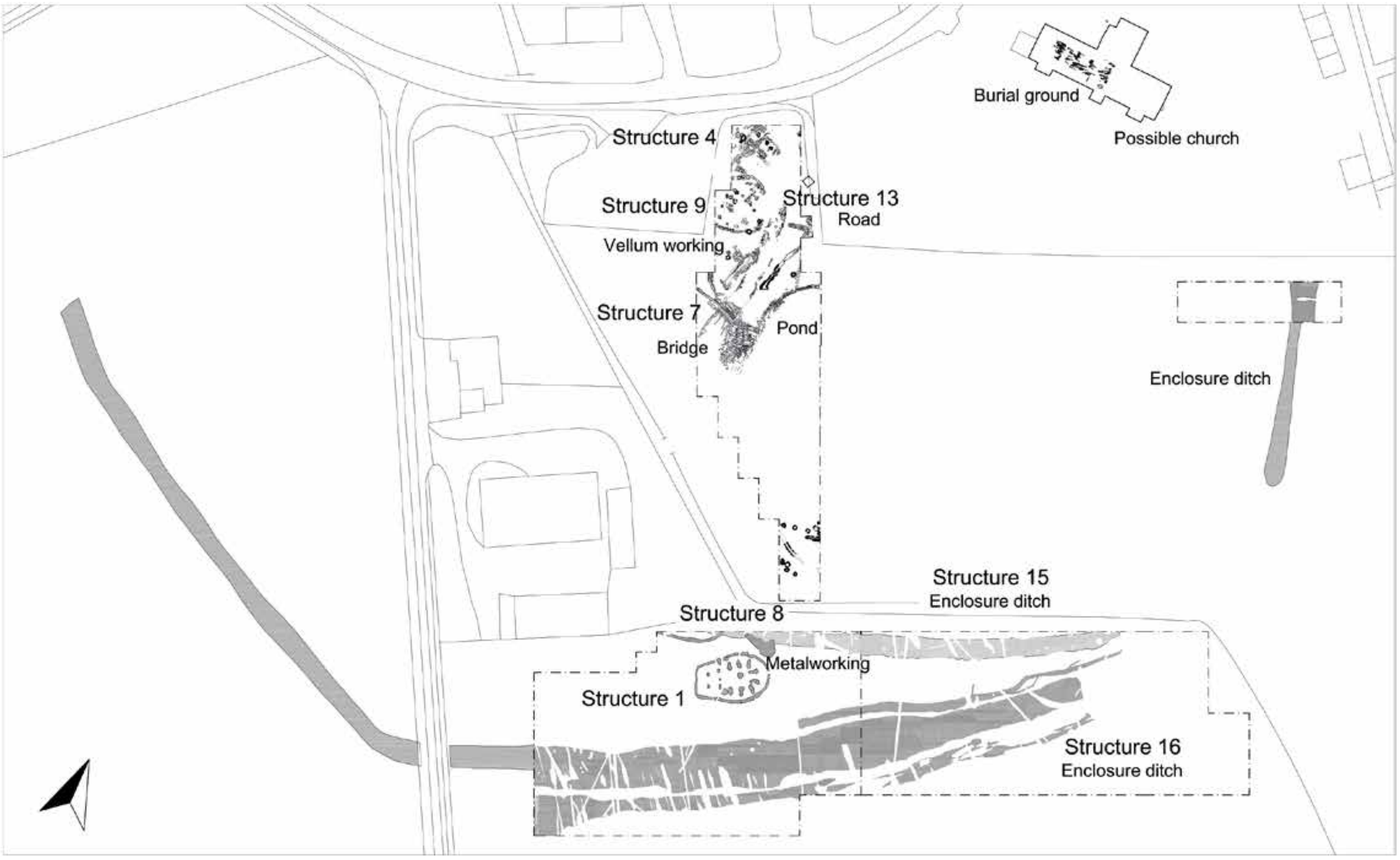


Illustration 5.1.1
Map of the excavated site in Period 2 (eighth century)

5.2 The Monastic Cemetery: Burials of Periods 2 and 3

The burials to be presented here were all excavated within the nave of the present church building or in an adjacent service trench in contexts that predated the first medieval church. They were of three main types: long-cist burials, head-support (including head-box) burials and simple burials. The cemetery was used continuously, although with varying intensity, from the fifth through to the twelfth century. A total of 74 burials could be shown by stratigraphy to precede the construction of Church 2 in the eleventh or twelfth century (Chapter 3, p 54), and of these, 21 were radiocarbon dated (Table 3.1, p 68). Those of the fifth to seventh century (Period 1) could be associated with the cist burial rite and grouped with some confidence (see below and Chapter 4). The burials of the eighth century (Period 2) were harder to detach from those that could be ninth to eleventh century (Period 3), and for this reason are here presented together. It will be argued that although the use of the site in the other Sectors changed radically after the raid that terminated Period 2, in the cemetery itself burial continued in the same tradition into Period 3, although at a diminishing level. Period 3 ends when walls and floors belonging to the twelfth century medieval church (Church 2) were constructed. Burial began again in the thirteenth or fourteenth century, after an interval following the construction of Church 4. Within the nave of the present church the excavations therefore contacted three different populations in stratigraphic order, 16 burials of the sixth/seventh century (Period 1, see Chapter 4), 58 of the eighth to eleventh century (Periods 2 and 3, this chapter) and 88 of the thirteenth to sixteenth century (Period 4, see Chapter 7, p 296 (Illus 3.21).

Stratigraphy

The first burials on the hill were the long-cist graves of Period 1, which had been cut into glacial sand subsoil. Where related by stratification, long-cist burials consistently preceded head-support burials, and those dated fell within a radiocarbon span of AD 420 and 725. The majority of the long cists were not oriented W–E, unlike those that followed. On this basis, sixteen burials were assigned to Period 1 and of these, twelve were complete or partial long-cist burials and four were simple inhumations without elaboration of the grave. There was a cluster at the west end, proposed to indicate a mound, which formed part of a more extensive mound cemetery (Chapter 4, p 82).

Table 5.1.1
Chronology for Period 2 (an excerpt from Table 3.1)

Defined Period	Sector 1 [South Field]	Sector 2 [Glebe Field]	Sector 4 [Church]	The Tarbat Peninsula
HIATUS *1–5 years*				
PERIOD 2 Monastic **eighth century** AD 680–810	*Start: 610–780* *Infrastructure* First enclosure ditch S15 Second enclosure ditch S16 Stake in enclosure ditch [O-10159] **670–890** *Bag-shaped building S1* Last use of hearth in S1 phase 1, F65 [S-2621] **700–940;** [S-33415] **670–870** *Bag-shaped building S3* *Well S8* *Metal-working in and around S1*	*Start: 645–685/735–765* *Infrastructure* Pool, dam and bridge S7 Road S13 *Boundary walls* *D2*. Animal bone under boundary wall F480 [S-13266] **640–770** *D3*. Earliest pool C2296 birch twigs [S-14994] **590–760** *Vellum workshops* *S4 tank* *S9 yards* *D4*. Hearth in yard F445 **640–770** *D4.* Bone pegs in yard F393 [S-13267] **640–770** *D4*. Butchered bone C2335 [S-13265] **650–780** Hearth in S9 F495 [S-13581] **650–780** *D4.* Stake by dam F404 [S-13276] **650–780** *D4*. Bone row C2000 [S-13271] **660–810** *Sceat* of **715–735** (F185)	*Start: 670–760* *Cemetery with grave markers* HS burial 128 [O-13487/fish] **640–770** *A3*. Burial 171 [S-33414/fish] **660–850** Burial 165 [O-13509] **650–780** Burial 129 [S-33404] **670–880** Burial 153 [S-33410] **650–780** Burial 144 [O-13488/fish] **680–890** *A4*. Burial 130 [S-33405] **660–780** *B2*. Burial 160 [O-13486/fish] **680–880** HS Burial 116 [O-13489/fish] **680–880** *Cross-slabs, grave markers, sarcophagus* *Crosses A–D* **late eighth-early ninth century**	*The portage?* *Monumental cross-slabs at Portmahomack, Hilton of Cadboll, Shandwick and Nigg* **mid-eighth-ninth century**
RAID 780-810	 *End: 700–840*	*Burnt workshops* Timber 26/C1030 [O-9664] 330–550 (Prob. *c* 800: old wood) Hazel stake F490 [S-13273] 400—570 (Prob. *c* 800; old wood) Wattle on terrace F483 [S-13274] 610–690 (Prob. *c* 800; old wood) *D5*. Burnt wattle C2704 [S-13275] **650-810** Sculpture broken up **after late eighth-early ninth century** *End: 710–780*	*Conjectural victims of raid* Burial 158 [GU-9296] **680–900** [Blade wound, healed] HS Burial 152 [GU-9297] **780–1000** [Blade wound, fatal] *End: 690–790*	

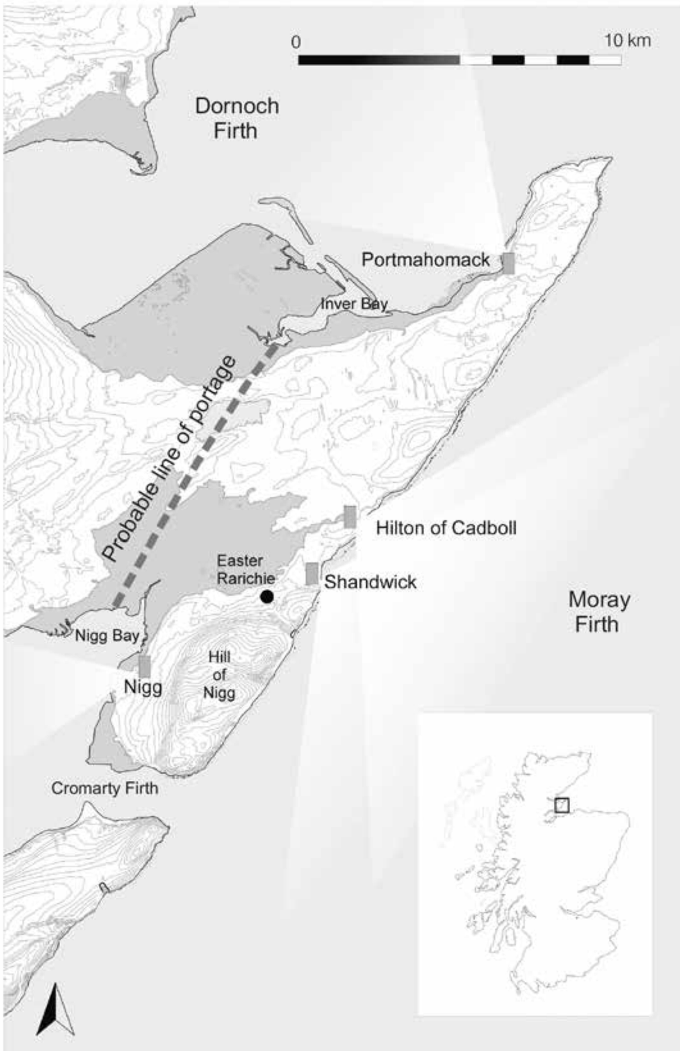


Illustration 5.1.2
Map of the Tarbat peninsula in the eighth century with hypothetical viewsheds commanded by the principal Pictish monuments

There were fifty-eight Period 2 and 3 burials which were stratigraphically later than those of Period 1, were oriented W–E, included head-box or head-support burials or had radiocarbon dates between the late seventh and twelfth century (and shared two or more of these attributes). They are listed in Table 5.2.1 and mapped in Illus 5.2.1. Period 2 burials had cut burials and features of Period 1, and/or cut into an intermittent horizon of pink sand (1064, 1068). Head-box Burial 125 cut long-cist Burials 149 and 162. Head-box Burial 40, and simple Burials 43 and 127 cut ditch F129. Patches of a brown buried soil (1225, 1217) were recorded as having been cut by the foundations for Church 2, and this has also been modelled as the horizon that marked the disuse of the Period 2/3 cemetery. It lay between 17.2m and 17.6m AOD. Period 2/3 burials were disturbed and truncated by the foundations of Church 2 and by the deeper Period 4 burials.

Cemetery plan and development

The basic layout of the cemetery consists of a series of rows where the burials are aligned W–E and one row at the east end where the burials are aligned ESE–WNW. This layout is made more visible in the edited version of the cemetery shown in Illus 5.2.2. The alignment of the eastern row is not dissimilar to that of some of the Period 1 long cists, raising the possibility that it is this eastern row that begins Period 2. However, this is countered by the distance of these graves from the Period 1 epicentre, which is at the far west end, and the fact that the cist graves were then well underground, although marked by a mound; this western area also provided the richest sequence of stratigraphically consecutive burials, including the earliest burials certainly belonging to Period 2 (Burial 128, AD 640–770; Burial 130, AD 660–780). The ESE–WNW orientation also affected stratigraphically late graves Burials 125 and 142 which lie further east.

In general, burials of Period 2 and 3 respected each other. Direct evidence of respect was given by the close and layered siting of graves that usually left preceding burials undisturbed, although they were sometimes so close that mere centimetres separated articulated bones, particularly at the elbows of adjacent burials. Where truncation took place it was often superficial: only toes were lost or the feet of a later burial oversailed the skull of an earlier. This apparent knowledge of the layout and organisation of burial plots persisted into Period 3.

The distribution of the burials shows three forces at work: an initial pull from the pre-existing Period 1 cemetery in the west, a tendency to arrange graves in N–S rows and an attraction from something standing slightly north of east. At the west end, especially in the north-west corner of the nave, there was a notable concentration of twelve burials of Period 1 and 2 interments within an area of *c* 3.5m^2. This concentration lies to the immediate north of the main Period 1 cluster, suggested as forming a mound (Chapter 4, p 82; marked on Illus 5.2.1), and may itself have been another mound focused on the deep Period 1 simple inhumation Burial 170. In contrast to Period 1, orientation was true W–E, a pre-echo of the medieval orthodoxy. However, Period 2 burials at the eastern limit of our intervention hinted at a group deviation in orientation closer to WSW–ENE than W–E. This gravitational pull is interpreted here as due to the west wall of a Pictish church (see Chapter 5.4, p 169).

The space occupied by the Period 2 cemetery seems to have been constrained. Burial 189, located within Int 16 on a notably skew alignment, may lie outside or near the northern limit, since subsoil was exposed for the continuation of the trench and no further Period 2 burials were exposed. The free section provided through natural subsoil to a depth of 17.0m AOD provided by the Period 4 Mackenzie grave did not expose or clearly truncate further Period 2 burials in this position. This suggests that the rows of burial did not extend much further north. Likewise, Int 22 (the southern service trench) encountered strata belonging to non-cemetery activity and, where subsoil was exposed, no burials were identified, suggesting that the southern boundary of the Period 2 cemetery also lay nearby between the bounds of Int 17/20 and Int 22 (see Illus 5.2.1). To the west lay the Period 1 cemetery, with its probable mounds, and to the east a possible

Illustration 5.2.1
Plan of all Period 2 and Period 3 burials, showing location of putative mounds at the west end

church suggested by the orientation of the more easterly burials. These factors suggest that the Period 2/3 cemetery was confined within fixed boundaries at the top of the hill.

Burials of Period 3

Burials that were dug in Period 3, that is from the ninth to eleventh century, have been tentatively assigned by stratigraphy and radiocarbon dating. The latest intact burials, stratigraphically, lie just under the brown sand that signals the construction of the medieval church. They are located over the full length of the nave. The candidates are five from the eastern group (44, 45, 47, 124 and 176), five in the centre (111, 123, 125, 142 and 157) and seven of the western group (136, 156, 145, 147, 164, 152 and 158). Of these seventeen, six were radiocarbon dated, all at the west end, where the longest stratified sequences were to be found. Of these six, three (136, 156 and 111) must be later than 970, while the remaining three (152, 158 and 147) are eighth to tenth century in date.

The transition was seamless, since nine of the seventeen stratigraphically late burials are conventional members of established rows (Burials 152, 158 and 164 at the west end, 157 in the middle and 44, 45, 47, 124, 176 at the east end). Of the six dated burials, Burials 152 and 158 respected the west row and had dates spanning the eighth to tenth century. Of the remaining four, Burial 147 had a date that spanned the eighth to tenth century but did not respect the rows, and the remaining three (136, 156, 111) that had dates after 970 did not respect the rows either. Burials 136 and 111, although tenth century or later, exhibited the head-support burial rite. Burial 147 (720–960) (an immigrant from the west) was a departure from the established burial rite, being placed on a wicker bier.

From this it can be inferred that the basic structure of the cemetery, with its grave markers, remained visible and accessible into the ninth century, but may have been lost in the two centuries after that. The raid would certainly have disrupted the lives of the population that is being commemorated here, but they remained faithful to some of the established ways of death for at least another century. This suggests an alignment between these burials and the metalworkers of Sector 2, placing both in Period 3A (see Chapter 6, p 280). As a group, these burials had more than an equitable share of trauma, at 47% (see below). Burial 158 (680–900) and Burial 152 (780–1000) had suffered blade wounds, although one had recovered (see below).

The verdict drawn from these strands of information is that the Period 2 cemetery began amongst the Late Iron Age

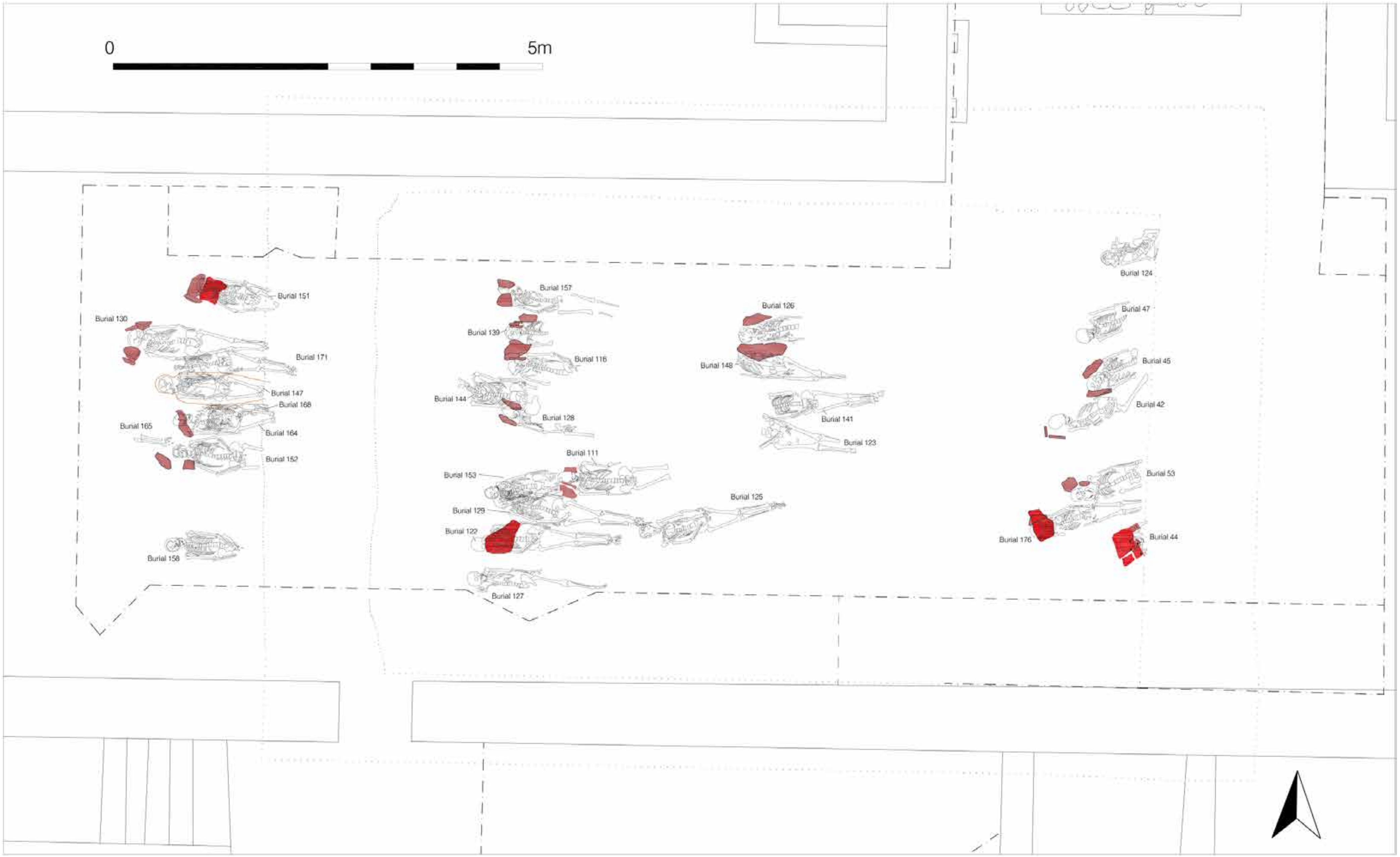


Illustration 5.2.2
Period 2 row burials

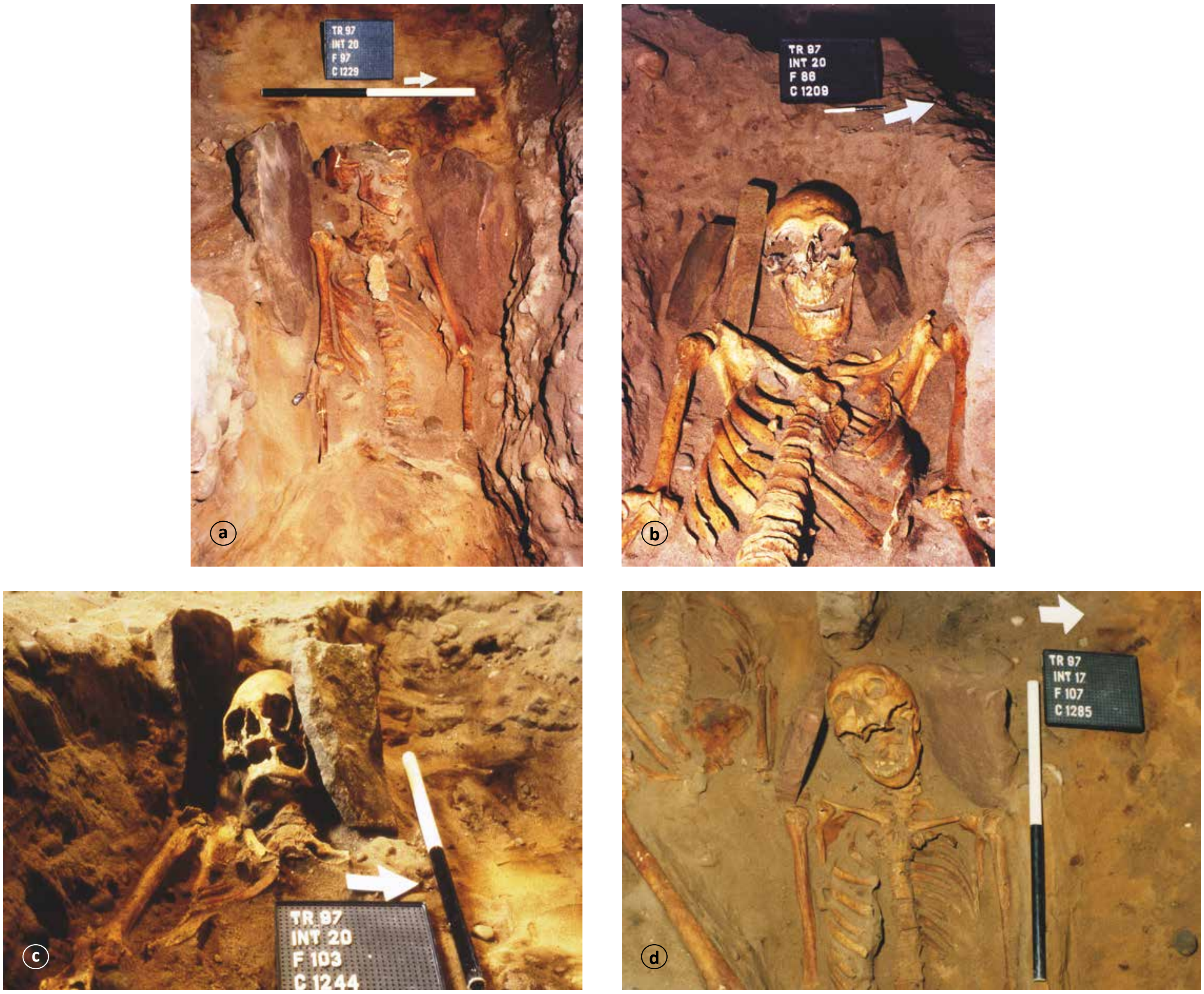


Illustration 5.2.3
Head-box variants: (a) Burial 126 (F97); (b) Burial 111 (F86); (c) Burial 128 (F103); (d) Burial 45 (17/F107)

burial mounds on the high ground to the west and developed in an easterly direction in orderly rows. At a given moment, within the eighth century, the most easterly row adopted an orientation a few degrees north of east, perhaps reflecting the erection of a church (Chapter 5.4). This alignment also affected burials further west (for example Burials 125, 137, 141, 142, 143). Burials made at the end of Period 2 conformed to the cemetery layout at both ends, at least in the first century following the late eighth/early ninth-century raid. But there is an indication that by the tenth century, if not before, the cemetery had lost its surface plan, if not its location. If late stratified burials are correlated with radiocarbon dating and membership of a row, it would seem that the majority of the burials (forty-one) were interred in Period 2, with no more than seventeen in Period 3, nine in the ninth century and no more than eight in the two centuries that followed. These numbers cannot be known precisely, but they indicate a drop in the use of the cemetery in the ninth century, and diminishing numbers in the tenth and eleventh with a concurrent loss of the cemetery's structure.

Grave markers

Indirect evidence that the burials were visible from the surface, and their positions respected, was provided by thirteen small cross-slabs, probably grave markers, which were found in the

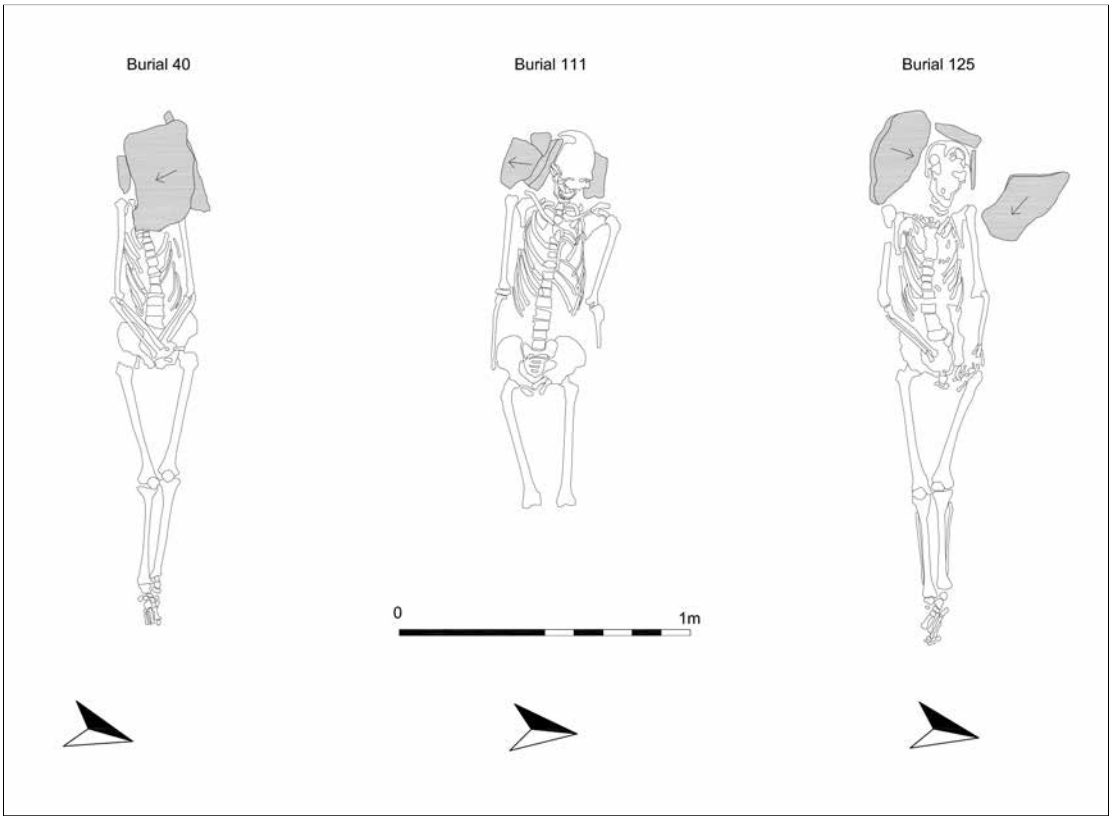


Illustration 5.2.4
Head-box burials: Burials 40, 111, 125

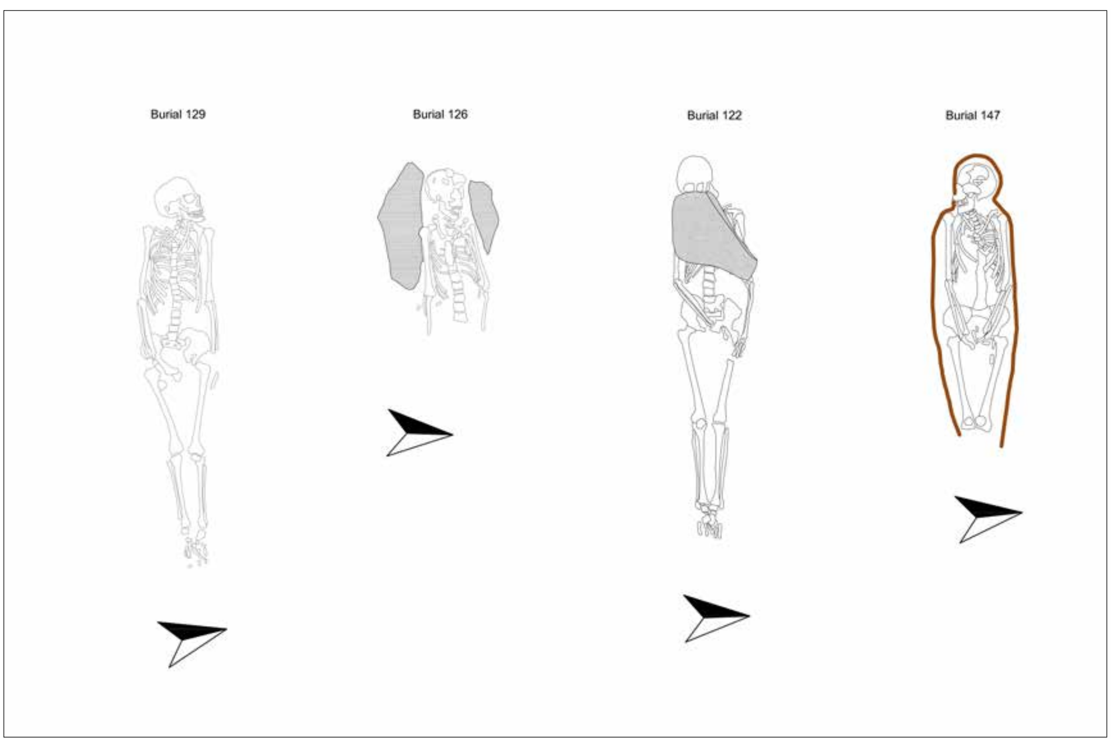


Illustration 5.2.5
Burial variants: Burial 129 (simple); Burial 126 (head-box variant); Burial 122 (head-box variant); Burial 147 (wicker bier)

Illustration 5.2.6
Wicker bier, Burial 147

area or reused in the fabric of the present church (see Chapter 5.3, p 130). One simple marker, TR25, incised with a crude cross, was recovered from a service trench (C1008) from a context that might possibly be early enough to attribute to Period 1, but its height (between 17.3 and 17.5m AOD) suggests a closer equivalence with the buried ground surface for the Period 2 cemetery. The other grave markers were recovered from secondary contexts dating to Period 4 or later, the majority in circumstances suggesting that they had been disturbed by the construction of the medieval Church 2 (Chapter 7, p 289). There is no grave marker that can be certainly assigned to a period before *c* 700, or after *c* 800, although of course this remains possible (Chapter 5.3, p 148).

Burial rite

Of the fifty-eight Period 2/3 graves (Table 5.2.1), twenty-one (36%) featured the head-support burial rite, where small slabs of stone had been set beside the head or over the face (Illus 5.2.3, 5.2.4). Twelve well-preserved examples were head-box burials, where slabs were set either side of the head with a covering slab enclosing the head. Five other settings consisted of two slabs to the sides of the head, and where disturbance could be invoked are recorded as probable head-box burials. Some variations seemed to be intentional. Burial 122 had a large slab placed over the head and upper torso with no other slabs (Illus 5.2.5). Others were so poorly preserved that the original rite could not be read, and are recorded simply as head-support burials. Some Period 2 burials were noted during excavation as 'shrouded,' and examination of burial photographs and body position has allowed the identification of further examples. In total, thirteen shrouded and eight probably shrouded burials have been identified within Period 2. The evidence for shrouded burial consisted of signs of constraint in the skeleton, notably showing the upper body, particularly shoulders and arms and lower limbs, positioned unnaturally close together at the knees and feet (for example see Illus 5.2.4, Burial 40). Both simple inhumations and head-box burials included shrouded

Table 5.2.1
Period 2 and 3 burials
*Burials that are probably or possibly of Period 3 (ninth-eleventh century) are marked with an asterisk. For abbreviations used in trauma, see D4.1.

No.	Type	Occupant	Stratification	Height AOD	Analyses	Date
38	Simple, extended, supine, probably shrouded	Male 46–59 y Ht 1.70m/5' 7"	Overlay head slab Burial 42 and cut by head-box Burial 45		Neoplasm, SJD, Dental, periostitis	
39	Simple, extended, supine	Adult, Prob. male Ht 1.68m/5' 6"	Represented by lower legs only, cut by Burial 47		Fracture: R.Proximal Fibula	
40	Head-box, extended, supine, shrouded	Male, 46–59 Ht 1.74m/5' 9"	Cut into Period 1 ditch 20/ F129			
42	Head-side-slab; extended, supine	Male 46–59 Ht 1.78/5' 10"	Overlain by Burial 38, later truncated by Burial 45		L.Rib Fracture, OA, SJD, DJD, Spina bifida occulta, Dental	
44*	Head-box; extended, supine, oriented W–E; skull and upper torso only	Prob. male, 46–59 y	cut by Church 2 east wall foundation 17/F85	Skull – 16.8		
45*	Head-box; extended, supine, oriented WSW–ENE	Male, 46–59 y Ht 1.71m/5' 7"	overlay Burial 38	Skull – 16.8 Sacrum – 16.6		
47*	Simple extended, supine, oriented WSW–ENE	Male, 26–35 y Ht 1.74/5' 8"	cut by Church 2 east wall foundation 17/F85	Skull – 16.9	Dental, Entheses	
48	Simple extended, supine, oriented WSW–ENE represented by lower legs, minus feet	Prob. male, 36–45 y Ht 1.66m/5' 5"	cut by head-box burial 45, later truncated by deep Period 4 Burial 35	Tibia – 16.9	Entheses: L4, Cancanei	
50	Simple extended, supine, oriented W–E, represented by upper right leg only	Prob. male adult Ht 1.64/5' 5"	disappeared beyond northern baulk, truncated by Period 3 Burial 1	Tibia 17.0		
51	Simple extended, supine, oriented SW–NE; represented by lower right arm, lower torso and legs	Male, 36–45 y Ht 1.64/5' 5"	truncated to west by Church 2 south wall 20/F62	Sacrum – 16.7 Tibia – 16.7	Fracture (R.5th MT), OA, DJD	
52	Simple extended, supine, shrouded, oriented SW–NE	Male, 46–59 y Ht 1.66/5' 6"	aligned with Burial 51, cut by Church 2 east wall 17/F85 and south wall 20/F63	Tibia – 16.7	Periostitis (R.Fibula)	
53	Simple extended, supine, furnished with (disturbed) head slab, oriented WSW–ENE	Male, 46–59 y	cut into Period 1 ditch 20/ F129, cut by head-box Burial 176	Skull – 16.8 Sacrum – 16.6	SN, Calculus, caries, abscess, mand. tori.	
54	Simple oriented WSW–ENE	Male, 18–25 y Ht 1.73m/5' 8"	legs cut by 17/F72 foundation trench of north wall of Church 2	Skull – 16.83	**Local** Pulmonary infection (TB?) Calculus, DEH	
111*	Head-box; extended, supine, oriented W–E	Male, 26–35 y Ht 1.68m/5' 6"	cuts Period 2 Burial 143 and Burial 153	Skull – 17.2 Sacrum – 16.9	**Immigrant?**	AD 1020–1170
116	Simple extended, supine, furnished with (disturbed) head-box, oriented broadly W–E	Male, 46–59 y	cut by Burial 117, cut Burial 144	Skull – 17.1 Sacrum – 16.8	OA: verts, L.shoulder	AD 680–880
118	Simple represented by legs	adult male		Tibia – 17.2	Fracture: R.5th MT Tuberosity	
121	Simple extended, supine, oriented W–E	Male, 26–35 y Ht 1.67m/5' 6"	preceded Period 2 Burial 144, head truncated later by Church 2 west wall 20/F73	Sacrum – 16.9 Tibia – 16.9	Compression (L1), Spondylolysis (L5), SN, Os Acromiale, DJD	
122	Head-slab; extended, supine, probably shrouded, furnished with slab covering lower face and torso, oriented W–E	Male, 46–59 y Ht 1.74/5' 9"	aligned with Burial 127 and 129	Skull – 17.1 Sacrum – 16.8 Tibia – 16.9	OA, SJD, Dental, Fractures (T7, R.Fib, L.Rad)	

Table 5.2.1
Period 2 and 3 burials (*cont.*)

No.	Type	Occupant	Stratification	Height AOD	Analyses	Date
123*	Simple extended, supine, oriented broadly W–E	Male, 60+ y Ht 1.75/5' 9"	post-dated Burial 141	Sacrum – 16.7 Tibia – 16.8	Fracture (R.5th Prox phalanx), OA (Hip, L4-5)	
124*	Simple extended, supine, oriented WSW–ENE	Male, 18–25 y Ht 1.77m/5' 10"	disturbed and repositioned while partially articulated, later cut by Church 2 east wall 17/F85	Skull – 16.8 Sacrum – 16.7	Scurvy (?) C1 to Occipital fusion, SN	
125	Head-box; extended, supine, oriented WSW–ENE, furnished with probable head-box and shrouded	Male, 60+ y Ht 1.73m/5' 8"	post-dated Period 1 cist Burial 149 and may have reused robbed stones from cist for head setting, also cut Period 2 Burial 129 but did not disturb it	Skull – 17.0 Sacrum – 16.9 Tibia – 16.9	Fracture (L.Tib/Fib), OA (L.Hip, C.verts)	
126	Head-support; extended, supine, oriented W–E	Male, 46–59 y Ht 1.70m/5' 7"	post-dated Burial 148 but did not disturb it	Skull – 16.8 Sacrum – 16.7	SJD, OA, SN, DJD, Dental Abscesses, Calculus	
127	Simple; extended, supine, oriented W–E	Prob. male, 36–45 y Ht 1.62m/5' 4"	aligned with Burial 122 and 129, disappeared beyond southern baulk	Skull – 16.8 Sacrum – 16.6 Tibia – 16.7	**Local** **Oat or wheat starch in calculus**	
128	Head-box; extended, supine, oriented W–E, furnished with probable head-box	Prob. male, 46–59y	post-dated by Burial 144 but not disturbed by it, later truncated by Burial 117	Skull – 17.1 Sacrum – 16.8		AD 640–770
129	Simple; extended, supine, shrouded, oriented W–E	Prob. male, 18–25 y Ht 1.66/5' 5"	aligned with Burial 127 and 122, post-dated but not disturbed by Burial 125 and 153	Skull – 16.9 Sacrum – 16.7 Tibia – 16.8	**Migrant from Scandinavia**	AD 670–880
130	Head-box; extended, supine, probably shrouded, oriented W–E	Prob. male 46–59 y Ht 1.70m/5' 7"	buried in dense north-west zone, post-dated Burial 171 but did not disturb it, post-dated by double Burial 136/156 but not disturbed by them	Skull – 17.3 Sacrum – 17.20 Tibia 17.10	**Local**	AD 660–780
133	Simple; extended, supine, probably shrouded, oriented W–E	Male, 60+ y Ht 1.69/5' 6"	truncated by Church 2 west wall 20/F73	Sacrum – 16.9 Tibia – 16.8	DJD, SJD, OA (Verts, Hips, Tarsals)	
135	Simple; extended, supine, oriented W–E	Prob. male, 46–59 y	post-dated head-box Burial 154, cut by Church 2 west wall 20/F73	Sacrum – 17.3	SJD, SN, Possible Scheuermanns (T11)	
136*	Simple; extended, supine, oriented W–E in possible double burial with Burial 156	Male, 36–45 y Ht 1.74m/5' 8"	In dense north-west zone, post-dated but did not disturb head-box Burials 130 and 151, cut by Church 2 west wall 20/F73	Skull – 17.0	**Immigrant?**	AD 970–1040
137	Head-slab; extended, supine, oriented W–E	Prob. male 36–45 y Ht 1.74/5' 9"	cut by head-box Burial 173	Skull – 17.0		
139	Head-box; extended, supine, oriented W–E, furnished with probable head-box	Male, 46–59 y Ht 1.64/5' 5"	post-dated by head-support Burial 157	Skull – 17.0	Scurvy, Vert OA, SN	
140	Simple extended, supine, probably shrouded, oriented broadly W–E	Male 18–25 y Ht 1.66m/5' 5"	post-dated head-box Burial 154	Sacrum – 16.9 Tibia – 16.9	**Immigrant?** SN, R.Os acromiale, CC Entheses	

Table 5.2.1
Period 2 and 3 burials (*cont.*)

No.	Type	Occupant	Stratification	Height AOD	Analyses	Date
141	Simple; extended, supine, shrouded, oriented W–E	Male, 36–45 y Ht 1.69/5' 6"	post-dated by Burial 123, later truncated by Period 4 Burial 113	Sacrum – 16.6 Tibia – 16.7	SN, Spondylolysis, Sacralisation, R.Fibula Fracture	
142*	Simple; extended, supine, oriented SW–NE	Male, 46–59 y Ht 1.74m/5' 8"	post-dated head-box Burial 173	Sacrum – 16.9 Tibia – 17.0	OA, Fracture (R.5th MT), O.Dissecans?	
143	Simple; extended, supine, shrouded, oriented W–E	Male, 60+ y Ht 1.68m/5' 6"	post-dated by head-box Burial 111	Sacrum – 16.8 Tibia – 16.8	SN, OA, Infection	
144	Simple; extended, supine, oriented W–E	Male, 46–59 y Ht 1.61m/5' 4"	post-dated by Burial 116 but not disturbed by it, later truncated by Burial 117	Skull – 17.1 Sacrum – 17.0	**Local Anomalous diet** **Barley starch in calculus** OA(Verts), SN, DJD, Dental diseases	AD 680–890
145*	Simple; extended, supine, oriented W–E	Male, adult	Disappeared beyond southern baulk, cut Burial 158 and cut by Church 2 west wall 20/F73	Skull 17.1	Vert OA, L.Clavicle Fracture, Caries	
147*	Wicker-coffin; extended, supine, oriented W–E, furnished with anthropomorphic cover	Male, 26–35 y Ht 1.72m/5' 7"	cut toes of Burial 160, lower legs cut away by Church 2 west wall 20/F73	Skull – 17.3 Sacrum – 17.10	**Immigrant from west**	AD 720–960
148	Simple; extended, supine, probably shrouded, oriented W–E	Male, 60+y Ht 1.78m/5' 10"	cut by head-box Burial 126, truncated later by Period 4 burial		OA (R.Wrist, R.Hip, L.Knee & verts, Periostitis (L.Femur), DJD/SN	
151	Head-box; extended, supine, shrouded, oriented W–E	Male, 46–59 y Ht 1.72m/5' 8"	post-dated Burial 155, 167 and 174 in dense north-western zone, pre-dated double Burial 136 and 156, later truncated by Church 2 west wall 20/F73	Skull – 17.1 Sacrum – 16.9	OA, SJD, DJD, L.Mid Rib Fracture	
152*	Head-slab; extended, supine, oriented W–E	Male, 26–35 y Ht 1.74m/5' 8"	aligned with and very close to head-box Burial 164	Skull – 17.2 Sacrum – 17.1	Blade wounds × 3, Dental, Max Sinusitis(?)	AD 780–1000
153	Simple; extended, supine, shrouded, oriented slightly towards WSW–ENE	Male, 36–45 y Ht 1.71m/5' 7"	post-dated Burial 129, cut by head-box Burial 111	Skull – 17.1 Sacrum 16.9	**Immigrant from Scandinavia** SN/Scheuermanns, Vert fractures, Dental	AD 650–780
154	Head-box; extended, supine, shrouded, oriented W–E	Male, 46–59 y Ht 1.73/5' 8"	post-dated Burial 140, later cut away through torso by Church 2 west wall 20/F73	Skull – 17.1	SJD, DJD, OA, Infection (R.Tibia), Dental	
155	Simple; extended, supine, shrouded, oriented W–E	Female, 46–59 y Ht 1.65m/5' 5"	post-dated Burial 170, post-dated by head-box Burial 151 but not affected by it in dense north-western zone, buried adjacent to female Period 2 Burial 174	Sacrum – 17.0 Tibia – 17.0	SJD, Osteoporosis(?)	
156*	Head-box; extended, supine, oriented W-E, with head-box	Male 36–45 y Ht 1.71m/5' 7"	Possible double burial with Burial 136 although recorded heights are 0.20m higher	Sacrum – 17.2	**Immigrant?**	AD 970–1040
157*	Head-box; extended, supine, oriented W-E, furnished with probable head-box	Male, 46–59 y Ht 1.74/5' 8"		Skull – 17.0 Sacrum – 16.8 Tibia – 16.8		

Table 5.2.1
Period 2 and 3 burials (*cont.*)

No.	Type	Occupant	Stratification	Height AOD	Analyses	Date
158*	Simple; extended, supine, shrouded, oriented W–E	Male, 46–59 y Ht 1.73m/5' 8"	aligned with row of Period 2 burials, cut by Burial 145	Skull – 17.1 Sacrum – 16.9	**Local** Blade wound (L.Parietal), Fractured L.Ribs, OA: L&R ACC; Verts, SN, Dental disease	AD 680–900
159	Simple; extended, supine, oriented W–E	Child, 10 y	aligned with Burial 140 and 121, cut by Church 2 west wall 20/F73	Sacrum – 16.9 Tibia – 16.9		
160	Simple; slightly flexed, supine, probably shrouded, oriented W–E	Prob. male, adult Ht 1.66m/5' 5"	Predated Burial 169 and beneath Burial 147 in dense north-western zone, disappeared beyond western limit of intervention	Sacrum – 17.1 Tibia – 17.1	OA: R (& L?) Hip, L3	AD 680–880
164*	Head-box; extended, supine, shrouded, oriented W–E	Male, 46–59 y Ht 1.66m/5' 5"	aligned with head-box Burial 152 (Period 3), cut away by Church 2 west wall 20/F73	Skull 17.2 Sacrum – 17.0	Lytic(Neoplasm?), Entheses, sacralisation Fractured ribs,OA/SJD/DJD, Dental	
165	Simple; supine, extended, oriented W–E; represented only by lower legs	adult, sex undetermined,	post-dated Burial 163, post-dated by head-box Burial 152 (Period 3)	Tibia – 16.9		AD 650–780
167	Simple extended, supine, oriented W–E; represented by part right side	Male, adult Ht 1.67m/5' 6"	early burial in dense north-western zone post-dated by Burial 174	Sacrum – 16.8		
168	Simple; extended, supine, oriented W–E	Prob. Male, 36–45 y	pre-dated head-box Burial 164	Sacrum – 16.9		
171	Simple; extended, supine, oriented W–E	Male, 36–45 y Ht 1.75m/5' 9"	post-dated Burial 169 and post-dated by head-box Burial 130	Sacrum – 16.9 Tibia – 16.9		AD 660–850
173	Head-box; extended, supine, oriented W–E	Male, 46–59 y	cut Burial 137, post-dated by Burial 142	Skull – 17.0 Sacrum – 16.7	SJD, Granuloma/Abscess, Scheuermann's, SN, Max Sinusitis, Ankylosing Spondylitis (?)	
174	Simple; extended, supine, shrouded, oriented W–E	Female (?), adult	post-dated Burial 167, post-dated by head-box Burial 151, buried adjacent to female Period 2 Burial 155	Skull – 17.1 Sacrum – 17.0	Neural arch entheses	
176*	Head-box; extended, supine, probably shrouded, oriented WSW–ENE	Male, 46–49 y Ht 1.62/5' 4"	aligned with Burial 53, 42, 45, 47 and 124, cut by Church 2 east wall 17/F85	Skull – 16.9 Sacrum – 16.7	OA, SJD, dental, fracture, infection (sinusitis), cribra orb, spondylolysis (L5)	
189	Simple; extended, supine, oriented NW–SE	Male, 26–35 y	encountered within Int 16 cut into subsoil covered with buried soil	Skull – 17.55 Sacrum – 17.35	Calculus & DEH	

individuals. Radiocarbon dating suggests that head-box burial began after the mid-seventh century and was being used into the ninth to eleventh (here Period 3); simple inhumation began during Period 1, persisted throughout Period 2 and into Period 3. One radical deviation of burial rite was noted: Burial 147 (Period 3) appeared to have been buried within an anthropomorphic, organic matrix which was analysed and identified as highly humified organic remains, possibly wood or wicker (Illus 5.2.6).

The goals of the analyses of the skeletal material included age, sex, congenital conditions, trauma, diet and place of birth, and the methods applied were osteology, stable isotope signatures of carbon, nitrogen, oxygen and strontium, and examination of calculus on the teeth (Digest 4).

Age/sex profile (Digest 4.1, 4.2)

Taking both periods together, the population of the cemetery was 93% male: fifty-four males, two females, and one child, with

Table 5.2.2
Early medieval trauma
*Burials assigned to Period 3

Burial	Phase	Age	Sex	Bone	Side	Description
39	2	adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
42	2	adult	M	rib		Healed fracture with new bone formation which has developed into a facet for articulation with a middle rib
51	2	middle adult	M	fifth metatarsal		Non-united fracture at the base (tuberosity)
122	2	old adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
123*	2	old adult	M	fifth proximal phalanx	R	Well-healed, complete, straight fracture across the shaft
125*	2	old adult	M	tibia fibula	L	Both are well-healed, complete, oblique fractures on the distal ends, but the tibia also has gaps and cloacae present along the fracture line. The ends of the fracture overlap by approximately 35mm and as a result, the left tibia is shorter than the right. In addition, the proximal end of the fibula shaft is angled slightly medially and the fracture ends overlap by approximately 22mm. This individual also has OA of the left hip (secondary?), and probably walked with a limp
141	2	middle adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
142*	2	old adult	?M	fifth metacarpal fifth metatarsal	R	Fusion at an angle with the proximal phalanx – trauma? Non-united fracture at the base (tuberosity)
145*	3	middle adult	M	clavicle	L	Non-united fracture approximately mid-shaft, with healed irregular new bone formation on both sides which articulated with one another. The ends of the bones are displaced such that the medial portion of the clavicle overlaid the lateral portion (anteriorly)
151	2	old adult	M	rib		Healed fracture of a middle rib
152*	2	adult	M	skull		Three blade wounds
158*	3	old adult	M	ribs		Mid-shaft fractures on four middle ribs. One rib also has a lytic lesion (oval with rounded edges – approximately 4.4 × 2.8mm in size) approximately 20mm away from fracture, possibly indicative of infection. This individual also had evidence of trauma to the skull
164*	2	middle adult	M	rib		Rib fracture as well as a trauma or infection to the pelvis (see below)
170	1	middle adult	M	clavicle	L	Well-healed fracture near the conoid tubercle – slightly displaced, so that the lateral end is slightly inferior to the rest of the shaft
176*	2	middle adult	M	clavicle ribs	L	Non-united fracture approximately 25–30mm from the acromial end. One side is flared, and the other is rounded, forming a pseudo-joint. Five healed middle ribs

one undetermined. It may be significant that the two females (Burial 155, 174) were interred side by side within the dense north-western zone. The age profile was unusual. Of those that could be assessed, twenty-three of the men (and one woman) had died after forty-six, with five men dying at sixty or older, 67% (29/43). The child's age was assessed at ten years old, a likely age for a novice.

Physique

The stature of men was around 1.70m (5' 7") with three measuring 1.78m (5' 10"). Fifty-two per cent of the monastic population were affected by spinal joint disease, particularly at T10, L1 and L2. These observations, along with three cases of spondylolysis (a condition which may occur as a result of bending and lifting in an upright posture) and three cases of compression fractures of the vertebrae (possibly as a result of a vertical force injury) suggested that the monastic period individuals may have participated in activities resulting in lower back stress more frequently than the medieval individuals that succeeded them (p D27). There is also evidence to suggest that this stress began at younger ages than in the medieval period.

Teeth

Calculus, abscesses, ante-mortem tooth loss and dental wear were more frequently observed in the monastic than in the medieval period, implying that in Period 2, the diet may have been more coarse. Indeed, a small piece of stone was embedded in the pulp cavity of one of the well-worn teeth from Period 2. The heavy wear may have also resulted in exposure of the pulp cavities, causing dental abscesses. The presence of heavy calculus may be associated with diet type and/or the lack of oral hygiene to remove plaque build-up.

Trauma

Fifteen persons (23%) had suffered fractures or more severe damage, of whom eight were among those seventeen assigned to Period 3 (47%). These included breakage of arms, legs and ribs (Table 5.2.2). In addition to these accidents of the workplace, there was also evidence of interpersonal conflict at Tarbat – sharp-edged weapon wounds were present on two skeletons, both buried in Period 3 (Burials 152, 158). A middle-adult male (152) had three sharp cut marks to the skull (Illus 5.2.7). One was approximately 72mm in length and extended across both parietals, with radiating fractures extending from both ends (one curved into the right side of the frontal bone and the other curved along the left parietal). The cut was angled such that one side was sharp and the other was broken post mortem, but it did not extend into the endocranial surface (although there was a fracture line along the wound). The second wound bisected the lamboid suture on the left side. It was 41mm in length, and was slightly angled and did not penetrate the inner table. The last fracture was on the right side of the occipital; however, much of the area was broken post mortem and the extent of the wound was difficult to assess. A radiating fracture extended from this cut towards the cranial base. There was no evidence of healing, suggesting this individual did not survive after the wounds were inflicted. As two of the cuts were on the back of the head, it is likely that the assailant attacked from behind. Given that one of the fractures was on the crown of the head, the individual may have been below the assailant at one point (eg kneeling). As injuries with larger weapons are more likely to produce terminal fractures (Wenham 1987), it is possible that a weapon such as a sword might have been used to produce these fractures.

The other casualty was an elderly male (158) who had two well-healed fractures on the left parietal. They were smooth parallel depressions extending from the coronal suture approximately 46mm and 30mm posteriorly, and 12mm and 10mm wide, but did not extend into the internal table. Given the linear nature of the injuries, it is possible that a large blade was used to inflict these injuries, probably in a 'face-to-face' position.

Disablement

Three middle-adult males from Period 2 had collapsed vertebrae. In Burial 153, three vertebrae were flattened on the left side of the body, and one on the right side, resulting in scoliosis. In contrast, the anterior surface of the first lumbar vertebrae of Burial 121 was wedge shaped, resulting in kyphosis (hunchback). Burial 176 also had kyphosis as a result of three wedge-shaped vertebrae.

Illustration 5.2.7
Head wounds sustained by Burial 152

It is possible that these individuals sustained these fractures as a result of a vertical force injury. Burials 121, 141 and 171 had spondylolysis (degenerative osteoarthritis).

An elderly adult (Burial 128) had a fused sacroiliac joint on the right side (the left side was missing), as well as fusion between vertebrae and ribs. The osteophytes on the cervical vertebral bodies were square and 'bamboo'-like in appearance, with fusion also occurring between the lamina and transverse processes. In addition, the atlas was fused to the occipital in such a way that this individual's head would have been permanently raised and tilted to the right side.

Stable isotope analysis

Twenty-five skeletons from Periods 1, 2 and 3 were sampled for their carbon and nitrogen isotope signatures and the results used to infer the likely sources of nutrition. They were found to depend largely on terrestrial plants and animal protein, with no marine component (see Chapter 5.8, p 224). Thirteen skeletons from Periods 2 and 3 were sampled for their oxygen and strontium isotope signatures. Three out of the eleven that were measurable were local to the peninsula, and eight were immigrants, including four from Period 3 (Table 5.2.3). It was noted that two of the immigrants had data consistent with an origin in Scandinavia. Of these, Burial 129 was buried with a standard W–E orientation in one of the central rows. Burial 153 apparently knew the spot, since he was buried on top of his compatriot. The later of the two burials was dated AD 650–780 by radiocarbon, and adopted the WSW–ENE orientation of the east end. This implies that both were fully fledged members of the monastic community.

Table 5.2.3
Oxygen/Strontium isotope signatures for Periods 2 and 3
(Chapter 3, p 60; Walther, OLA 7.2.3.1)

2	Burial 54	Local
	Burial 127	Local
	Burial 129	*Scandinavia*
	Burial 130	*East Britain (not local)*
	Burial 140	*East Britain (not local)*
	Burial 144	Local
	Burial 153	*Scandinavia*
3	Burial 147	*Western Britain*
	Burial 158	*East Britain (not local)*
	Burial 111	*East Britain (not local)*
	Burial 136	*East Britain (not local)*

Starch (Walters, Digest 4.6; OLA 7.2.2.2)

As a result of isolating and analysing starch granules extracted from calculus on the teeth of three skeletons, it could be shown that one of them had been eating barley, and another oats or wheat.

Discussion

Adrian Maldonado's recent study of radiocarbon-dated burials in first millennium Scotland shows that long-cist burial, barrow burial and cairn burial have their roots in his Middle Iron Age (200 BC–400 AD) (2011, 39), but there is a surge in the numbers of all three rites from AD 400–650 (his Late Iron Age; ibid, 98, 123, 127). It would be reasonable to add Class I symbol stones to this 'Late Iron Age package', since most of the carved stones in context were retrieved from the sites of cist burials (ibid, 258). Burials with small slabs placed about the head (his 'head-box' burials) herald a new order; they originate in the seventh century and continue into the twelfth century, and are associated primarily with churches (ibid, 103).

The Portmahomack burials conform well to this scheme. As noted in Chapter 4, burials at Balnabruach, dated to the Middle Iron Age, are followed in the Late Iron Age a few hundred metres further north along the ridge overlooking the sea by a likely chain of Period 1 graves that includes at least two groups of cist graves, probably under barrows. Three contemporary cist graves lay under a barrow in Sector 2 (p 85), while on the hilltop beneath the church (Sector 4) one barrow is implied by a rising mound created by a succession of six superimposed cist graves, the earliest of which contained a mature woman (p 77). A second example of intensive burial begins immediately to the

Table 5.2.4
Starch analysis

Sample Number	Period	Size of granule	Shape of granule	Possible identification
Burial 144 [F98]	2	15.09µm (length), 17.46µm (width)	Round/slight oval	Barley
Burial 127 [F128]	2	13.82µm, 11.71µm	Round	Oat or wheat
Burial 127 [F128]	2	13.72µm (length), 11.02µm (width)	Round/slightly oval	Oat or wheat
Burial 127 [F128] (attached to above mentioned granule)	2	10.20µm (length), 9.45µm (width)	Round/slightly oval	Oat or wheat
Burial 149 [F117]	1	11.27µm, 11.83µm	Round/bell-shaped	Undetermined

north of this with Period 1 Burial 170. Eight males and three females were identified among the sixteen burials of Period 1, six of which were radiocarbon dated to AD 550–700 (Period 1). It is proposed in Chapter 4 that a series of ring ditches seen as parchmarks from the air in 1945 were barrows related to a theme of prehistoric burial that stretched from Balnabruach to Chapel Hill (Chapter 4, p 100).

A number of mounds were therefore visible to the Period 2 community, and one if not two were used as a focus for Period 2 burial parties, who were attracted to them. The only two women in the cemetery were buried side by side on, or in, the more northerly of these proposed barrows at the west end of the Sector 4 excavation area. Compared with its Period 1 predecessor, the Period 2 cemetery is tightly packed and well ordered, and overwhelmingly male. It remains possible that there is a women's burial ground elsewhere, as inferred at Inchmarnock (Lowe 2008, 257; cf O'Sullivan J 1994, 359–60). A degree of segregation was implied at Hartlepool where there was a male cemetery group adjacent to St Hilda's church (Groups A & D) which included graves edged with pebbles, and there was also a high-status burial ground with pre-monastic roots at the tip of the peninsula where women's graves were unequivocally marked with their names (Loveluck in Daniels 2007: 205). Nevertheless the space of the Period 2 burial ground is confined (see above, p 109). The location of the two Period 2 women at Portmahomack would conform to a model whereby the monastic cemetery grew from an existing burial ground, in which earlier loyalties were exercised.

Period 2, from 700, excludes cist burials, but sees the first of the burials with small slabs. The majority are head slabs placed beside the head (head support) or beside and over the head (head-box), while others are body slabs, placed in the grave beside the body. It is not excluded that some head-support burials represent examples of disturbed head-boxes with the facial stone missing. Other aspects of the Period 2 cemetery also mark a new sense of order and control: the use of grave markers and the respect accorded to previous interments by those that followed. The shift to graves in rows, and to strict W–E orientation in the eighth to ninth century is another sign of spatial control, also paralleled at the Isle of May and Whithorn (Maldonado 2011, 227). Although there are few burials that can be directly dated after 800, we have argued for seventeen, six with radiocarbon dates, that should have run into the ninth, tenth or eleventh century, if with diminishing intensity.

The head-box burial rite is thus associated with better mortuary management in a more institutional Christian context, and may have originated with the early monastic project (Hadley 2002, 214; Maldonado 2011, 102). One explanation offered for the rite is that the stones are designed to steady the gaze of the head and so give greater emphasis to an expectation of salvation (Thompson 2004, 117–26). The idea that the corpse is making some kind of ingenious exegetical statement is also supported by Maldonado (2011, 202–3). More cultural and referential explanations might be preferred. Since so many attributes of Late Iron Age and Early Medieval ritual practice have their roots in the prehistoric past, real or perceived, it behoves us to at least put the small slab to the same test (James 1992, 102; Carver 2009a; Maldonado 2011: 260). In this respect it is worth noting that the use of small stone slabs in various guises is very widespread in Britain and known in Europe, even if the contexts in which they were employed are diverse. Burials from 100 locations in Wales have shown a variety in grave structure, from single markers to stones with plank lining to the rare stone-lined cists to the 'head-cists' at Capel Maelog, all seen as 'confined to Christian practice' (Longley 2009, 108–11, 126). Practice in Aquitaine also includes coffins with stone supports, cists and stone coffins, the two latter being eighth-century preferences (Colardelle 1996, 294–5). At Castelseprio (Province of Varese, Italy), head-slab and side-slab burials followed the installation of a massive ninth-century founder grave of mortared stone with a sword carved in relief in the stone slab top, and were seen as retrospective references to its stone lining (Carver 1987).

Confining ourselves to Britain, there are numerous variations on this theme of small stone inserts, related to the culturally British parts of the island in the fourth to seventh century, even where the full cist burials are rare. The cemetery of Wasperton in Warwickshire proved particularly useful in this respect in that it was completely excavated, ran from the third to the seventh century and included culturally Roman, culturally British, culturally Saxon, culturally Anglian and seventh-century Anglo-British burials in the same cemetery. Those designated culturally British were orientated W–E and contained stones and sometimes traces of planks (Carver et al 2009). The rite appeared in the fifth-century sub-Roman phase, and continued into the seventh century, many of the examples occurring within one corner of the cemetery enclosure into which no other type of burial penetrated. The burial rite was apparently professed by one group throughout the whole period of 400 years, so making the case not only for a familial or religious group but for the survival of specific long-term loyalties, allowed in this case by the absence of an authority to impose orthodoxy.

The parallels cited at Wasperton were mainly drawn from Wales and the West Country, the homelands (according to stable isotopes) of several of the individuals buried in this way. The late and sub-Roman phases at the cemetery at Cannington, Somerset, offer good examples. Here, 'a significant number (thirty) of the graves had some blocks apparently deliberately placed within the graves, in one case a complete surround, in five by the head and in two under the head'. FT26 (409) had a stone capping and could be considered 'analogous to the cist graves of the Early Christian west and north' (Rahtz et al 2000, 410). 'Stone used in these ways seems to be a late phenomenon, in the late fourth century or later and is proposed as a Christian attribute by Woodward' (ibid, 417; citing Clarke 1979, 355–6). At Lankhills, Winchester, Clarke (1979, 143) pointed to thirty-eight graves where flints or tiles had been deliberately placed, from blocks all the way round (G284) to token placements by head, shoulder and hips (G296) 'almost all of them [thirty-eight] belonging to the period after *c* 370' (ibid, 428). Clarke preferred a ritual explanation, seeing the stone inclusions as a reference to the Tomb of Joseph of Arimathea given to Christ, which was 'hewn out of rock' (Matthew 27:60) (ibid, 428). In their study of Llandough, Holbrook and Thomas demonstrate how rough stone inclusions characterise late Roman and post-Roman cemeteries in the south-west of Britain (Holbrook & Thomas 2005, Table 4, p 19).

The head-box/body-slab rite, like the long cist, can thus be seen as having deeper prehistoric and Roman roots. However, specific early medieval communities could potentially draw on a broad repertoire. At Thornybank, Midlothian, among over 100 burials belonging to the mid-first millennium, there were long cists, pebble-lined infant burials, log coffins, two square-ditched graves and a four-poster. The majority of thirty radiocarbon dates centre on 230–680. In the neighbourhood was a pit alignment, ring groove and Bronze Age rectilinear enclosure (Rees 2002). At the Hirsel, where the stones added to the eleventh- to fifteenth-century graves were distinguished from those in natural deposits, there were quartz pebbles in children's graves, some head sets, slab pillows and covering of legs (Cramp 2014, 100, 134). Head-support burials are also found in cemeteries dated eighth–eleventh century in Yorkshire and Lincolnshire, where their use was found to be unrelated to the sex of the deceased (Buckberry 2007, 122). At Barton-upon-Humber token head-support stones were employed in fifty-four burials, the majority within coffins. The earliest identifiable burials in the cemetary were radio-carbon dated AD 975–1010 (Rodwell 2011, 224–6, 234).

If the head-box rite was favoured by ecclesiastical and monastic communities in the eighth century, the practice also endured, as can be seen in Portmahomack's Period 3 where it continued to command allegiance into the ninth century, perhaps among the survivors of the Viking raid. Raided or not, the early ninth century is likely to have seen the break-up of the monastic estates, and the redistribution of their responsibilities and assets into small 'secular' church properties, in north-east Scotland, as in north-east England (Cramp 1980, 18; Carver 2001, 17–18). These hypothetical new centres may have professed the head-box rite as a statement of connection with the former establishments. At Balblair, Newhall Point, Ross, on the Black Isle, across the Cromarty Firth from Tarbat, there were fifty-eight excavated graves, including twenty-one with head-boxes, dating to the end of the first millennium (Reed 1995, 789; Maldonado 2011, 244). Although admittedly harder to see in casual discovery, finds of head-box and allied burials are rare elsewhere on the peninsula (Chapter 4, p 256). This suggests either that the eighth-century monastery had centralised burial at Portmahomack or that the head-box itself is indeed diagnostic of monasticism. On its own therefore, head-box burial is a helpful guide to early ecclesiastical sites, but tight dating and context will still be required to distinguish the monastic phase from what was to follow it.

Argument for a narrative

Burial would seem to have begun at the west end of the cemetery and lasted longest there. This was the most dense zone of burial, as well as the highest in altitude. It was in the western edge of the area examined that Period 1 cists had resulted in, or been topped by, hypothetical mounds, seemingly continuing to attract burial in Period 2 (p 109; and see Illus 5.2.1). The two female graves were also found here in association with the more northerly cluster.

Period 2 burial may have begun in a pre-existing cemetery of cist graves, using simple interment, but quickly introduced the head-box rite, identified in this context as a specific signal of organised Christianity (cf Maldonado 2011, above). Period 2 graves were added in rows, which show a slight difference in orientation: those in the west and centre are orientated strictly W–E, while those at the east end are aligned ten degrees north of east. The heights of the skulls are slightly lower towards the east, but so is the ground. Longley notes that the orientation of early medieval graves in Wales is predominately ENE, although deciding this 'is not diagnostic' (2009, 126). In the case of Portmahomack, the ENE group at the east end is thought to be responding to a feature in the landscape. The skew east wall of the crypt, which is orientated nine degrees north from true east, offers the possibility that the alignment of the eastern graves is shared with a church building (see Chapter 5.4, p 109).

The narrative proposed is that the new community of the early eighth century began to bury in the pre-existing Period 1 cist cemetery, perhaps focused on known mortuary landmarks that survived as mounds. The alignment of the new burials, W–E, was already practised among some the burials of Period 1 (Burials 169, 170, 179, 180). Grave digging then spread eastwards in rows, within a demarcated area and employing grave markers. According to the isotopic ratios, those commemorated were well fed on a high-protein diet, ie meat, and avoided fish. The community, which is culturally Pictish according to the sculpture, identifies only three persons as local out of eleven measured for oxygen and strontium isotopes, although five others are from 'East Britain'. The reference to a British substrate in the burial practice is a theme that will be reprised in the next chapter about the stone carving. Surprisingly perhaps, two of the community were brought up in Scandinavia, although they were fully integrated into the Christian ritual and their deaths, before 780, are likely to have predated any raid. It would be unwise to assume that there was no traffic in the North Sea before the Vikings crossed it. At a given moment, the eastern rows began to align with their feet a few degrees north of east, implying the influence of a new ritual focus. Given the skew alignment of the east wall of the crypt, a possible candidate for such focus is a church building, which is thus a late arrival in the story of the cemetery. The latest stratified burials (Period 3) are those likely to have been interred after the fire that terminated the monastic phase in the neighbouring workshop. They are not numerous in the ninth century when the workshops revive under new management, and still less numerous in the two centuries after that (Chapter 6). It is not unlikely that the church, assuming there was one, would also have been a target in a raid that broke up some of the largest stone monuments.

The monastery recruited from a wide catchment area, as befits an ideological project, including just one westerner, five from elsewhere in eastern Britain, and two apparently of Scandinavian origin. The gravitational pull of the cist graves and the Late Iron Age cemetery that straggled along the crest of the hill was felt at the beginning and at the end of the century during which an idealistic community developed its monastic complex, introduced a new burial rite, erected stones large and small, built a church and, at the end, abandoned the experiment to begin again elsewhere. The sequence in the cemetery shows how intellectual allegiance can long endure at one level, even while it welcomes innovation at another.

5.3 Early Medieval Memorials

Introduction

Three groups of carved stones were recorded at Portmahomack. The first, and largest, consists of more than 250 pieces of sculpture that can be broadly dated to the sixth to ninth century (early medieval). The second group comprises a few pieces belonging to the eleventh to sixteenth century (medieval) which have been found in the church fabric or buried in the churchyard; and the third consists of gravestones still standing in the churchyard which can be assigned to the seventeenth to twentieth century (post-medieval). This chapter is devoted to the early medieval memorials, while those erected in the medieval and post-medieval periods are referred to in Chapter 7. These groups are not as disparate or irrelevant to each other as one might imagine, since they are all memorials and relate to people who were buried at Portmahomack over a period of 1,500 years. The differences and similarities observed between them thus throw into contrast the structures and motivations of the different communities that revered this place (Carver 2005b).

The early medieval sculpture from Portmahomack forms one of the most important assemblages brought to light in Pictish Scotland and is unique in that the great majority of the known pieces were recovered by archaeological excavation. The assemblage was nevertheless trailed throughout the nineteenth and twentieth century through chance discoveries made by gravediggers and antiquaries, and included the outstanding pieces TR1, the lower part of a cross-slab, and TR10, which carries a Latin inscription. Of more than 300 carved stone fragments recovered during the present campaign, about 230 carry identifiable features. Added to the thirty-four curated pieces known from before 1996, these together total 264. All are listed in the catalogue (Digest 5.1), with their context, dimensions and descriptions. A photograph of each piece will be found in the OLA 7.1.8.1. Table 5.3.1 shows the pieces assigned to their probable parent monuments.

Pictish sculpture has had a long tradition of art-historical study, demonstrating its wide web of contacts, its intellectual sophistication, and its exceptional contribution to insular and European creativity (eg Foster 1998; Henderson & Henderson 2004). The art of the new Tarbat collection has already attracted attention and resulted in valuable observations and insights (Henderson & Henderson 2004, passim; Meyer 2005; 2011).

The present opportunity is exceptional: the occasions when an assemblage of sculpture may be addressed primarily by designed archaeological research are extremely rare. Thus while the form, ornament and iconography of the assemblage forms part of this study, they are not the whole of it, and indeed the iconographic detail of the assemblage remains among its more elusive aspects. The approach taken here is to treat the 264 fragments as artefacts and interrogate them for their social, political and ideological meaning using archaeological procedures: namely, the recovery of the objects, their raw materials (p 137), their classification by shape and ornament (p 148), their association through shared features and refitting (p 159), the likely form of the monuments and their original position and purpose in the community (p 165). These studies have led us to propose a sculptural repertoire at Portmahomack that includes a number of simple grave markers and a stone sarcophagus or grave cover originally displayed in the cemetery on the hill (where the church now stands), four major crosses situated at its boundaries, and embellishments that should relate to the fittings of a stone church, including parts of a probable shrine or *cancellum* and an architectural corbel. The monumental centre assembled at Portmahomack is put into its regional context by the other great standing cross-slabs, for which the Tarbat peninsula is renowned, at Nigg, Shandwick and Hilton of Cadboll (Chapter 5.10). Later in this book, a historical and intellectual context is proposed for this brief outburst of artistic brilliance at the north end of Christian Europe in the eighth century (Chapter 8).

Recovery

The earliest of the antiquarian visitors, Charles Cordiner in 1776, paid a visit to the monuments at Shandwick and Hilton, and was then escorted by 'Mr M'Leod of Geanies' to the Tarbat churchyard where he saw several fragments of 'obelisks', no less inferior but 'shattered to pieces' (Cordiner 1780, 66, 75; Illus 5.3.1). The pieces (belonging probably to TR2) were still there in 1845 when George Denoon, a Tarbat schoolmaster, reported that 'fragments of what is said to have been a Danish cross' were still to be seen scattered among the grass in the churchyard (Illus 5.3.2). At that time 'a low, green mound adjoining the east gable of the church was pointed out as the site on which it [the Danish Cross] stood' (NSA XIV, 461). It was a mound with an evil reputation: 'There was a tradition that [victims of] the plague had been buried there', wrote Hugh Miller, after visiting in the 1880s, 'and so rooted was the aversion to disturbing it, that it was not until the late parish minister took a spade in hand and actually threw off his coat to dig *in propria persona* that the gravedigger could be induced to break into ground accursed by the presence of the plague' (Miller Jr 1889, 442; NMR no NH98SW0014).

Although not necessarily seen by Cordiner, and not mentioned by the Rev D Campbell (the minister who wrote the *New Statistical Account* for Tarbat), a quite separate piece of sculpture was already in the churchyard in the early nineteenth century, since it had been removed from there to Invergordon Castle by the time Stuart drew it, before 1856 (Stuart 1856, plate xxx). It had been situated further to the east of the green mound and consisted of the wreckage of another great cross-slab, fallen and broken into two. The Ordnance Survey (1907) marked it east of the church and east of the 'Danish Cross' at NH 9151 8402. The larger piece of this cross-slab is said to have been thrown into a grave and covered up (OS *Object Name Book* 1872), and thus should still lie buried near the Dingwall Memorial. It was the stump of the base, with a snapped-off tenon, that remained on the surface in the churchyard. Its ornamented face has an indeterminate figurative scene with a vine-scroll border, and along one side of the slab are four Pictish symbols carved in relief (TR1; Illus 5.3.3). The rear side has been defaced and smoothed, which might imply preparation for its reuse as a recumbent grave cover, as had been done with Hilton of Cadboll (see p 253). Two other smaller pieces were also retrieved from the grass at about this time: one was a stone boss in the form of a circle nearly a foot (300mm) across, shaped like a wreath and

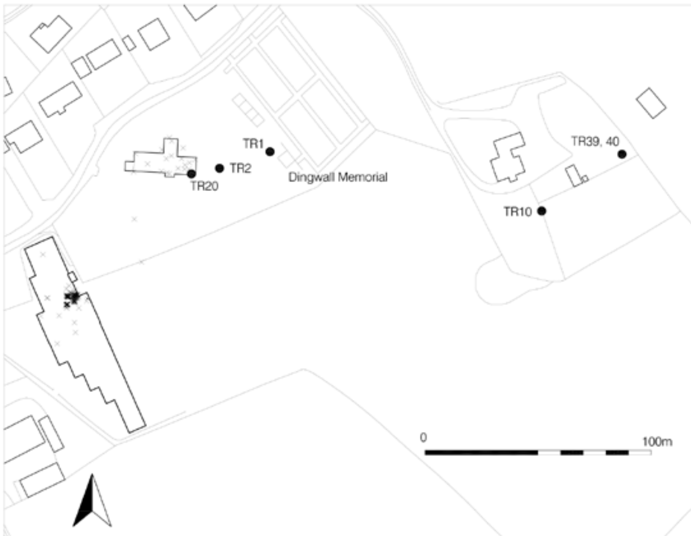


Illustration 5.3.1
Findspots of early sculpture inside and outside St Colman's Church

containing seven small bosses (TR5; Illus 5.3.4). Another was a triangular fragment of sandstone ornamented with a geometric fretwork in sharp relief (TR8; Illus 5.3.5). Mr Macleod, the occupant of Invergordon Castle, displayed the Hilton slab and Portmahomack's TR1 side by side in his garden. The smaller pieces were arranged in a room in the tower or stacked near the door with geological specimens.

New discoveries followed in the later nineteenth century. Sometime in the 1880s a Mr William Mackay retrieved a carved boss from 6–7ft down in the burial place of Ross of North Balkeith (TR6; Illus 5.3.4). The same gravedigger dug up and retained a fragment of sculpture 'about four yards from the east gable of the church in the burial place of Roderick Bain of North Tarrel' (this is the exquisite TR7; Illus 5.3.4). Miller noted that it was freshly 'broken off by wanton violence' and suggests that it had long lain buried. Allen and Anderson (1903, II, 92, no. 7) say it was found 'four yards from the west gable' (ie in the Macleod enclosure) but Roderick Bain's grave is four yards south of the east gable, so Miller was right. When Hugh Miller Jr visited in the 1880s, both these pieces were on the windowsill at the west end of St Colman's Church, and he arranged for them to be donated to the National Museum of Antiquities of Scotland in Edinburgh (Miller Jr 1889, 435).

A most significant addition to the early chance finds was soon afterwards noticed in the coursing of the garden wall of the Portmahomack manse, a quarter of a mile from St Colman's Church, where it was spotted by the Rev Dr J M Joass of Golspie, curator of the Duke of Sutherland's museum at Dunrobin (TR10; Illus 5.3.6). It carried a Latin inscription in insular majuscules, resembling those used in the gospel books of Northumbria (the Lindisfarne Gospels) or Iona (the Book of Kells), but executed in relief (Higgitt 1982). This is one of only a handful of possible Latin inscriptions so far found on Pictish monuments. Those at Fordoun, Dupplin and St Vigeans are thought to commemorate kings or clerics (Henderson & Henderson 2004, 170, 190). TR10 will be shown to belong to a large cross-slab (Cross C) with an apostolic theme celebrating an unidentified, but probably saintly person (p 157).

The discovery of TR10 had already been made when, at the turn of the century, J Romilly Allen and Joseph Anderson visited the Tarbat peninsula. They saw the re-erected Nigg stone outside the vestry of its church overlooking a steep slope and dripped on by the rain; Shandwick stood in a field overlooking the firth and Hilton was at Invergordon Castle. In their survey (published 1903), Allen and Anderson numbered ten fragments or sets of fragments as originating from 'Tarbat' – meaning Tarbat Old Church at Portmahomack (ECMS III, 88–95). Seven of these were at Invergordon Castle, two already in the National Museum and one still in St Colman's Church. A visit of the Inverness Scientific Society in 1903 confirmed a similar tally and recorded the opinion that the churchyard at Portmahomack 'contained at one time three sculptured stones of the Columban period', an opinion repeated in the *Third Statistical Account* of 1957: 'The churchyard has also yielded fragments of three Celtic crosses of the finest type, made of the warm yellow sandstone from the tall coast cliffs near Rockfield, and from other places and caves round the coast'. The three crosses were presumably implied by the largest pieces, that is TR1, TR2 and TR10.

Only a few carved stone fragments came to light during the ninety years following 1903, and the recording of their provenance was poor. One fragment (TR11) described as a 'small boss richly fretted like a knot of young adders interlaced' had been seen by Miller (1889) at Invergordon, but did not materialise in the National Museum, and must be assumed lost (unless this is a fanciful description of TR6). A new find was reported from St Colman's by D J Ross, merchant, of Portmahomack and given to the NMS in 1927 (TR12; Illus 5.3.7). Another was found while digging a grave at a depth of six feet: the greater part of the slab it belongs to remains in the grave, under the coffin, but no lover of art or archaeology was on hand to say where this grave might be (TR13; PSAS 73 (1939), 333; this stone was passed to the National Museum in 1939; Illus 5.3.7). Another was seen in the churchyard briefly by James Ritchie in 1914 before it was destroyed (Ritchie 1915; TR15; Illus 5.3.8). A piece bearing a tight form of interlace was noted in the relieving arch of the west tower by the Royal Commission of Ancient and Historical Monuments investigator recording the church in 1956 (TR14; Illus 5.3.8).

In the course of the twentieth century, the Invergordon collection of sculptural trophies was gradually transferred through the good offices of the Macleod family to the National Museum in Edinburgh: the Hilton slab and TR1 together in 1921 by Captain R W Macleod (PSAS 56 (1922), 63) and nine further fragments by Lt Col R B Macleod of Cadboll in 1956 (PSAS 87 (1956), 239; TR2, 2a–c, 4, 5, 8, 9,10). In 1991, the Tarbat Historic Trust began its campaign to restore the church of St Colman, and cleared the crypt under the supervision of archaeologist Jill Harden, during which exercise two more pieces of sculpture came to light (TR17, 18; Illus 5.3.8). During the attention raised by the 1994 campaign David Henry spotted a cross in the churchyard wall (TR19), and a stone post in use as a recent grave marker (TR27), both of which were removed and placed in the care of the Tarbat Historic Trust (Illus 5.3.9; 5.3.10).

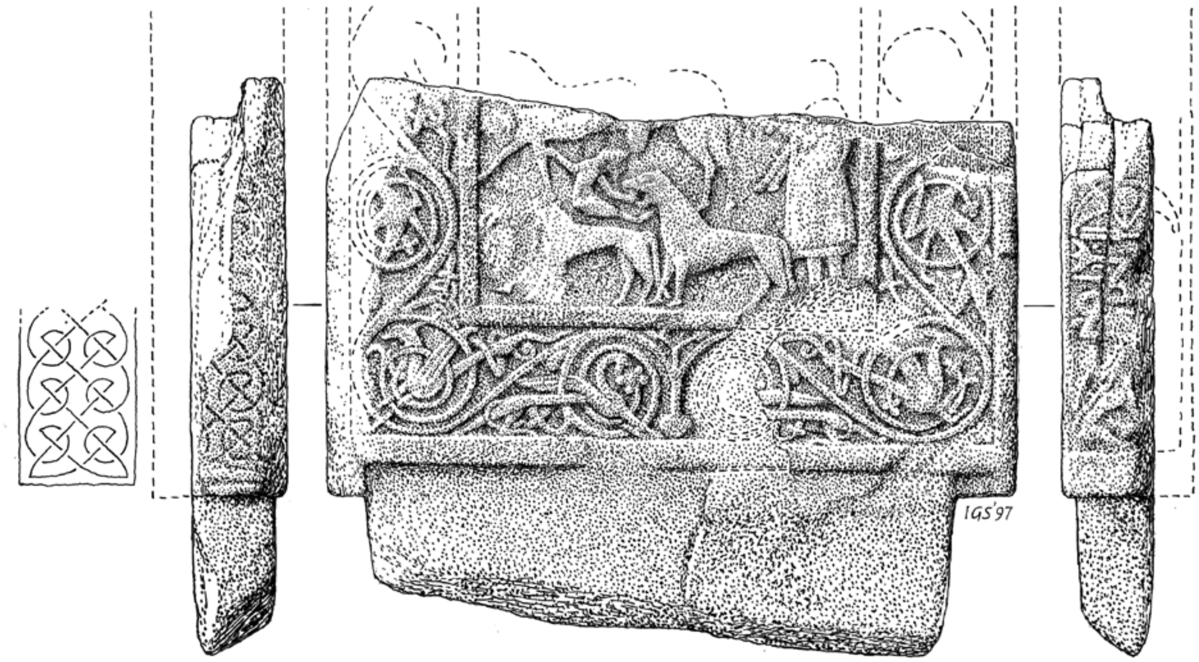


Illustration 5.3.2
Cross-slab base TR1 (650×1100×150mm), showing the ornament on the sides. The back is shaved of ornament

Illustration 5.3.3
Cross-slab panel TR2; the largest piece (2b) is 490×470×50mm

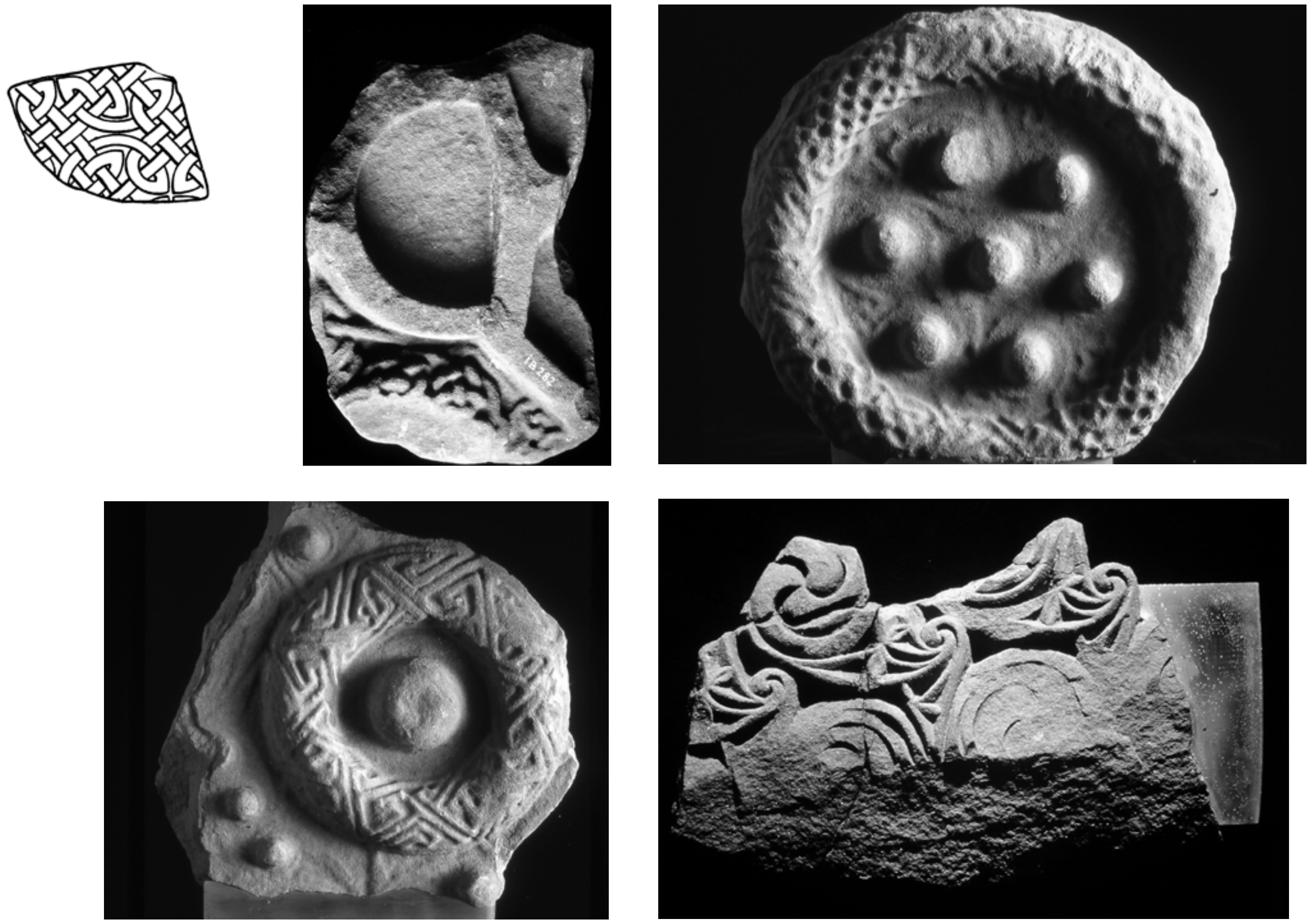


Illustration 5.3.4
From top left: Interlace fragment TR3 (150 x 90 x 50mm) (ECMS II, 90); cross armpit TR4 (270×190×35mm); boss TR5 (310 in diameter, 55mm thick), boss TR6 (340×300×40mm); fragment TR7 (240×175×15mm)

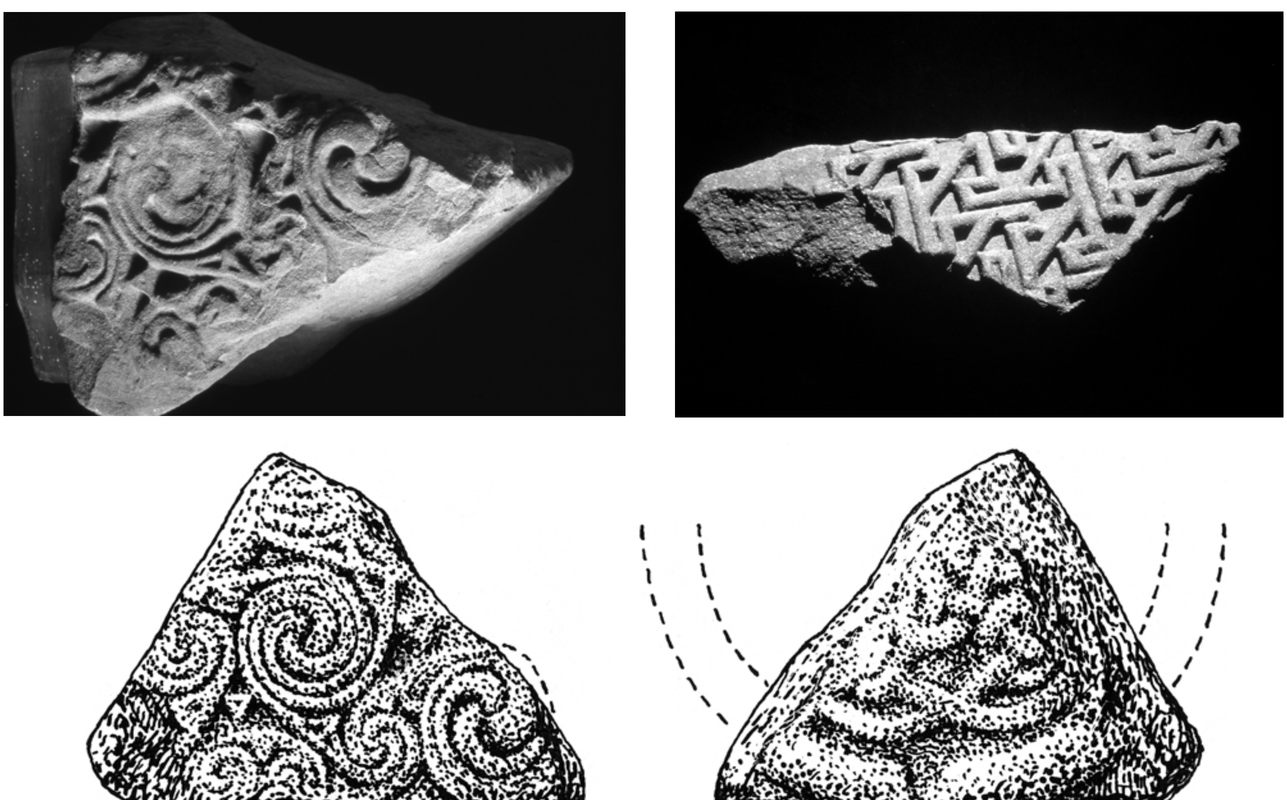


Illustration 5.3.5
Top right key pattern panel TR8 (250x160x60mm); remainder a central panel TR9 (220x180x190mm)

Illustration 5.3.6
Inscribed edge piece TR10 (470×310×170mm). The inscription is carried on the side of the monument and the triangular panel is on the orthogonal front face where it forms part of the cross (see TR20). For inscription see text, p 157

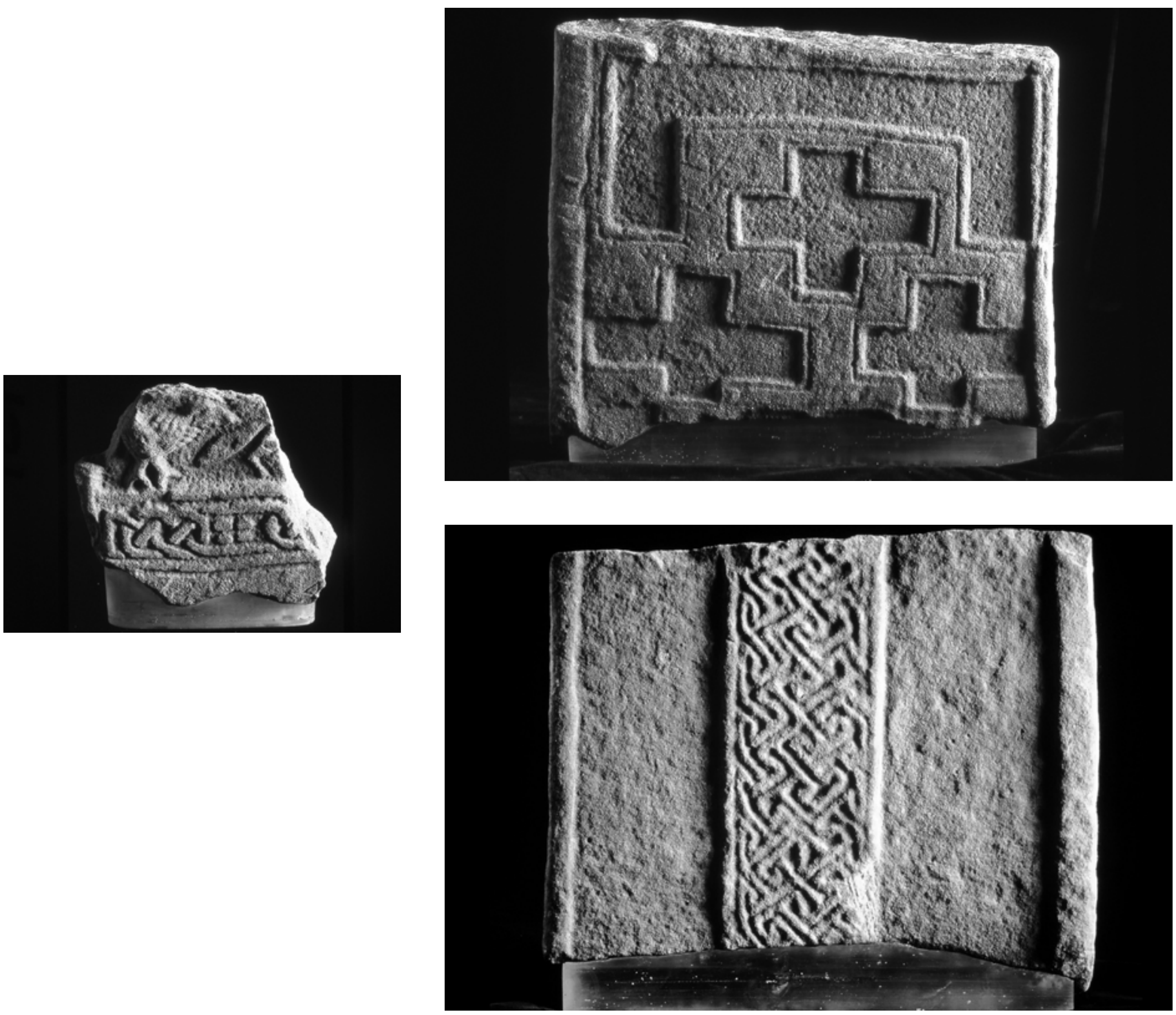


Illustration 5.3.7
TR12, with cockerel and fox (170×190×40mm); TR13, fragment of *cancellum* or shrine (430×350×80mm)

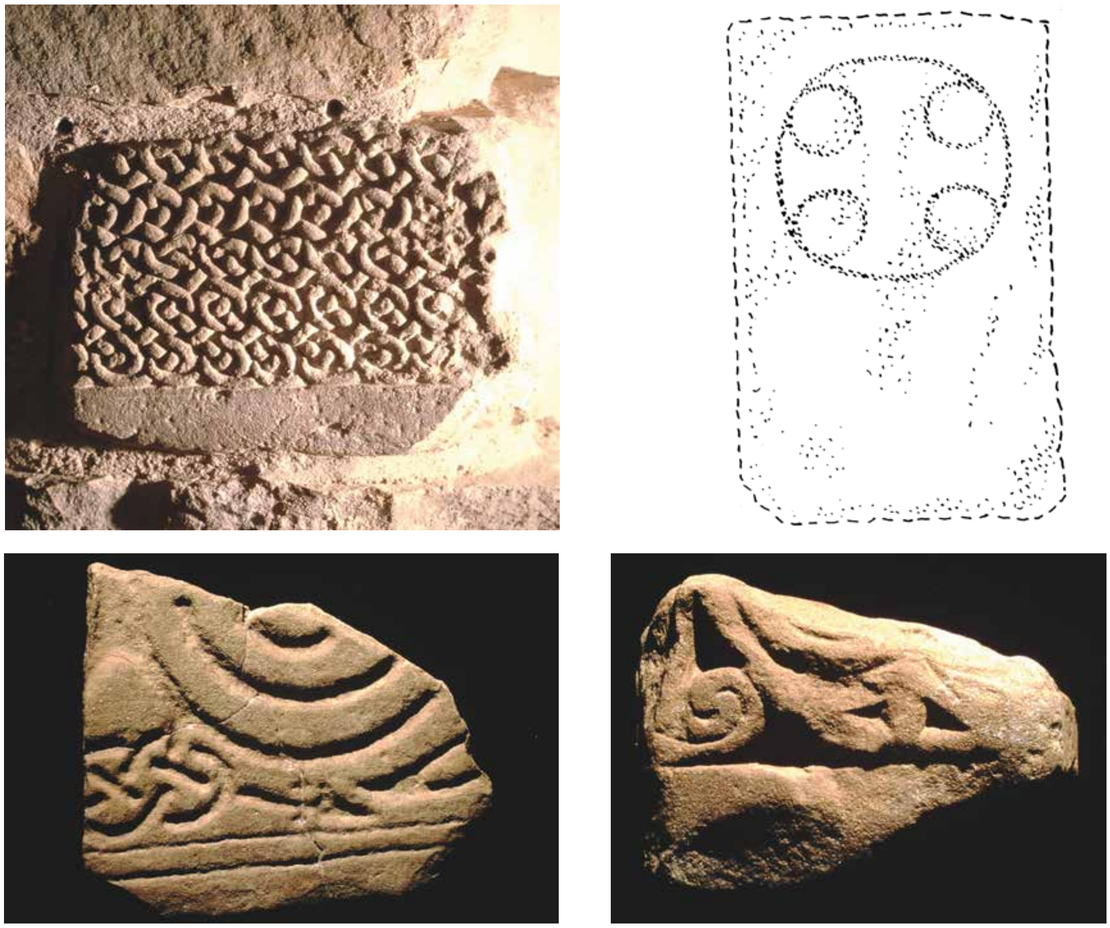
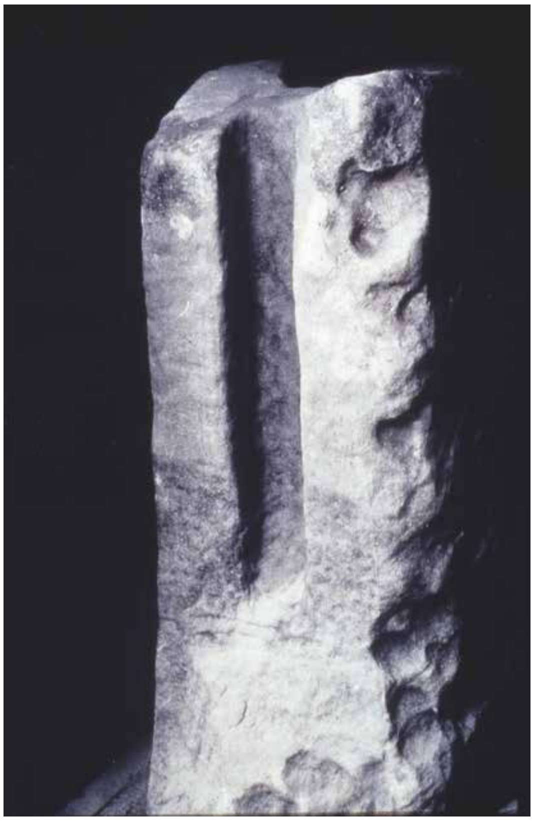


Illustration 5.3.8
TR14 interlace panel remains in situ in the west end of St Colman's Church (210 × 160mm); grave marker TR15 (*c* 1000 × 600 × 175mm) now lost; from the crypt clearance, 1991 – TR17, fragment of shrine panel (215 × 190 × 25mm); decorated fragment TR18 (82 × 111 × 72mm)

Illustration 5.3.9
Grave marker TR19, and its location in the churchyard wall (340 × 126 × 80mm)



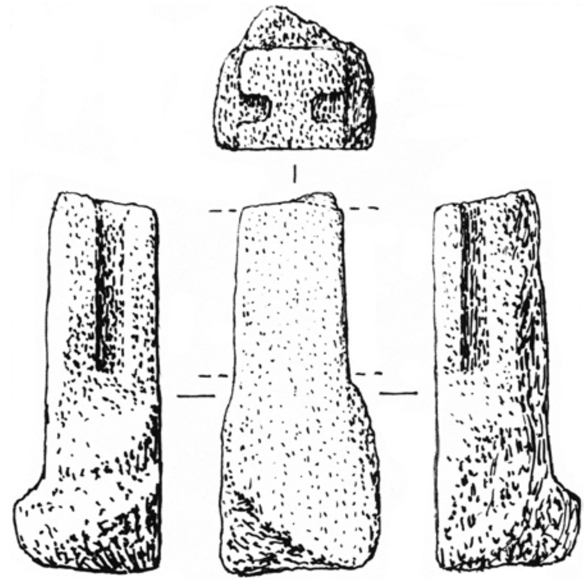


Illustration 5.3.10
Grooved stone post TR27 (560×150×140mm). The grooves are 40 to 50mm wide and 40mm deep. (Below) Stone shrine corner posts from St Ninian's Isle, Shetland (Small et al 1973, plate VII). The grooves are about 2.5ins (60mm) wide
© University of Aberdeen

Illustration 5.3.11
Discovery of the 'Apostle Stone' (TR20) incorporated into the medieval crypt vault

After formal investigations began in the church in 1996, several early medieval carved stones were seen in the fabric or were exposed during excavation or clearance (Illus 5.3.12). TR 20 'The Apostle Stone' was located in the south wall of the vault of the crypt, extracted in 1997, and replaced by a time capsule deposited by local schoolchildren (Illus 5.3.11, 5.3.13). Grave marker TR21 and the 'Boar Stone' (sarcophagus lid TR22) were found in the foundations of the north wall of the medieval church (Illus 5.3.14, 15, 16). Grave markers TR30, 31 and 33 were found in the foundations of the south wall of the medieval church and TR29 in the west wall of the crypt (Illus 5.3.17). A fragment (TR32) was recovered from rubble infill beneath the supporting arch of the belfry (Illus 5.3.17). Grave marker TR34 was found beneath the stair to the Laird's Loft during the restoration. Two further pieces belonging to the Portmahomack assemblage were recovered by Richard Blosse while building a wall at Seafield from stones recycled from a barn demolished at Portmahomack manse (TR39, 40; Illus 5.3.1; Illus 5.3.18).

The remaining 230 pieces were all recovered during formal archaeological excavations in the Glebe Field on the south-west side of the churchyard (Sector 2). A small residual piece had reached medieval layers (TR23) and was recovered first. The 'Calf Stone' (TR28, 35) was the first large piece to be found: it had been reused to line a culvert serving the post-monastic community in Period 3 (Illus 5.3.19). The remainder, that is the vast majority, were stratified in layers placed by multiple dates at the end of Period 2 and the beginning of Period 3 (Illus 5.3.20). These layers are modelled by radiocarbon dating to have been deposited after 780 and before 810 (Chapter 3, p 259). The sculpture, freshly carved, should lie within the eighth century, although stylistic parallels offer some support for an early ninth-century date for the latest products at Portmahomack.

The Glebe Field pieces were generally very fresh, but had been broken up with a heavy tool into pieces that were mainly fist sized. They were dumped over the burnt-out workshops, in the eastern ditches of the road S13 and into the pool (Illus 5.3.21). The disused Period 1 wicker-lined well (F527), dug into running sand, subsided during the following centuries, ingesting material from the later pool, notably a large fragment of sculpture (p 141; TR227/260).

The overall distribution of the assemblage shows that the monuments were focused on the hill that now carries St Colman's Church, even if some had been subsequently dispersed. It can be reliably surmised that an assemblage several times greater than that already recovered still lies beneath the ground in the churchyard, and in the Glebe Field south of it, areas now under

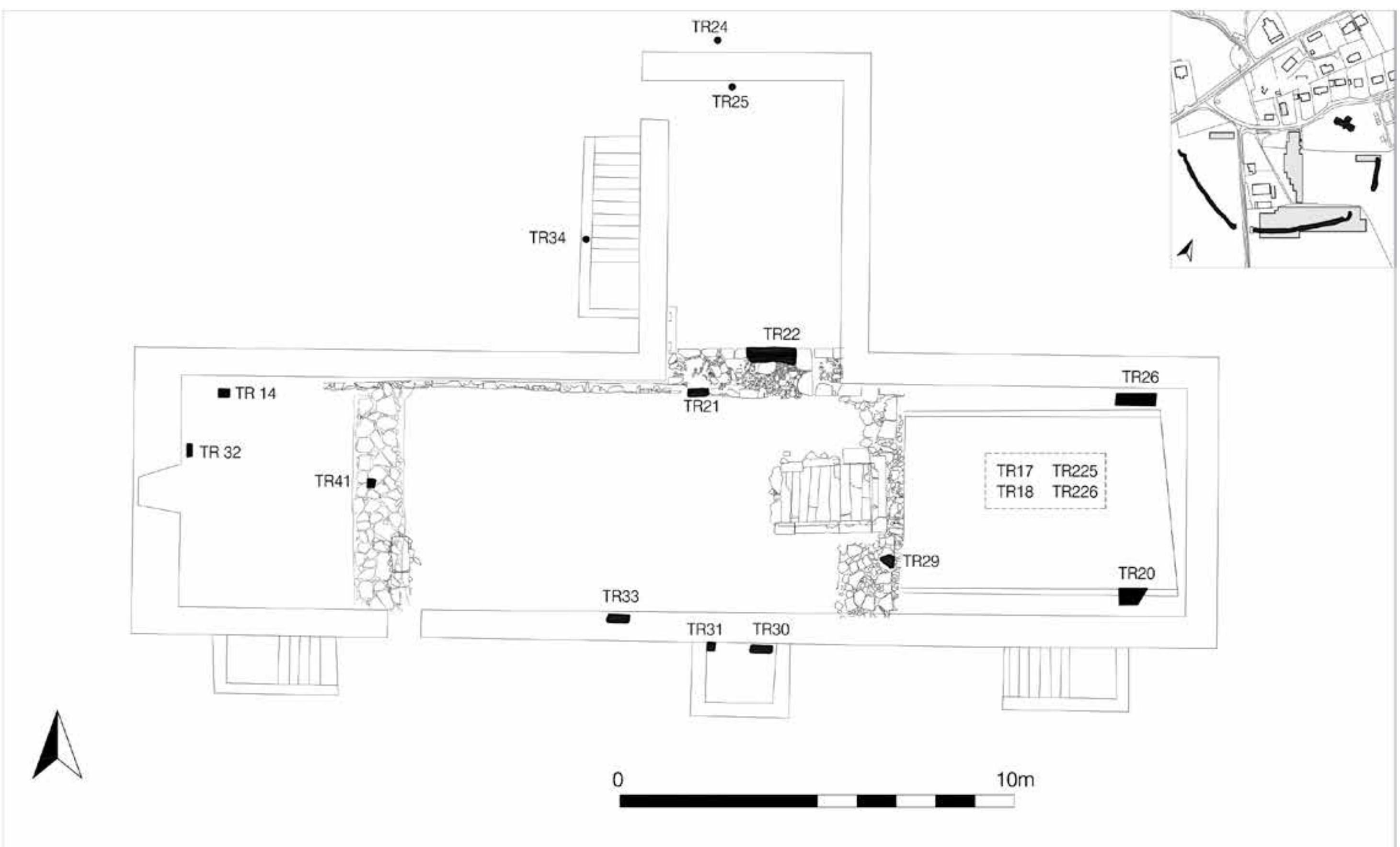


Illustration 5.3.12
Findspots of sculpture inside the church

Illustration 5.3.13
The 'Apostle Stone' or 'Dragon Stone', a large cross-slab piece TR20, found in the crypt vault (710 × 410 × 178mm)

Illustration 5.3.14
Pictish sculpture reused in the foundations of the twelfth-century church (Church 2). Grave marker TR21; Sarcophagus lid TR22

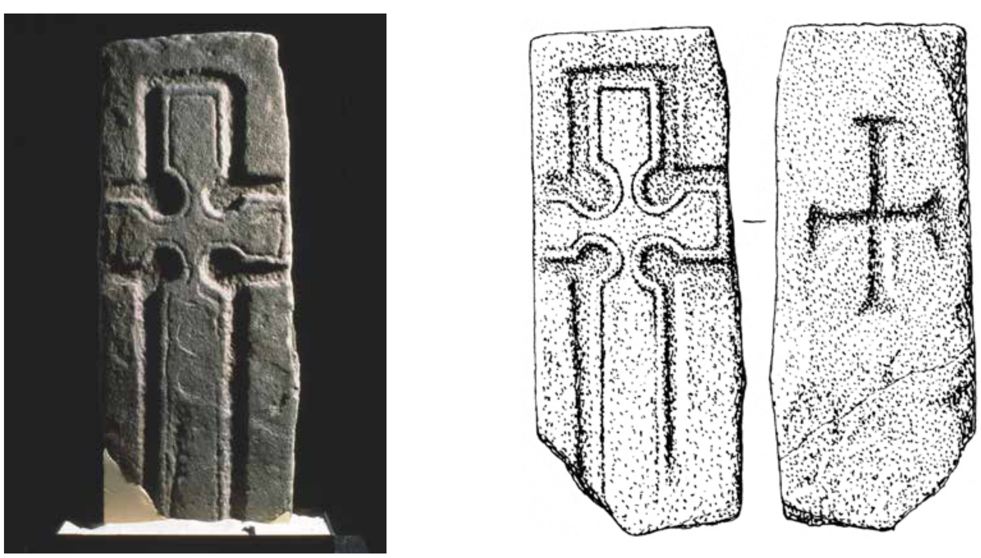


Illustration 5.3.15
Grave marker TR21 (510 × 510 × 45mm)

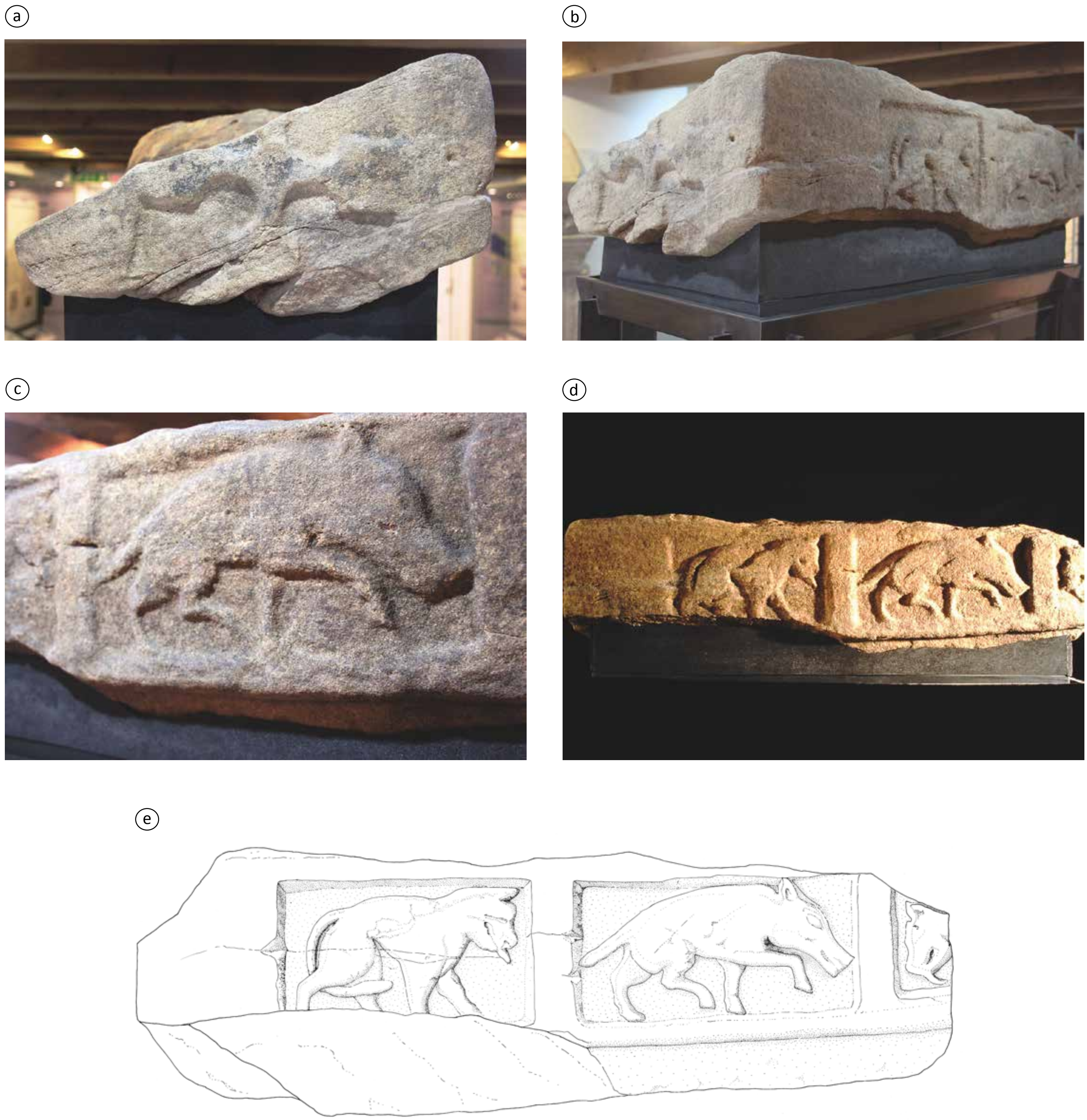


Illustration 5.3.16
Sarcophagus lid TR22 (1065 × 460 × 230). (a) Cross at short end; (b) three-quarter view; (c) detail of boar panel; (d) side view; (e) drawing

Illustration 5.3.17
Sculpture from the medieval fabric of St Colman's Church.
(left) TR29 in situ (325 × 325 × 72mm); (right) TR32 (140 × 90 × 60mm)

Illustration 5.3.18
Block retrieved from the manse steading beyond the churchyard by Richard Blosse; both faces (TR40; 370 × 270 × 190mm). Fragment of boss, also found by Richard Blosse (TR39)

Illustration 5.3.19
Discovery of the 'Calf Stone' (TR28) in the Glebe Field (Sector 2)

Illustration 5.3.20
Carved stone fragments exposed over the primary burning layer in the Glebe Field (Sector 2)

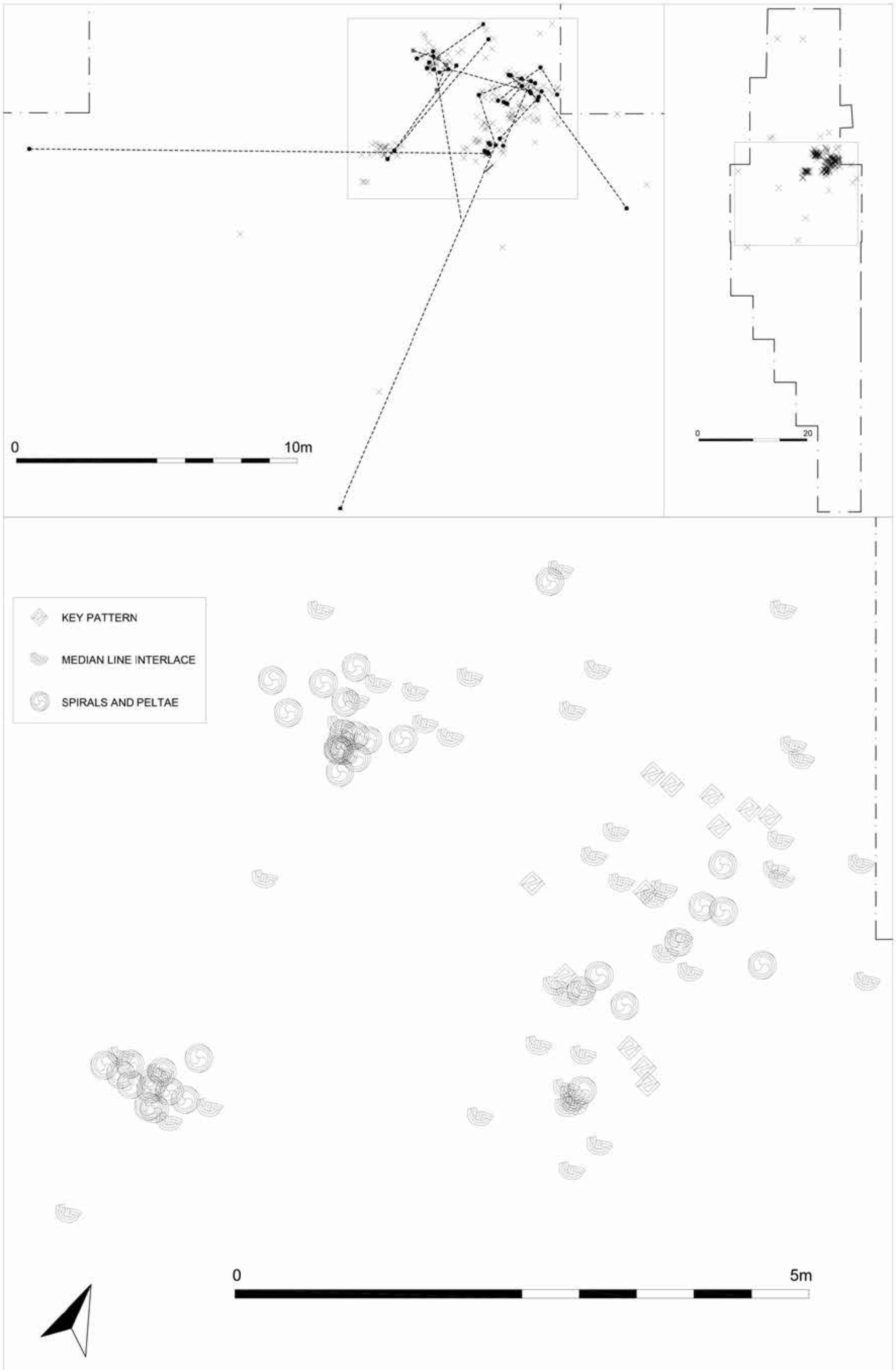


Illustration 5.3.21
Distribution of ornamental fragments in Sector 2, Int 14–24, showing cross-joins

Illustration 5.3.22
Refitting fragments in the Scottish National Portrait Gallery, Queen Street, Edinburgh

Illustration 5.3.23
Mason/sculptor Barry Grove (left) making the first of the Tarbat replicas (TR1) observed by Raymond Lamb

state protection (Chapter 2, p 18). The stratified group still retained some of its associations, in that pieces with similar ornament or borders appeared to have been deposited close to each other. This was endorsed in many cases by the fact that fragments could be conjoined. Precise recording of each piece in the ground, followed by refitting (Illus 5.3.22), offered an opportunity to study a very varied set of artefacts in an unusually direct manner.

Raw materials

Drawing on research by Barry Grove and Nigel Ruckley

The stone used for sculpture and building was examined with a view to matching the pieces and determining their provenance. The geology of the region and the likely quarries used were reviewed by Nigel Ruckley (Digest 6.9; OLA 7.5.1). Our conclusions profited from the experienced opinion of Barry Grove, the sculptor and mason we recruited to make replicas of TR1 and, later, the Hilton of Cadboll cross-slab (Illus 5.3.23).

The nineteenth-century local scholar Hugh Miller had already undertaken a geological examination of the pieces of sculpture he encountered, and it is instructive to recall his views. In 1889 he observed that TR6 and 8 were cut from 'pale olive-green sandstone speckled with mica – a stone similar to certain tough flags associated with the shale and fish-beds of the [Middle] Old Red Sandstone on the southern side of the peninsula, chiefly near Geanies' (Illus 5.3.24). Petrologically, he found TR6 'to be identical with both of the two fragments figured by Stuart' (ie TR1 and TR 2). He felt that the fragments he saw were worn and may have derived from a cross that had met the same fate as the Ruthwell cross, which was broken up in compliance with the ecclesiastical edict of 1642 and had lain in Ruthwell churchyard for a century. TR7 was cut from 'the warm yellow sandstone of the tall coastal cliffs near Rockfield village, and of the secluded cliff-bound site, marked "Hermitage" on the OS map, known among older people as the temple or Teampull'. Shandwick, Hilton and TR6 and 8 are of greenish stone. Miller found another stone in the base or pedestal of the Shandwick stone which had anthropomorphic ornament and was of 'warm reddish stone different from all the others' (1889, 441).

The petrological verdict one hundred years later was that TR10 (the inscription) and TR20 (the Apostle Stone) could have come from the same geological formation. The two stone bosses, TR6 and TR5 were seen to have affinities with TR2. The small fragment that carried deep-cut peltaic ornament (TR7) was not thought to have a geological match to TR20. A group of stones, defined by the presence of iron blebs or of Liesegang rings, include the finest of the Tarbat sculptures (TR1, TR10 and TR20), as well as the other monumental stones sited elsewhere on the Tarbat peninsula: Nigg, Shandwick and Hilton of Cadboll (this also applies to the chippings recovered at the Hilton chapel in 1998).

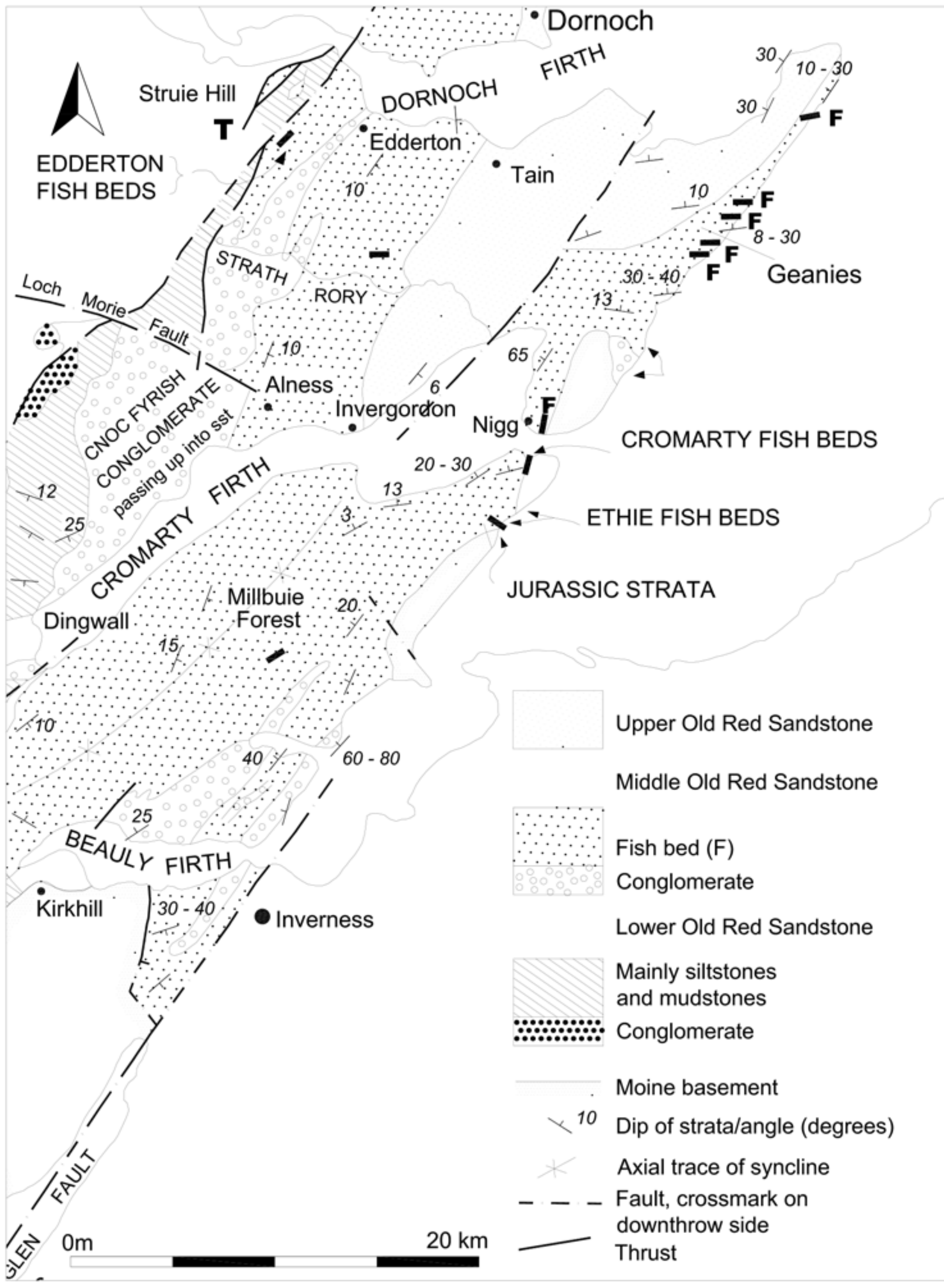


Illustration 5.3.24
Geological map of the Tarbat area, showing outcrops of Old Red Sandstone (ORS) and Middle Old Red Sandstone (MORS)

No rock exposures examined by Ruckley on the Tarbat peninsula showed the presence either of the iron blebs or the Liesegang rings, so the source for the major Tarbat monuments was thought to lie beyond the peninsula. However, the sculptor Barry Grove has affirmed that stone of this kind is present on the east side of the peninsula among the Middle Old Red Sandstone (MORS), particularly near Geanies, so endorsing Hugh Miller's verdict of a century ago. Neither the interlace panel TR2 nor the spiral piece TR7 match geologically with TR10 or 20 and thus are unlikely to have formed part of the same monument.

The panel TR2 has affinities with the bosses TR5 and 6, and these with Triassic deposits on the south side of the Moray Firth, so may have come from outside the peninsula. The grave marker TR21 is also probably imported. It is composed of clast-free colour-laminated fine-grained sandstone (see OLA 7.5 for technical description). Although the quarry at Shandwick has reddish laminated sandstones with mica-rich bedding planes, TR21 bore no resemblance to the range of stone in the quarry and does not seem to come from the Tarbat peninsula.

These results suggest that the Tarbat assemblage can be classified into at least four different stone fabrics. The largest and most important cross-slabs, including TR1, TR10/20 and those at Nigg, Shandwick and Hilton of Cadboll, are made of a fine sandstone likely to come from the MORS outcrops on the east coast of the peninsula, or, if not, a fine freestone from elsewhere. The two bosses TR5 and 6 and the panel TR2 come from another source, perhaps lying outside the peninsula (although Miller would include TR1 in this group). The small and portable grave marker TR21 seems to be exotic, and could have been pre-carved elsewhere. The Calf Stone TR28/35 is the only ornamental piece certainly carved from the coarse Upper Old Red Sandstone seen on the beach at Portmahomack itself.

There is little information about how the larger stone blocks were quarried and extracted, given that they would be up to a metre wide, 20cm thick and nearly 3m long (2700 × 990 × 210mm in the case of Shandwick). It may be supposed that the extraction and transport of stones to carve

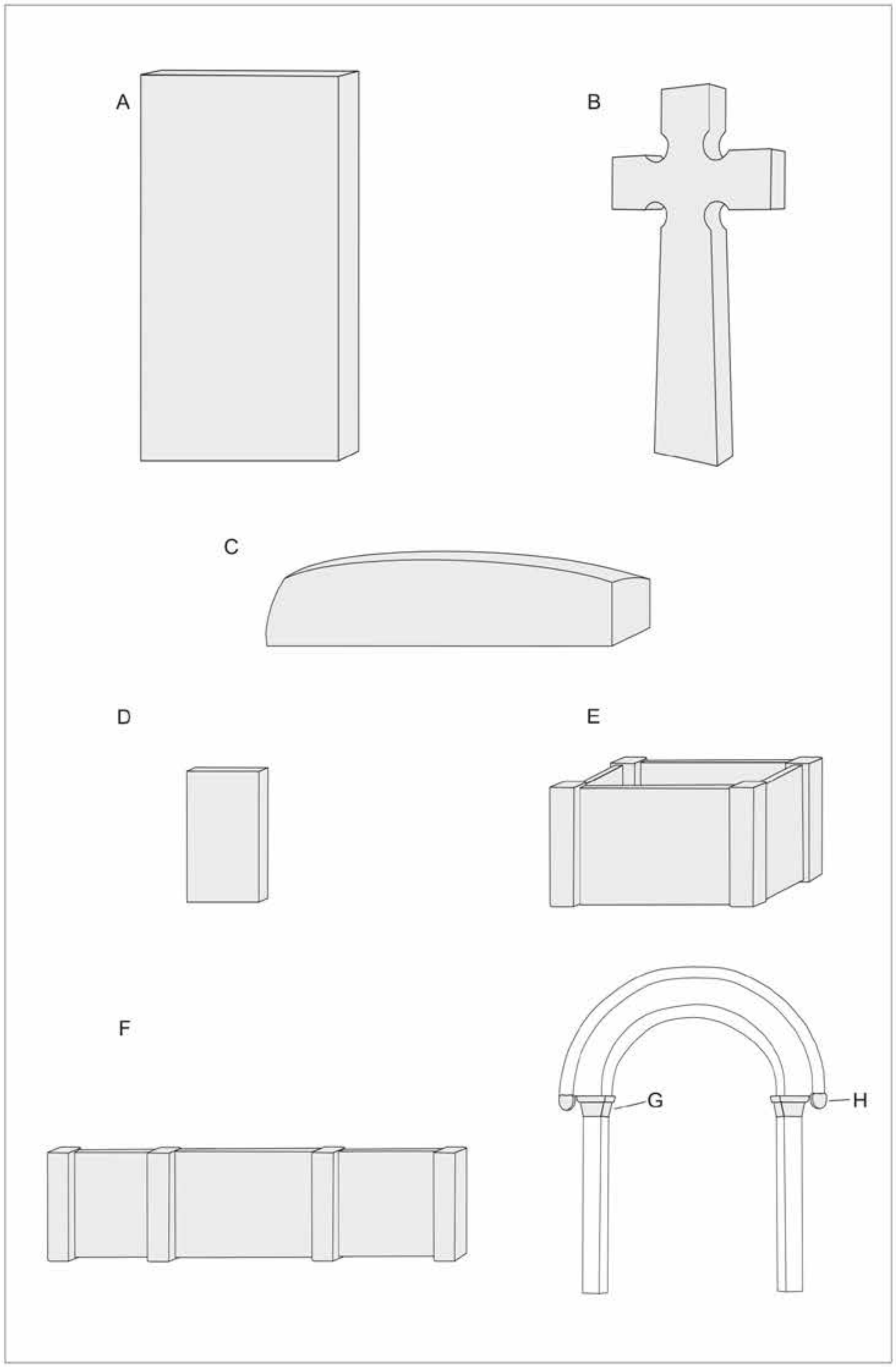


Illustration 5.3.25
Repertory of the principal forms at Portmahomack: (a) monumental cross-slab; (b) monumental cross-shaft; (c) sarcophagus; (d) grave markers; (e) panelled shrine; (f) *cancellum*; (g) corbel or impost; (h) label-stop

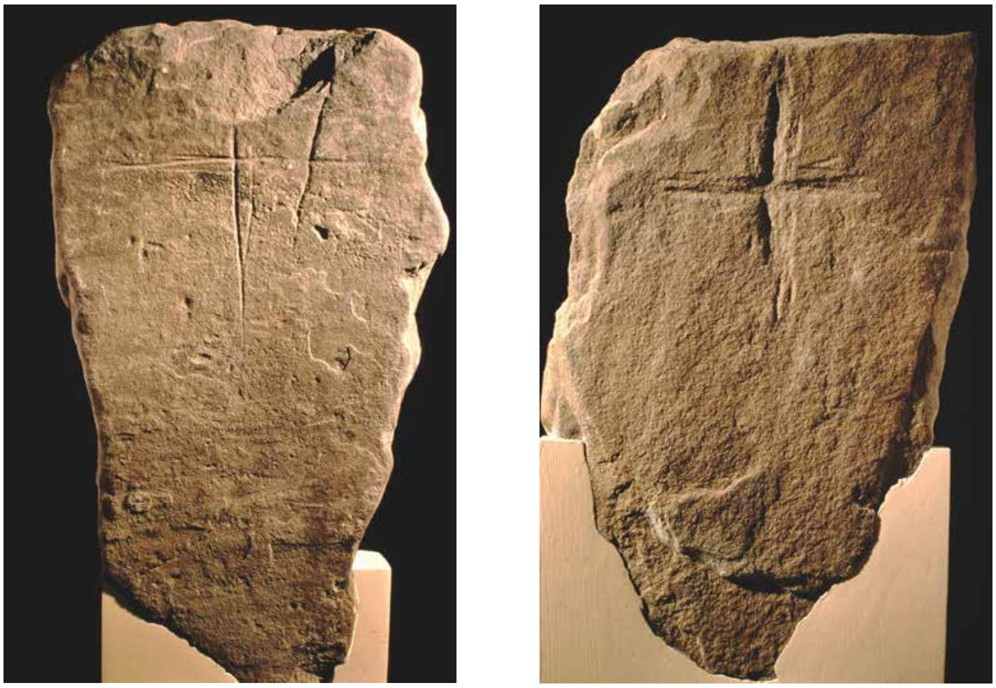


Illustration 5.3.26
Simple grave markers scratched with a cross: (left) TR24 (470 × 245 × 130mm); (right) TR25 (231 × 195 × 47mm)

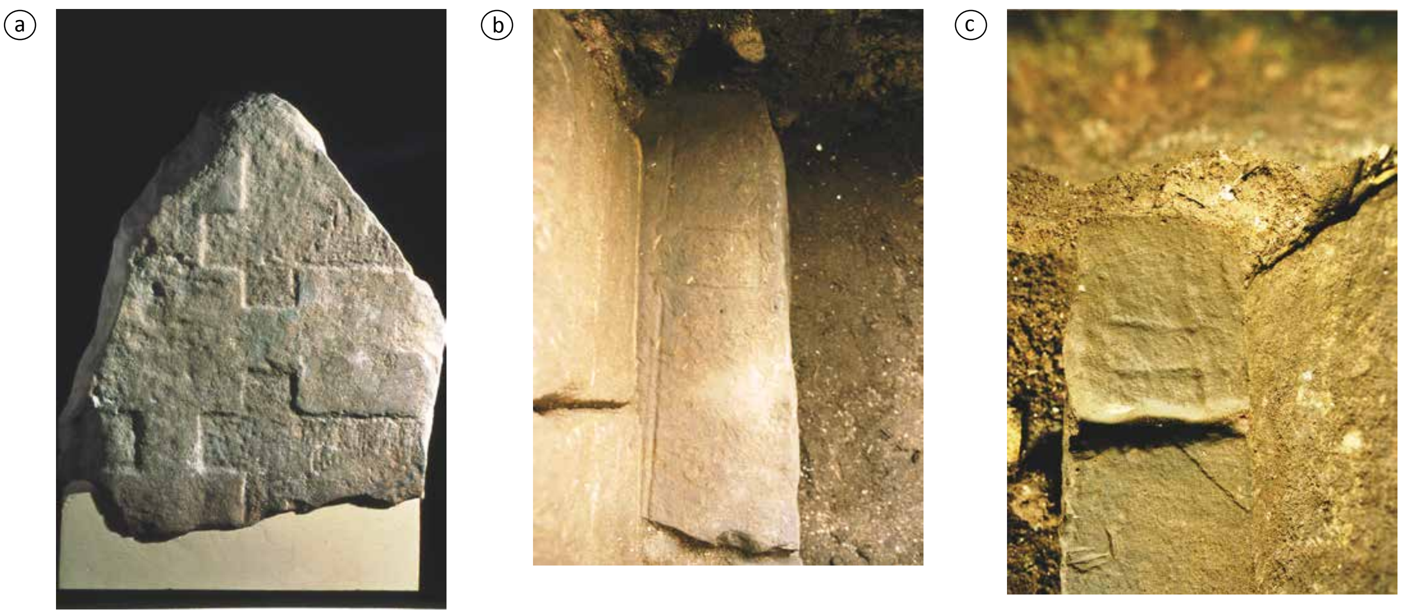


Illustration 5.3.27
Grave markers: (a) TR29 (325 × 325 × 72mm); (b) TR30 (in situ: 560 × 620mm); (c) TR31 (in situ: 190 × 180 × 70mm); (d) TR33 (524 × 212 × 56mm); (e) TR34 (350 × 350 × 75mm)

Illustration 5.3.28
Fragment with face of holy man, TR201 (124 × 45 × 28mm).
Probably part of TR20

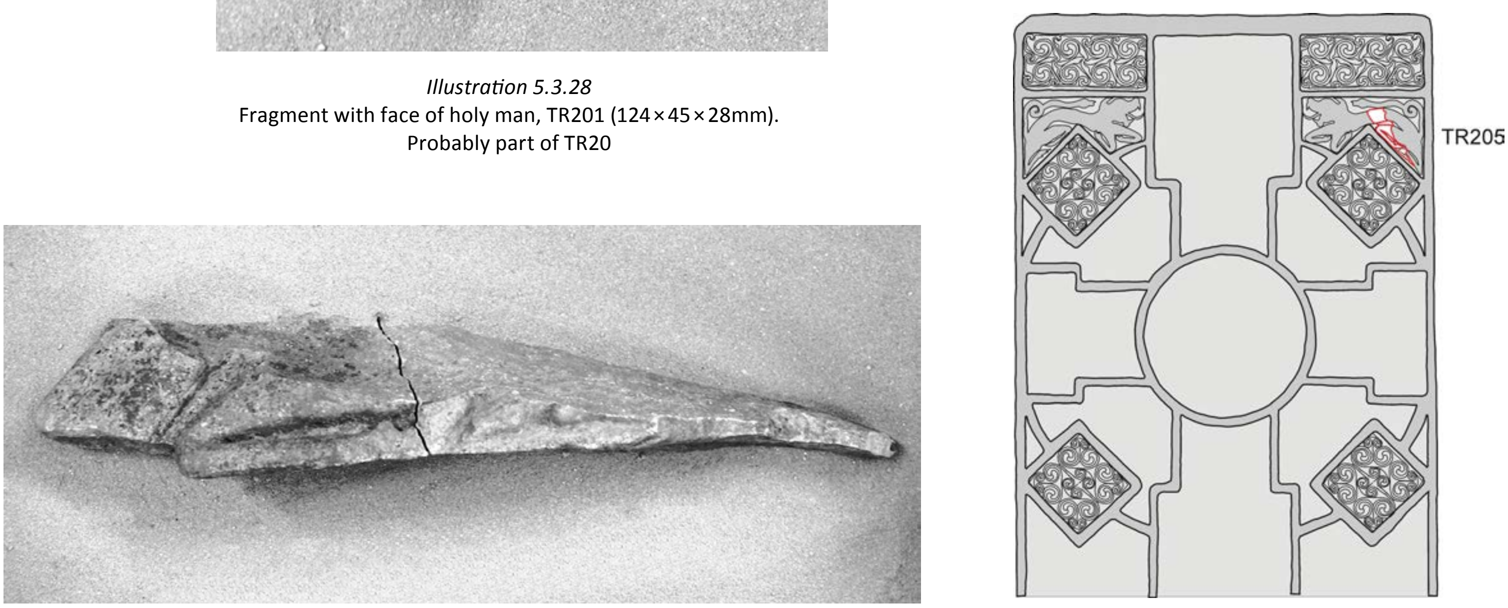


Illustration 5.3.29
Fragment with animal leg, TR205 (285 × 80 × 35mm), showing its likely position on TR20

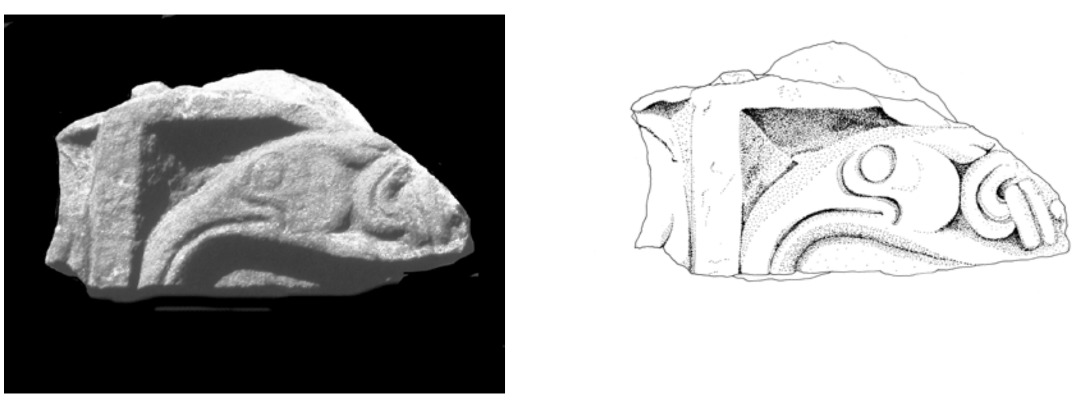


Illustration 5.3.30
Bird head in panel, TR218 (150 × 70 × 150mm)

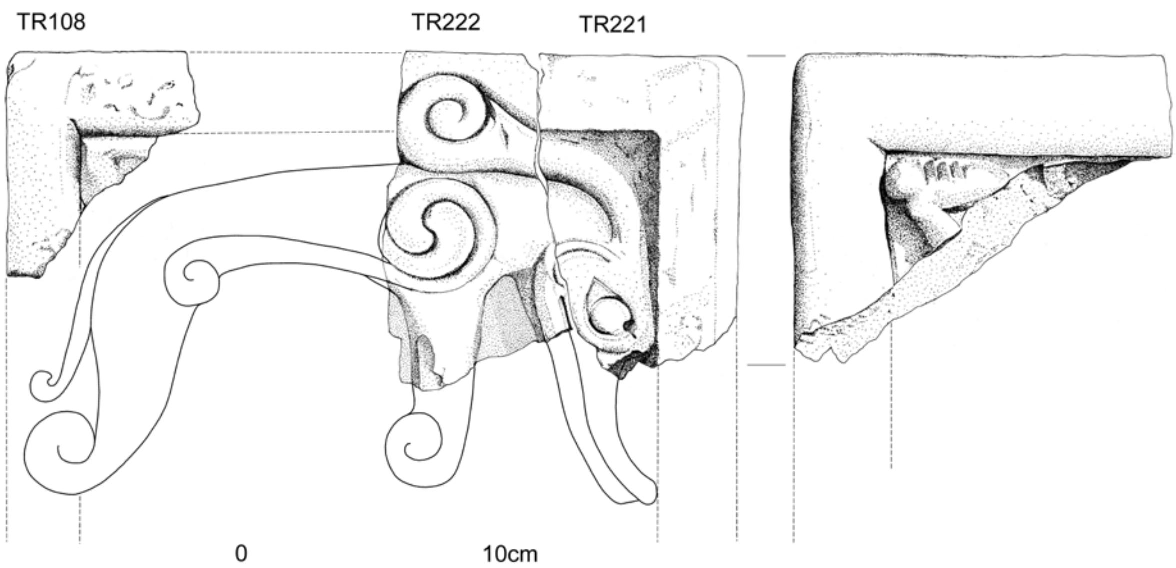
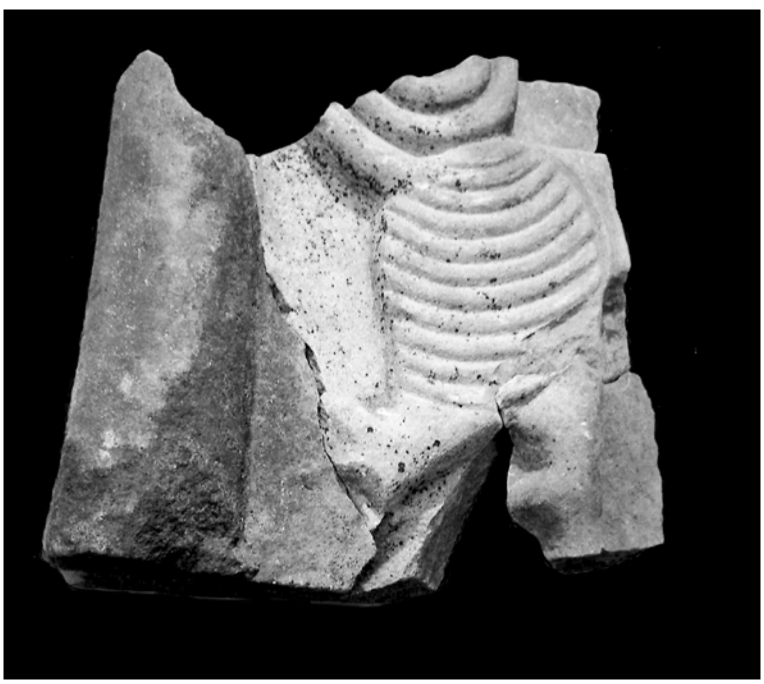
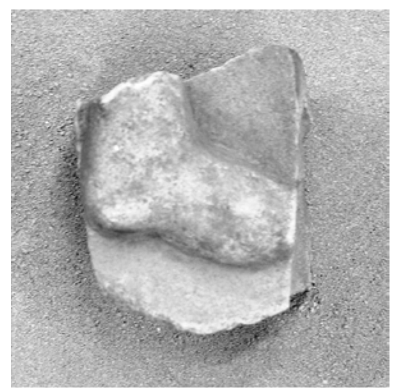


Illustration 5.3.31
Conjoining panels TR221/222, with the form of the Pictish beast reconstructed. TR221 measures 147×121×98mm. With related corner piece TR108 (90×75×55mm)

a



b



c

d

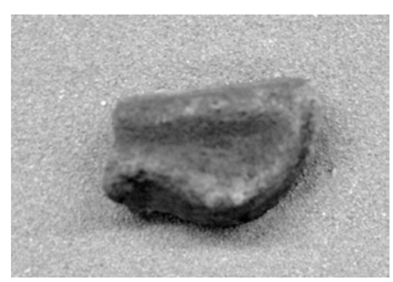


Illustration 5.3.32
Ribbed figure: (a) TR100/227/260 (200×200×50mm) (from F527); (b) leg TR215 (85×60×15mm); (c) eye TR209 (30×30×12mm); (d) ear TR208 (40×25×15mm)

Illustration 5.3.33
Affronted equines, TR216 (280 × 260 × 89mm)

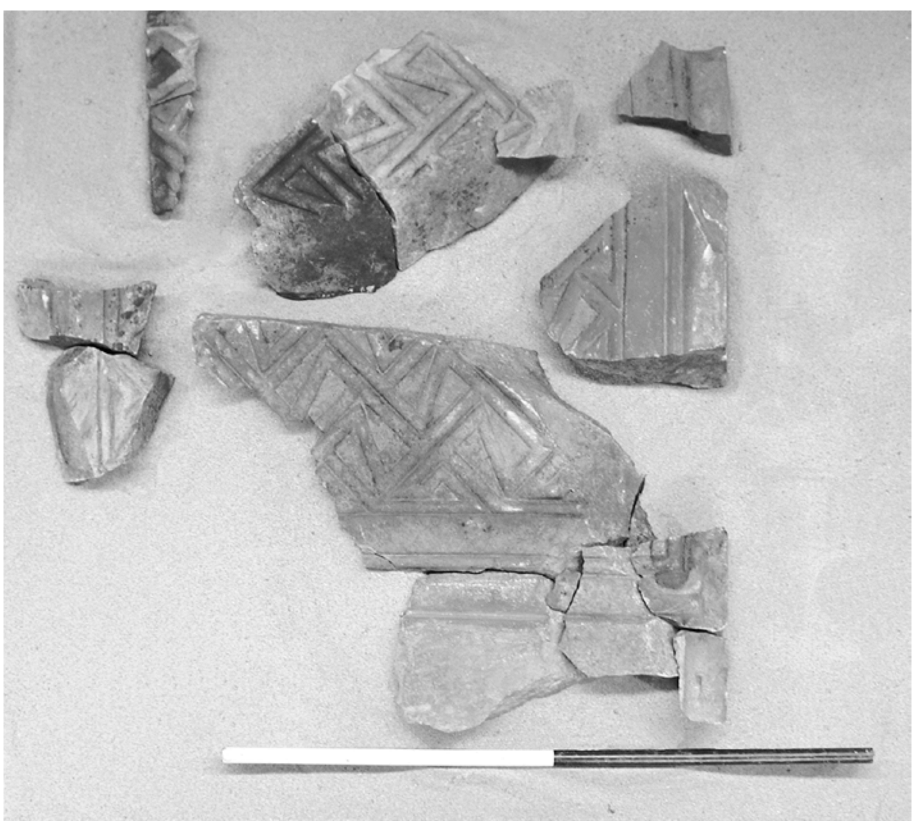


Illustration 5.3.35
Tight knotted interlace, TR149 (97 × 42 × 21mm)

Illustration 5.3.34
Conjoining set of key pattern, TR74 and others
(Set 1 see Digest 5.1)

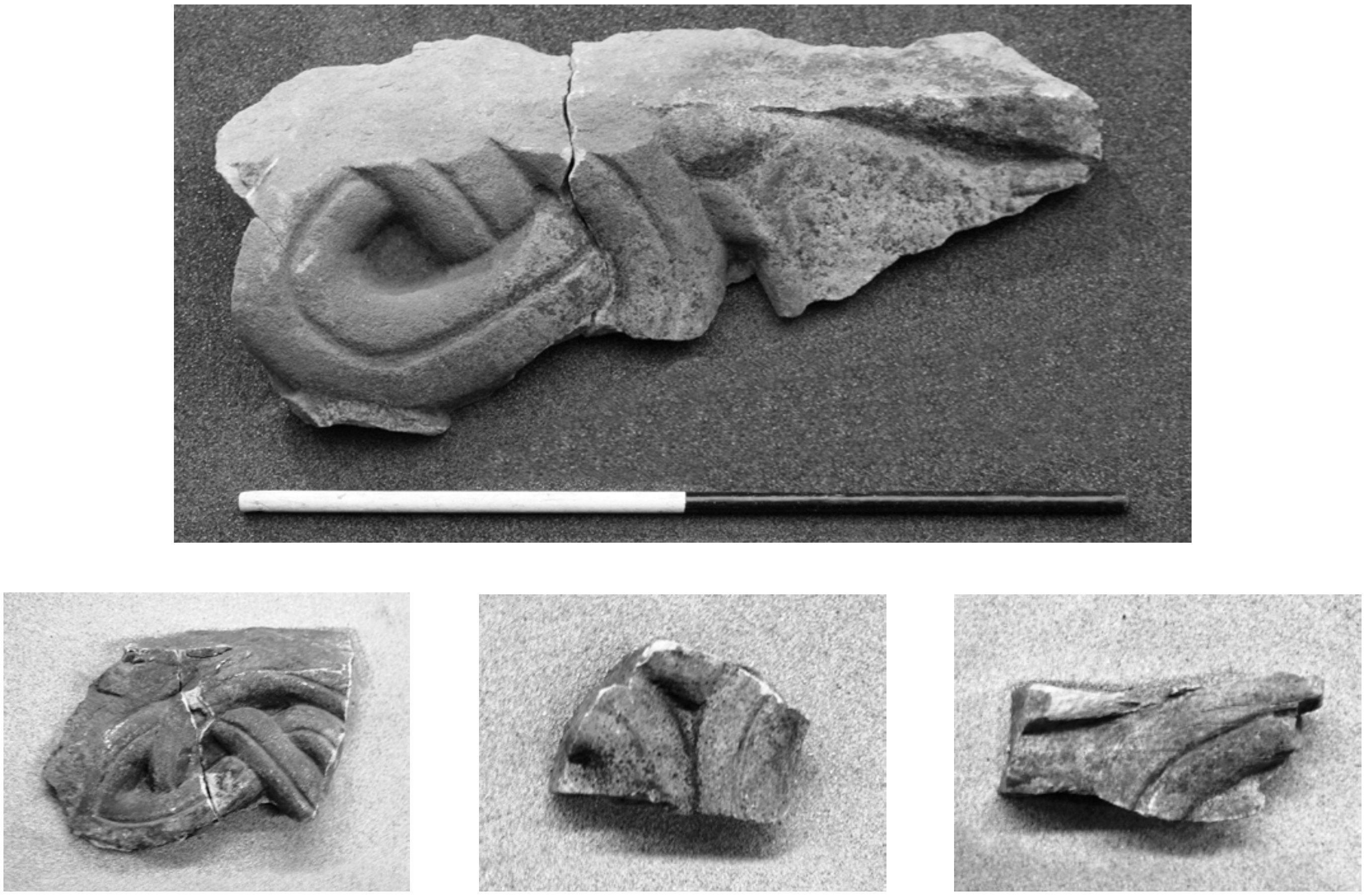
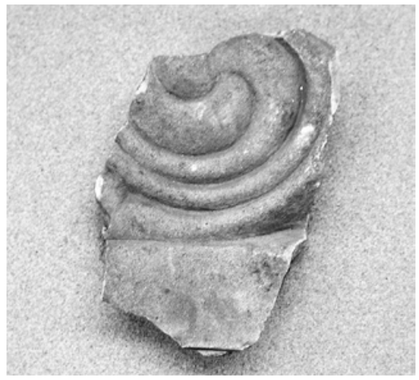


Illustration 5.3.36
Interlace with incised median line, TR258 (280×80×70mm); TR183 (150×90×85mm); TR162 (45×70×56); TR171 (95×37×70mm)

a b

Illustration 5.3.37
Flat spiral ornament. Conjoining Set 4: (a) TR229, 231, 233, 237, 239; (b) Conjoining set 1: TR45, 54, 114, 129



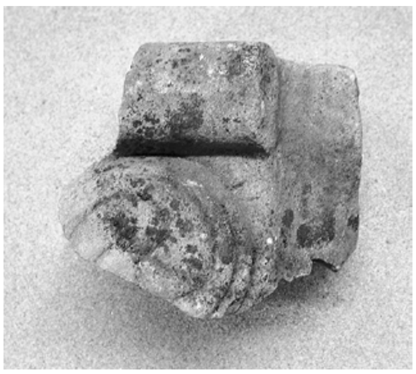


Illustration 5.3.38
Flat spirals TR116, 123, and spiral bosses TR128, 130

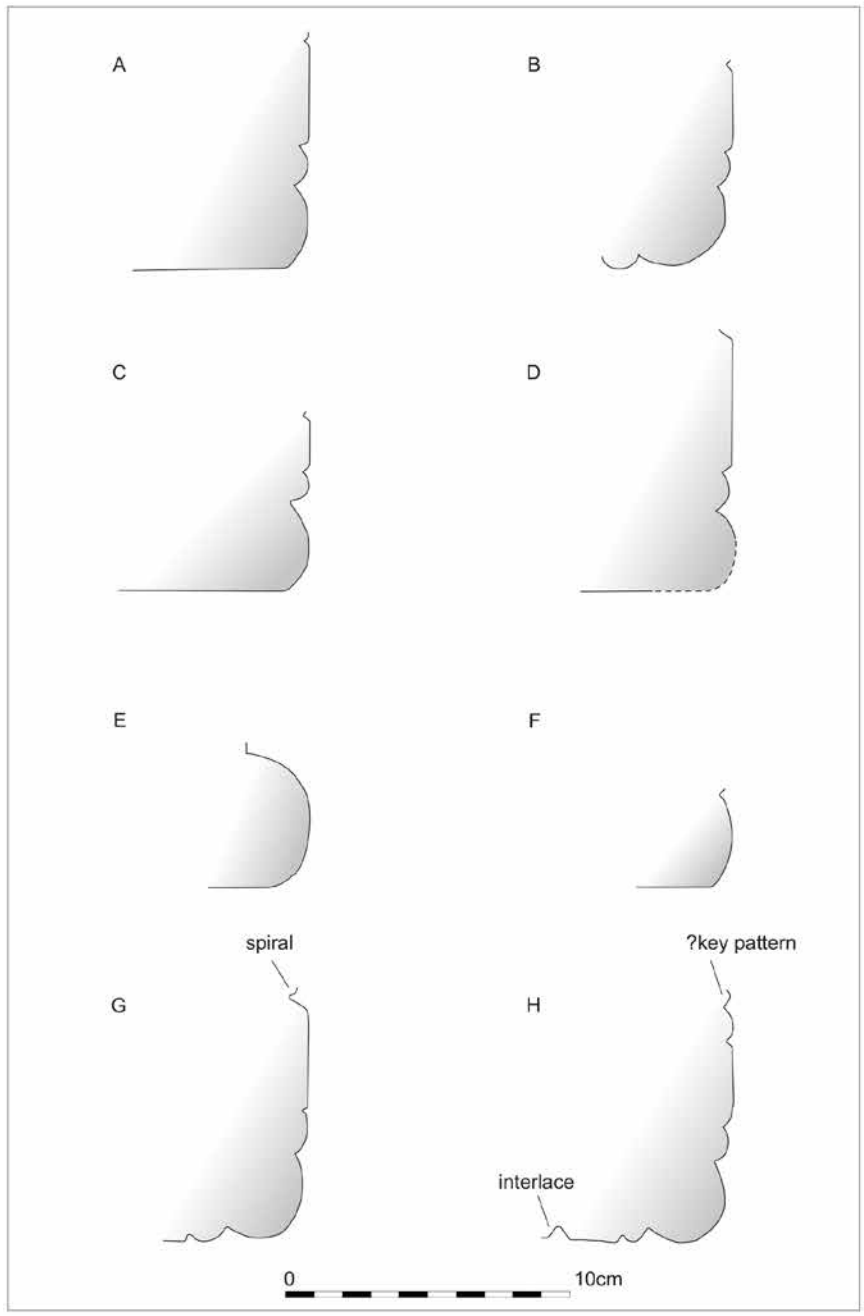
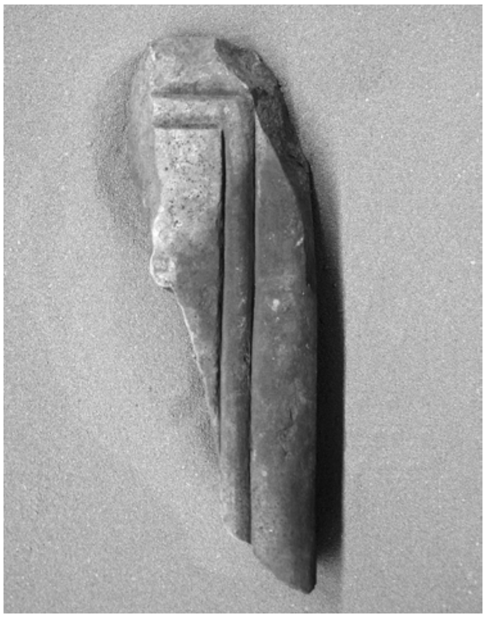
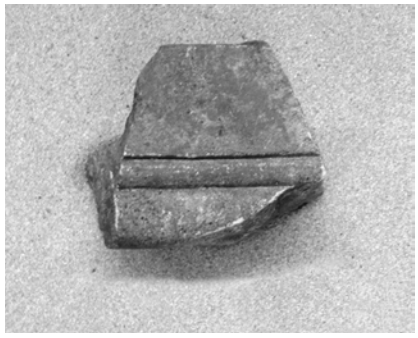


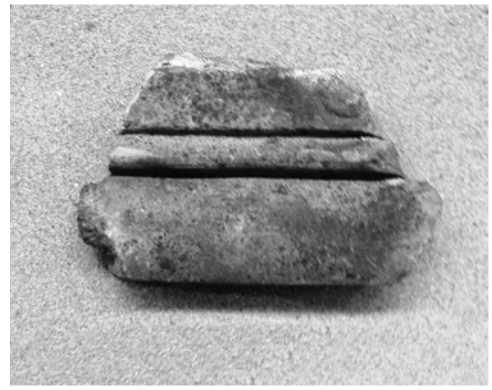
Illustration 5.3.39
Profiles showing types of moulding on edge pieces in the Glebe Field assemblage, Types A–H



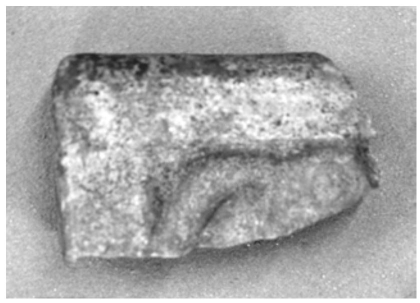
a



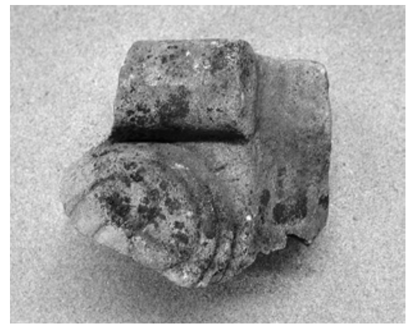
b



c

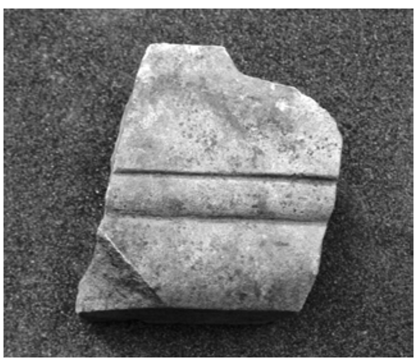


e

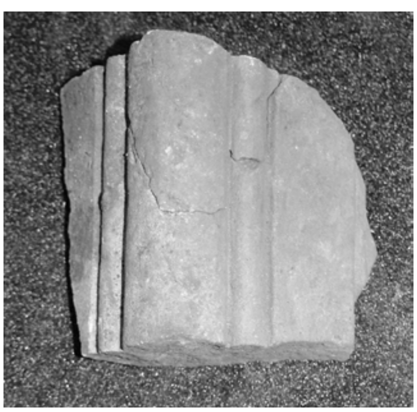


f

Illustration 5.3.40
Examples of mouldings of Type A–E and G (TR56 measures 230×80×75mm). (a) TR56; (b) TR42; (c) TR104; (d) TR238; (e) TR221; (f) TR128; (g) TR242



d



g

Illustration 5.3.41
Corner piece TR257 (Type H) (185×120×111mm)

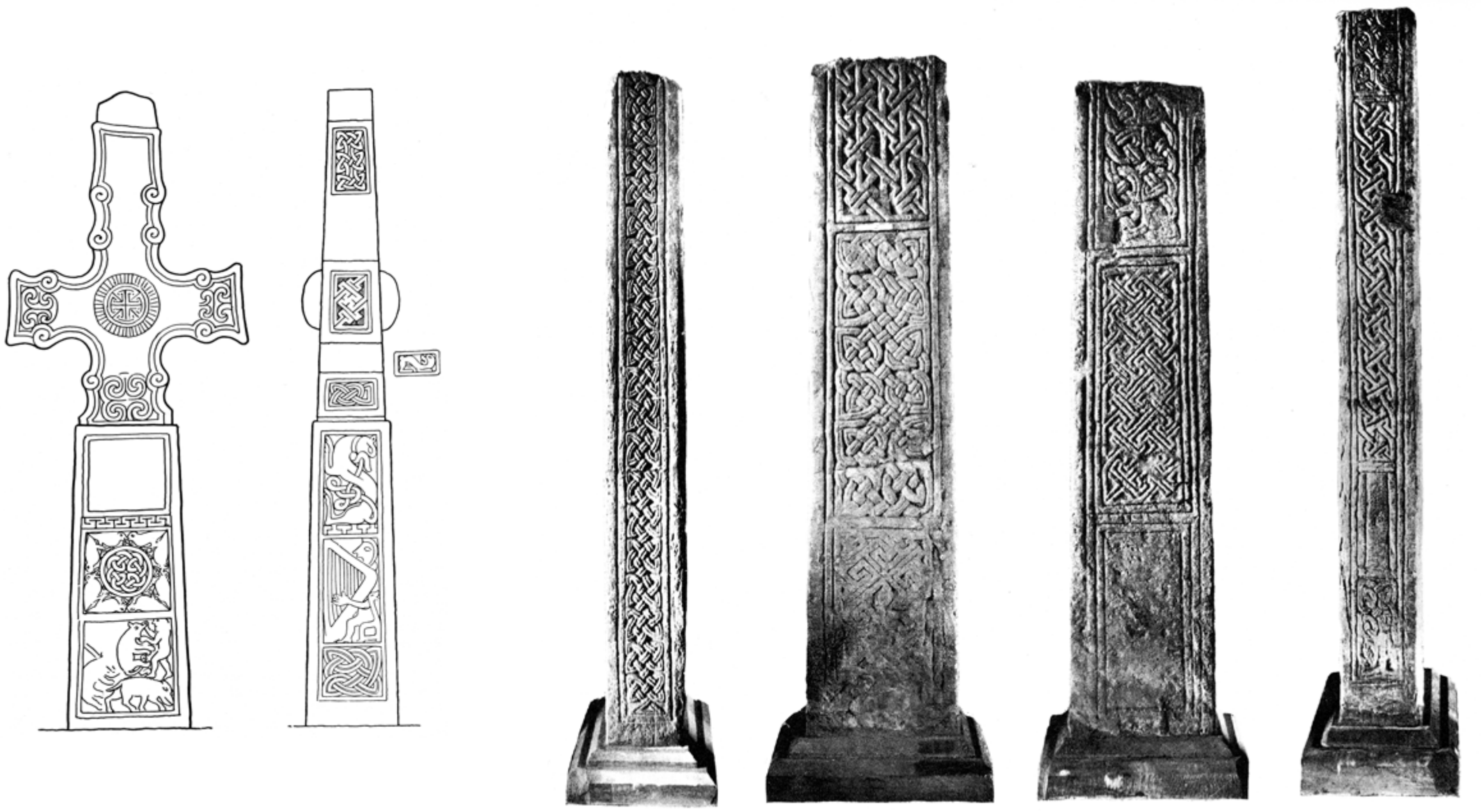


Illustration 5.3.42
Comparative forms of cross-shaft: the Dupplin Cross (left) and St Andrews 14 (ECMS II, Fig 334A; Fig 373A)

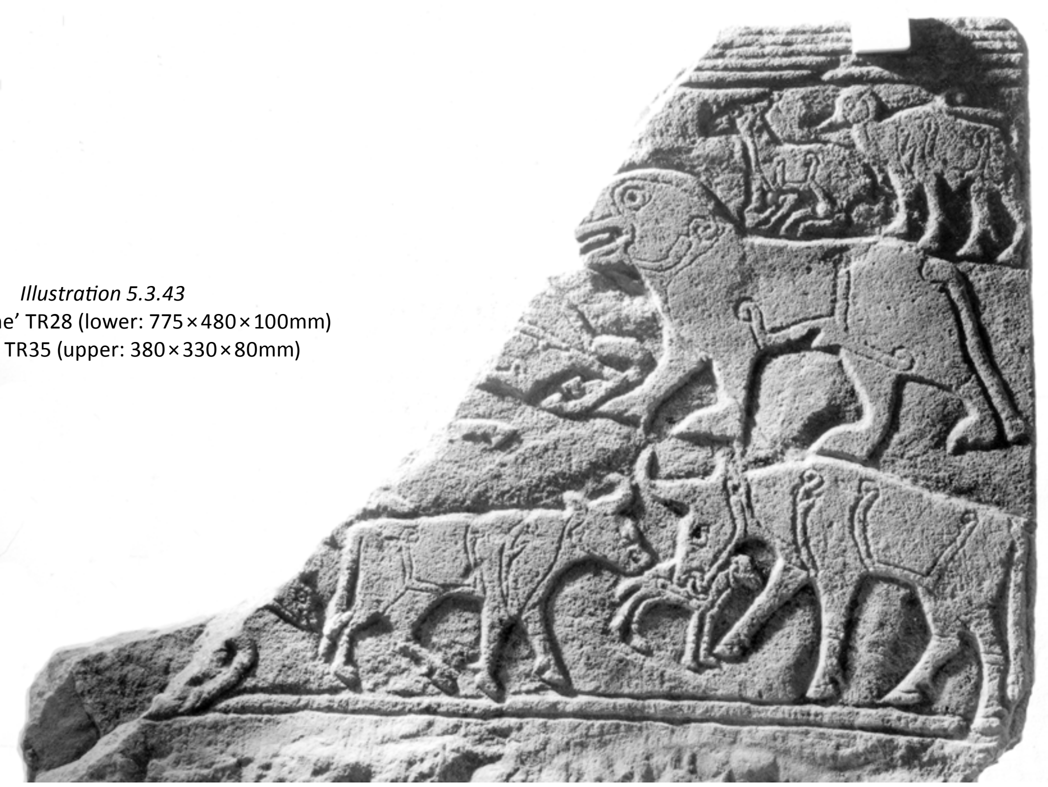


Illustration 5.3.43
The ‘Calf Stone’ TR28 (lower: 775 × 480 × 100mm) refitted to TR35 (upper: 380 × 330 × 80mm)

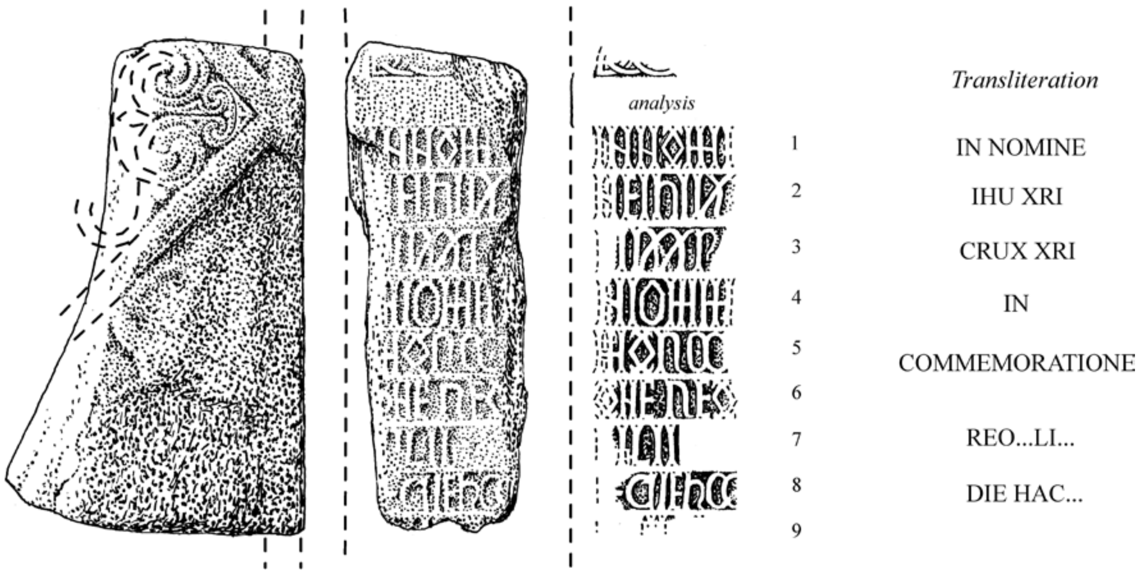
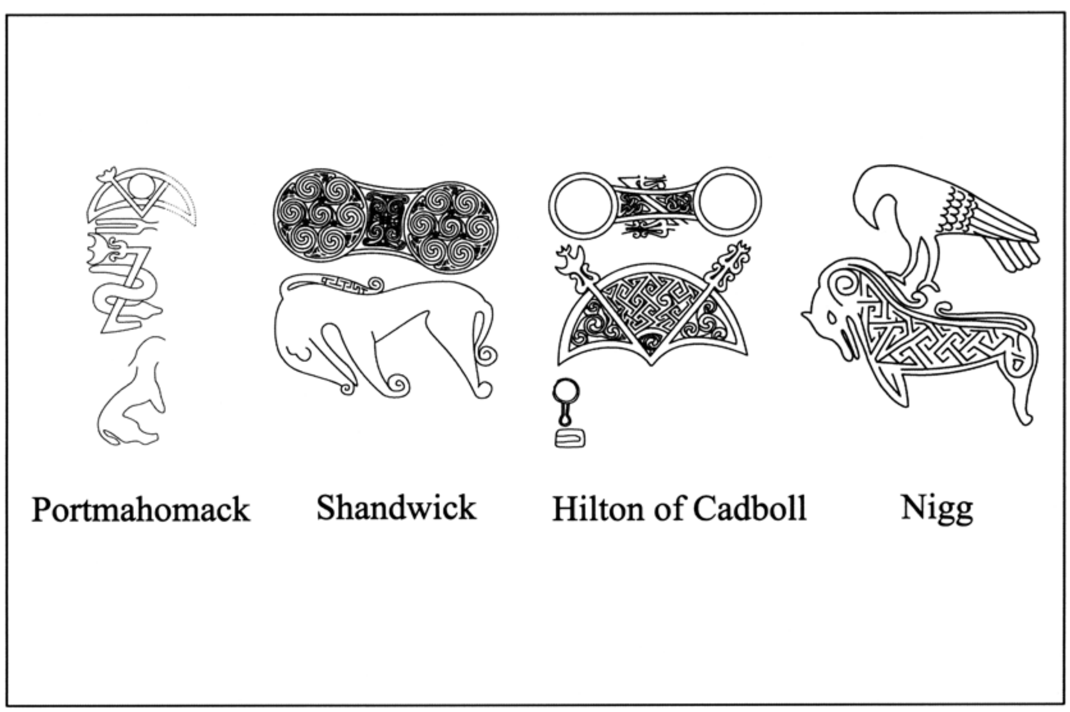


Illustration 5.3.44
Inscription on TR10 and transliteration (above); Pictish symbols displayed on monuments on the Tarbat peninsula (below)



Nigg, Shandwick, Hilton and the four monuments of comparable size at Portmahomack would have required teams of around thirty men apiece (also Chapter 5.9, p 229).

Classification: repertoire of forms

Seven main forms of monument have been recognised so far amongst the 264 pieces of carved stone in the Portmahomack assemblage: cross-slabs, cross-shaft, sarcophagus, grave markers, parts of a shrine or *cancellum*, a corbel or impost and (possibly) a label-stop (Illus 5.3.25 a–h). The majority of fragments are likely to derive from *monumental crosses*, the largest pieces being those that have been found in and around the church. TR1 consists of one side and one edge of a *base with tenon* (Illus 5.3.2). TR2 is one side of a centre panel (Illus 5.3.3). TR20 has both sides of a *top corner section* with the cross one side and apostles the other (the Apostle Stone; see Illus 5.3.13). Decoratively, these three pieces have little in common, and may be viewed as the parent pieces of three different monuments, to which other fragments may be variously assigned (see below). The form in each case indicates a *cross-slab* (Illus 5.3.25 A) of a type common in Pictish Art; see for example Aberlemno, Angus (Henderson & Henderson 2004, Illus 186), Elgin (ibid, 188) or locally Hilton of Cadboll, Shandwick and Nigg (Chapter 5.10). The general shape of these monuments is rectangular (Cramp type b; Cramp 1984a, xv). Given their method of recovery (by gravediggers), other pieces found in the churchyard were usually of larger size and so also likely to belong to cross-slabs (Illus 5.3.4, 5). The bosses TR5 and 6 may belong to TR2. TR10, the inscribed stone (Illus 5.3.6), surely belonged to TR20 since it carries an identical (and unusual) pattern on its face. TR9 features a roundel so may be a survivor from a cross centre; it carries a pattern that relates to TR20. The spirals glimpsed on TR40 (see Illus 5.3.27) also suggest a relation with TR20. At first sight it would seem that both TR9 and TR40 are too thick (at 190mm) to have belonged to TR20 (at 178mm), but studies of whole slabs show quite a variation in thickness so these associations are not disqualified.

Fourteen small, plain and relatively thin slabs of stone carrying a cross are designated as *grave markers* (TR15, 19, 21, 24–6, 29, 30, 31, 33, 34, 41, 225, 226). The simplest are simple indeed, unshaped pieces of stone carrying a scratched cross, recovered in a service trench (TR24, 25; Illus 5.3.26). The discovery of similar objects in early Christian contexts on the West Coast does suggest that such things were part of the formal symbolic repertoire (Fisher 2001, 28; Lowe 2008, 98–104). On TR19 (see Illus 5.3.9) the cross is rendered in relief. On the well-finished TR21, the cross is shown in relief against a recessed background, with a deep incised cross on the other side (see Illus 5.3.15). Other examples feature a variety of simple cross forms (Illus 5.3.27). These too have close parallels in early Christian sites on the west coast. The unworked base of eg TR 33 suggests that the grave markers stood upright in the ground, probably at one end or the other of a grave. The concentration of these finds in the area of the monastic burials endorses their use as grave markers. (Note that TR15 is lost; TR30, TR31 remain in situ in the church; TR41, 225, 226 are not illustrated.)

TR22 (Illus 5.3.16a–f) is designated as a *sarcophagus lid*. It features standing or strolling animals in relief within recessed panels along one side, which shows that it was used in a horizontal position, and the underneath of the frieze side is recessed. The height of the stone appears to vary from one end to the other, suggesting that the top surface slopes with respect to the base (Henderson & Henderson 2004, 40). The surviving end face has a cross in low relief. The animals, from left to right, take the form of a lion and a boar, the latter confronted by another large feline (head only). Alternatively this monumental stone may have been used as an architectural building block, in which case it would have had to be placed at a quoin or as an impost for a chancel arch (so that the two adjacent faces were visible). It has also been suggested that TR22 was an altar (Nadine Alpino, University of Kiel, pers comm). However, the rebate on the base, which appears to be primary, and the slight taper, does suggest that this heavy monolith was the lid of a stone coffin, or a recumbent slab laid over a grave. TR108/221/22 (Illus 5.3.31) forms two orthogonal faces with rebated panels featuring animals. This fragment may also derive from a sarcophagus.

A few of the 230 carved stone pieces recovered from the Glebe Field (Sector 2) may originate in one of the monumental types already mentioned. TR201 (Illus 5.3.28) is a human face, which is the right size and style to belong to cross-slab TR20, while TR205 is a hoofed and clawed leg that provides a mirror image for TR20's dragon (Illus 5.3.29). TR218 (Illus 5.3.30) has adjacent recessed panels, one with a bird's head, separated by a rib 15mm wide. TR108, 221 and 222 together form the corner of a rectangular block, featuring the head of a Pictish beast and upturned foot (Illus 5.3.31). These have a border that varies between 25mm and 40mm. Another corner fragment with 40mm/25mm borders is TR108. It is possible that these four fragments belonged to a side panel or end of a sarcophagus like TR22 (Illus 5.3.16), which, however, has a rib thickness of 40mm. Figurative ornament is also discerned on five other pieces: TR100/227/260 suggests the body of a creature with ribbed body, TR215 a leg, TR209 resembles an eye and TR208 an ear (Illus 5.3.32). TR216 (Illus 5.3.33) represents two affronted equines.

The majority of the Glebe Field pieces would appear to derive from a single monument, as suggested by their ornamental similarity and a number of joins. Among the certainly identified examples, twelve pieces are from panels carrying *key pattern* (Illus 5.3.34), fifty-four have *interlace* mostly identified as made from strands incised with a median line or groove (Illus 5.3.36), two pieces show tight *knotwork* (Illus 5.3.35). Sixty fragments carry *spiroform ornament* (Illus 5.3.37) and four fragments were *spiral bosses* (Illus 5.3.38). The Glebe Field assemblage also contained fifty-seven pieces of *moulded edge pieces* (Illus 5.3.39–41). The majority of these do differ from the surviving parts of TR1, 2 and 20, so their absence from the churchyard is significant. Their form is more appropriate to a cross-*shaft* than a cross-slab, so Pictish parallels have been sought in the free-standing crosses exemplified by Dupplin and St Andrews 14 (Illus 5.3.42; Form *a* in Cramp 1984a, xv). These moulded edges may imply a fourth cross at Portmahomack; alternatively they may strengthen the case for architectural fittings.

Architectural sculpture

Some of the less certainly identified pieces may derive from fittings integral to a building, as seen in Anglo-Saxon churches. At Wearmouth and Jarrow, for example, there was evidence for string courses, friezes, framing for openings, relief figure sculpture, enclosures marked out by rows of upright baluster shafts and a terminal for a stone chair. Sculpture was painted over a white lime background, the most enduring traces being red and black (Cramp 2006a, II, 162–4). Panels carrying inscriptions or figurative carving were also set into or stood against walls at Jarrow, Wearmouth and Whitby (ibid, 165).

Architectural sculpture in Pictland is indirectly implied by the arch segment at Forteviot and lintels at Meigle and Dunblane, as well as panels and posts which 'provide the best evidence to date for church building' (Henderson & Henderson 2004, 205–8). At Portmahomack, a group of thin decorated panels (TR13, 17 and 28/35), together with a stone post (TR27), is suggested as belonging to one or more church fittings, perhaps an *altar, shrine, above-ground cist* or *cancellum* (a stone screen between the chancel and the nave) (Illus 5.3.7, 8, 10). TR13 and 17 are too thin (90mm and 25mm) to belong to cross-slabs. Of the stone panels, TR28/35 (Illus 5.3.43) has one decorated face, is 100mm thick and has a ribbed top and an unworked base, showing that it would have stood above the ground, with a height of up to 520mm showing. TR13 (Illus 5.3.7) is 76mm thick and ornamented both sides. It should therefore have stood on its side or end. The pattern of recessed crosses (3, 5 or 7?) is suggestive of an altar table, but this would hide the reverse-side pattern, so TR13 more probably stood as *cancellum* screen before a chancel or part of a panelled shrine as at St Ninians' Isle, Shetland (Small et al 1973, Fig 9, Plate VII). Of the panel fragments, only TR17 (at 25mm) is thin enough to be accommodated in the groove of the stone post, TR27, where it may have belonged to the panel of a shrine.

Heads in the round and their implications

Stone architecture at Portmahomack is also implied by two heads fashioned in the round. TR206 is a frontal fragment of a frowning head (Illus 5.3.45), while three other pieces (TR217, 223 and 263) conjoin and form a species of corbel (Illus 5.3.46). Fragment TR219 carries an ornamental scheme that relates to the swept-back hair or mane on TR206. Another fragment fashioned in the round is the interlaced TR39, but this more likely derives from a large boss on a cross-slab (perhaps TR2). Isolated high-relief insular animal and human heads have been proposed as label-stops for doors and openings (as at Deerhurst, now on an inner doorway), or as a figurehead protruding from a wall (*prokrossos*, as at Deerhurst, above west door) or as terminals to chairs (Bailey 2005; Bryant 2012, 176–81). The eighth-century animal-head terminal from Monkwearmouth (AS11) was seen as deriving from a stone chair rather than a label-stop or *prokrossos* (Cramp 1984b, 130; 2006a, II, 171 (Illus 5.3.48b)). Animal-head terminals from Lastingham have also been assigned to stone chairs (Lang 1991, 172–3) (Illus 5.3.48d). Both these examples cite King David's chair as depicted in the manuscript Durham BII30, f 81v, where the animals look inwards and upwards from the top of the chair back. Likewise, TR206 might have served as the terminal knob for a stone chair back, as depicted on the slab at Kirriemuir 1 (Henderson & Henderson 2004, 211–12). Alternatively it might derive from an architectural feature, either side of a door, as at late eighth- or early ninth-century Deerhurst. Heads used as label-stops tend to look down (as Deerhurst 18), whereas *prokrossoi* or the examples considered to embellish chair backs (as at Lastingham 10A and Wearmouth AS11) look up or across (see Illus 5.3.49). However it is not always easy to tell when the head is detached from its anchor point.

The Corbel

(The following section has profited from the guidance and opinions of George and Isabel Henderson and colleagues attending the seventh International Insular Art conference at Galway, 2014.)

TR217 and its conjoined additions are not from a chair: the head, with large eye and criss-cross hair, protrudes from beneath a convex corbel with a flat top, implying that it was set in a wall and supported a beam or arch (Illus 5.3.46). It is well dated. Two of the three pieces that make up the corbel (TR217, 223) were found in the layer of burning above the eighth-century workshops (C1547). The third was among crucibles dumped over the western boundary wall by the metalworkers who were installed after the raid, in the early ninth century (C3463; see p 130). While the stratified context of the Portmahomack corbel in layers of the eighth/ninth century is secure, a contemporary parallel has proved hard to find. The arrangement of a head carved in the round beneath a corbel is best known from the twelfth century and later, where it is deployed to support rafters, tie-beams, the springing of an arch, or as stops to a hood moulding (eg at Kilpeck, Bury St Edmunds, Trondheim or Bourges). Anglo-Saxon impost profiles are commonly angular rather than curved, as at Escomb or Lincoln St Peter (Taylor & Taylor 1965, Illus 464; ibid, 395). Stone corbels jutting out from walls of early Irish churches are known, if of uncertain purpose (Ó Carragáin 2010a, 88). At White Island, Co Fermanagh six flat-topped statues dating from the ninth to eleventh century are thought to have acted as pairs of caryatids supporting a pulpit or preaching chair; they are now built into the church wall (Hickey 1985; Edwards 1996, 170). Early medieval travellers may also have observed heads under corbels in Rome, deriving from the *caryatid*, *telamon* or *atlante* figures supporting architraves.

The practice of embellishing openings in churches with animal (and human) heads in the round is known in the west of Britain where it is noted from the eighth into the eleventh century, for example at Bitton, Deerhurst, St Oswald's, Gloucester and Worcester 1 (Bryant 2012). The Anglo-Saxon church at Deerhurst retains eighteen carved stones in their original positions in the fabric: these include beast heads protruding from the walls (*prokrossoi,* nos 9, 10, 15) and zoomorphic label-stops on openings and on the chancel arch (nos 11–14, 16–19), and flat-topped 'ship stem' capitals (nos 24, 25), all now assigned to a single building dated by radiocarbon to the late eighth/early ninth century (Rahtz et al 1997, 174; Bagshaw et al 2006;

Illustration 5.3.45
Corbel with convex chamfer and head modelled in the round: conjoining fragments TR217 (154 × 115 × 55mm), TR223 (130 × 54 × 65mm) and TR263 (72 × 56 × 30mm)

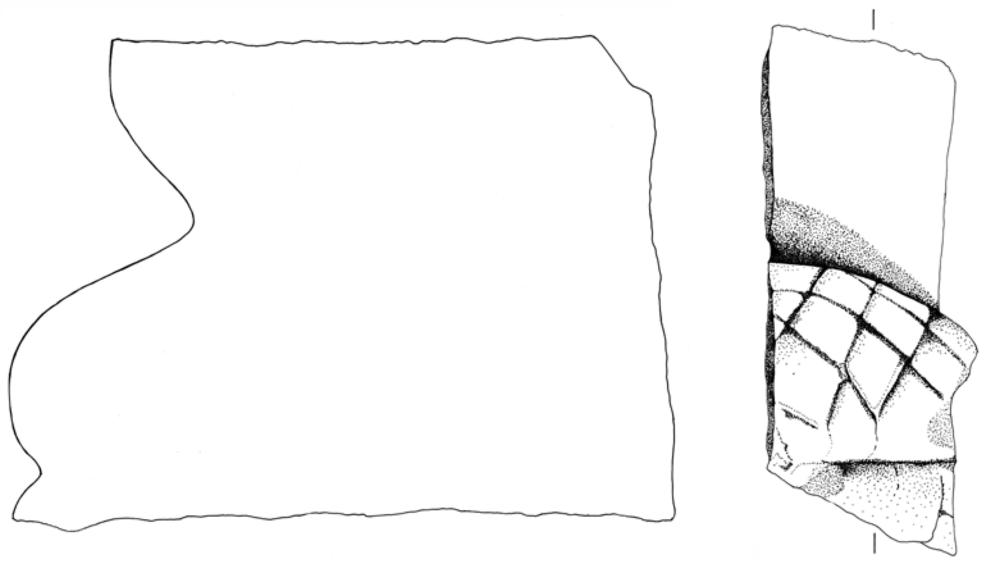


Illustration 5.3.46
Left: Impost at Malles (ninth century) and Bobbio (late twelfth to thirteenth century)

Table 5.3.1
Fragments assigned to forms of monument at Portmahomack

Type of Monument	Sub-type	Components
Monumental cross	Base	TR1
	Body pieces	TR2, TR7, TR9, TR12, TR40
	Corner piece	TR20
	Bosses	TR5, 6, 39
	Edge with inscription	TR10
	Part of hollow–arm cross	TR4
	Fragments bearing anthropomorphic or zoomorphic images	TR108/221/222 (Pictish beast), 102 (?), 201 (Apostle head), 202 (head?), 204 (beak?), 205 (dragon leg), 208 (ear), 209 (eye?), 215 (foot), 216 (equids), 218 (bird), 220 (?), 100/227/260 (ribbed creature)
Grave markers		TR15, 19, 21, 24–6, 29, 30, 31, 33, 34, 41, 225, 226 [14]
Sarcophagus	Lid	TR22
Shrine, cist or *cancellum*	Stone post	TR27
	Panels	TR13, 17, 28/35
Label-stop or chair knob	Head	TR206, 219
Impost or label-stop	Corbel	TR217/223/263
Unassigned	Moulded edge pieces	TR 42, 48, 50–60, 64, 68, 70, 71, 73, 76–85, 89, 90, 97, 98, 101, 103–7, 109–13, 203, 213, 214, 232, 238, 243, 246, 247, 249, 251–56 [57]
	Pieces from panels bearing key pattern	TR8, 49, 61, 62, 63, 69, 72, 74, 75, 86–8 [12]
	Fragments from panels bearing spirals	TR18, 114–27, 129, 131–43, 146, 147, 229–31, 233, 235–7, 239–42, 244, 248, 250 [54]
	Spiral bosses	TR128, 130, 144, 145
	Fragments bearing median–incised or other interlace	TR 37, 38, 148, 150–77, 178–99, 224, 228, 234, 245, 259, 261, 262 [60]
	Corner pieces with moulding, interlace and key pattern	TR32, 257
	Pieces of tight knotwork	TR14, 149
Unidentified		TR3, 11, 16, 91–6, 141, 142, 200, 207, 210–12

Hare 2009; Bryant 2012, 110, 179). It has been determined that all the animal-head label-stops and *prokrossoi* formed part of a design innovation dated to the late eighth to early ninth century (Bryant 2012, 179; Gem 1984, 237–8). Five of the beast heads were originally painted in red and yellow iron oxide, charcoal black and calcium carbonate white (Emily Howe in Bryant 2012, 112–15). Although there was an upper floor at Deerhurst, none of these is claimed as being a corbel, although the capitals (nos 2, 25) supported the chancel arch, and elements of a flat-topped string course survived at high level (ibid, 55).

Iconic beasts (or humans) placed on openings (or objects) and expressing a severe and protective demeanour seem to form an important part of the vocabulary of Christian conviction in its transitional phase, continuing the apotropaic function of the

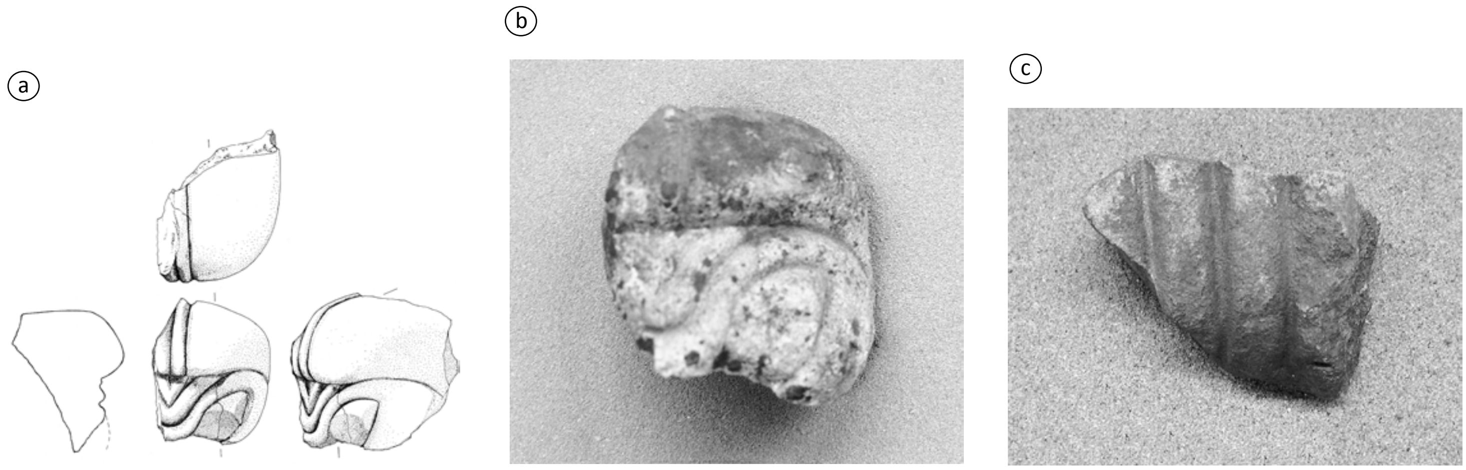


Illustration 5.3.47
(a), (b) Head TR206 (90×80×80mm); (c) Fragment TR219 (50×65×40mm)

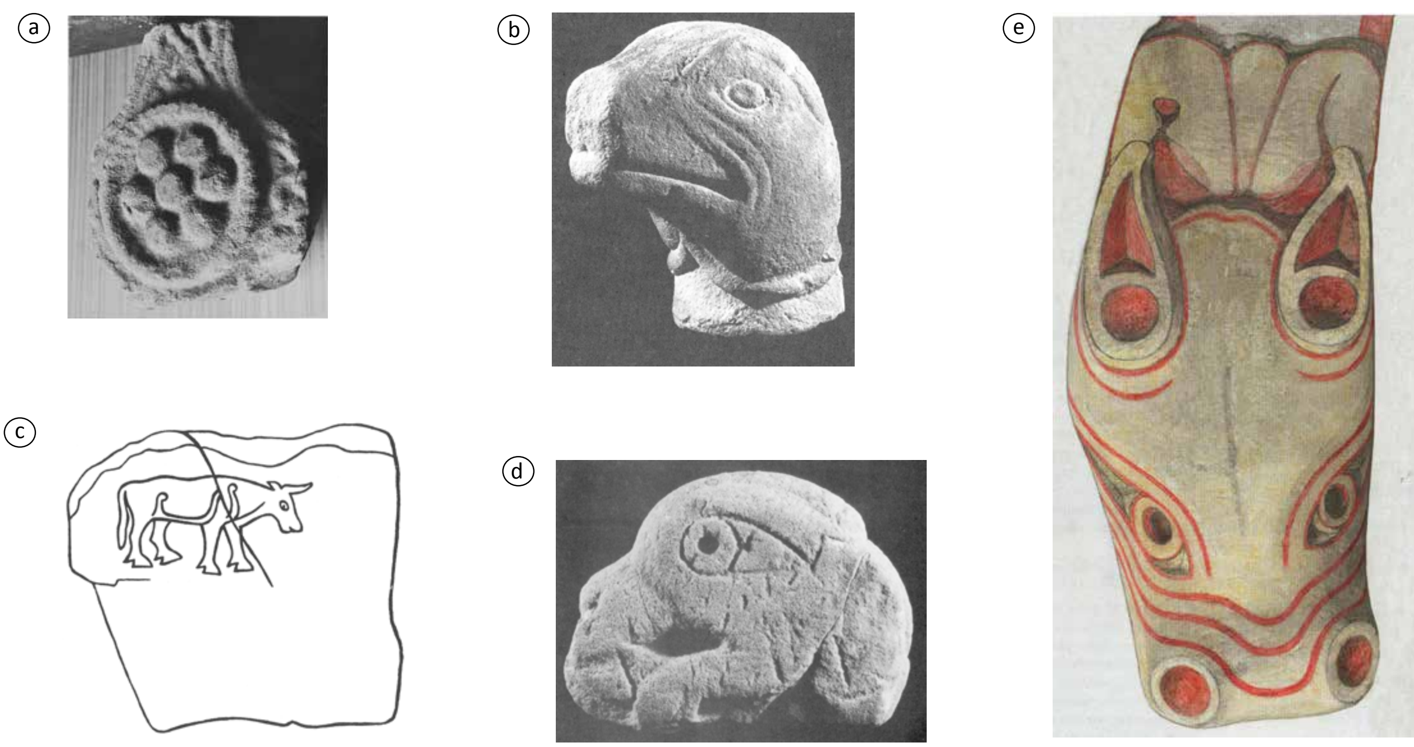
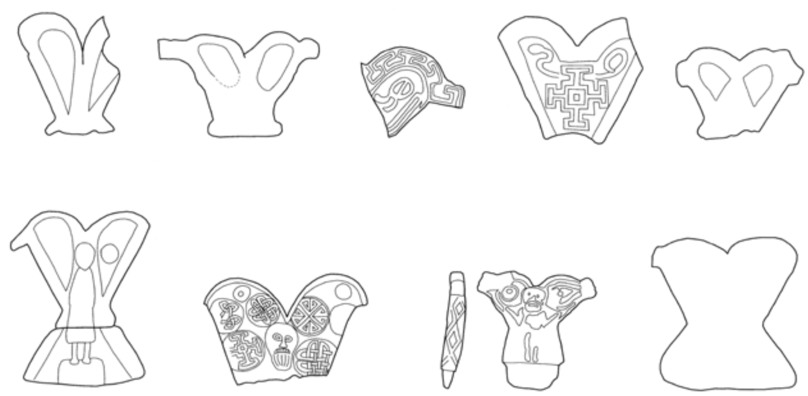


Illustration 5.3.48
Comparative ornament and figures: (a) Encircled bosses, Carpernwray Hall, Lancs (W G Collingwood MS GB 479, Sackler Library Oxford, Fig 434); (b) Monkwearmouth, ASII Cramp 2006 (© Corpus of Anglo-Saxon Stone Sculpture, photographer T Middlemass), II, 172; (c) Inverness 2 (ECMS II, Fig 107); (d) Lastingham 10A Lang 1991 (© Corpus of Anglo-Saxon Stone Sculpture, photographer T Middlemass) 172–3; Fig 614; (e) Deerhurst 18 Bryant 2012 (© Corpus of Anglo-Saxon Stone Sculpture Volume X The Western Midlands, Colour Plate 1)

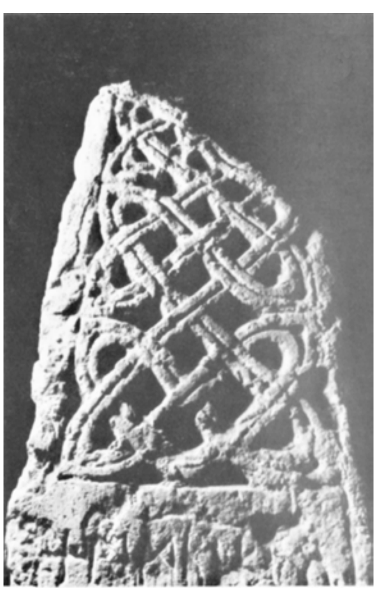
c

a



b

Illustration 5.3.49
(a) Possible fragment of 'butterfly' roof finial from Portmahomack TR264 (210×130×100mm); (b) Comparative examples from Ireland (Ó Carragáin 2010a, 42); (c) St MacDara's Island, Co Galway (© National Monuments Service, Department of Culture, Heritage and the Gaeltacht)



a

b

Illustration 5.3.50
(a) Hackness I Lang 1991 (© Corpus of Anglo-Saxon Stone Sculpture, photographer T Middlemass) Fig 462; (b) Telfont Magna Cramp 2006 (© Corpus of Anglo-Saxon Stone Sculpture, photographer D Craig) Fig 518; (c) Gattonside (ECMS II, Fig 453)

c

ornamental beasts of the pagan era. 'The translations of old themes and images into new meanings could have been as potent a factor in conversion as was the similar practice in poetry' (Cramp 2006a, II, 167). This is the most likely role for an eighth-century corbel, as opposed to that suggested for their twelfth-century successors: addressing marginalised persons outside the church walls (Magrill 2009). More appropriately, heads either side of a chancel arch or doorway offer power and so bring comfort and security to those that enter. Eleonora Destefanis (pers comm) has pointed out that human heads are incorporated into lintel-bearing corbels of the late twelfth/early thirteenth century on the doorway from the cloister at Bobbio, and that heads may be seen bearing the imposts of pillars of the ninth-century chancel at Malles (Illus 5.3.46). These observations raise the further possibility that the straight moulded pieces that make up most of the Glebe Field assemblage derive from jambs or lintels, offering an image of unexpected grandeur. However the verdict here is that these moulded pieces belong to a cross-shaft (Cross D, below, p 165), leaving the corbel as the main witness of an architectural construction.

Although the competence of the Portmahomack head remains startling for its place and date, there is indirect evidence that relates it to a general insular context. Outfacing paired heads in the church at Breedon on the Hill (Jewell 1986, 109, Plate LIIIe) and heads deployed as the imposts in the Canon Table arcade in the Barberini Gospels (Rome Vat. Lat. 570; Henderson G, 2001, Fig 14.4) show that cephalomorphic corbels could have formed part of the insular repertoire. Human heads fashioned in the round are otherwise features of late eighth-century Pictish carving: the David on the St Andrews sarcophagus, the Elgin Matthew and the left-facing desert father on the Nigg cross-slab share signature features of 'large almond-shaped eyes, a moustache, elaborate curls and a high brow' (Henderson I, 1994, 81–2; see also James et al 2008, Illus 4.16 (.16) for a possible face from Hilton). These examples imply that the Portmahomack corbel can find a home within this extended family.

An identity for our head might be indicated by the criss-cross pattern that covers it and bunches forward in a neat circular 'brow'. This could be intended as hair, a hair net or a head cover. James Lang (1993) noted the use of heads carved in the round in Roman memorials and busts, subsequently serving as models for niched eight-century figures at Otley, Easby and Masham (ibid, Fig 32.3). Roman men with tight curls or waves appear as aristocratic or imperial figures, and the style was affected by Offa (Jewell 1986, 109). The Portmahomack head does not echo this kind of hair, nor does it resemble the images of filets, crowns, diadems or helmets seen on Anglo-Saxon coins and deriving from emperors and kings (as assembled by Gannon 2003, 25–54). However a domed head covered by a criss-cross pattern is depicted on a Series L, Type 13 late Secondary penny, which Gannon suggests as 'another way of portraying the texture of hair, or representing caps in precious fabrics' (Gannon 2003, Fig 2.40, 51). This figure belongs to a group thought to be wearing diadems, held on with knotted strings at the back, while knotted hair, hanging by the ear, may be intended as a sign of status in both pre-Christian and Christian iconography (ibid, 49–50). The surviving side of the corbel has knotted hair or a knotted tape slightly forward of where the ear would be. Clerical or divine figures are also apparently figured wearing head dress. A seated figure at Fowlis Wester appears to wear a domed cap. On the Forteviot arch, two of the figures wear hoods and the third and largest (perhaps Christ: Henderson & Henderson 2004, 145), wears a diadem with a tie at the back (ibid, Fig 211; cf Gannon 2003, cf Fig 2.35, 48).

Given the exemplars of heads on the Tarbat peninsula and at Portmahomack itself, together with the presence of a 'porcupine' sceat (p 260) and the known proficiency of the 'practised hands' of sculptors, it is hard to accept the head cover as an obscure version of something exotic, and more tempting to interpret it as a real, if unfamiliar, artefact. Since there are no convincing indications of hair, a diadem or crown, the pattern may refer to a religious head cover. Ecclesiastical head gear today comes in prodigious varieties worn by clerics (and latterly academics) at various ceremonies (see www.dieter-philippi.de/en/the–philippi-collection/head-coverings-1). These surely have deep roots. Examples of domed or 'boule loaf'-shaped caps of woven wool are noted on Christian, Muslim and Jewish clerics. One of the more common is the 'Oxford cap', a type of beret used to cover and enclose the hair. The head might therefore indicate a wise or holy person (male or female) who wears a cap or bonnet with the hair bunched inside it with tape hanging by the ear securing it in place. Such a person might belong to the group of ancestor saints proposed for the great cross-slabs (p 337). The corbel can be seen as the best evidence that the eighth-century monastery had a stone church (Chapter 5.4, p 339).

A footnote to this section on architectural carved stone is TR264, recovered residually in a Period 7 soil in Sector 2, which resembles the 'butterfly finials' known to have been placed on gabled ends in early Irish churches such as Church Island, Co Kerry or Macdara's Island, Co Galway (Ó Carragáin 2010a, 42–3) (Illus 5.3.48). It is included for the sake of completeness rather than as crowning (in any sense) the case for an early church building.

Repertoire of Ornament

The contribution of Kellie Meyer to the study of the ornamental schemes on the Tarbat peninsula is warmly acknowledged (Meyer 2005; see also Meyer 2011 and OLA 7.1.8.2).

The principal diagnostic ornamental schemes used in the Portmahomack assemblage are *key* or *fret pattern*, *interlace* and *spirals*, while TR1 features a notable border of inhabited *plant scroll*. These all find wide application in early medieval Ireland, Western Scotland, Southern Pictland and Northumbria. There is a small range of *figurative images*, of which the majority are stand-alone beasts with mythical or semi-mythical attributes. Ornamental fields are bordered by *edge pieces*, which show a variety of mouldings. The following analysis examines the Portmahomack repertoire with a view to determining what sorts of monuments were erected there. The artistic and intellectual context of the monuments that are envisaged is discussed below.

Edge pieces (see Illus 5.3.39–41)

The Glebe Field assemblage includes a number of edge pieces that may derive from cross-shafts or slabs or buildings. Forty-

Table 5.3.2
Fragments assigned to types of moulding

Singular mouldings	Type E	TR20, 99, 106, 109, 128, 205 (dragon leg), 221 (Pictish beast), 222
	Type F	TR101 [not illus.]
Multiple mouldings	Type A	TR43, 44, 45, 47, 50, 51, 54, 55, 56, 58, 59, 67?, 68, 71,72, 86, 87, 89, 107, 122, 123, 124, 129
	Type B	TR42, 62, 66, 79
	Type C	TR103, 104
	Type D	TR57, 238
	Type G	TR242
	Type H	TR257

one examples were sufficiently complete to reveal the mouldings embellishing the angle between two orthogonal and adjacent faces. Only one piece (TR257) had sufficient surface in both planes to observe the continuation of recognisable ornament. There was no example of a complete width with two parallel faces. Two main groups and six variants (A–H) have been distinguished (Table 5.3.2).

Singular mouldings are represented by Types E and F. *Type E* has a single shallow convex profile 40–60mm wide, connecting two flat faces. F is incomplete, but likely to be similar, although both faces may not be flat. The convex border matches the top edge of TR20, so that membership of this group potentially indicates an association with a cross-slab. The top border of TR20 is 50mm wide, and the ribs of the panel sides are 25mm wide, but there is no border.

Multiple mouldings are represented mainly by *Type A*, the most prevalent numerically, which joins a moulded face to a flat face. The moulded face has a shallow moulding 30mm across nearest the edge and a steeper moulding 15mm across which borders it on the inside of the face. Types C and D are close variants of Type A. Minority variants B, G and H have symmetrical mouldings on both faces (Illus 5.3.40; ECMS I, 86 calls the A/B edge a double-bead moulded border). The mouldings of this group are not matched directly by the 'churchyard collection', and are not features of Hilton, Nigg or Shandwick. Similar forms can be seen on the Dupplin cross (back face) where the inner narrow moulding is used to contain the panels, and on St Andrews 21–4 (Henderson & Henderson 2004, Illus 278; Illus 264–7). Both of these are cross-shafts rather than cross-slabs.

A *plant scroll* occurs only on TR1 (Illus 5.3.3), and closely resembles that on Hilton of Cadboll (see below). It may be classed as an iconographic as well as an ornamental theme, since it is considered to represent the Eucharist (Henderson & Henderson 2004, 29, 138; Meyer 2005, 183, 190).

Key pattern is composed of abutted ribs of stone forming a geometric maze. Where the pattern is arranged in squares it recalls the lands of keys and may be referred to as key pattern (Henderson & Henderson 2004, 23, Illus 16). Six of the variants recorded in ECMS have been found at Portmahomack. The numerical majority of the Portmahomack examples consists of ribs 10mm wide and corresponds to ECMS no 974 (compare Drainie [Kinnedar] 14 (ECMS ii, 149); see Illus 5.3.38). It is well represented in the area (Rosemarkie 1 and 2, Shandwick) and further afield (Reay, St Vigeans 24, Meigle 4, St Andrews 1, 7, 8, 14, 20: Meyer 2005, 65n).

The key pattern on TR8 (see Illus 5.3.5) is shared with Shandwick and Burghead (ECMS no 14). TR13 (Illus 5.3.7) has a band of fret pattern on one side equating to ECMS no 977, which appears at Kells, Ireland (ECMS I, 354). Key pattern 829B, which is closest to the design that appears on Face A of TR40 (see Illus 5.3.27), appears on the cross-shaft at Nigg, as well as on monuments at Ulbster, Canna, Kilmartin, Burghead, Aberlemno, Ardchattan, Abercorn and Norham in Northumberland. The key pattern on TR6 (Illus 5.3.4) is closely related to ECMS patterns nos 1020 and 1022, and finds a close parallel on the Monymusk Shrine (Meyer 2005, 200). Carved stone *bosses* with key pattern wreaths occur at the centre of the cross-heads of St John's and St Martin's crosses at Iona (RCAHMS Argyll 1982, 6.82, 6.83; Fisher 2001, 131–4). The stone boss with a decorative relief has obvious ties to metalwork, especially to the raised metalwork bosses found on Irish shrines, characterised by a central jewel or smooth metalwork stud and surrounded by filigree wreaths (Meyer 2005, 51). The specific relationship with the metalwork bosses on reliquary shrines might be significant, as it has been suggested that certain cross-slabs, especially those with a particularly 'metallic' appearance might have functioned as types of public reliquaries reflecting the appearance of specific metalwork shrines more privately located within ecclesiastical centres (Henderson I 1993, 216).

The *spirals* are similar to those seen on Hilton (ECMS no 1078) and Shandwick (ECMS no 1079). Some have elliptical pellets at the corners, as in ECMS pattern no 1025 (TR128). At Portmahomack there are fifty-four examples on fragments of panels (see Illus 5.3.37), and four spiral bosses (TR 128, 130, 144 and 145; Illus

5.3.38). Peltae forming C-shaped connections between spirals and terminating in smaller spirals of their own can be found on Nigg and Shandwick as well as on St Vigeans and Keills, just to name a few examples (Pattern nos 1051–5, 1066–71 in ECMS *I*, 389–90).

In general, spiral and peltaic forms are found on carved stones throughout Pictland, *Dál Riata* and Ireland, and the motif seems to be typically 'Celtic' (ie occurring in Ireland and west and north Britain), not frequently appearing on Anglo-Saxon stones, though a notable exception is a late eighth- to early ninth-century carved panel from South Kyme, Lincolnshire (Everson & Stocker 1999, 248–51, Illus 339, 343). The triple-band spirals in this panel are connected by simple peltae, one of which is embellished with a floriate design not unlike those on TR7.

Spiral designs are also prolific on Celtic metalwork from the sixth century, appearing on both secular and religious objects and those of less certain function, such as hanging bowls with decorated escutcheons (Youngs 1989; Bruce-Mitford 2005). The Tara and Hunterston brooches display spirals and connecting peltae with almond-shaped floriate embellishments (Meyer 2005, 114). The spiral panel on the early ninth-century Brunswick, or Gandersheim Casket, though based on the triskele type, does contain trefoil embellishments at the extremities that resemble the almond-shaped leaves in the peltae on TR7. It is quite likely that this design was influenced by the virtuoso variants of spiral and peltaic ornament in the *Book of Kells, Book of Durrow,* and the *Lindisfarne Gospels,* all of which feature triple-band spirals and elaborately decorated peltae (Meyer 2005, 115n). The *Book of Durrow,* in particular, features peltae with almond-shaped 'leaves', rather than the simpler triangular embellishments (Meehan 1994, 18, 65).

Spiral pattern no 1096, found on and around the central bosses within the wreath of TR5, is found on a variety of insular objects, such as the Lullingstone bowl, the *Book of Durrow*, the *Book of Kells,* and on the Maiden Stone, St Vigeans 6 and on the Kilnave Stone (ECMS 1, 398). Small raised bosses connected by peltae can be seen on a variety of Irish High Crosses such as the ninth- to tenth-century cross at Durrow, Co Offaly; early tenth-century Cross of Scriptures at Clonmacnoise, Co Offaly and the tenth-century Muirdach's cross at Monasterboice (Richardson & Scarry 1990, 38, plates 63–6, 85–8, 158). TR5 is paralleled by a wreath with seven bosses at Carpernwray, Lancs (Illus 5.3.48).

Interlace

There are twelve examples of single-strand interlace, mainly from the churchyard, and at least forty-one examples of a type with an incised median line or groove, all from the Glebe Field. Among the singular examples, the pattern on TR2 has no direct parallels but is quite similar to ECMS 708, which is found on the central panel of the cross-head on the Nigg slab (ECMS I, 281, II Fig 74). ECMS 619 (seen on TR17) is carved on St Madoes 1, illuminated in the Stockholm Gospels and the Vespasian Psalter, and worked in metal on the Hunterston brooch and a penannular brooch from Mull, as well as on the croziers of St Damhnad Ochene and St Dympha (ECMS, I, 239). TR149 and TR14 have single-strand 10mm-wide knotwork ('knitting') (Illus 5.3.35). Interlace pattern 658A (on TR14) appears on St Andrews 14, the Kells crosses in Ireland and in the *Book of Durrow* and the *St Gall Penitential*. The *interlace* patterns 713 and 714, which are closest to the design on Face B of TR40, can be seen on slabs at Collieburn, Brodie, Glamis 2, and Gattonside.

The interlace type dominating the Glebe Field assemblage (and confined to it) consists of rounded strands 20–30mm wide incised with median lines or grooves (see Illus 5.3.36). *Median-incised interlace* occurs widely in Pictish areas, for example on St Andrews 14, 31, 15 (ECMS II, 363), Abernethy, Kirriemuir, Benvie, Glamis and Drainie (Kinnedar). But it is also widespread in the rest of Britain: at Melling, Neston and Lancaster St Mary in north-west England (Bailey 2010); Whithorn and locality (ECMS ii, 481–91), Govan (ECMS ii, 462), Gattonside, Melrose (ECMS II, 432) in south-west Scotland; at Sutton on Derwent, Lastingham and Hackness in Yorkshire (Lang 1991); in south-west England at Gloucester (London Road) (Bryant 2012, Illus 357; where it is dated to the mid-ninth century) and Ramsbury and Knook (Cramp 2006b). The dates given are late, ranging from the late eighth to tenth century, although some examples, eg Teffont Magna in south-west England, have been dated to the eighth/ninth century, which would suit Portmahomack (Cramp 2006b, Fig 518). Some of these ornamental forms raise the possibility of associations with the British areas of the west as opposed to, or in addition to, the more familiar parallels with Northumbrian and Irish motifs (Illus 5.3.48; 5.3.50).

Figurative

A number of *animals,* real and imaginary, were fashioned by the Portmahomack carvers.

Those on TR1 (Illus 5.3.3) are unidentified (but see iconography below, where Meyer identifies the most prominent beast as a lion). The front face of TR20 (cross-side; Illus 5.3.13) has a composite beast, with fangs, a snake's-head tongue and snake's-head tail, and legs terminating in hooves with claws. On the reverse side of TR20 is a row of clerical figures carrying books, and in an upper register two lion-like creatures confronted over the half-carcass of a deer. A bear-like animal is seen at the top right. The face TR201 (Illus 5.3.28) is likely to belong to this monument, as is also the leg TR205 (Illus 5.3.29), which should derive from a symmetrical confronted beast.

The sarcophagus lid TR22 (Illus 5.3.16d) features two 'strolling' animals, a lion and a boar, moving towards the head of an unidentified third. TR28/35 (Illus 5.3.43) presents the busiest animal pageant. A family of cattle occupy the lower register, a cow and a bull, the latter licking a calf. Above this bucolic scene a large lion confronts the knees of a horse, and above that a creature with a sharp beak menaces a lamb-like victim. TR218 (Illus 5.3.30) takes the form of a bird's head. Fragments TR221/222 carry parts of a Pictish beast in low relief (reconstructed in Illus 5.3.31). Other fragments have elements in low relief suggestive of a leg, an eye and an ear (Illus 5.3.32). TR100/227/260 appears to belong to a creature with a ribbed or hatched body (Illus 5.3.32). TR216 shows two horse-like creatures with opposed hooves and affronted heads (Illus 5.3.33). Most of these parts of stand-alone creatures are referenced on Pictish sculpture elsewhere, as at Meigle (ECMS II, 330–7; see also Illus 5.3.48c). A cross-shaft (now reused as a lintel) at Acton Beauchamp (Herefordshire) dated to the early ninth century also features curvilinear ribbing on a number of birds and animals (Bryant 2012, 281, Illus 496). At Gloucester St Oswald's 4, a creature with a ribbed body and an arrowhead tail stands on a patch of median-incised interlace. This composition is dated to the mid-ninth century (Bryant 2012, 211, Illus 289, 291). Serpents are prominent on TR2 and the Nigg and Shandwick cross-slabs. As well as signifying death and redemption, they have been suggested as showing a link with the Columban *familia* and the western liturgy (Meyer 2011, 186).

Crosses and other symbols

The forms of the *cross symbol* in the Portmahomack collection are very diverse and range from the simple scratch marks of TR24 and 25, to the elaborate saltire cross proposed for TR20 (see Illus 5.3.53). A well-established hypothesis relates the simple cross-marked stones as evidence for the advance of Christianity through the countryside, but varieties of cross form may also indicate regional preferences (Henderson & Henderson 2004, 165). The admixture of types seen at Portmahomack might be explained as a chronological evolution, where the design (and increasing expertise) reflect changes over a century or more. But there is no archaeological bar to all the carved stone grave markers standing in Period 2 and given the short span of monasticism at this site, another reading could be that of social difference, and yet another the exercise of liturgical preference in an age of experiment.

Kellie Meyer (2005, 249ff) has reviewed the *forms of the cross* on the peninsula noting references to wider Pictland and to Iona. She interprets TR33 as combining the form of the *majestis crucis*, *crux gemmata*, the *suspendium* and *patriarchal cross*. The presence of such a cross at Portmahomack means that the ritual of *adoratio crucis* was probably practised there. The patriarchal cross features on Iona 18a and on the Monza reliquary and other reliquaries, and on Merovingian coins (Meyer 2005, 250–4). The *saltire cross* proposed for TR20 (see below) finds some echoes in illuminated manuscripts (the *Book of Kells* and the *Book of Deer*) which use the diagonal form to divide a page (Henderson & Henderson 2004, 218). The form is associated with St Andrew, executed on an X-shaped cross, but Meyer (ibid) derives it from the chi-rho, as re-employed by Constantine for the Roman imperial standard. The wide variety of cross forms used at Portmahomack and on the peninsula indicate a highly developed and well-informed Christian community.

The *Latin inscription* on TR10 also signifies a mature eighth-century atelier. It is composed in insular majuscules and rendered in low relief and is the longest so far known from Pictland. The inscription has been read: '[I]N NOM[IN]E IHU X[PI CRUX XRI [IN] COM[MEM]ORA[TIO]NE REO[..]LII [D]IE HA[C]', translated as 'In the name of Jesus Christ, the/a Cross of Christ in memory of Reo[….]lius…. on this day' (Higgitt 1982, 306). The lettering is closely connected to that of the Lindisfarne Gospels, suggesting that a similar codex was present at Portmahomack, although the lettering on the cross is trending towards that in the Book of Kells, suggesting a date in the second half of the eighth century (ibid, 317). In the last century, the name 'REO …' was read as 'REOTETII', and identified it with 'Reothaide or Reodaide whose death is recorded under the year 762 in the Annals of Ulster, and under 763 in the Annals of Tigernach. In both he is called 'Ab. Ferna', which however is understood to be Ferns in Ireland [as opposed to Fearn in Easter Ross], and the difficulty of connecting him with Tarbat remains' (ECMS II, 95). Higgitt considered that 'the traditional identification of the name as that of an eighth-century Irish abbot of Ferns is not compatible with the extant letters on the stone' and he believed that the name was probably Pictish (1982, 317).

Pictish symbols are clearest on TR1, where they are rendered in relief along one edge. Four symbols may be identified which are (in descending order) the crescent and V-rod, the sword or 'tuning fork', the snake and Z-rod and the Pictish beast (Illus 5.3.2). A Pictish beast featured in TR108/221/222, possibly constituting panels from a sarcophagus (Illus 5.3.31). Pictish symbols were carried on all three major surviving monuments on the Tarbat peninsula (Illus 5.3.44). The most convincing attempt to assign meanings to the symbols suggests that they signify personal names (Samson 1992; Forsyth 1997). At Portmahomack, the execution in low relief and the location on the edge of the slab used both for the symbols on TR1 and the inscription on TR10 corroborate that function: the memory of a named individual. The Latin inscription and the Pictish symbols may be considered as analogous ways of labelling the monuments. While not providing a 'Rosetta Stone' for the Pictish language, the 'names' signalled on TR1 and TR10 show that the monastery at Portmahomack was a project in which Picts were prominent (see Chapter 5.10).

Iconography

Animals in insular art perform both by virtue of their own symbolic properties, and the role they are portrayed as playing. Beasts celebrated for their fierce temperaments were depicted as having been tamed by Christ. The damaged figurative scene on TR1 has been argued to be *Daniel in the lions' den*, a strong redemption theme (Meyer 2005, 185–8; 192ff). Serpents (on TR2), which signify death, are overcome (Meyer 2005, Ch 2; 2011, 182–3). Distressed animals menaced by composite beasts (as on TR28/35) are seen as signifying aspects of the world's terror, which Christ can control (Henderson & Henderson 2004, 85). The lion and the boar, which occupy adjacent niches on TR22, are noble if dangerous beasts, denoting royalty (Meyer 2005, 237). The bird on TR218 also echoes the theme of nobility, since the falcon, eagle and bird of prey have been shown to have been adopted by the Byzantine and European aristocracy in the seventh century (Akerström-Hougen 1981). Meanwhile, the family of cattle portrayed on TR28/35 has been interpreted as a holy family 'representing the old and new covenants' (Meyer 2005, 247).

The scene on the upper register of the back face of TR20 features two lions disputing or sharing the half-carcass of a deer, while a bear slinks to the top right. For Meyer this is a reference to sheep in peril in 1 Samuel 17:34–37, a text which also mentions a bear; the scene would be followed by David rending the lion's jaw (Meyer 2005, 224). For Henderson and Henderson (2004, 142) the tableau illustrates Genesis 15, 9–11, where Abraham obeys God's command to make an offering of a heifer, a goat and a ram, dividing them *per medium*. Jeremiah 34:18–20 expatiates on a covenant with God that depended on a correct division in two equivalent parts: the lions could represent the princes of Judah who failed to fulfil the covenant.

The lower register of TR20, reverse, shows four *clerical figures*. These recall the apostles on the Cuthbert coffin and the identification of apostles is endorsed by the recognition of St Andrew from his heavily dishevelled hair, as portrayed on a sixth-century mosaic at Ravenna. The left-hand figure has lower shoulders, so may be seated, and a nimbus, so may be Christ. But the right-hand figure stands at the edge of the stone, so this would imply a representation of Christ and six apostles, and may imply an association with baptismal sites (Bailey 1996, 58–9; Lang 1999; Henderson & Henderson 2004, 146–7; Meyer 2005, 215). Alternatively, they may offer an image of a priest celebrating mass (Meyer 2011, 189). However, our reconstruction prefers twelve apostles in a row for reasons given below. These observations suggest that all the iconographic material at Portmahomack fits within an orthodox Christian context, and indicates a wide knowledge of Christian teaching and symbolic language. The contemporary, and more complete schemes featured on Hilton, Shandwick and Nigg reveal a still broader intellectual repertoire (see pp 249–56).

Affiliations

In sum, the ornamental and iconographic references place the Portmahomack assemblage in the eighth up to the early ninth century, with links to Ireland, west Scotland, south Pictland, Northumbria, Mercia, Cumbria and south-west England. Some art historians have argued for a special relationship between Pictland and Mercia (Henderson 1994, 81; Webster 2012, 143–6) and Plunkett was led to expect Mercian-Pictish connections by a documented alliance between Athelbert of Mercia and Angus son of Fergus in 750 (1998, 225–6). The latter rightly accepts that connections were not diffused, but targeted, and assumes that these targeted links result in the production of similar kinds of aspirational art, as from Breedon to the St Andrews sarcophagus (ibid, 213). On these readings, Mercian carvers taught Pictish sculptors the art of carving in high relief, and this in turn explains the quality of the Portmahomack corpus. Some reinforcement of this view might be gleaned from the artistic Mercian references seen on the 'book plaque' (14/1286; see Chapter 5.6, p 211).

However, the course of artistic currents and their direction of flow can be misleading: rather we may be seeing the surviving nodes of an interrupted network. In her study of early Mercian sculpture, Rosemary Cramp notes that three of her four schools have links to neighbouring areas, while the fourth (Group 1), comprising Breedon, Fletton, Castor and Peterborough, is grand, architectural, innovative and engages with eastern influence (1977, 192, 194, 206). This group is consequently more diagnostic of the state-of-the-art rather than a regional speciality. If Breedon, St Andrews and Tarbat resemble each other, that is because they flourished at the same time, not because cultural credit always moves from south to north or west to east. The missing links disentitle affiliation, and not only in Pictland where the 'authentic independent insular voice' is surely the norm (Henderson & Henderson 2004, 217). Similarities then become artefacts of the period rather than results of diffusion: diffusion is not required. As Nancy Edwards reminds us, 'sculptors, metalworkers and indeed manuscript illuminators on either side of the Irish sea in the late eighth and early ninth century had a similar outlook, a similar attitude to art and design and were working in a similar milieu' (1998, 225–6). Although a late eighth-century flowering focused on Mercia suits the political reputation of Offa, it is as likely that the innovative sculpture formed part of a more widespread contemporary initiative, spearheaded in the north and west by the fundamentalist monastic movement (p 175). For this reason also,

Table 5.3.3
Direct association of moulding type with ornament

Moulding	Spiral	Spiral boss	Key	Median incised interlace
A	123, 124, 129		72, 86,	
B			62	
C				
D				
E		128		
F				
G				
H				257
U				257
No border		130, 144, 145–7		

Table 5.3.4
Association of conjoining sets with moulding type [K=key; I=Interlace; S=Spiral]

Moulding	Conjoining set 1	Conjoining set 2	Conjoining set 3	Conjoining set 4	Conjoining set 5
A	43 (S?), 44, 45, 47, 54, 55, 59, 68, 72 (K), 107, 114(S), 129 (S)	56, 67?			
B	62 (K)--------------	66, 42, 79			
C					
D					
E					
F	101				
G					
H	257 (I)				
U	58, 60, 69 (K), 74, 78, 97, 257 (I)	243 162(I), 163(I), 171(I)	38 (I), 156(I), 177(I); 239(S)	229(S), 231(S), 233(S), 237(S),	217, 223, 263 (label-stop)

it is reasonable to expect that art will celebrate saints as often as kings.

Reassembling the Portmahomack monuments

Associations between pieces

There is a distinction in the usage of ornament as between the Glebe Field assemblage and that in the churchyard. The *key pattern* falls into two groups: the more numerous Glebe Field collection and the five singular examples from the churchyard. In the repertoire of *spirals,* the group of four *spiral bosses* connect to TR20 via a Type E edge, but the remaining spirals, mainly in low relief, seem to belong together in the Glebe Field, with at least one conjoining group. The *interlace* likewise falls into two groups, the numerically dominant type (median incised) in the Glebe Field, and the smaller group of twelve diverse types predominantly from the churchyard. The Glebe Field group also shows a general distinction from the churchyard in its preference for mouldings: Types A–D, G and H as opposed to Types E and F, which occur in the churchyard. If all the ornament in the Glebe Field were to be assigned to TR1, 2 or 20 we would have to suppose that, as with the Dupplin Cross, the double-bead moulding occurs only on their lower half, and that this was the part transported to the Glebe Field and broken up there, while the upper half remained near the west end of Church 1 and was broken into larger pieces before being incorporated into the foundations of Church 2. This is unlikely.

The implication is that the broken pieces in the assemblage from the Glebe Field (Int 14–24) largely represent parts of a different monument to those that survived in the churchyard.

This monument featured type 974 key pattern, flat spirals, median-incised interlace and edges with double-beaded moulding. In general, it is the Glebe Field assemblage that has the forms of ornament that are later in date.

The scattered components of the three cross-slabs in the churchyard and the Glebe Field monument were assigned largely from physical and stylistic associations. Table 5.3.3 shows the few direct associations that were observed between ornament and mouldings. Table 5.3.4 shows the five main sets of conjoining fragments, and the mouldings and ornaments with which they are associated. Conjoining Set 1 includes four fragments with flat spirals and three with key pattern that connect with Type A, B or H moulding. Conjoining Set 2 also connects to A and B mouldings, although they report no ornament. Spiral boss TR128 connects to Type E moulding, as by implication do its three similar bosses (TR130, 144, 145). The ornamental groups as well as the pieces that conjoin were found near to each other on the ground, reinforcing the impression that these remains resulted largely from the breaking of a single monument (Illus 5.3.21).

It can be deduced that a major monument was broken up in the Glebe Field that featured type 974 key pattern, flat spirals and median-incised interlace, and that it should date towards the end of Period 2 (late eighth /early ninth century). These associations represent an example of a varied repertoire. Median-incised interlace occurs with regular key pattern at Collieburn (near Kintradwell, Brora; ECMS II 52). Median-incised interlace and regular key pattern occurring with double-beaded moulding can be seen at Gattonside, Melrose (ECMS II, 433) (see Illus 5.3.50).

By the same token, there should have been at least three monuments thrown down in the churchyard, of which TR1, 2 and 20 respectively survive as the parent pieces. Few pieces from

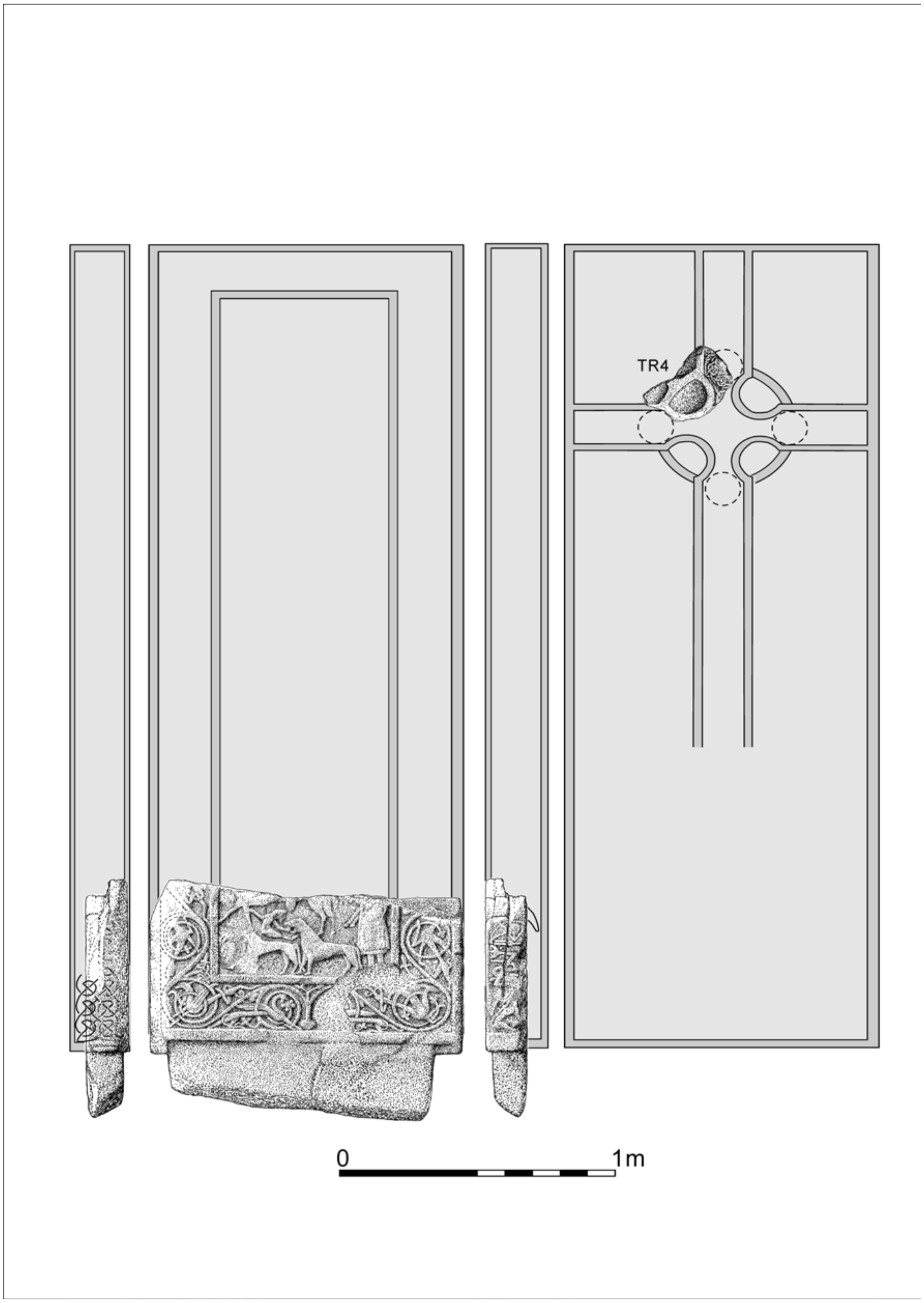


Illustration 5.3.51
Proposed form of Cross A

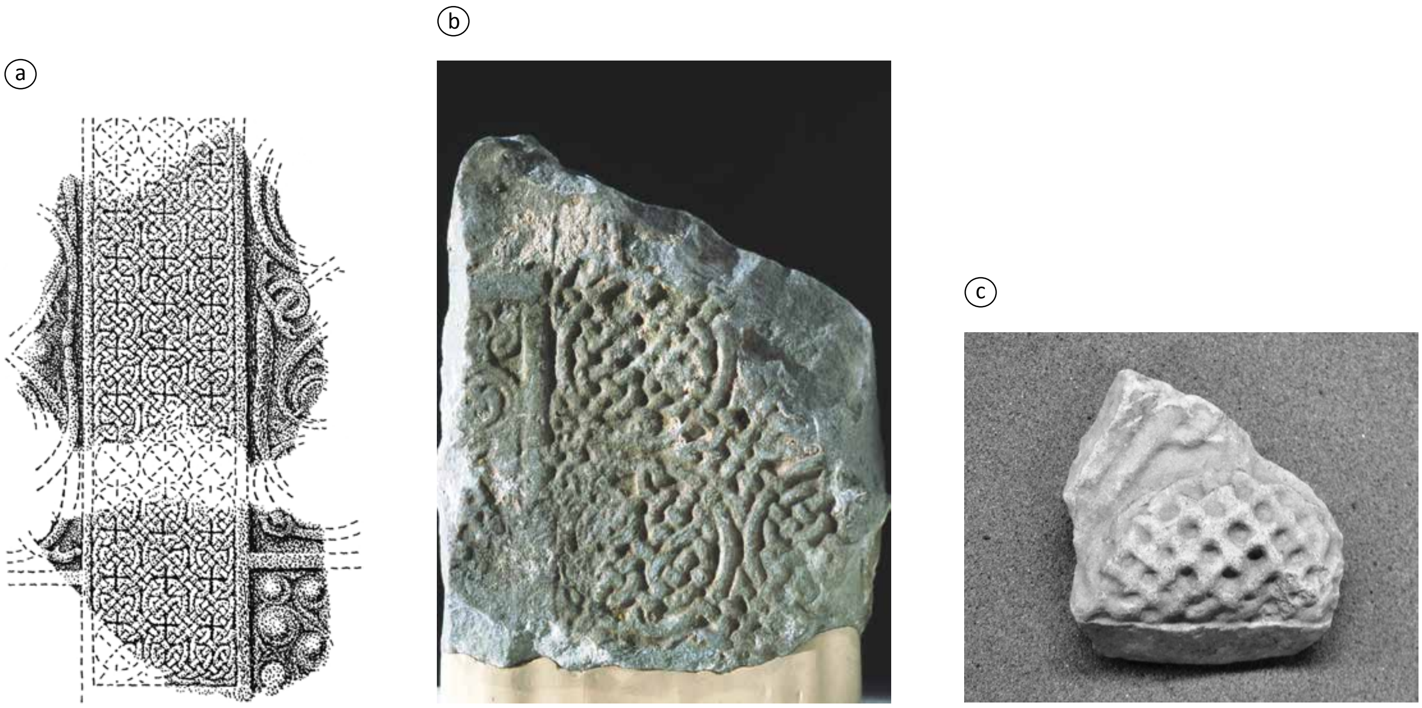
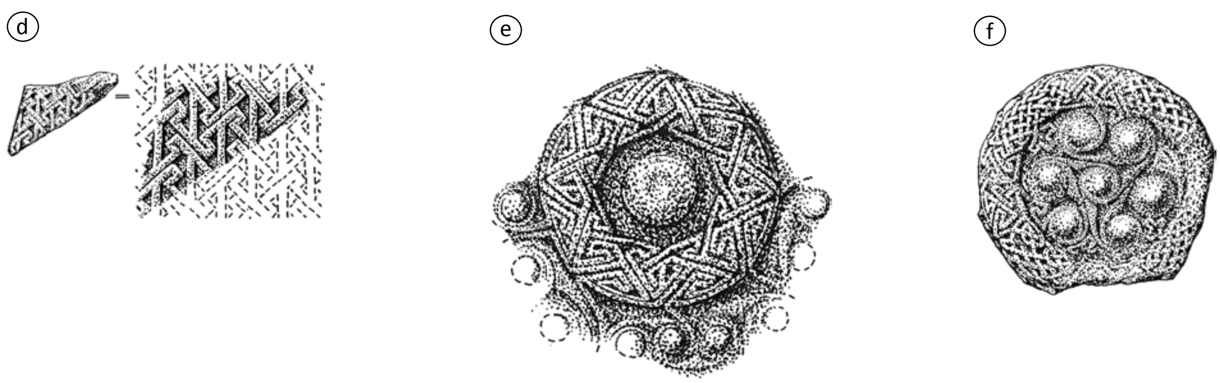


Illustration 5.3.52
Components of Cross B: (a) TR2; (b) TR40; (c) TR39; (d) TR8; (e) TR6; (f) TR5



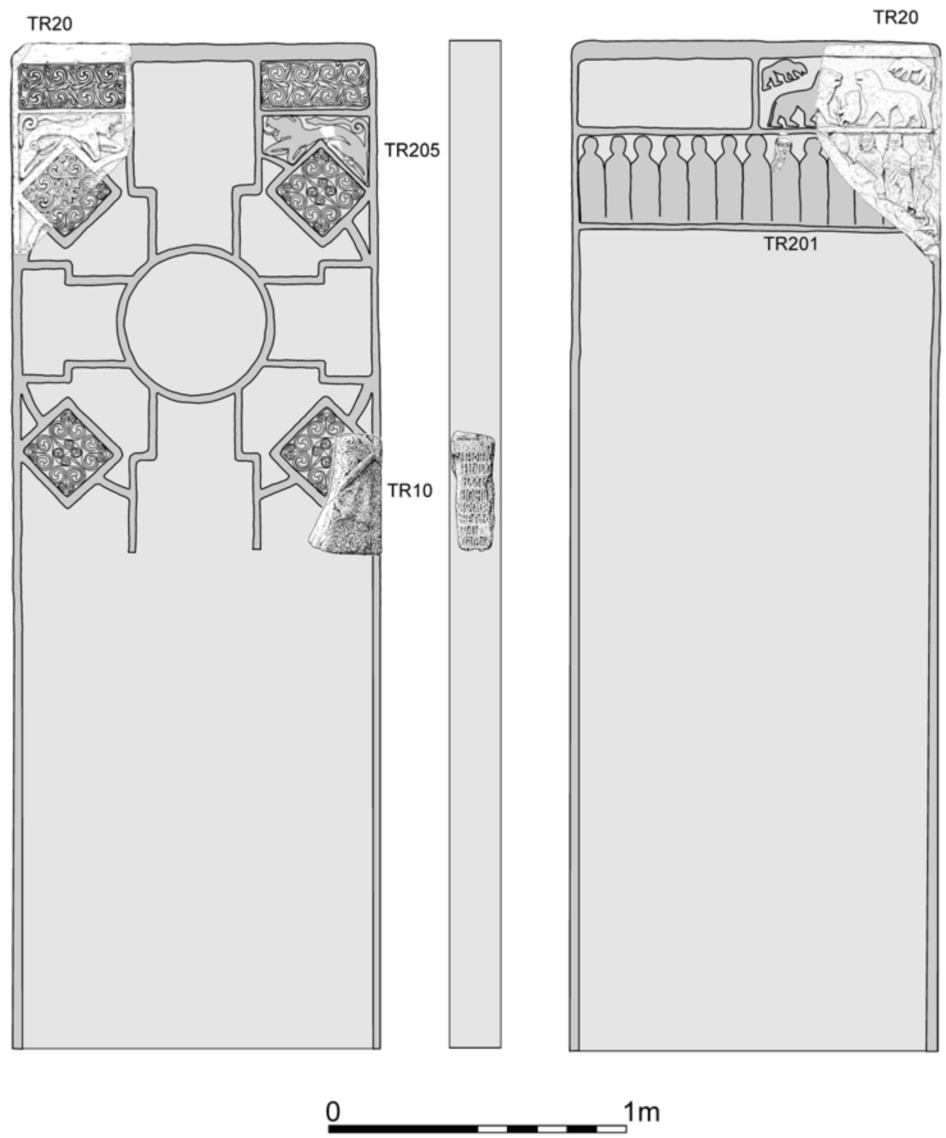
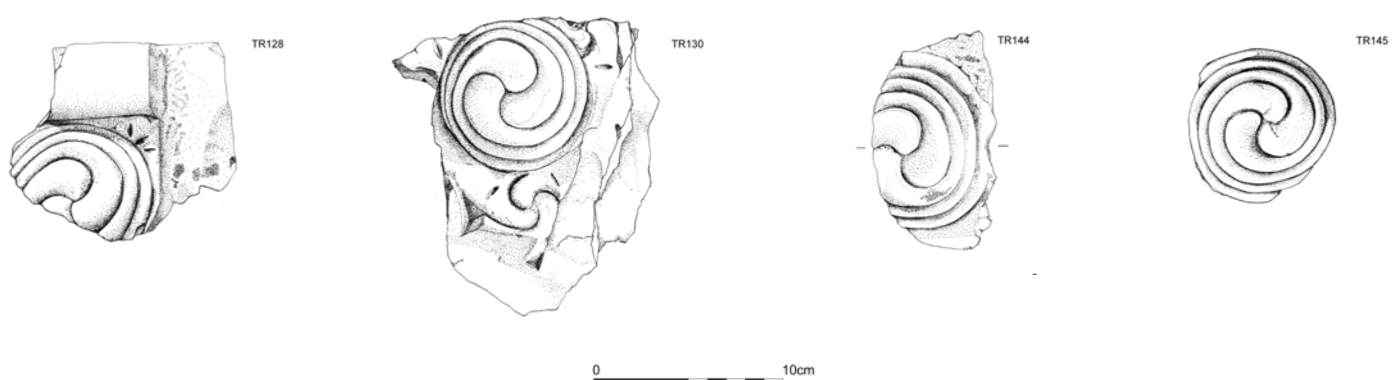


Illustration 5.3.53
Proposed form of Cross C



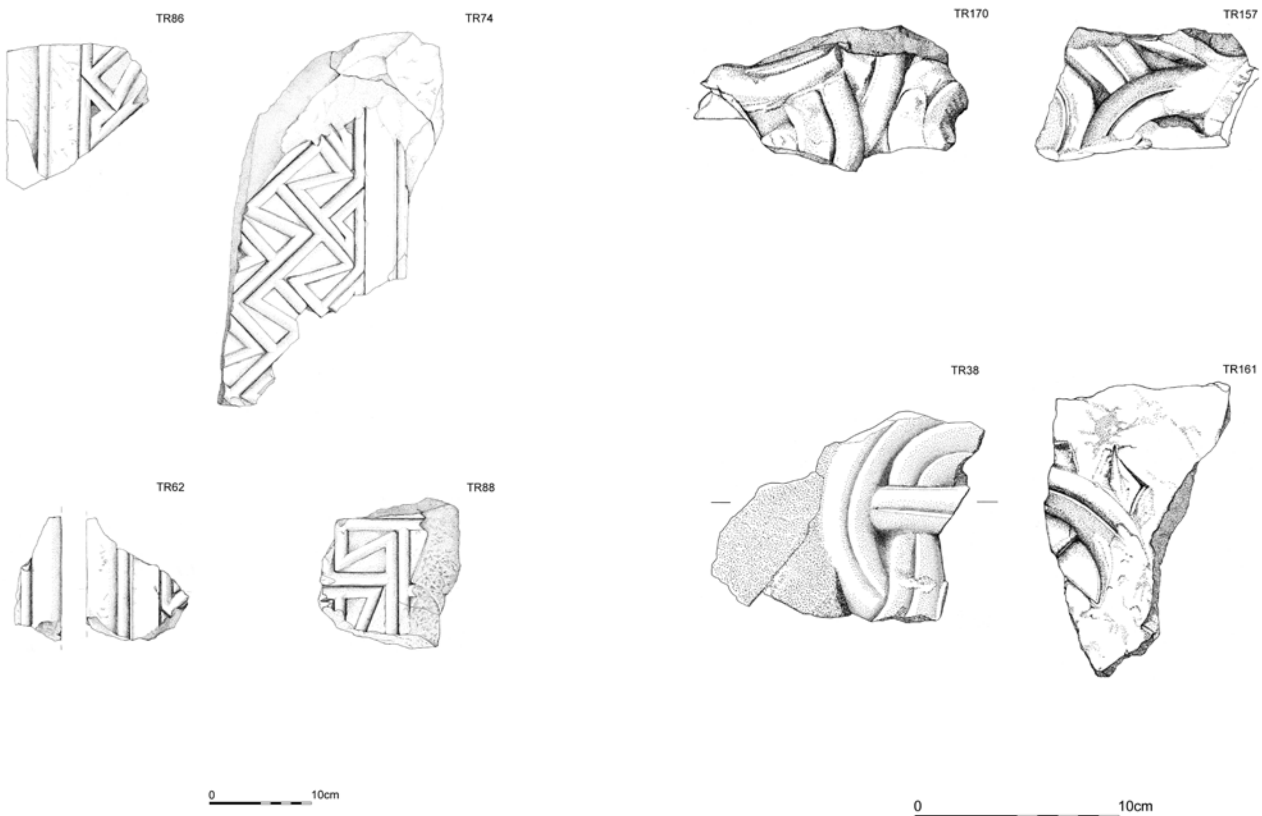


Illustration 5.3.54
Ornamental components of Cross D

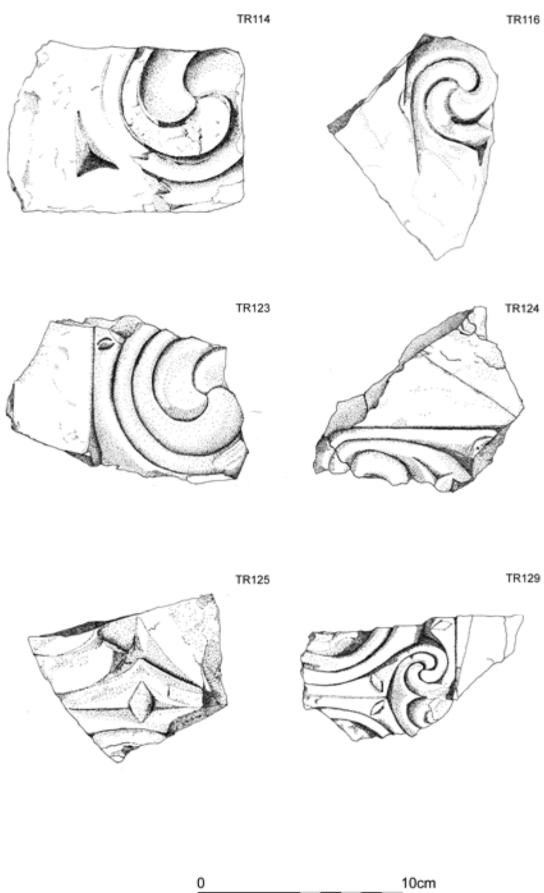


Illustration 5.3.55
Sculptor’s chisel (24/4921)

Table 5.3.5
Associations of fragments with hypothetical cross-slabs

Parent piece	Location	Geological associations	Stylistic associations
CROSS A TR1	E of Cross B	TR4; TR6 [Miller]; TR7?	TR7
CROSS B TR2 'Danish Cross'	E of Church	TR5, 6, 8	TR4, 5, 6, 9 (centre piece), TR39, TR40
CROSS C TR20	NW of Church	TR10, 20; not TR7	TR10; TR9 (centre piece), TR201 [face of holy man]; TR205 [dragon leg]; TR218 [bird]; TR216 [horses]; TR260 [ribbed body]; TR108/221/222 [Pictish beast]; Spirals TR128, 130, 144, 145; Type E, F mouldings
CROSS D	W of Church		Type A–D, G, H mouldings; flat spirals; key pattern; median-incised interlace

the Glebe Field assemblage can be assigned to this more distant group, but there are some. As mentioned above, TR201, the face of a holy man, matches the apostles in TR20 and is the same size (50mm across) (Illus 5.3.28). TR205, a hoofed and clawed leg, matches the dragon in TR20, and appears to belong to a beast that is a mirror image of the first and confronted with it (Illus 5.3.29). TR216 (horses) and TR260 (ribbed body) have an edge moulding that resembles the Type A/G group less than the Type E/F group, so both may belong to cross-slabs in the churchyard. The corner piece TR221/2, which carries a Pictish beast, is also designated as having a Type E moulding, so may have belonged to TR20. If the beast runs head up (as TR1) it could sit in a side panel, leaving its orthogonal face (with the mysterious leg in the air) to form a back panel. In this position it might have served as the back corner of the missing half of TR20. Although not claiming an E moulding, TR108 provides a corner fragment not dissimilar in form. An alternative (and preferred) interpretation of TR108/221/222 is that it forms part of a sarcophagus. In either case, the Pictish beast is likely to be performing in a high-status ecclesiastical context.

The type of monument broken up in the Glebe Field

The majority of the pieces found in the excavations in the Glebe Field were recovered from a grey brown soil with charcoal (C1510, C1547) laid down over the demolished monastic workshops. Most of the pieces showed evidence for being freshly broken up shortly before burial, for example TR111 where the back had been sheared away by a single blow. Only one example was noted as 'quite abraded'. Staining was seen on several pieces that were investigated to determine whether the discolouration had arrived on the stone before or after burial. Of the thirteen examples cited as having staining attributed to the presence of iron or minerals, all that had precise locations lay close to each other around the four square metres 882/3, 994/5. On one example, TR66, the staining was noted on the face of the broken edges. This and the proximity of the findspots suggest that this staining was post-depositional.

Evidence that the sculpture had been subjected to burning was noted on several examples: TR42 and 65 showed cracking, TR84, 109, 131, 147, 187 and 188 were discoloured red or pink apparently by heat, TR82, 98, and 207 had black accretions and TR57 and 70 had dark patches. The distribution of these was a little broader than those with staining, over nine square metres from 880–883 E and 993–996 N. None of these pieces conjoin. Some support for the idea that the sculpture had been subject to fire before being broken up is given by the pieces TR145 and 147, which conjoin and both of which were affected by heat. Against this is the observation that very few of the edge pieces appear to have been burnt, and yet they would be most vulnerable to a fire in situ. The association with a soil in which evidence for burning was prevalent suggested that the sculpture had either been broken up and dumped before a fire took place in the workshop area, or was broken up and gathered together with burnt debris and then dumped on the workshop area. In either case it can be argued that the breaking of the sculpture and the fire were close to each other in time. Seven pieces were noted as having traces of *red pigment* (TR149, 160, 162, 163, 164, 171, 181). These were all examples of interlace. They were distinguishable from 'reddening by heat' and no example featured both. Unlike the other colouration, this can be attributed to the painting of the original monument.

The presence of a dominant group of border pieces, many of which conjoin, argues for a standing cross-shaft with a double-beaded moulding at its corners. The borders also argue for the presentation of the iconography in framed panels, as at Dupplin. The observed links between the border pieces and key pattern (TR72) and spirals (TR129) suggest they belonged to the same composition. Although forming a different interlace pattern, the tight knotwork of TR14/149 was also painted red and TR149 was found with the dominant median-incised interlace in the Glebe Field.

Unfortunately no edge piece survives to a complete thickness. The only complete width observed in a piece with two parallel faces was TR221/222, which was 165mm thick. This differs by 13mm from TR20 (178mm), but is nearly the same width (168mm) as the inscribed stone TR10, which could derive from the same monument. On the other hand TR10 is incomplete. TR40 has a thickness of 190mm. TR1, which had had its back removed, is 152mm thick. Shandwick is 210mm thick, Nigg is 127mm. Hilton is 210mm thick at the base and 240mm thick higher up, and the upper part would have been even thicker before the removal of the cross face in or before 1676. The variety of dimensions observed in the same monument makes association (or disassociation) by thickness alone a capricious exercise.

Forms of the demolished monumental crosses

The question of how many cross-slabs once stood at Portmahomack was addressed by examining three criteria of association: geological, stylistic and location of discovery on the ground (Table 5.3.5). Geological investigations (p 137) provide associations that are often tentative, since all the pieces are made from a broadly similar sandstone. However, the evidence would appear to be reasonably strong that TR10 and TR20 can belong together but not to the same slab as TR2. TR1 is 150mm thick and TR2 is 50mm thick; it is therefore possible that TR2 was planed off TR1, which was originally 200mm thick, and thus close to TR9. The bosses TR5 and TR6 can both belong to the same stone as TR2. However TR1 is reported as geologically associated with TR20 and the grand monuments at Nigg, Shandwick and Hilton, but not with TR5 or TR6. TR7 cannot belong to TR20. Thus there are at least three slabs, based on TR1, TR2 and TR20. The bosses TR5 and TR6 should belong with TR2 and TR7 should belong to TR1 or TR2.

Miller thought that, geologically, TR1 could belong to the same slab as TR2 (above), but although both were found east of the church, they seem to have originated from separate locations. Since the 'other half' of TR1 was buried in a grave, its association with many of the larger surviving fragments is unlikely. In particular TR9, which represents a centre and a whole width of a slab, and TR4, the arm of a cross, are likely to have belonged to the top centre of a slab, so they should more readily find a home with TR2 or TR20. Stylistically, there is a family of pieces associated with TR2 and another with TR10/20. TR14 might have belonged with TR20 or TR2; the location would favour the association with TR20. TR1 does not obviously connect with either TR2 or TR20.

On this scheme *Cross A* is represented by TR1, TR4 and possibly TR7. It stood to the east of Church 1 (and east of Cross B). It is the Class II cross-slab noted by the Ordnance Survey. *Cross B* is represented by TR2, and possibly included TR4, bosses TR5, TR6, key pattern TR8, centre piece TR9, boss TR39, and TR40). It stood to the east of Church 1 (and west of Cross A) and is the 'Danish Cross' referred to in the nineteenth century (see p 123). *Cross C* is represented by TR20 and TR10, and possibly apostle TR201, dragon leg TR205, bird TR218, horses TR216, ribbed animal TR100/227/260, Pictish beast TR221/2, corner TR218 and spiral bosses TR128, 130, 144, 145. Its original location is unknown, but it was found scattered between the Glebe Field (TR201 etc; Table 5.3.6), the medieval vault (TR20), the churchyard (TR9) and the post-medieval manse (TR10). If Cross D stood near its wreckage, a suitable place for Cross C might be on the mound to the west of Church 1 or on the north side of the churchyard near the road (Illus 5.3.55).

The Nature of Cross D

Cross D is represented by the double-beaded mouldings, median-incised interlace and key type 974 on pieces deposited in the Glebe Field. These could belong to a cross-shaft, but before settling on that, the possibility was examined that some of the material may have been architectural. This was certainly the case for the remarkable corbel TR217, an object that is singular in every sense, there being only one example at Portmahomack and no parallels from elsewhere. The use of an ornamental corbel in the twelfth century and later includes the support of a roof, the support of an arch or the support of a lintel. While corbels serving to support a roof should be several in number, the corbels flanking a doorway or chancel arch could be as few as a pair, and this is its most likely role.

The expectation that arises is that other pieces of the Glebe Field assemblage might have had an architectural function. It is not impossible that the smooth moulded edge pieces performed as cladding for moulded jambs or lintels, such would be implied by the high quality of the corbel. The Dunblane stone, cited by Henderson and Henderson as a likely lintel and inferring the presence of a church (2004, 209), places passages of median incised interlace, key pattern and animal interlace side by side much as is proposed here for Cross D. On the other hand, there were no traces of mortar on any of the pieces or on the corbel, nor was there any obvious masonry included in the debris deposited over the burned workshops. For this reason, the panels with interlace, spirals and key pattern might be better placed on a cross-shaft. The matter should be left open until other large assemblages are excavated, preferably with the total excavation of a contemporary church. At Portmahomack, the assumption *pro tem* is that the Glebe Field assemblage belongs by and large to a demolished free-standing cross-shaft of the late eighth to early ninth century.

Models

Cross A finds its principal echo in Hilton of Cadboll. No fragment of vinescroll has been identified among the pieces recovered elsewhere in the assemblage and it is assumed that the upper half of TR1 (and its trimmings) lies buried somewhere near the Dingwall memorial. It will have had a cross on one side and historiated panels on the other, perhaps continuing the one that survives. The original slab should have stood some 3m high (Illus 5.3.51). *Cross B* is rich in bosses and should owe much in its design to Nigg, but the fragments are too exiguous to propose a form (Illus 5.3.52). The reconstruction for *Cross C* is based on Elizabeth Hooper's model for TR20 and features a St Andrew's cross, with two confronted dragons, the inscribed stone on one edge, a Pictish beast on another and twelve apostles on the back (Illus 5.3.53). The components for a model for the Glebe Field cross-slab (*Cross D*) are edge pieces, key pattern, spirals and median-incised interlace (Illus 5.3.54). Imaginative reconstruction is elusive but ought to be based on a cross-shaft of the type of St Andrews 14 (see Illus 5.3.42).

Biographies of the monumental cross-slabs and their original locations

The *original siting* of the major early medieval monuments may be implied by the secondary contexts in which they were found, on the grounds that large pieces were cumbersome to move at hazard.

Some had been reused in the foundations of the early church, others were found in a single deposit in the Glebe Field, others in the graveyard and further afield (see Illus 5.3.1). The degree of recycling could be estimated to some extent by the traces of earlier mortar and the amount of weathering. The pieces reused in the *Church 2 foundations*, ie reused in eleventh century and originally on the west side of Church 1 (or within Church 1), were TR21, 22, 30, 31 and 33. In the *Church 4 foundations* (thirteenth century) were TR14, 20 32 and 26, but these may also indicate recycling of Church 2 fabric. Pieces found in *post-medieval buildings* may have also been recycling from rebuilding operations at the church. These were TR10 (manse garden wall) and TR39 and 40 (originally in the manse steading). Those remaining in the *churchyard*, include TR 1–9, 11–13, 15, 19, 24, 25, 27 and 34. These include both simple grave markers and major cross-slabs, but gravediggers may not report the less decorated fragments. These can all be associated with an early cemetery.

Those in the *Glebe Field* were deposited over the workshops so should represent breaking up or reuse in the ninth century (Chapter 5.11; Chapter 6). Since there are so many pieces and the connections between them are strong, this should represent the demolition of one major monument. The pieces are relatively unweathered and had been forcibly hammered from a recently erected monument. The material found in the church and churchyard was more weathered and had sometimes been reused for building. The implication is that the major memorials were levelled at the raid or soon after, say in the early ninth century and that the larger stones surviving from the monuments were recycled 300 years later when Church 2 was built. TR6, which is associated with TR2 (Cross B) was found at a depth of 6–7 feet before 1889. This implies that the 'Danish Cross' was broken up before 1889 and, unless reburied in a grave, perhaps a considerable time before then. The back face of TR1 had been smoothed off, perhaps in preparation for reuse as a grave cover. A comparable event had afflicted the Hilton of Cadboll slab in 1676 (see p 253). Antiquaries reporting the existence and location of Class II and 'Danish' crosses were thus most likely offering inferences from the observation of broken pieces.

We can infer that the cross-slabs and grave markers were mainly located in an early cemetery on the hilltop (see Chapter 5.2), which may also have been the location for an eighth-century stone church (Chapter 5.4). Wherever the cross-slabs stood, they probably had liturgical roles and may have emulated the stations of ceremonial processions such as were practised at Rome and Inishmurray (Meyer 2005, 341; O'Sullivan & Ó Carragáin 2008). On this basis, they could possibly have been

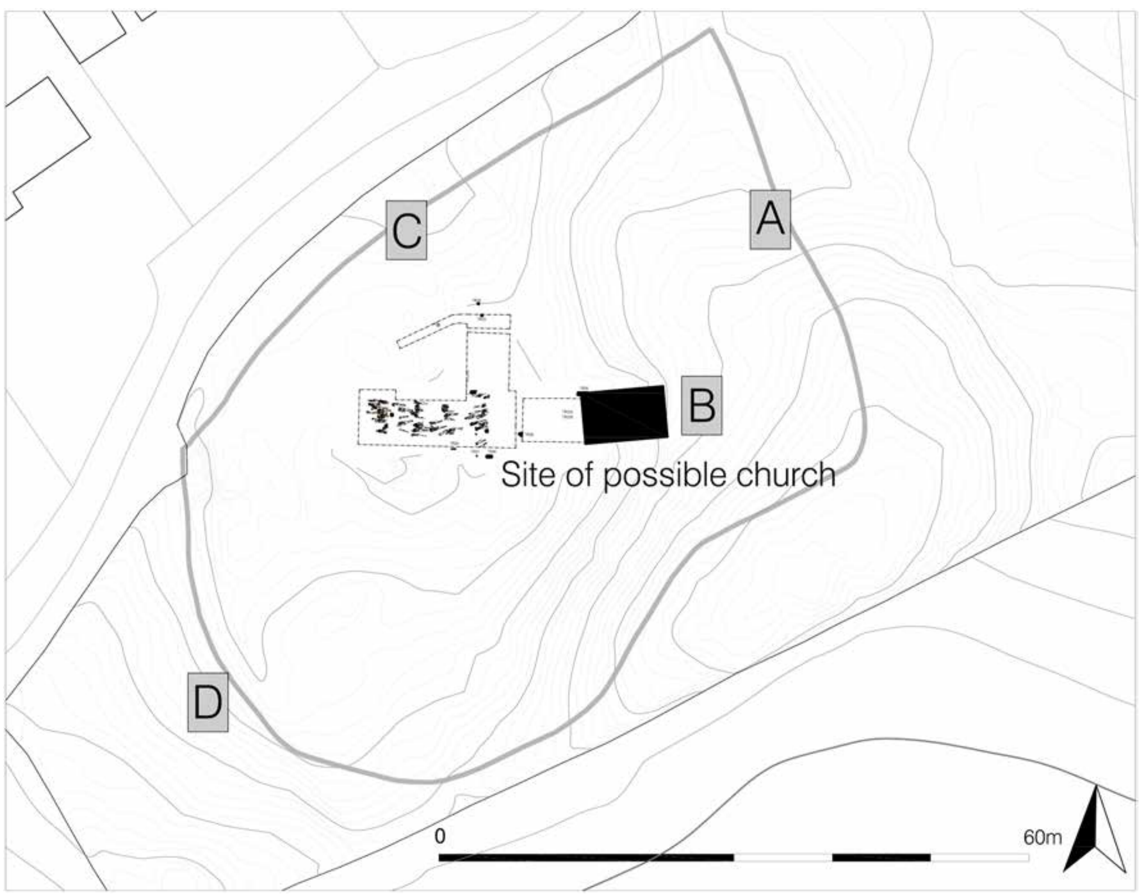


Illustration 5.3.56
Plan of the churchyard showing the hypothetical locations of Crosses A–D as deduced in the text

sited at entrances to the inner enclave implied by the (later) graveyard enclosure (Illus 5.3.55). Two of the grand cross-slabs were sited to the east (the TR2 group: 'Cross B') and further east (the TR1 group; 'Cross A'). TR20 provides the nucleus for a cross-slab somewhere near the church ('Cross C'), here proposed as lying to the north of it. The Glebe Field collection suggests a cross-shaft, placed between the church and the workshops ('Cross D'). Cross D is placed on the path where it crosses the inner churchyard bank. While their locations are hypothetical, sited by inference, four large monuments would probably mark out the inner precinct of the monastery, and the same form of territorial declaration is also proposed for the peninsula as a whole (Chapter 5.10).

Some conclusions

The Portmahomack assemblage should thus have included four grand crosses *c* 3m high, a number of short grave markers marked with plain crosses, a sarcophagus and possibly a panelled shrine which stood in the cemetery, while a stone building (presumably a church) was embellished with architectural imposts or label-stops and a *cancellum*. The large number of thick fragments worked in high relief suggests that the cross-slab formed a major subject of investment at Portmahomack. Each featured the cross together with one or more iconographic schemes referring to events or individuals from scripture. The latest of these monuments, Cross D, was probably a cross-shaft rather than a slab, resembling Dupplin or St Andrews 14. The remaining three were cross-slabs, one carrying a Latin inscription commemorating an individual and one (or possibly two) bearing Pictish symbols. In this, and in the detail of their ornament, they resemble the surviving cross-slabs at Nigg, Shandwick and Hilton of Cadboll, to be discussed in Chapter 5.10.

The stylistic dating cited above puts the carvings within the seventh to early ninth century, with an emphasis on the latter part of that period. The simple incised grave marker TR25 was found while digging a service trench at a level that might plausibly be assigned to Period 1, although its context is thought to align more convincingly with the ground surface of the Period 2 cemetery (Int 16, p 27). The forms of ornament on Crosses A–C (and the lettering of the Latin inscription) would allow them a date in the eighth century. The ornament assigned to Cross D has parallels that are dated in the late eighth or early ninth century. Overall the timespan for the production of the sculpture at Portmahomack is compatible with that of the burials, craft and all the other events of Period 2 as determined by radiocarbon dating, namely *c* AD 680–810 (Table 3.1).

The wide range of stone carving represents an impressive achievement over a relatively short timescale. Apart from one portable grave marker (TR21) made of exotic stone, all the output would seem to have been contrived from local materials. It seems unlikely that such large sculptural pieces would have been carved in situ (at or near the Geanies quarry) since moving a completed work would have risked damage. In the areas excavated at Portmahomack there were no dumps, spreads or areas covered with associated debris such as stone chippings that one might associate with sculptors' waste. However, there was a sculptor's chisel from Sector 2 (24/4921) (Illus 5.3.56). This iron tool is complete and has a fine double-bevelled end suitable for detailed work, including epigraphy. Sculptor's chisels have rarely been identified in Britain (cf Manning 1976: Fig 16 no 70), and the findspot in the vellum workshop is a nice reminder that this was a single artistic community, whose members carved stone, built buildings, made vellum and cast objects of bronze and silver.

There are few pointers to the way that stone carving at Portmahomack changed its emphasis over the century or so it was in operation. Common sense would suppose an evolution from a simpler (TR24/25) to a more complex (TR20) output. But it is equally possible that the first monument was the grandest, and that lesser works followed as skills or contacts diminished. Perhaps more attractive, given their variety, is a picture of a steady provision of grave markers through the period, with the different forms of expression a reflection of figures of greater prominence or greater humility. The making of cross-slabs A–D constituted major projects and perhaps signalled particular episodes of high investment. It would be a reasonable deduction that such investment was in the hands of a king or lord. This appears to be the burden of the documentation from Clonmacnoise, where Raghnall O'Floinn has proposed that the 700 or so memorials were concentrated in 'a number of short periods when the monastery came under the control of powerful neighbouring kings'; in the late eighth century these were Kings of Connacht, in the mid-ninth to early eleventh century, the Clann Cholmain kings, and in the twelfth century the Kings of Connacht again (Ó Floinn 1998, 97). It can be argued that the Pictish symbols signify names (p 157) and since the major Tarbat monuments (Cross A, Hilton, Shandwick and Nigg) carry them, individuals should be itemised by these, as well as by the Latin inscription on TR10. It is not easy, in the case of Pictland, to be sure that these persons must be kings. Even at Clonmacnoise there are grounds for saying that those commemorated by cross-bearing stone markers are predominately churchmen, the principal managers of the monastic estate (Swift 2003, 119). It also seems logical for such a devotional institution to put its highest premium on holiness. There is a third possibility, advanced both for the Portmahomack precinct and for the peninsula as a whole, namely that the individuals celebrated on cross-slabs are neither kings or churchmen, but saints, of actual or legendary acquaintance and not excluding those to whom churches are dedicated (Carver 2008a, 187–8).

The rapidity with which this small group of artisans achieved such a diverse and masterly output has naturally raised thoughts of imported expertise, but we can offer little hard evidence of whether and when the Portmahomack community entertained initiatives from beyond its natural frontiers. Some of the grave markers bear a close resemblance to those known at Iona and the west coast of Scotland and one of these, at least, was imported as a finished piece perhaps from that area (TR21). This piece, easily lifted by one pair of hands, may have been part of a stock of grave markers available at major Irish centres and serving gift, trade or proselytization as suggested at Clonmacnoise (King 2009, 340). Anglian motifs are quoted with equal enthusiasm and in high-status contexts (such as the vinescroll on TR1). The contacts with the Northumbrian, western Scottish and Irish ecclesiastical repertoire might have been anticipated, but there are also indications that an important if neglected source of ideas may be found in west Britain, from Govan to Gloucester (see above). This was also the case with the form of burial (p 121), so it might be legitimate to sense a 'British' substrate linking the north-east and south-west parts of the island.

The carved stone from Portmahomack shows that northern Pictish sculptors were major contributors to the flowering of Christian art in its first millennium. They were well versed in its repertoire, were creative in their own variations, were as knowledgeable of the liturgy as any of their Continental peers and, as artists, were more inspired than most. The Portmahomack monastery emerges as a player in Europe's long eighth century, writing its own highly sophisticated and eclectic manifesto in which the sculpture played a major role (Chapter 8, p 340).

5.4 Evidence for a Stone Church

Inference for a church

The existence of a Pictish stone church at Portmahomack is implied by the eighth-century cemetery (Chapter 5.2), the large quantity of Christian sculpture, including architectural pieces (Chapter 5.3), and the craft activity (Chapters 5.5–5.7), which taken together present a convergent case for an early medieval monastery (p 337). The eighth-century cemetery was eventually

Illustration 5.4.1
Aerial photograph showing St Colman's Church with present churchyards and curved bank of earlier churchyard boundary showing to SW of church (NMRS B49260, 1991)

succeeded in the same place by a medieval church, aligned W–E. The first manifestation of this church was a stone foundation laid out as a simple rectangle, in the eleventh or twelfth century (Church 2), onto which a chancel was added to make Church 3. In a major development of the thirteenth century, the church was lengthened and a belfry added to the west and a crypt added to the east (Church 4; see Chapter 3, p 56 and Chapter 7, p 292).

The co-location of the eighth-century cemetery and the twelfth-century church suggests that a Pictish church would have stood at this location rather than elsewhere on the hill (Illus 5.4.1). 'Was there such a church?' and, if so, 'what form did it take?' are the questions addressed here. An enclosed Christian ecclesiastical settlement *without* a church is theoretically possible, but could not be demonstrated without the excavation of the whole enclosure. The questions must therefore be reframed as, 'what is the evidence for a church from this excavation?', 'where was it located?' and 'what is its implied form?'

In order to distinguish between the probable, the possible, the permissible, the conjectural and the inferential with reasonable transparency, the argument for a church is presented at three levels. *Archaeological evidence* is offered by the anomalous east wall of the extant crypt, by the alignment of eighth-century burials and by the eighth-century architectural sculpture. This suggests that there was a stone church built of faced rubble with architectural fittings. *Circumstantial evidence* comes in the form of the context provided by the monastic infrastructure, the sequence of burials and the disposition of carved stone fragments. *Comparative evidence* can be gleaned, rather sparsely, from the handful of examples in Ireland, Northumbria and the Anglo-Saxon south-east that might vicariously reflect the character of early church buildings in Scotland, the form of which remains, at the time of writing, largely unknown (Foster, forthcoming).

Archaeological evidence

None of the excavations inside or outside the present church revealed structural stone or timber-derived features of a form of church that could be certainly assigned a date before the twelfth century (see Chapter 3, p 56). However, the upstanding fabric of the crypt, the alignment of the eighth-century burials and certain pieces of sculpture did give some indications of a former stone building. The most easterly row graves of the eighth-century cemetery had departed from an E–W alignment by ten degrees or more, and this was attributed to the influence of a newly erected building (Chapter 5.2, p 109). It had been noted during the study of the church fabric that the west face of the east wall of the crypt showed a similar, if lesser, divergence (nine degrees) from the alignment of the east wall of the later medieval church (Church 4); this implied that the east wall of the crypt belonged to an earlier build (Illus 5.4.2). It therefore seemed worthwhile to explore the hypothesis that the medieval crypt incorporated or concealed fabric from a Pictish stone church.

Examination of the crypt

The crypt as encountered in 1997 consisted of a barrel vault abutting and closed by east and west walls, accessed by a flight of steep stone steps descending from the level of the nave floor (Chapter 7, Illus 7.10, p 296; OLA 6.2/3.4.4). The fabric of the vault had incorporated a large piece of eighth-century cross-slab (TR20, p 129) and retained what appears to be a section of a thirteenth- to fourteenth-century window mullion (Chapter 7, p 297). There were medieval burials interred above the vault

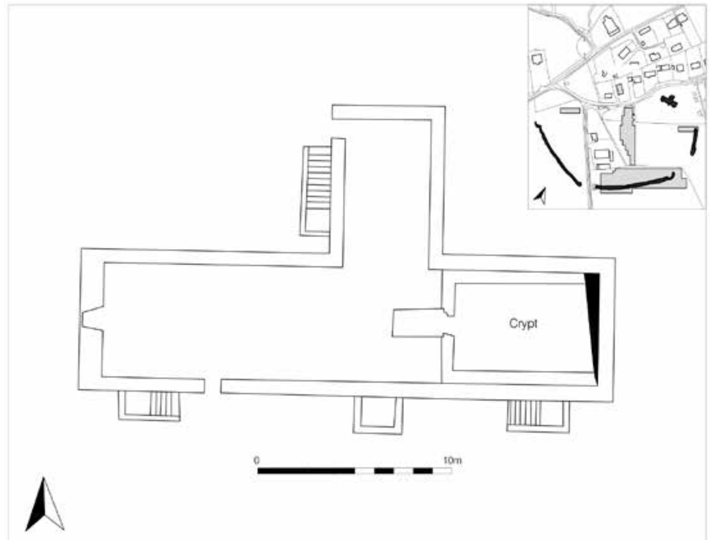


Illustration 5.4.2
Plan of Church, showing skew east wall of crypt (19/F3) in black

Illustration 5.4.3
East wall of crypt, with aumbry (below) and lights to the outside (above)

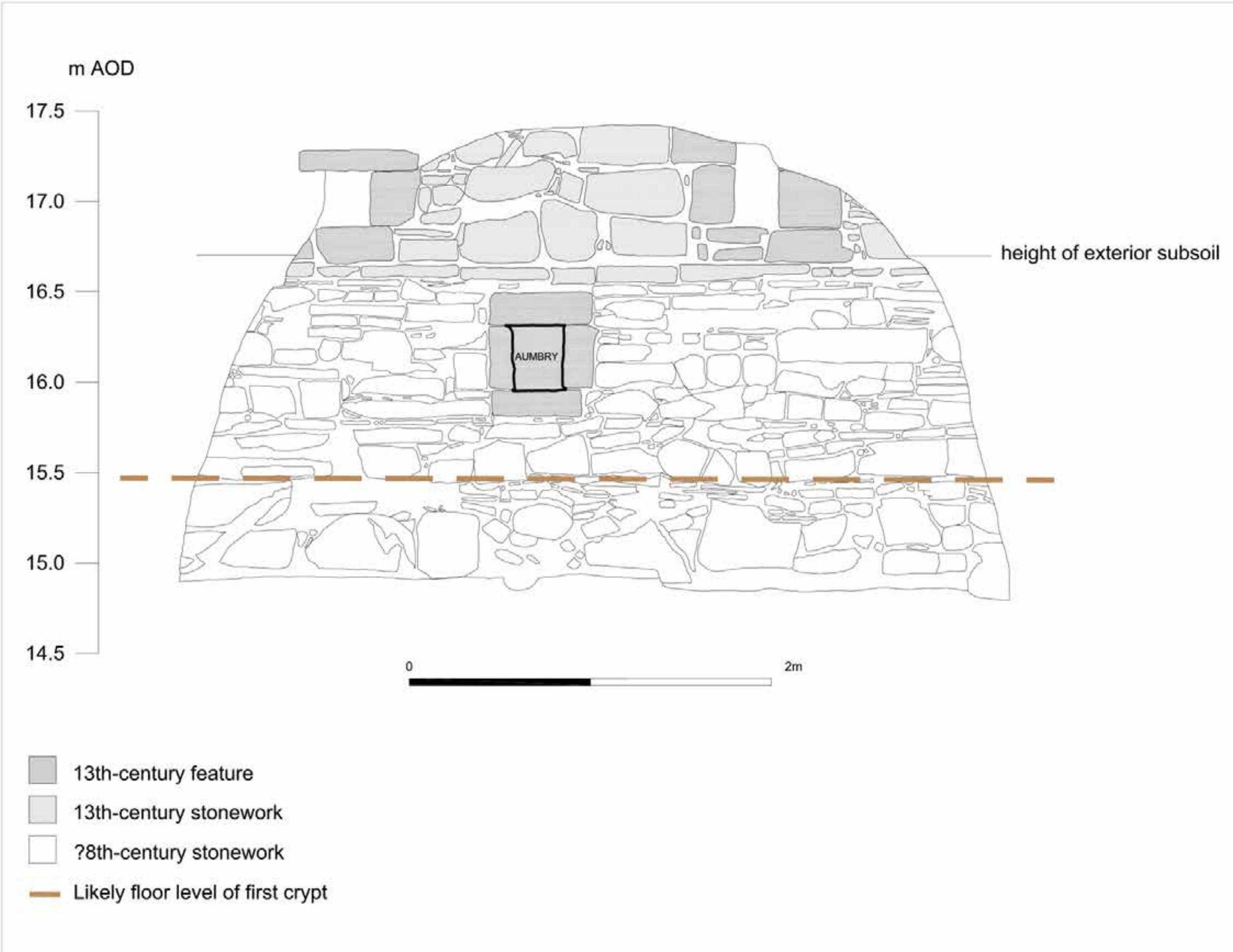


Illustration 5.4.4
Face of east wall of crypt, elevation

(p 292). The stone frame of the door into the crypt featured a mason's mark (p 294). The vault, doorway and the steps in their present form are therefore deemed to be medieval but no earlier than the thirteenth century and have been assigned to Church 4. As it has survived, the west wall of the crypt, orthogonal to the vault and incorporating the west door and steps, also belongs to the medieval church.

The focus is therefore on the skew east wall (F3). It measures 4.25m internally along the ground and 7.5m externally. Its west face (F3) shows a primary build of unsquared red sandstone blocks of various sizes, the larger blocks comprising the lowest courses (Illus 5.4.3). About two-thirds of the way up, there is a course of flat slabs, above which the wall continues in yellow sandstone; while not exactly ashlar, this part of the fabric is contrived in squared stones, similar to the fabric of Church 4. Slightly off centre is an aumbry composed of four stone slabs. Above, to north and south, are two lights formed of large blocks that are integral with the higher courses but precede the vault (Illus 5.4.4). The aumbry may be an integral part of the first build, given the straight coursing abutting it on the south side; or it may have been added as part of the rebuild, given the tumbled coursing abutting it on the north side, and the similarity of its build to that of the lights. The latter seems the more probable, since the aumbry is off centre, and the southern courses may have been relaid during its insertion. Since the inner (west) face of the east wall is not orthogonal to the rest of the building, so the internal length of the crypt is 6.76m long on the north side and 7.2m on the south side. There are therefore three builds: a primary of coarse blocks in red sandstone, a secondary of yellow sandstone squared blocks with two lights, likely to represent the build or rebuild of the thirteenth century

Church 4, and a vault of the fourteenth/fifteenth century. The first phase is eligible for consideration as a wall that predates the thirteenth century. However it does not belong to Church 2/3, the east end of which was cut away when the crypt was built (Chapter 7, p 293). There remains the possibility that this wall served a still earlier church, which will here be referred to as 'Church 1'.

A west-running Church 1A?

In theory, such a relict wall could be the east wall of Church 1, or its west wall. If the building ran west (option A in Illus 5.4.5), its east and west walls would nearly coincide with those of the crypt, and its footings would be more or less concealed by the present church. To elude detection, its west wall would need to lie west of the present crypt but no further west than the east wall of Church 2, or we should have found it. The masonry complex west of the crypt incorporated the east wall of Church 2, the truncated extension of Church 3 and the foundations of Church 4 including the west wall of the crypt (17/F88 & 97; OLA 6.3.1, 37). Assuming the west wall of Church 1A lay beneath this complex, it would measure *c* 11.25 × 7.5m externally. However, the present crypt is largely underground, so the feasibility of this location depends on the relative heights of the ground surface in the early Middle Ages. If the floor of the church was more than about 0.5m below its contemporary ground level it would be difficult to access and so not easily viable in that location. The following analysis attempts to relate the likely floor of a Church 1A occupying the site of the crypt with the likely ground surface of the Period 2 cemetery that was its contemporary.

The highest ground surface outside the south-west corner of the present building is *c* 19m AOD, and the present ground surface outside the east end is 17.5m, so the present church lies on a hill sloping downwards towards the east (Illus 5.4.6). The old ground surface used by the Pictish cemetery can be estimated from the depths that the skeletons were buried. The depth of the capped Burial 188 in Sector 2 was 15.10–14.26 = 0.84m as excavated (OLA 7.2, Fig 7) but the top of extant subsoil immediately north was recorded as 15.40m (OLA 3.1.1). Thus the minimum depth of a cist grave could be estimated at about 1.20m from turf to base, allowing for a topsoil 20cm thick. In Sector 4, the three recorded skulls of Period 1 (in Burials 149, 170, 172) all lie at 16.9m AOD, suggesting a ground level of 17.90m (allowing for a 20cm-deep skull). Period 2 skulls in the western row (Burials 151, 171, 169 and 164) lie at about 17.1m, implying a ground level at about 17.9m AOD. In the eastern most row, argued as aligned with a church, the tops of skulls

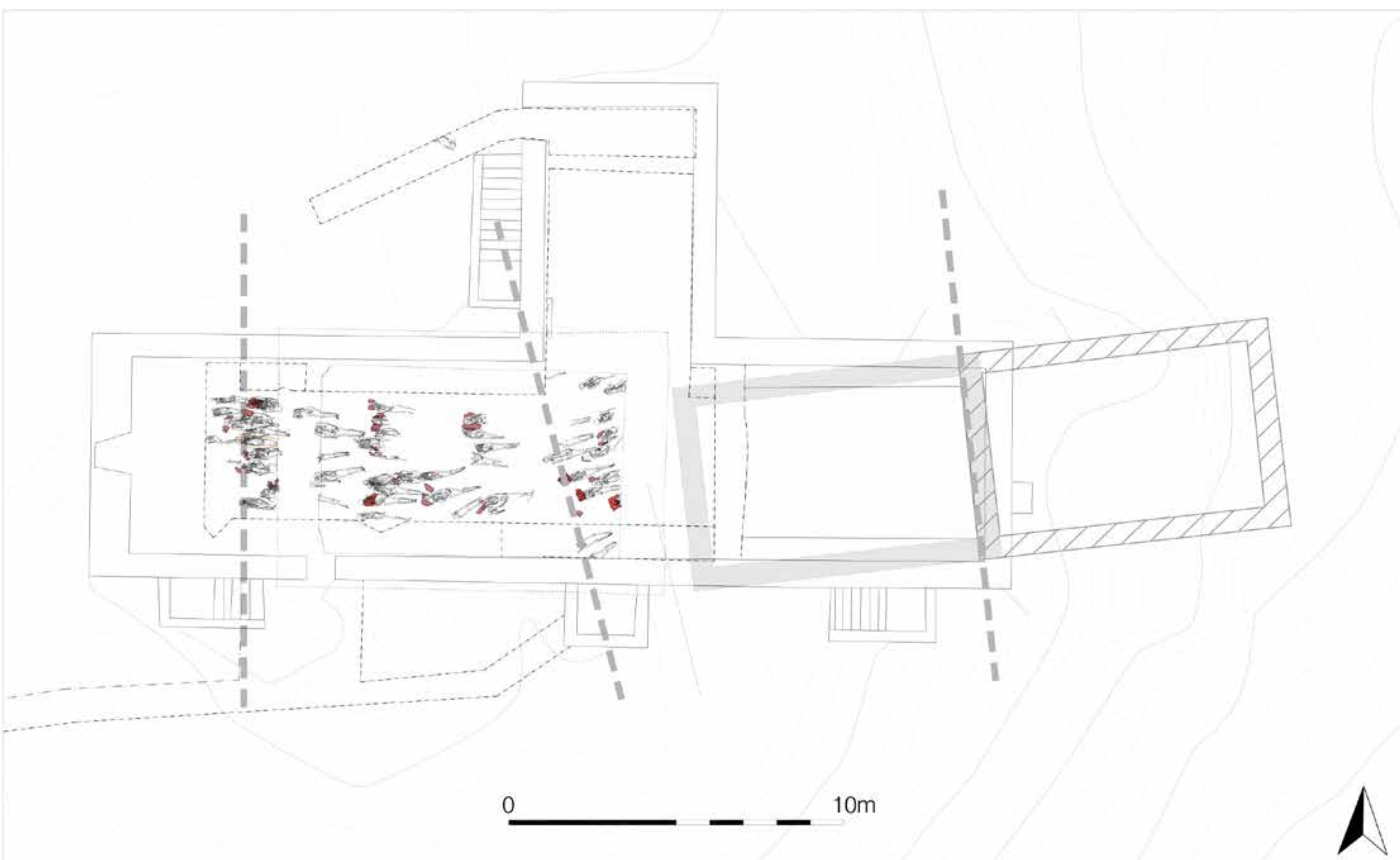


Illustration 5.4.5
Plan of church showing orientation of Period 2 burials and two possible positions for Church 1

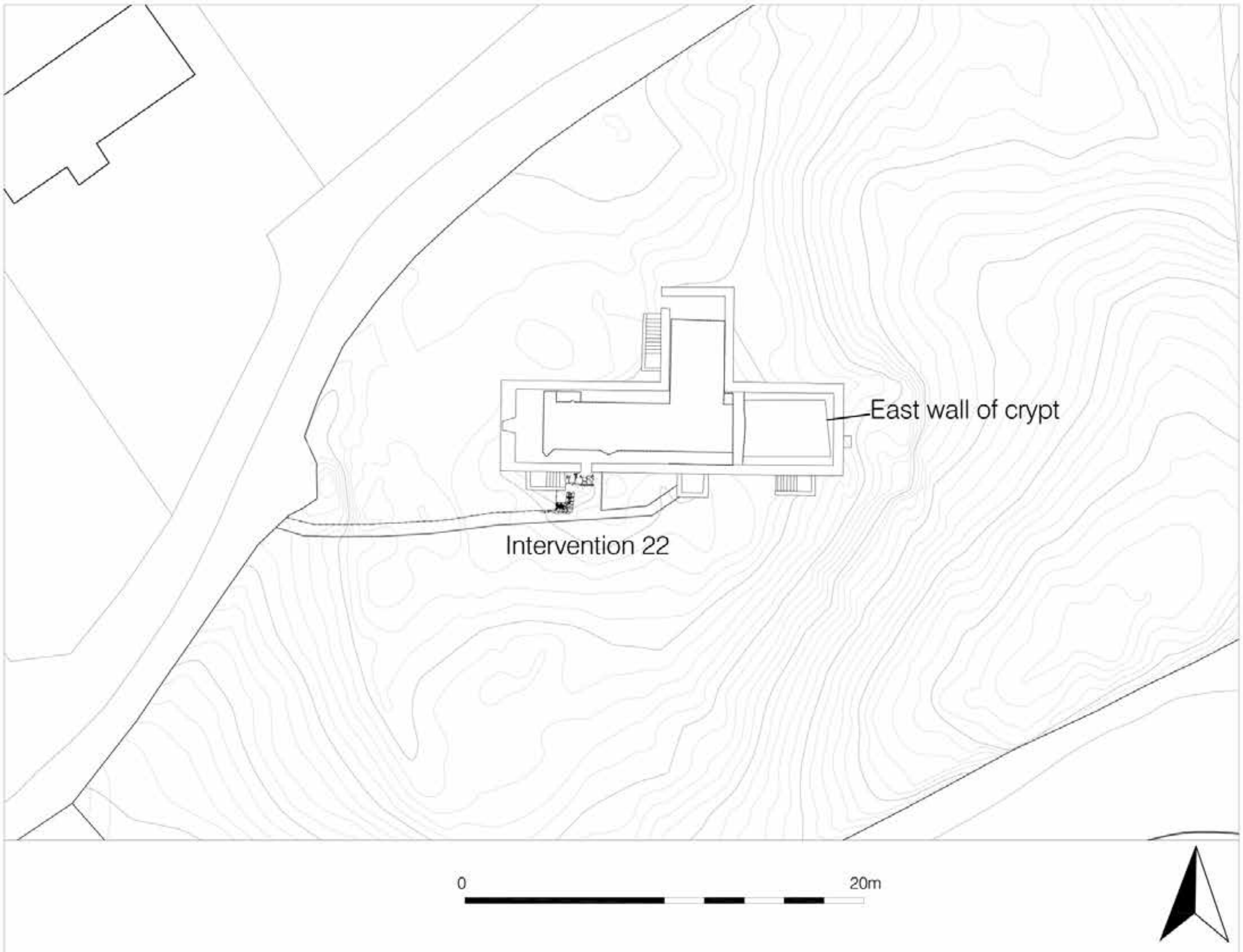


Illustration 5.4.6
Contours of the Church site

lay at about 16.9m implying a ground surface at 17.7m. Thus the general topography of the cemetery slopes gently towards 17.7m AOD at its recorded eastern end (Illus 5.4.7).

The threshold of the medieval Church 2 was at 18.0m, but the height of its floor was estimated at *c* 17.6m AOD from the height of the top of the foundation courses; its footings lie about a metre deeper at *c* 16.70m AOD (OLA 6.4/3.4.1). Up to 30cm of the soil covering the Period 2 graves was thus truncated when Church 2 was built, taking with it a quantity of grave markers, some subsequently incorporated into the Church 2 fabric. Inside the crypt, the base of the stones of the east wall (F3) lie at 14.73–14.87m, and the west wall (F4) at 14.93m. The lowest level of the crypt floor is currently at 15.025m. The top of the aumbry is at 16.41m AOD. F3 (the east wall of the crypt) was reported by the architect as cut 1.5m into subsoil externally, implying a current subsoil surface at 16.5m at the east end. The south and east external walls of the crypt were thirteenth-century dressed stone to a depth of 1m below the chamfered plinth (which was at 17.7m AOD), ie to *c* 16.7m AOD, which should therefore represent the old ground surface outside the east end in the thirteenth century (OLA 6.3/, 3.4.4). The eighth-century old ground surface would have been much the same, since it could not have been lower than the extant subsoil. The floor for a western Church 1A therefore must have lain somewhere between *c* 15m and 16.7m AOD (ie not lower than now, not higher than the thirteenth-century old ground surface). If the aumbry was in use in Church 1, then the floor could not have been much higher than it is now (15m AOD). If not, then the floor could be higher, say 15.50m to allow for a wall footings buried by half a metre (Illus 5.4.4). This study implies that in Period 2 there was a drop down from the old ground surface to the floor of Church 1 of 2.4m, roughly what it is today: the present Step 2 is at 15.41m, Step 10 is at 17.50m; the height of church floor at 18.13m. (OLA 6.3, Fig 25). The situation is summarised in Illus 5.4.7.

Thus if an eighth-century Church 1A ran west from the east crypt wall, it was already underground, and was in effect already a crypt. This is not impossible culturally (see below), but practically it would require steps and the top of its steps would need to be inside a building or the crypt would rapidly become a cistern. Since no additional walls were found, a Church 1 in this location would need to have the same footprint as Church 2 plus the crypt of Church 4, and it would require the same elements: steps and a vault. Stratigraphically this cannot be so, since the steps are cut through the west wall of Church 2 (Illus 7.2, p 290). An earlier study had concluded that while the case for a Church 1A on the crypt site was weak, it was at least possible (Carver 2008a, 86). Here the detailed use of the cemetery data throws additional doubt on this location, although the alignment of the eastern Period 2 burials, and of the east wall of the crypt, are anomalies that still demand explanation.

An east-running Church 1B?

If Church 1 ran east (Church 1B in Illus 5.4.5), F3 would become its west wall. Its floor level of *c* 15.50m would be still 1m below extant subsoil at its west end, but further east, the ground level drops away quite rapidly: judging from the trend of the modern topography, it would drop about one metre in five (Illus 5.4.6). While there was still no access from the west, there would be a fair chance of fitting a north or south door opening at contemporary ground level. It would thus have been only partially subterranean (at its west end) and at floor level at its east end, as shown in Illus 5.4.7. In this scheme, the aumbry would be a later addition.

Outside the east end of the present church is a square patch of ground level with its highest part at the east end (Illus 5.4.8). It extends eastwards 5m, at which point its eastern limit is marked by a row of stones. This row seems to belong to two burial vaults marked by pillars. The more southerly is a Ross vault; the northern vault is unmarked. Graves associated with these two plots are Mackenzie, Corbett and McDonald. It was about 5m east of the crypt on 'a low green mound' that pieces of Cross B (the 'Danish' TR2) were located (Illus 5.3.1, p 124).

If the east wall of the crypt is to be used to determine the width of Church 1B, it needs to be greater than 4.25m and less than 7.5m, the internal and external lengths of the east wall, F3. Pits dug by the architect inspected both exterior eastern quoins without encountering any reliable signs of east-running walls (OLA 6.4/2.1.3). The length is even less certain. To fit within the

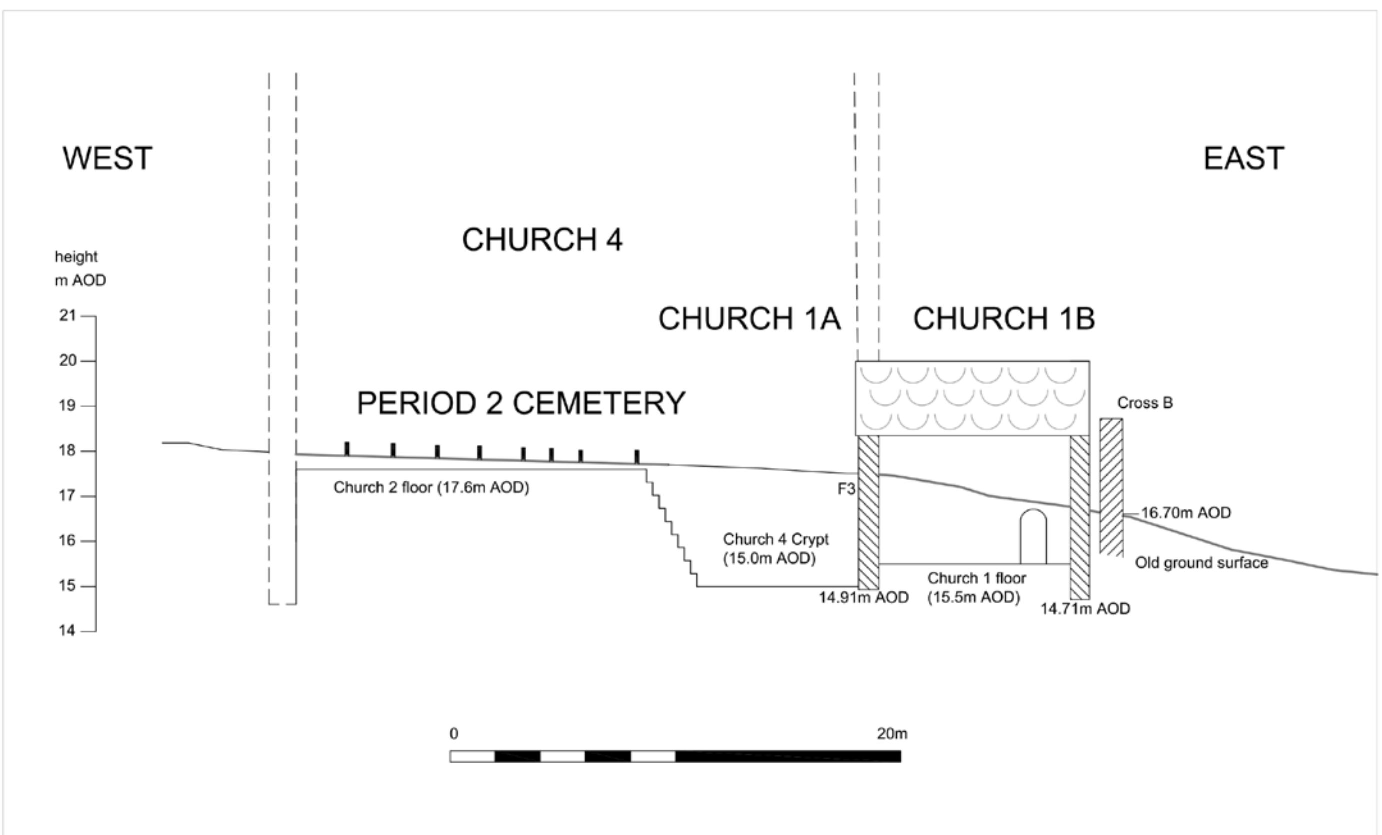


Illustration 5.4.7
Profile W–E through Church 4, showing the old ground surface in the eighth century with the hypothetical Church 1 in the 'B' position (vertical exaggeration × 2)

Illustration 5.4.8
Outside the east end of the present church, the possible site for Church 1B

platform observed, Church 1B would have to be more or less square. The ratio of length to breadth for plans of early churches is variable (see below, Table 1) but would be unlikely to fall below 3:2. Assuming an external minimum width of 5.25m, this would give Church 1 a hypothetical length of at least 7.9m. Cross B that had stood somewhere to the east of the present church would be a suitable monument to mark the east end of the hypothetical Church 1B.

If such a building existed, it may have been destroyed in the raid, the time that the crosses were felled (p 259). At the time Church 2 was built, the ruin of Church 1B would lie partially underground and about 12m away. In this case, the medieval builders had room to enhance their ground plan with a chancel (Church 3) without disturbing the ruin of Church 1. Given the recycling of sculpture disturbed by this building operation, it would be no surprise if some of the stones of Church 1 had also ended up in Church 2, except perhaps for the part still underground. In this scenario, it would be the thirteenth-century builders (of Church 4) who recommissioned the west wall of Church 1B as the east wall of their crypt. The implication is that this wall was available for re-employment, whether through pragmatism or piety.

The archaeological case that there was an early church at St Colman's has been assembled from three sources, two of which we have reviewed: the alignment of the crypt wall and the alignment and topography of the Period 2 burials. The third element is perhaps the strongest argument for the existence of a church, although not for its location: the finds of fragments of sculpture that imply use within a building. Mentioned in the last section were panels and a stone post (TR13, 17, 27), which imply a *cancellum*, if not a shrine, on parallels drawn from St Ninian's Isle (see p 138; Thomas 1973). Henderson and Henderson would see shrines of the post and panel type as being normally mounted indoors (2004, 208). Other forms of carving may imply a building by virtue of having been employed inside it. The slab at Flotta (Orkney) was an altar table mounted on vertical slabs as implied by vertical grooves on the back, and an altar and reredos are discerned at Rosemarkie (ibid, 210–11). The Hendersons also suggest that large cross-slabs such as those erected on the Tarbat peninsula were designed to be kept and seen indoors (2004, 180–1; Foster, forthcoming).

Of particular interest in the Tarbat assemblage were heads modelled in the round, which were suggestive of architectural fixings. If TR206 could be the knob of a stone chair (Chapter 5.3, p 149; Henderson & Henderson 2004, 211), it would be harder to say the same of the TR217 group, the form of which, when assembled, appears to be that of a flat-topped chamfered corbel (Illus 5.3.45, p 150). The corbel is an architectural device keyed into masonry to support a feature proud of the wall, such as a statue, a roof beam, a corbel table or the springing for an arch, the anthropomorphic form imitating a person appearing to bear the load. It may also appear as a label-stop for the hood moulding around an opening. In any event, the presence of a corbel implies a stone building. The main parallels to the form are twelfth century in date, and its occurrence in the eighth century is challenging (see Chapter 5.3). However the component parts of this conjoining group were stratified above the burning and below the medieval horizon (C1547), so they must represent detritus from the Pictish period (Period 2). In Chapter 5.3 it was argued that the corbel finds an antecedent in twelfth-century Bobbio and ninth-century Malles, as well as in depictions on eighth-century Canon Tables, implying its use on the imposts of a chancel arch or a doorway (p 150). TR264 can also be called as a witness of some sort, resembling as it does a butterfly finial of a kind well known in early medieval Ireland (see Chapter 5.3, p 153, Illus 5.3.49). Given the context and parallels for Pictish architectural sculpture discussed in Chapter 5.3, the elusive eighth-century stone church at Portmahomack is likely to have featured a corbel, perhaps on a doorway impost, an arch, a *cancellum*, a shrine, a sarcophagus and perhaps horizontal friezes, all carved expertly with diverse ornament and animal and human figures, much of it probably painted.

Circumstantial evidence

The area examined as the potential church site occupies the high ground in an enclosure marked by a C-shaped ditch which enclosed a burial ground, stone sculpture, craft activities and infrastructure, all of which correlates to the monastic movement of the seventh/eighth century (see Chapters 5.2, 5.3, 8). The eighth-century burials occupy the highest point and form a continuous sequence with a cemetery that had begun in the fifth century or earlier. Since there is little overt sign of Christianity before the eighth century in this part of Britain, the church is likely to be a late arrival in the early medieval sequence. Assuming that the long-used cemetery was to be respected, a church would have been placed to the south or east, in each case on a down slope.

The eighth-century community had the capacity to quarry and shape stone, as is signalled by the large number of carved stones, including cross-slabs some 3 × 1m, which would be extracted and transported from the east side of the peninsula (Chapter 5.3, p 229; Illus 5.9.1). Large amounts of stone were also used in the construction of a road, a revetment wall, a dam and a megalithic bridge (Chapter 5.5). There was no trace of mortar mixing, but calcite was extracted from shells, so the use of mortar ought not to be excluded (Chapter 5.6). The construction of a stone building using shaped, squared and faced and perhaps even mortared sandstone blocks is thus plausible.

There is an expectation that once a church is built, subsequent churches will occupy the same site, so that Church 1 would be found under or very close to the medieval and later churches. This need not be the case, especially in a site with a well-documented hiatus. However there is little doubt about the focus of the early sculpture and its Christian and monumental character. In addition to the carvings that are likely to represent grave markers, four crosses (three slabs and a shaft) are proposed in Chapter 5.3. Where they have not been exported for building or levelling purposes, their fragments are focused on the hilltop.

Although the medieval church was constructed well after the Pictish monastery, there were clearly memories to be accommodated. The medieval church and cemetery continue the monastic cemetery in the same place; the medieval crypt was thought to have housed relics of St Colman in the mid-sixteenth century and in the nineteenth century it was declared to be a structure built by St Columba (Carver 2009a, 10). The crypt could have been related in the minds of its medieval builders with the real or supposed burial of St Colman within the Period 2 cemetery on the high ground to the west.

Circumstantial evidence therefore points to the construction of an eighth-century church on the hilltop, adjacent to a burial ground and standing stone monuments of the same date. There are no carvings and few burials that can be confidently assigned to the mid-ninth to eleventh century, so a church at this site should be a construction of the eighth century (pace Yeoman 2009, 233).

Comparative evidence

Early Celtic church buildings survive in greater numbers in Ireland than in Scotland or Wales and have been the subject of more comprehensive examination there. Timber-built and carpentered churches and oratories are theoretically part of the early scene. The 'Irish method' was to use hewn oak and thatching with reeds, and was contrasted to the 'Roman method' of building in stone (Ó Carragáin, T 2010a, 15). Tomás Ó Carragáin remarks that it is 'now widely recognised that in eighth-century Northumbria the choice of building materials had become emblematic of the wider dispute between "Irish" and "Roman" factions' (ibid). The remains of timber churches are notoriously elusive, but an oratory built in turf is suggested by a perimeter of vertical stone slabs at Illaunloughan (Ó Carragáin, T 2010a, 17; White Marshall & Walsh 2005, 15, 23). Virtually all the early Irish churches survive as single rectangular rooms (unicameral) constructed in faced dry-stone rubble. By the eighth century, church builders were using mortar. Chancels were added in the ninth to tenth century, connected to the nave by arches, as at St Kevin's, Glendalough, and this type of scheme endured until the twelfth century (ibid; MacGibbon & Ross 1896, 9).

Differences in construction can be regional rather than chronological (Harbison 1970; Ó Carragáin, T 2002; 2005). In Ó Carragáin's analysis, five types of pre-Romanesque church were distributed in different parts of Ireland, and all were significantly absent from Ulster. Ó Carragáin's survey confirmed several features as generally diagnostic of Irish pre-Romanesque churches: all were constructed with plinths; building blocks are large; and spalls (stone chips) are uncommon; the door is always in the W wall; most early churches have a window in the S wall, but a significant minority were lit only by an E window. *Antae* (external projections on E or W walls) occurred in 89% of his dry-stone Type 1 churches. Six out of nine aumbrys occur in his Type 2 churches (early mortared). All pre-Romanesque churches appear to be designed as single-room rectangular buildings (Ó Carragáin, T 2002, 90, 102, 45, 87, 76, 74, 80), while single-phase bicameral churches are very rare (Hare & Hamlin 1986, 134). Surviving examples of mortared stone churches are unicameral, with a single door in the west wall, one window in the east and south walls and steeply pitched roofs covered with thatch, lead or shingles (Ó Carragáin, T 2010a, 140). Corbelled dry-stone beehive huts and clachans need not be indicative of an early date but may be adopted in the eighth to tenth century. Their use was in deliberate contrast to the sacred character of churches (Ó Carragáin, T 2002, 140). On the Irish model, an insular church of the sixth to ninth century would therefore have been single cell, rectangular, dry-stone or mortared, corbelled or roofed with timber beams, with a west door and an east or south window, may have antae and could well have an aumbry. Early churches in Ireland could remain ruinous for long periods. On the practical side, their rubble construction did not lend itself to recycling in coursed walls, but ideologically the interior of a roofless chapel did attract burial in the Middle Ages and later.

In Wales, there are no upstanding remains of churches dated earlier than the twelfth century (Davies 2009, 44), and the expectation is that churches were built in timber to go with the cemeteries from the seventh century, although this has yet to be demonstrated (Longley 2009, 126, 251). At Capel Maelog, the first church was built in the late twelfth century some time after the establishment of the cemetery, and without any intervening timber phase church. Amy Pritchard's investigation concluded that while cemeteries may or may not have had timber churches, churches in stone should have begun to appear from the later eighth century, with the adoption of the Roman Easter (Pritchard 2009, 258).

Seventh to eighth century upstanding stone churches are known in Northumbria, notably at Jarrow and Escomb, both making use of reused Roman stone. Jarrow has two churches (west and east). The surviving foundation inscription, dating to the late seventh century, refers to the earliest, western building, but the east church is likely to follow closely in date (Cramp 2005, 151, 160). The east church was here placed on the crest of a gentle downslope; it measured 4.66–4.82m wide by *c* 12.8m long and had a south door (ibid, 147–8, 154). The west church was not preceded by a timber phase. Its nave measured 19.81m × 5.49m and its chancel 5.49m × 4.27m internally (ibid, 160). This well-explored site also featured stone buildings additional to the church, one with an integral carved stone column (AS37 in Jarrow Building A; Cramp 2006, II, 166). The seventh/eighth-century church at Escomb was bicameral and probably also had a door in the south wall of the nave in its first phase (Taylor 1978, 985; Pocock & Wheeler 1971). Among examples with reasonably complete plans, the early Southumbrian churches are bicameral with chancels and south and west doors, but these may open into *porticus* (eg Bradwell-on-Sea, Canterbury St Martin, Canterbury St Pancras; Taylor 1978, 974ff).

Could there have been an early crypt at Portmahomack? In Ireland, burial inside the church was quite uncommon and the original cemetery retained its spiritual power. Revival of the cult of relics in the early Christian period (Carver 2009a) led rather to the creation of shrine chapels for remembering the special dead built over graves away from the church. These were unicameral, smaller than twelve square metres (Ó Carragáin, T 2003b; 2010a, 66–9, 84–5). In the south of Europe, relics were exhibited in underground crypts that could be visited by the public – a form of devotion designed to serve pilgrims developed in Rome and furthered in France as at the Hypogée of Mellebaude at Poitiers (sixth century) or Jouarre (seventh century). This scheme seems to have been adopted in northern and southern England, using an annular passage as at St Augustine's Canterbury or separate access and egress passages as at Repton, Ripon and Hexham (Taylor 1978, 1014–17). An early church could be provided with a lighted crypt by burying its western half in a hillside, as at Lastingham, North Yorkshire. Thus an eighth-century church, drawing on Roman, French or Northumbrian models, can already have included the idea of a crypt to house a special relic.

The evidence for early churches in Scotland itself has been beset by poor dating and confused by documentary expectations. These latter suggest that early constructions would be in timber, wattle at first and then in oak board from the early eighth century, as at Iona, while (following Bede) after AD 710 churches in Pictland would be constructed in stone (*iuxta morem Romanorum*) (HE V.21). The difficulty is that no church building has actually been identified in Pictland or *Dál Riata* earlier than the mid-eleventh century (Fernie 1986; Yeoman 2009, 228). In 1986 Eric Fernie showed that all Scotland's prime candidates for early churches (those surviving at Abernethy, Brechin, Egilsay, Restenneth, Edinburgh Castle and St Andrews) may all be dated *c* 1090–1130. He found the variety in their structure to be typical of this period and notes architectural references to both Ireland and (at Egilsay) to the North Sea lands. In 1994 Neil Cameron suggested that there was a well-established tradition of stone church building before the twelfth century. In general he meant the eleventh, for example the foundations at Birsay attributed

Table 5.4.1
Length/width ratios of some unicameral churches from external measurements
(for bicameral churches see Lowe 2008, 266)

Site	Length [ft]	Width [ft]	Length [m]	Width [m]	Ratio
Portmahomack Church 1A Portmahomack Church 1B			[11.25] 8.1	[7.5] 5.25	[1.5] 1.5
Portmahomack Church 2			12	8	1.5
Howmore, South Uist	17 feet 7 inches	11 feet 6 inches	5.4	3.5	1.5
Tigh Beannachadh Lewis	18 feet 2 inches	10 feet 4 inches	5.6	3.2	1.75
Dun Othail, Lewis	17 feet	11 feet 3 inches	5.2	3.5	1.5
St Columba, Balivanich, Benbecula	33 feet 6 inches	14 feet 6 inches	10.5	4.5	2.3
Island of Wyre Orkney	19 feet 2 inches	12 feet 10 inches	5.9	4	1.5
Lybster, Caithness	17 feet 10 inches	10 feet 11 inches	5.5	3.4	1.6
Egilsay, Orkney *c* 1000	29 feet 9 inches	15 feet 6 inches	8.8	4.8	1.8
Brough of Birsay *c* 1100	28 feet 3 inches	15 feet 6 inches	8.7	4.8	1.8
St Oran's Chapel, Iona, about 1074	30 feet	16 feet	9.2	4.9	1.9
Birnie before 1184	42 feet	18 feet 6 inches	12.9	5.7	2.3
St Ninian's Shetland			6.5	5	1.3
Auldhame			8.3	5.7	1.46

to the church built *c* 1060 for Thorfinn, Earl of Orkney. But, as he points out, the monolithic stone arch from Forteviot implies that eighth- to ninth-century church building in stone must have been achievable in Scotland (Fernie 1986; Cameron 1994, 1996; Alcock 2003, 285; Yeoman 2009; Foster forthcoming). Henderson and Henderson add the Rosemarkie panels and the Meigle lintel as good arguments for Pictish church building in the eighth century (2004, 208–11).

It is interesting to compare the ratio of length to width in the earliest of the churches collected by MacGibbon and Ross (Table 1). It can be said that those which are undated, but expected to be early, have ratios around 3:2, ie 1.5 (as in Ireland: Murray 1979, 83), while those that are known to be Romanesque have ratios larger than this. The ratio of length to width may thus provide a crude indication of early date.

Anglo-Saxon churches exhibit a wide range of ratios of width to length in Anglo-Saxon churches from 1:1 to 1:4. Those thought to be pre-Viking also vary: 1:6 for the three churches at Canterbury, 2:5 for Bradwell and Jarrow east, 1:3 for Escomb (Taylor 1978, 1032–3, Table 745). This implies that these ratios, so rarely available from complete early plans, are not ready to report reliable trends.

Excavated examples

Even at sites of high potential that are no longer in use, understanding of the development of early church building in Scotland has been impeded by academic excavators working on too small a scale. At St Ninian's Isle, the excavation of the medieval chapel in 1955–60 produced a confused result, subsequently reinterpreted through the ingenuity of later authors (Small et al 1973, 5, 12, 15–20). It was seen as the site of a prehistoric and early medieval burial ground with an eighth-century church and a composite stone shrine. This phase was terminated in the late eighth/early ninth century with the burial of the St Ninian's Isle hoard in a box within its presumed nave. The site was revisited in 1999–2000, but unfortunately the intervention was on too small a scale to improve greatly on the precision of the previous model. It endorsed the existence of a probable eighth-century church and shrine, and proposed its continued use through the ninth to eleventh century, especially for the burial of infants (Barrowman 2011, 174–9). The form of the church is unknown but suggested on the indications of surviving earlier foundations to have adopted a similar footprint as the medieval chapel, and to measure about 6.5 × 5m internally [1.3] (ibid, 42, 186 Fig 5.1, 197).

A timber post and plank building with a stone exterior was discerned under the medieval chapel on the Brough of Deerness and interpreted as a Norse secular chapel with a settlement rather than a monastery (Morris & Emery 1986). At Inchmarnock, a first stone church was thought to have been built after 650–780 surrounded by a rectilinear palisaded enclosure, but the church that became a focus for burial dates only from the ninth/tenth century (Lowe 2008, 82, 255). At the Hirsel in the Tweed Valley, the sequence began with a square cell constructed in the tenth/eleventh century, augmented by an apse in the late eleventh/twelfth century, lengthened by a nave in the mid-twelfth and enhanced by a thickening of the west wall in the thirteenth century (Cramp 2014, 72). The burials at the Hirsel were all later than the church (ibid, 134).

The implications of a Church 1 situated at the site of the crypt (1A) or further east (1B), is that in either case the cemetery took precedence over the church. The monastic (eighth-century) burials occupied the high ground overlooking the sea and represent a continuous development from a Late Iron Age (sixth/seventh-century) burial ground. At Iona the site of the early cemetery is not known but is likely to have been south of the church (at Rèilig Odhrain) and separated from it by a 3m-deep ditch; the layout at Reask and Eileach an Naoimh also suggests an initial separation of the dead from the ceremonial centre (McCormick F 1997, 63–5). The sites of the earliest burials at Wearmouth and Jarrow also remain uncertain, but in both cases the excavations focused on areas south of the church (Cramp 2005). At Jarrow there were Anglo-Saxon burials north and south of the eastern church, which may itself have been funerary (Cramp 2005, 167, 356). Although pre-monastic burials are known at Wearmouth and Jarrow, they are not thought to have had any relevance for the monastic builders (ibid, 355).

A working model for the north and west might be that early churches join previous cemeteries, while later churches start them. Future understanding will depend on examining cemeteries in plan and churches in depth, in the same place. At Auldhame, the burial ground was in use from the seventh to the seventeenth century in radiocarbon years, and erected within it after AD 650 was a small timber oratory (Building 1), which was replaced on the same footprint by stone foundations in the mid-eighth to mid-ninth century (Building 2). It was unicameral and measured *c* 8.3 × 5.7m (John Barber and Anne Crone, pers comm) This may survive analysis to be claimed as Scotland's first sight of a pre-tenth century church.

Conclusion

The little information we have to date offers some comfort that a partially subterranean church at Portmahomack, measuring 8.1 × 5.25m, would not be out of place in the Ireland or North Britain of the later first millennium. Following the Irish tradition, it should have a door in the west end and a window in the south or east wall, and an aumbry might well be a feature of such a church. This would not be possible in the site we have examined. Following the Northumbrian tradition, it might be cut into the side of a hill, with the west end subterranean and the east end lit by natural light, and entered by a less perilous south door. This is the hypothetical design labelled as Church 1B. A roof height at about 20m AOD might be surmised so that it rose above the barrows on the crest. This implies east and west walls up to 5m at the gable. The number of people who could stand inside this space to say the Divine Office was about thirty, or about twenty kneeling. It was therefore probably large enough to house the whole community in prayer together. Such a building could also be used to host the shrine of a founder, or a special relic or both. The building of a stone church may have signalled conformity with the Roman practice, an event that correlates with the cross-slabs in the later eighth century. By this time too, the burials appear to have aligned to the presence of a building (Chapter 5.2) and large cross-slabs stood at the edge of the inner precinct, with one erected immediately east of the proposed site of Church 1B (Chapter 5.3, p 166).

By analogy with Jarrow, it seems highly probable that a full sculptural package such as we encounter at Portmahomack would have served a stone building. The consultancy agreement between Nechtan and Ceolfrith described by Bede (V.21) included the provision of experts to build a stone church dedicated to St Peter in Pictland. Given the association between Nechtan and Fortriu (Woolf 2006), it is not excluded that some of this deal bore fruit in Easter Ross. If a 'cemetery chapel' was implanted in eighth-century Whithorn (Hill 1997), the Northumbrian architectural innovation could equally have penetrated into northern Pictland, arguably far more accessible from Jarrow (by sea) than Galloway (see Chapter 8, p 341).

If the skew east wall does represent the lineament of an early church, it is unlikely to belong to the ninth to eleventh century (our Period 3) by which time the monastic project seems to have died. This makes a stone church of the later eighth century a possibility that we may continue to entertain. The people of Period 2 were certainly used to lifting (p 228) and shaping large stones, so that the squaring of ashlar for megalithic dry-stone construction would present them with few problems. For these reasons, the lower courses of the west end of the crypt could still belong to what would be, at the time of writing, the only standing wall of an eighth-century church in Scotland.

5.5 Infrastructure

Introduction

The Period 2 settlement was laid out according to a design that promoted a new ideology, while exploiting the natural properties of the location. The cemetery, marked by standing stone memorials, occupied a dry site on the hilltop, which was also the likely location for a church (see Chapters 5.2–4). The primary objective of the infrastructure was the creation of a dry space beside the hill with controlled access to water (Illus 5.5.1). The *enclosure ditches* intercepted groundwater draining down the hill to

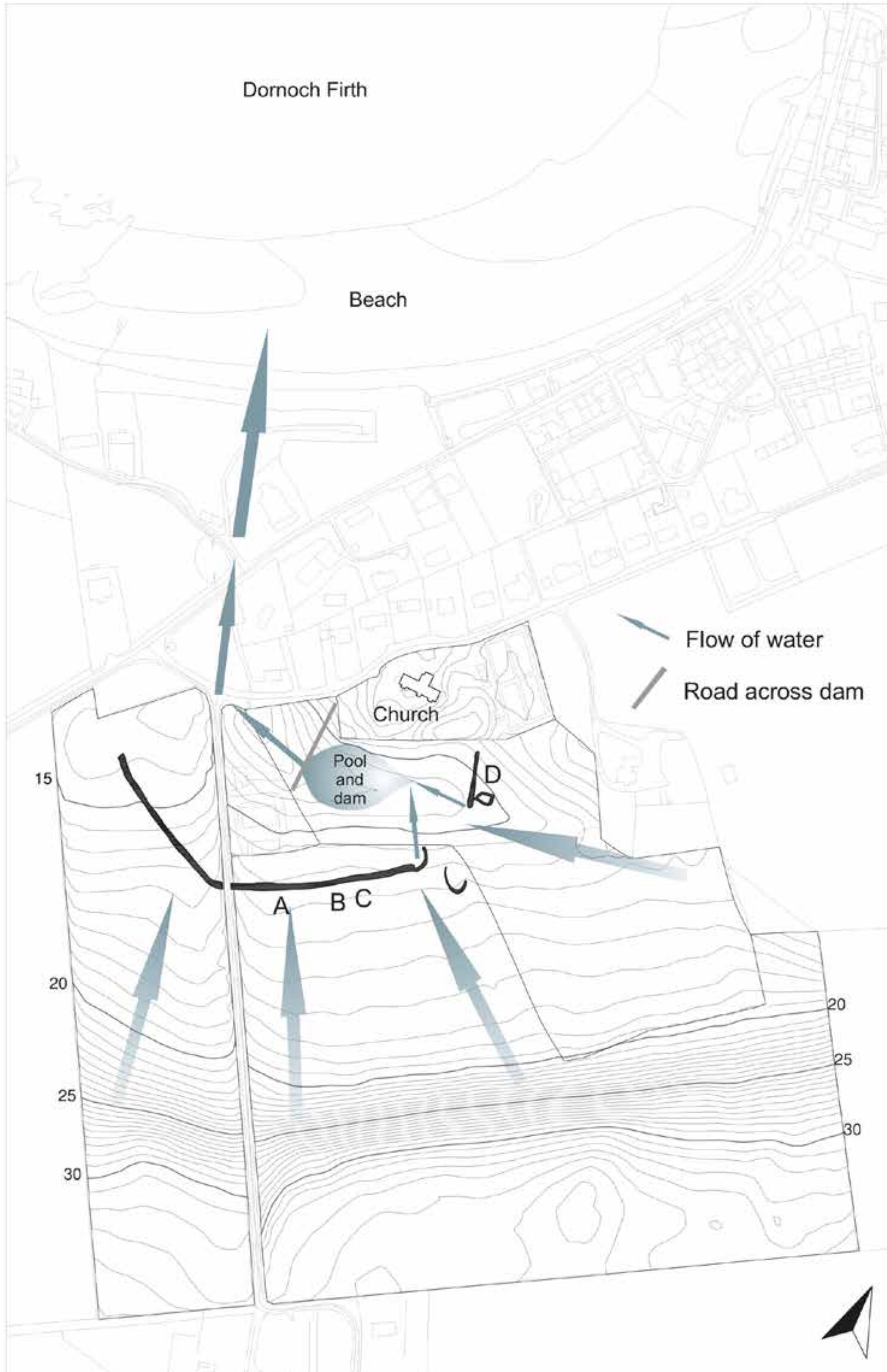


Illustration 5.5.1
Contour map of the site, showing the direction of drainage and the effects of impounding the valley stream

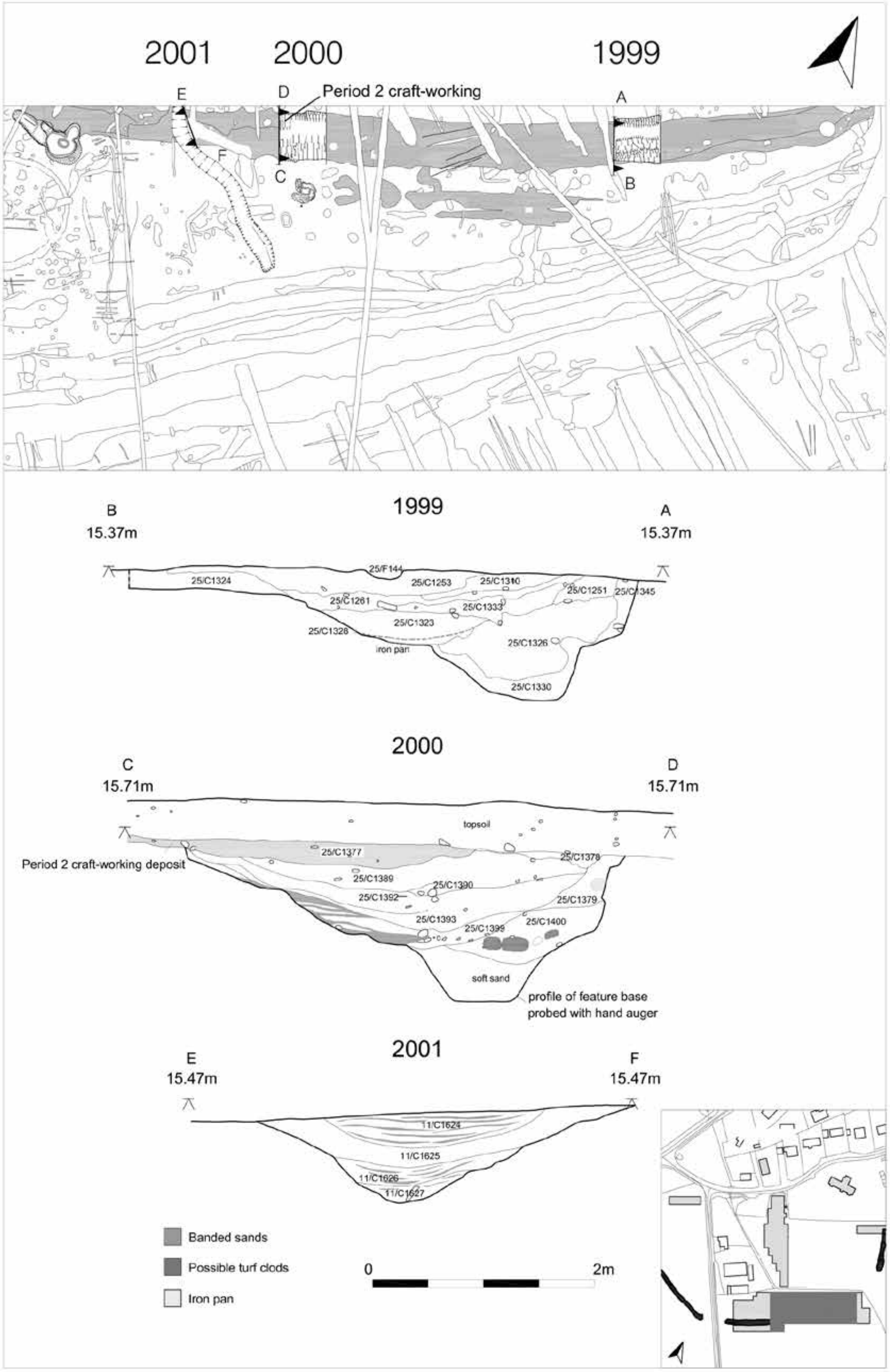


Illustration 5.5.2
Plan and sections of first enclosure ditch S15 in Sector 1

Illustration 5.5.3
Plan of the second enclosure ditch S16 in Sector 1

the south and dispersed or impounded it. Aerial photographs suggested that the original plan of the main enclosure ditch took the form of a flattened C, with east and west arms heading towards the beach and the firth. The ditch system embraced the area of the monastic settlement, as so far known, so probably would have been among the primary elements of the foundation.

The *stream* originating from a catchment to the north-east on Bindal Muir ran down the valley E–W. This was the main source of fresh water, needed for the sustenance of men and animals, for baptism, and for the industries that were planned. Attempts to obtain water from this source in its marshy pre-monastic phase had been complicated, remedial and small scale (Chapter 4, p 88), and something more massive and reliable was required. A *dam* laid across the valley impounded the water carried by the stream and canalised the overflow from the dam through a *culvert*. The *pool* so formed spread out to the south and was marked to the north by *boundary walls*, separating the pool and its drainage from the northern settlement area. Industries were to develop within the enclosure on either side of the valley, so it was important to establish a dry route between them. A paved *road* with kerbs and ditches led down the slope from the cemetery hill to the bottom of the valley. It was taken across a *bridge* to the west of the dam, composed of massive capstones, like a clapper bridge. Road, bridge, dam, boundary walls and enclosure ditch thus worked as a single designed infrastructure, to provide a dry working area and provide humans and animals with water.

Enclosure ditches (S15, S16) (OLA 6.1/3.3.1)

The *first enclosure ditch* S15 was sampled in three discrete areas, in 1999, 2000 and 2001 (Illus 5.5.2). Excavation of the feature in 1999 and 2000 was hampered by the presence of rising groundwater and unstable sections, but the basic form of the ditch was established and corroborated, using a hand auger where necessary. The first cut measured over 1.80m wide by 1.30m deep with a steep northern edge. The original southern edges been lost to a

Illustration 5.5.4
Definition of second enclosure ditch S16, with features inside the enclosure (right), looking west

Illustration 5.5.5
Definition of second enclosure ditch, with features outside the enclosure (right), looking east

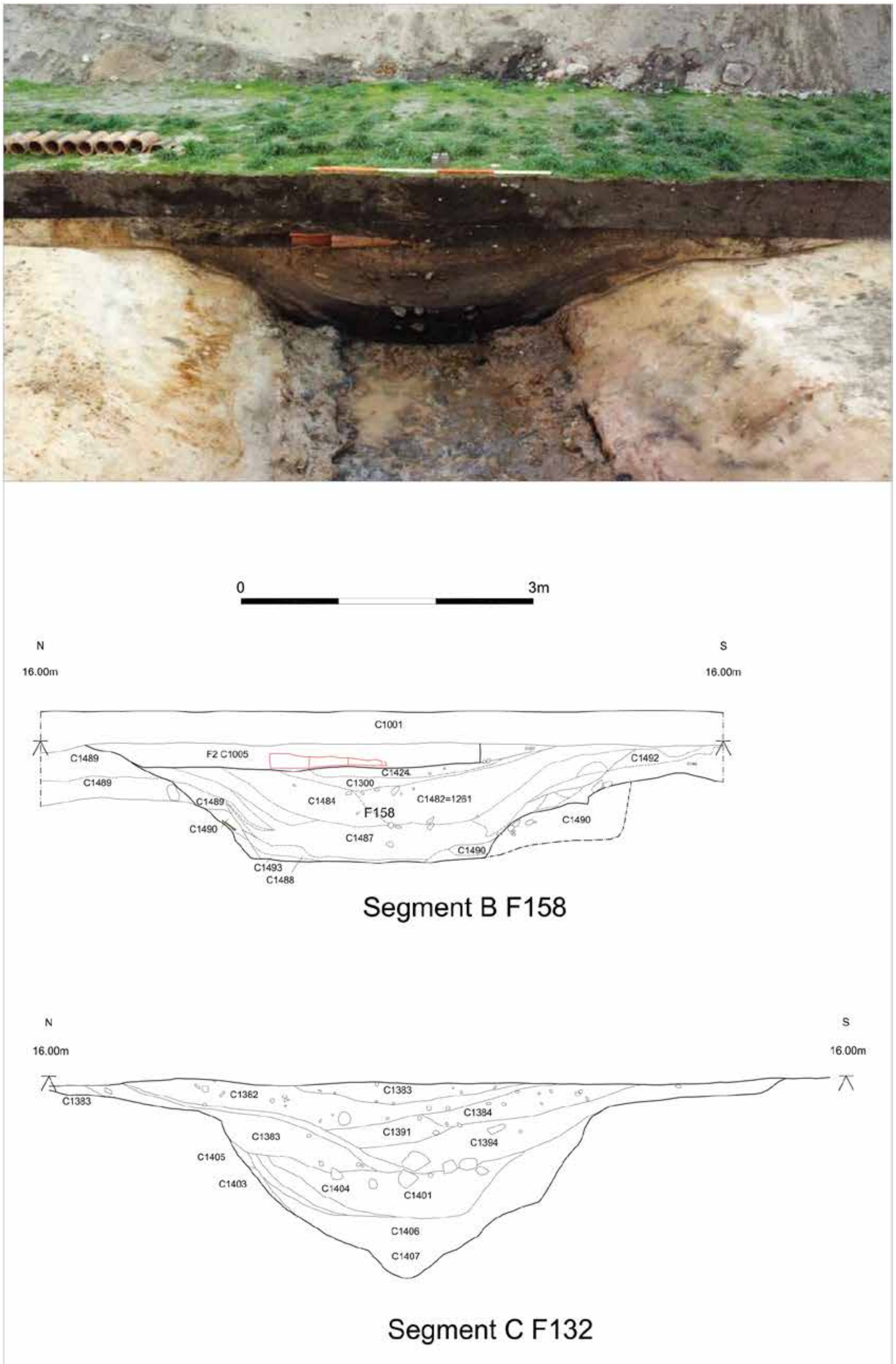


Illustration 5.5.6
Sections across the enclosure ditch at F158 (Segment B; photograph and drawn section) and F132 (Segment C)

Table 5.5.1
Excavated segments of the second enclosure ditch, S16; F158, F132

Segment	Profile	Maximum width (m)	Height AOD at base of ditch	Minimum depth (m)	Fills
A (Int 1, 1991)	Flat-bottomed	7.2	*c* 14.25m AOD	1.4	standing water with erosion from bank
B (Int 25, 2000)	V-shaped at base	8.15	13.93m AOD	2.0	standing water clogged by organic debris
C (Int 11, 1996)	Flat-bottomed	6.0	14.75m AOD	1.2	wattle lining containing standing water clogged by organic debris
D (Int 8, 1994)	Flat bottomed, stepped	4.0	13.87m AOD	1.0	–

broad shallow recut measuring up to 4.10m wide by 0.95m deep (OLA 6.1/3.2.1). The initial fills of the first cut in the 1999 and 2000 sections were soft pink sands, presumably laid down in watery conditions, with occasional clods of local pink clay, iron pan and dark silty sand (turves?) perhaps deriving from edge collapse. The broad shallow recut was filled slowly with pink sand, followed by a pink-grey sand seen as windblown, a thin grey-silt turf line and a final substantial fill of buff sand, also seen as windblown. Dished into the ditch in the sample excavated in 2000 was a later deposit of dark greyish-brown silt, which contained a rich assemblage of Period 2 metal- and glass-working waste (see p 212).

The story from the 2001 section was rather different, appearing as a U-shaped profile without any recut. Its refill sequence was the same as the secondary phase elsewhere, namely slow and intermittent, an initial silting, erosion from the edges, a thin deposit of dark grey silt and a levelling of buff sand. The overall sequence implied in S15 is that a ditch initially dug to drain or carry water was replaced by a broad and shallow successor on the same line. Here time elapsed in which turf grew or sand was blown in. These amorphous 'windblown' deposits ought to have originated from bare sand, ie from the beach, or from surfaces exposed by ploughing or stripping turf, events occurring in the life of the ditch, with grass recolonising the ditch in the intervals. Subsequent settling of the backfill system appears to have taken place during Period 2, since an important assemblage of Period 2 craft-working waste was captured in the resulting hollow, surviving fortuitously beneath the level of the modern plough (Chapter 5.7).

As an aspect of monastic development, S15 appears to be a false start, and the *second enclosure ditch* S16 was a more effective piece of engineering. It was this robust and extensive linear feature that led to the original discovery of the site (Chapter 1, p 11), being seen as a cropmark in 1984 and in 1995 as a parchmark (Illus 1.9, 2.9). The southern run (in Sector 1) was subsequently defined and mapped along a length of 109m, terminating in a butt-end on the east side (Illus 5.5.3). In plan, the feature was accompanied to north and south along its lengths with parallel grooves and depressions (Illus 5.5.4, 5.5.5).

Illustration 5.5.7
General view of the infrastructure S7, showing the road, the dam, the pool, the bridge, the culvert and the boundary walls

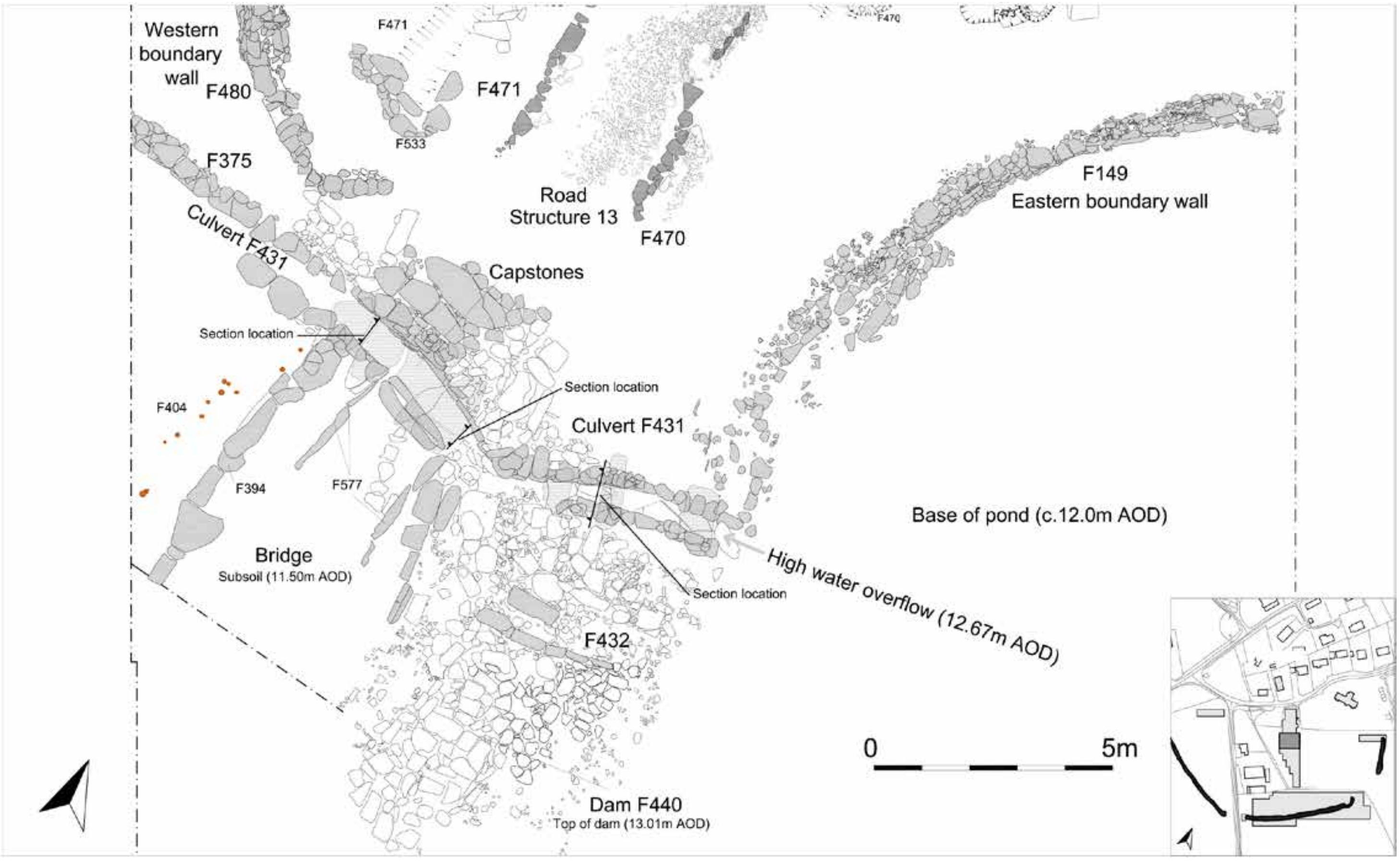


Illustration 5.5.8
Plan of S7

Segments of S16 were excavated in three locations in Sector 1 (A, B, C), and a small length of the eastern run was defined in Int 8 (D) (Illus 5.5.1; Table 1; OLA 6.1.1/3.4.2).

Segment A (Int 1, 1991) was excavated during the initial exploration of the site by Jill Harden (Chapter 2, p 18). It exposed a ditch cut into a natural deposit of pink cobble-rich clay-sand. The maximum depth exposed was *c* 1.40m below modern ground surface, and the profile a flat-bottomed base 2.6m across, with sloping sides widening to a maximum *c* 7.2m at the surface. The earliest deposit encountered within the ditch consisted of a laminated organic deposit (L2), which had the appearance of having accumulated slowly and intermittently and in the presence of water. During the accumulation of this laminated deposit, interleaved slumping shoulders of pink boulder clay were noted on both the north and south sides of the ditch, interpreted as deriving from internal and external banks. Three samples from the peat layer gave radiocarbon dates between the second and sixth century AD.

Segment B (1996; F158) was excavated within Int 11 on the southern run of the ditch east of Segment A (Illus 5.5.3). The form of the ditch at this point consisted of a flat-bottomed feature 2.40m wide at the base with sloping sides around forty-five degrees widening to over 6.0m N–S (Illus 5.5.6). It reached a depth of 1.2m. Stakes of wet-preserved wood were recorded in situ along the shoulders or recovered from the deposits inside the ditch, implying an initial wattle lining of the lower part. A sample of one wooden stake returned a radiocarbon date of AD 670–890 (95.4%). Within and subsequently overlying this wattle-work an organic-rich deposit accumulated, interleaved at the sides with sand eroded from the shoulders of the ditch. The final fills observed were tippings of grey humic sand representing a rapid backfilling, and including a sherd of medieval pottery.

Segment C (2000; F132) was excavated within Int 25, 12m east of Segment C (Illus 5.5.3). The ditch here had a V-shaped profile and was 8.15m at its widest and the water-logged sequence permitted a detailed study of the organic fill (Illus 5.5.6). The earliest deposit was primary silt (C1408), accompanied by a hurdle-like structure (C1403). An organic layer then began to accumulate that was rich in taxa indicating a body of standing water (C1407). The plant assemblage was dominated by elder and interpreted as deriving from over-hanging scrub from a hedgerow. Neighbouring activity was signalled by the presence of dung beetles indicating nearby livestock (C1407). A black clay then formed (C1406) followed by a wefted mass of leaf fragments and wood (C1405). These continued to imply an elder hedgerow, but detritus now included arable weed seeds, traces of uncharred heather (twigs, shoots and flowers), bog moss (*Sphagnum*) (leaves) and bog myrtle (*Myrica gale*). By implication, land nearby was under cultivation and other plants were being imported from areas of heathland or bog. Organic deposition was interrupted by grey silty sand (C1403), followed by twiggy debris including blackberry or bramble, willow and a substantial chunk of elder trunk wood (for detail see Digest 7.4; OLA 6.1.1). Willow twigs from this context (C1401) gave a radiocarbon date of AD 680–940 (Digest 3.2). The final surface of the ditch fill was littered with stones.

Segment D (Int 8 1994; F35–F37; Illus 5.5.3) targeted the ditch at the bottom of the valley on the east side as identified in the 1984 aerial photograph. The enclosure ditch was successfully encountered and here had a flat base and measured 4.0m wide and up to 1m deep.

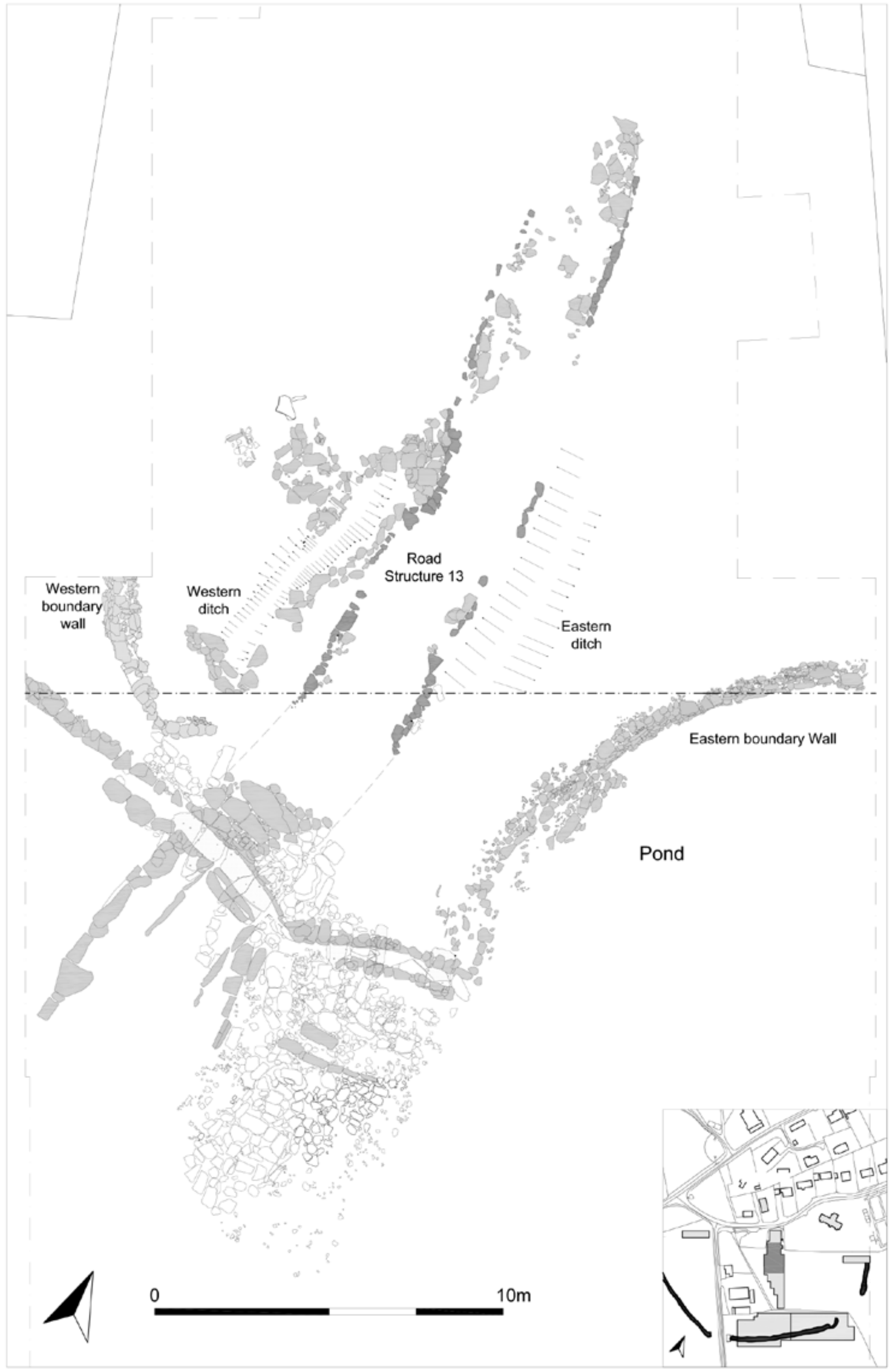


Illustration 5.5.9
Plan of road, ditches and boundary walls

Evidence for a bank

Direct evidence for banks, either internal or external, was elusive. Sector 1, including the area of the enclosure ditches examined, had been levelled by cultivation in the Middle Ages (and later) erasing all earthworks. The shallow features that ran intermittently along the northern and southern sides of the enclosure ditch (Illus 5.5.4, 5.5.5) were all defined against subsoil and investigated in detail by excavation, but without a clear outcome. There were no traces of timber structures, such as would be left by a palisade or timber revetment. The external features initially had the appearance of intermittent depressions made by wheeled traffic and were thought to represent a track around the outside of the enclosure. This was not supported by excavation, but such uneven wear patterns would not be untypical of droveways made by cattle. The distribution of ancient podzol (p 97) shows that the original form of the terrain here was not undulating, although it sloped downhill from east to west.

Banks were more credibly inferred from erosion products in the excavated segments A, B and C. The layers comprised grey silt-sand implying sand and turf and clay-sand resembling the impermeable subsoil that supported the water table. There was no indication of whether banks stood north or south of the ditch, or both, although the relatively active palimpsest on the south side favours that any upcast here would have been shorter lived.

Illustration 5.5.10
Section across the road S13, showing camber and (under the road) stones belonging to S11 (Period 1)

Illustration 5.5.11
Road S13: degraded paving stones

Nature and history of the enclosure

The first attempt to provide an enclosure (S15) was contacted only in Sector 1. The overall course of this first ditch is not known and in the area examined it collapsed or was backfilled leaving a depression that later captured the remains of metalworking (Chapter 5.7). The second ditch, S16, created an enclosure with a plan of a flattened C that contained the working part of the known monastic settlement. A three-stage biography seems appropriate for it. In its original form, the ditch was flat-bottomed, just cutting into the impermeable cobbled clay-sand. Its sides were revetted with wattle-work above the water table and it broadened to 6–8m wide at ground level. The quarried upcast of turf, sand, cobbles and clay-sand probably formed a bank on the inner (northern) side. This bank would be narrow – no broader at the base than 6m to allow it to stand between the ditch and S1. The butt-end of the ditch implies an entrance to the enclosure in the south-east corner. The subsoil as a whole slopes down from east to west, encouraging the water to move in this direction. But the segments sampled suggest that water was standing, at least in parts. It could be used to water animals, especially perhaps cattle, but the access would be steep from the south and impeded from the north (by the bank). The ditch was soon overhung by elder, dropping elderberries into open water from an adjacent tree line or hedge line, perhaps growing on the bank. The presence of a few dung beetles suggested 'a landscape dominated by grazing land' (Digest 7.4, C1407).

In a second stage, the ditch deposit diversified with alder and willow, and included weeds of cultivated land together with heather and moss probably imported from further afield (ibid, C1405). The third stage saw the ditch choked with branches and grey sandy soil pushed in probably as a result of the levelling of the bank (ibid, C1401). The ditch was subsequently ploughed over with rig and furrow. These three stages have been aligned respectively with Period 2 (eighth century), Period 3 (ninth to eleventh century; Chapter 6) and Period 4 (twelfth to sixteenth century; Chapter 7).

Road and ditches (S13) (OLA 6.2/3.3.2)

The infrastructure created at the northerly end of Sector 2 was a massive operation comprising a kerbed road with two roadside ditches, two boundary walls, a pool created by a dam with a culvert running over it and a bridge (Illus 5.5.7). There was some indication of a preparatory event in which sand and detritus of the Period 1 settlement had been spread by wind, before construction started (Chapter 4, p 99; Digest 7.5). This may have been promoted by the exposure of the sand surface caused by the stripping of turf used to construct walls (Chapter 5.9, p 236). Land north of the pool was prepared during an episode of levelling using a quantity of mixed clayey silt layers with a component of charred material, animal bone and small fragments of sandstone. Overlying these dirty mixed deposits was a markedly clean layer of bright yellowish-white sand. This preparatory sand was shared by the road (S13) and the vellum workshop (S9) showing they were conceived as a single development (Illus 5.5.8; and see Illus 3.12; Chapter 5.6). The other elements were integrated within this design: the dam (F440) that created the pool was joined to the east boundary wall (F149) and the culvert (F431), collectively termed S7. The road (S13) crossed over the culvert, and was served by two roadside ditches (F470, F471); the more westerly of these (F471) terminated at the western boundary wall (F480).

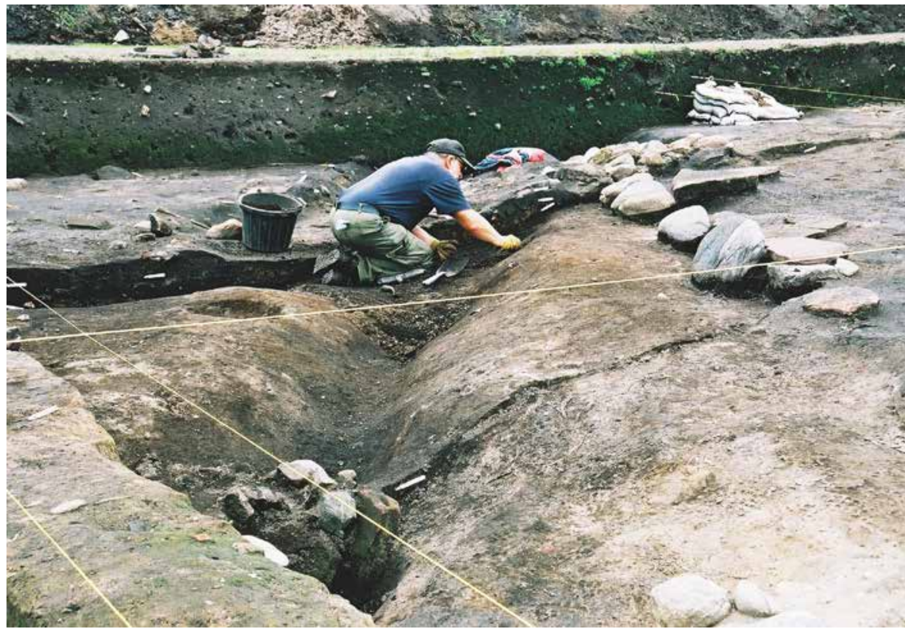


Illustration 5.5.12
Eastern roadside ditch under excavation, F470

The width of the *road* was about 3m, and it was recorded along a length of 40m where it crossed Sector 2 (Illus 5.5.9). It was founded on a homogenous causeway composed of a single, large deposit of imported gravelly sand subsoil, featuring lenses of dark brown silt, perhaps remnants of a redeposited buried soil. This material had been shaped along its length so as to provide

Illustration 5.5.13
Boundary walls: (a) East, F149; (b) West, F480, base showing bone raft

Illustration 5.5.14
Dam, looking south with the pool to the left; with northern overflow culvert (F431) in lower part of picture and southern overflow culvert (F432) just beyond it

a gradual and even gradient for the road as it travelled downhill from north to south (consequently, the sand make-up became deeper towards the pool). It was cambered across its width to throw off water into the roadside ditches (Illus 5.5.10). It was equipped along each edge with stone kerbs formed of cobbles of various sizes and originally surfaced with thin slabs of yellow and red sandstone, much degraded as found (Illus 5.5.11). In places the road surface seems to have been refreshed in an ad hoc manner with compacted ash.

Roadside ditches

The *western ditch* increased in depth down the slope towards the west boundary wall. At this point it was equipped with a stone baffle consisting of five boulders and smaller stones set in a V-formation and channelling water towards the pool (F533). Elements of an original timber lining and an area of sandstone-slab consolidation were seen. The ditch was subject to infilling from the adjacent industry: a group of vellum pebbles had tumbled into the open wood-lined feature and were found where they had scattered (Illus 5.6.11). Within the ditch, overlying the wooden lining, were brightly coloured ash deposits intermingled with more broadly deposited ash, which gradually raised ground

Illustration 5.5.15
Detail of top of dam, showing southern culvert (F432) in the foreground

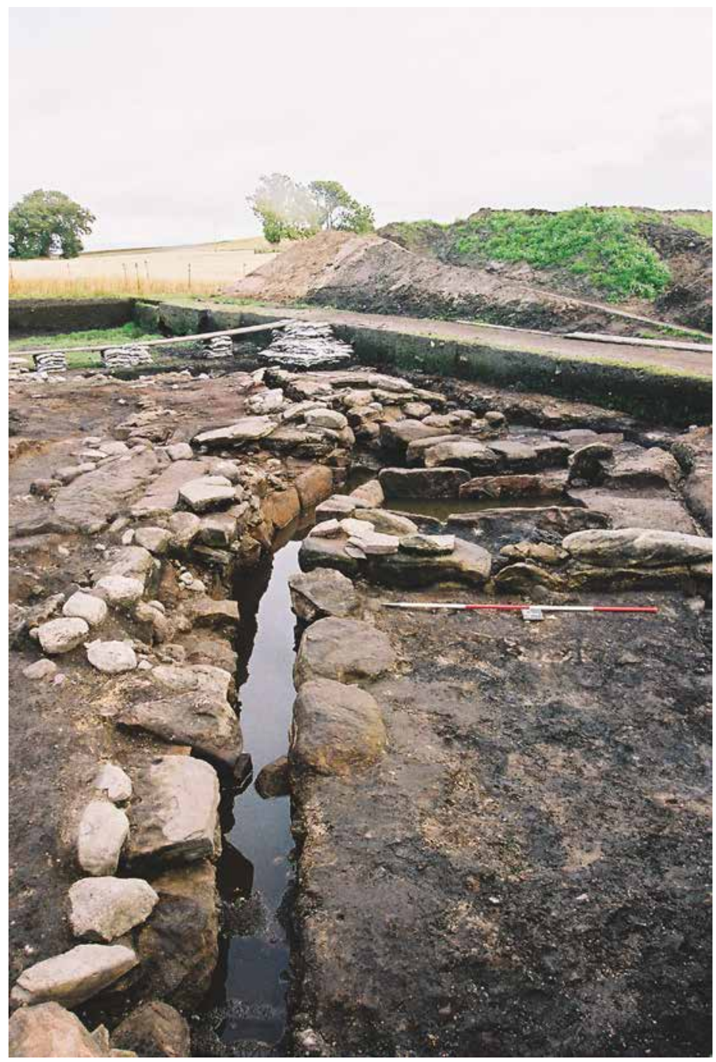


Illustration 5.5.16
Culvert F431, excavated

levels in the southern part of the vellum-working yard. Deposits contained a variety of material, mainly charcoal and charred organics, calcined fragmentary animal bone, unburned animal bone and occasional artefacts, such as flint strike-a-light flakes (Digest 7.5).

The *eastern roadside ditch* shared many characteristics with its eastern counterpart. In its earliest guise, it had a neat U-shaped profile, initially filled with a grey silty sand with a high percentage of small angular and rounded stones (Illus 5.5.12; uphill is in the foreground). A fragment of worked whale bone was recovered from among the stone component (24/7666) tentatively identified as the tip of a whale-bone mattock, which presumably broke during the initial excavation of the ditch. The stone component is thought to have been intended to encourage the movement or drainage of water before silting occurred. A thin layer of sticky, black silt (C2144), which followed the contours of the feature seemed to represent a developing turf line or a deliberate lining. The ditch was designed to channel water for collection and storage downslope, rather than encouraging it to exit the workshop zone altogether. The use of the ditch for water collection was endorsed by a stone-lined pit (F470), which had been sunk into it, apparently to intercept and store water or other liquids. The ditch subsequently silted up with a series of dumps and spreads, which almost levelled the eastern roadside ditch, although it persisted further downslope as a shallow depression that would receive fragments of broken sculpture in Period 3.

Boundary walls

Eastern boundary wall

The eastern boundary wall (F149) varied in thickness from broad at its base to narrow at its surviving summit (Illus 5.5.13a). It ran for *c* 14.0m oriented broadly E–W, curving south at its western end where it joined with the S7 culvert (F431). The stone make-up of the wall consisted of a basal course of beach boulders that formed the foundation for the upper courses, which became gradually smaller and more slab-like. The stone component was respected by a line of charcoal that followed the north side of the wall and was visible intermittently for most of its length and is interpreted as the remains of a hurdle (F483).

Western boundary wall

The yard adjoining S9 to its immediate south was contained by a south-westerly boundary wall F480 which enclosed an area measuring *c* 12.0m N–S bounded to the east by the western roadside ditch. The principal make-up of the wall consisted of rough angular sandstone blocks bonded with turf (C3637), atop a raft of butchered animal bone (C3122) (Illus 5.5.13b). The wall measured 3.80 × 0.70m, turning eastwards for a length of 1.50m before terminating. The deposition of the bone raft may have been to combat soft, waterlogged ground conditions, suggested by the presence of Period 0 deposit C3541, as well as a number of landscaping deposits. To the west of wall F480, deposits revealed a consistent occupation deposit characterised by a thick, plastic dark grey silt containing animal bone and occasional shell suggesting food refuse. Overlying this horizon, a series of rapidly accumulating deposits were laid down, suggesting localised inundation.

The boundary walls, constructed of boulders bonded with turf (p 230) were originally free-standing and their purpose was to demarcate the industrial zone to the north. For persons or animals entering from the south via the bridge and road, it is not excluded that they mark the beginning of an area of restricted access, where special crafts are practised.

Illustration 5.5.17
Culvert F431 pre-excavation with surviving roof slabs in situ. The pool is in the foreground and the collapsed megalithic bridge stones in the background. The water table is at the level typically reached when pumping stops

Dam, culvert and bridge S7

Construction

The Period 2 water-management scheme would have begun with the building of a dam across the valley (Illus 5.5.14). This comprised a dump of clay with branches, perhaps dug out of the stream that ran down the valley where the pool was to form. It included some animal bones deriving from the previous period

Illustration 5.5.18
West of dam, showing elements of bridge: capstones, with culvert running under, and supports for the timbers, encased in clay

(Period 1). The bulk of the dam elevation (F440) was continued upwards with stone rubble. On the west side it was roughly faced with yellow sandstone blocks, giving an overall width of 4.0m. Two culverts were built over or through the dam of which the more southerly (F432) survived as a short open channel with little sign of use (Illus 5.5.15).

The more northerly culvert, F431, was the main overflow channel for water breasting the dam (see Illus 5.5.8). Stratigraphically, it provided the key link between all the component parts of the water management structure of Sector 2, since it was bonded with the dam, the road, the east boundary wall and the bridge. The culvert was traced for *c* 15.0m (Illus 5.5.16). Its entry from the pool was at the same height as the extant dam, which it must have served as an overflow. It proceeded across the dam at right angles, oriented broadly E–W, and was here formed of parallel stone walls built on a floor of flat stone slabs, capped with large, thin sandstone slabs (Illus 5.5.17). This form of the culvert was maintained for the 4m thickness of the dam. Thereafter it continued unlidded, without a floor and with cobble-built side walls, altering direction after a further 2m to cross the road line at right angles. Here the culvert was reinforced on the south side with large monolithic recumbent slabs, the lowest of them a natural seaworn slab, marked with a number of small grooves. On the north side it was buttressed with large sandstone blocks supporting the capstone. It is likely that a trough quern found in the bridge area must have fallen off the south revetment, where it had been reused for building (Digest 6.1). The culvert was roofed with four massive sandstone capstones, the top surfaces of which were equivalent to the level of the road. Westwards, beyond this megalithic construction, the culvert walls returned to cobble-built, with a possible rammed-cobble base merging with the make-up of the western terrace wall.

Bridge

To the south-west of the capstones were three rows of stones set orthogonally, with a fourth at an angle of five degrees to the others (Illus 5.5.18). Together these stone rows appear in plan as a continuation of the road line (see Illus 5.5.8, 5.5.9). The most westerly (F394) was made of large stone blocks and its foundations lay on subsoil at 11.47m AOD. The two centre rows (F577) were simply stone slabs set on edge. Investigation of the strata between them revealed a sequence of deposits consisting of widespread concreted glacial gravel and sand, beneath a grey sand, similar in composition to the post-Period 1 flood deposit (Digest 7.5). The eastern stone row (C3492) appears to have been displaced along with several large stones from the capping of the dam.

It is argued that this configuration represents the foundations of a bridge; it is clear that the settlement required one. Road, pond, dam, culvert and terraced walls formed an integrated system that collected water into a pool and controlled the disposal of excess quantities down the re-entrant that led northwards to the sea. Once this infrastructure had been put in place, those working in the vellum workshop would be cut off from those working in the metal smithy (Chapter 5.7) and the fields beyond. People and cattle inside the enclosure would need to find a way of crossing the stream or the pool. They could have used the top of the dam, but it is not evident that they did so, and it would be more logical to use the road. The large stones capping the culvert at the termination of the road were clearly expected to bear weight, implying that the road should have continued over them. The wall of large sandstone blocks, founded on cobbles (F394), and two lines of upright slabs (F577) all continue the direction of the road and maintain the same width. If the bridge was made of wood, timber baulks about 40cm thick and 4m long could have lain across F394 and F577 from E–W, with a layer of N–S planking laid on these. This would raise the height from the top of the foundation stones, ie F394, F577 (at 12.6–12.4m AOD) to the top of the capstones C3572 (13–13.10m AOD) (Illus 5.5.19).

An alternative would be to bridge the crossing using stone slabs, so constructing a 'clapper' bridge like Tarr Steps on Exmoor (dated *c* 1000 BC) or Vila da Ponte in Portugal (medieval). This bridge would be required to deliver a wagon or a herd of cows without their getting bogged down, but need only have enough headroom for the tailrace. A third alternative would be to create a raised weir against F394, allowing cattle and people to cross the shallow outflow with only slightly wet feet. However, there was no sign of the expected massive blocks, or of the large amounts of rubble that would be necessary to create a raised ford and weir.

The most likely option is that timbers of the same kind and length as required for the rafters of S1 (Chapter 5.9), would be laid across the top of upright stones. The span required was 4m but it was supported at intervals. A large scantling was perhaps not necessary since the number of timbers could be simply multiplied. In this way the length of the bridge could continue as long as need be to get to dry land from the doors of the vellum makers to those of the metal-smiths'.

Excess water had flowed around and between these stone 'piers' although most of it would be canalised through the culvert when it was working. Beyond wall F394, water was released from the overflow. Here was a group of upright stakes along with collapsed examples of undetermined function, one of which returned a radiocarbon date of AD 640–770.

Disuse of Structure 7

The fills that relate to the use of the culvert consisted of an orange, possibly waterborne sand, and a black silt containing frequent twigs and organic material, and a thin, greasy, dark grey silty clay. A fragment of waterlogged leather, perhaps from a shoe, was recovered from the black silt (24/7810; Digest 6.16.1). These deposits are consistent with the function of the culvert as providing an overflow from the pool. The culvert had later slowly become filled with peat and a final backfill of brown silt. In places, the peaty fill of the culvert also gave out to a mixed deposit of concreted sand and pebbles, suggestive of deliberate blocking (Illus 5.5.20). At the pool entrance to the culvert there was a dump of disordered stones, and fragments of sculpture were found to the north against the dam (TR257). The pool still held water when metal-smiths were active in Period 3, since their debris sank into it. The road was resurfaced with pebbles while the capstones were still in place, suggesting the continued and necessary operation of the hypothetical bridge into Period 3.

Discussion

The Period 2 enclosure in Sector 1 was clearly not intended to be defensive, being at the foot of a slope. Its roles of collecting and draining water were equivocal, but the ditch (and bank) would at least protect the south industrial area (and S1) from flood water. The western arm has not been examined, but given the topography it too would have helped to canalise water towards the firth. The eastern arm was discontinuous in the cropmark, but its line crosses the re-entrant formed by the stream that provides the destination for ground water on the east side. These practical matters no doubt served to complement the function of the enclosure in demarcating a sacred space for the monastic settlement.

The land enclosed by ditch S16 in Period 2 measured 235m across at the widest (E–W), while the distance from the edge of the enclosure to the top of the ridge (Tarbatness Road) was 123m and from the road to the beach 200m, or 323m in all from the south edge of the enclosure to the beach. This enclosed an estimated 2.9ha of useful land south of the Tarbatness ridge, and 5.1ha of hypothetically enclosed dunes between the road and the sea, making 8ha in all. This larger figure is comparable to the broader areas enclosed at Hoddom and Iona (Lowe 2006, 186),

Illustration 5.5.19
The bridge area with the capstones removed, and all deposits removed to subsoil

although much smaller than Clonmacnoise (13ha) (Murphy 2003, 22). In general, these bank-and-ditch enclosures tend to the shape of a splayed C, more rectilinear than curvilinear, and it can be proposed that in addition to their symbolic role, their practical function is to manage the flow of water between the high ground behind the monastery and the sea or river in front of it.

Monasteries are assumed to have defined themselves with such a *vallum* at, or shortly after, foundation. The ditch at Hoddom was dated by radiocarbon on charcoal from its accompanying palisade to AD 600–680 and AD 600–755, indicating 'construction in or around the middle of the seventh century' (Lowe 2006, 171–2). However, peat formed beneath the bank at Iona returned a date of 5 BC – AD 125 (68%) suggesting that the vallum was based on an Iron Age enclosure (McCormick F 1997, 49). The earliest organic fill of the major ditch at Iona, 3m wide and 2m deep, was dated AD 610–780 (95%), post-dating the death of Columba in AD 597 (ibid, 50). The excavated Clonmacnoise ditch was 5–6.2m wide and 3.75m deep, and a radiocarbon date on animal bone in the fill (cited as AD 714–873) indicated that 'the ditch was backfilled in the late eighth to early ninth century'; the ditch was taken to be in place when the timber bridge was built across the Shannon in AD 804, as part of 'a major expansion of the monastery in the eighth/ninth century' (Murphy 2003, 19; O'Sullivan & Boland 2000). The dates assigned to these ditches are naturally dependent on such carboniferous contexts as survive in context – usually rather few. The first Portmahomack ditch (S15) was constructed and backfilled before the Period 2 metalworkers became active. The second ditch (S16) was equipped soon after its construction with a wattle-work revetment dated to AD 670–890. These are data without much historical precision. Events within the enclosure elsewhere are argued to be contained between AD 680 and 810 (Chapter 3). Since all the dated events appear to be broadly contemporary, an archaeological judgement is that the first enclosure ditch served the monastery between *c* 670 and *c* 700, and the second from *c* 700 to *c* 810, probably remaining visible until the tenth century or thereabouts (Illus 3.1).

A metalled road is a practical investment, with perhaps an additional symbolism. Paving is used to create dry areas of passage in many sites in early medieval Britain and Ireland, especially where there is a good supply of slabs, for example in the entranceway to the rath at Deer Park Farms, Co Antrim (Lynn & McDowell 2011, 120–4) and the more modest entrance and internal walkway of the eighth-century byre-houses at Pitcarmick (Carver et al 2012, Illus 22). However in Ireland formal paved ways are said to be more common on ecclesiastical sites, and mostly associated with sacred areas within a monastery, connecting cemeteries, shrines and oratories (O'Sullivan et al 2014, 173–4). Paved areas and streets have been defined at Downpatrick leading to a cemetery, at Church Island

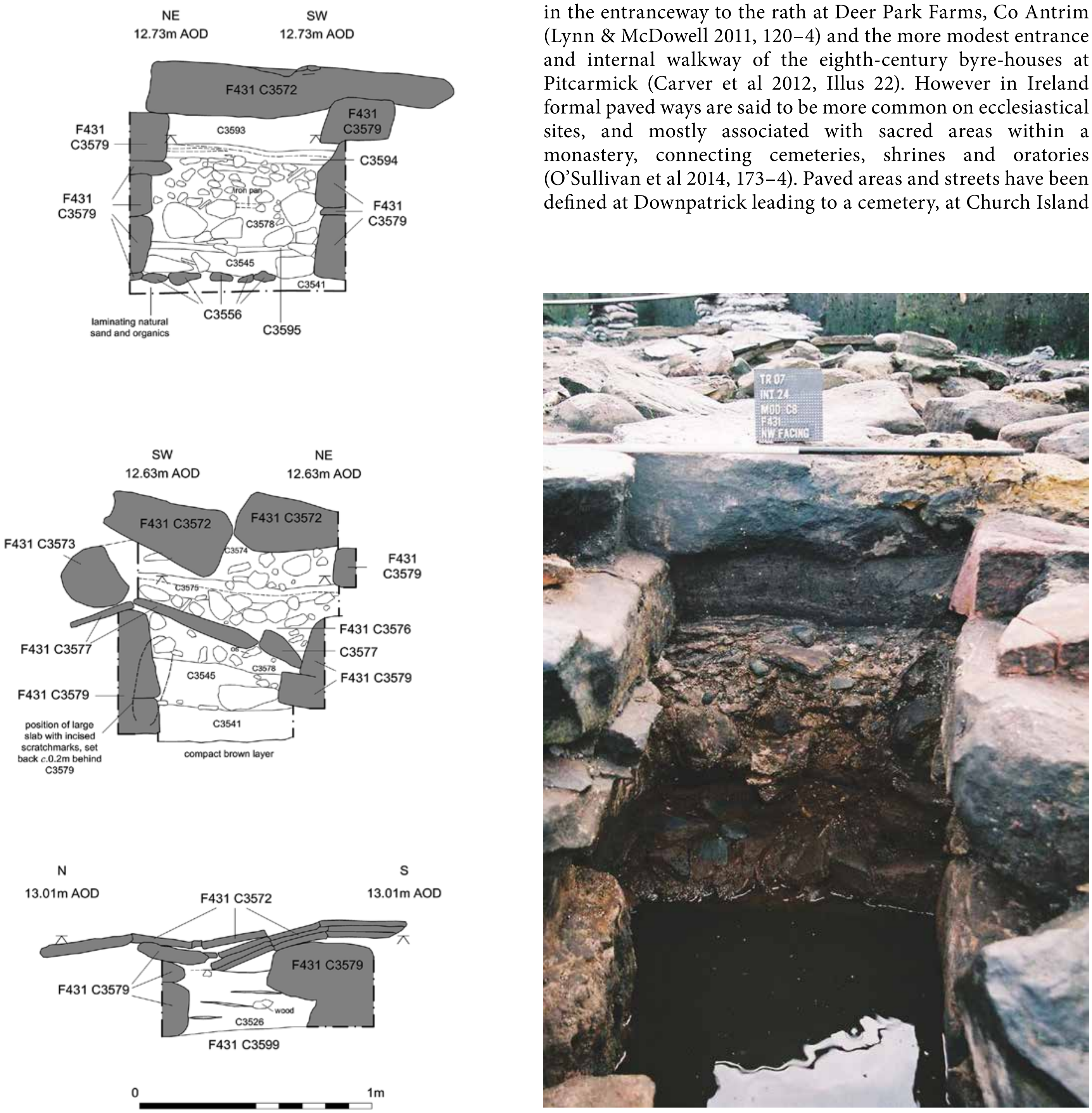


Illustration 5.5.20
Sections across the overflow culvert F431, showing the concreted fill (right)

leading to an oratory, on Inishmurray joining a cell and a *leacht*, while areas of identified monastic sites at Illaunloughan and High Island were extensively paved (ibid, 174). At Clonmacnoise paved streets were maintained from the late seventh century (King 2009, 345), one being 3m wide and at least 18.5m long (O'Sullivan et al 2014, 175). An eighth-century metalled road excavated at Chancery Lane in Dublin was 2.35m in width, and had surface of tightly packed rounded stones set into the natural boulder clay; it had one roadside ditch, but no kerb (Walsh 2009; O'Sullivan et al 2014, 193).

In Britain there are also indications of an early ritual role for dedicated pathways. At Cannington hillfort, Somerset, the focus of post-Roman burial was a burial mound containing a slab-marked fifth-century grave approached by a path that would be 'created by foot-traffic' (FT26; Rahtz et al 2000, 55). At Hallow Hill, St Andrews, Fife, a roadway crossed a long-cist cemetery SE–NW. The surface was densely reinforced with a thin layer of small pebbles and its 'slightly ragged' edges gave a width of 2 to 4m. It was respected by the long-cist graves (there dated sixth to ninth century), which implies that it preceded and structured the cemetery (Proudfoot 1996, 441). The monastic cemetery on the Isle of May was defined to the west by a kerbed paved road (Yeoman 2009, 235). Thus while pathways to ritual destinations may be fifth century or earlier, the establishment of formal paved streets is probably an attribute of the eighth-century monastic expansion. At Portmahomack, dry-stone construction was deployed only in the infrastructure (and possibly the church, see Chapter 5.4). In this respect its road represents a special investment, and being kerbed, paved and with roadside ditches with V-profile, has more than a hint of *romanitas* about its construction.

Was there a mill?

It has now been well demonstrated that early Irish monasteries, and indeed secular settlements, were equipped with watermills from the seventh century onwards and excavated mills have provided diagnostic footprints in timber and stone (MacErlean & Crothers 2007; Jackman et al 2013). At Raystown, Co Meath, the presence of several mills was signalled by ditches running downhill, some up to 2m deep, which fed small ponds intended to provide heads for square three-sided timber wheel pits (which partially survived). However there were no remains of flume, wheel or millstones (Seaver 2006). The wheel pit of the mill at Kilbegly measured some three square metres and there were no millstones; on the other hand, timbers both small and massive, including a geared hub, planks, pegs and a penstock orifice were recorded over a watercourse more than 27m long (Jackman et al 2013, 63). The water scheme may be spread wide and involve several ponds, leats and races (eg High Island: White Marshall & Rourke 2000, 190).

Particularly well defined and fully published is the tide mill at Nendrum where water from the tide was impounded by a dam *c* 4m wide with the wheel pit sited against it (McErlean & Crothers 2007). Its back wall was integral to the dam and it had two side walls at right angles to it, the fourth side being open (to the lough). The interior space of the wheel pit measured 2.45 × 2.2m and accommodated a wooden wheel with an estimated diameter of 97.20cm. Two millstones had fallen into the wheel pit from a floor above. There were no direct traces of a mill house. A penstock 3.78m long was constructed in stone and tapered in its bore from 1 × 0.85m at the mouth to 0.55 × 0.60m at the orifice. This latter had a hole *c* 20cm in diameter to provide the jet that drove the paddles on the wheel. The penstock was buried in the dam at an angle of fifteen degrees, its mouth at low water level (there 0.95m AOD) and its orifice at the level of the wheel (there at – 0.10m AOD). The fall was thus about 1m over 4m (ibid, 215).

Although the fine examples from Ireland cited above had yet to be published, the excavation of S7 at Portmahomack was undertaken with the expectation of a mill in mind, and the search to define it continued until the final days of the campaign (cf OLA 1.2.2, 11 August 2007). The interpretation given above – as a dam, pool, road and bridge – was based on the observed structures and the absence of any flume, paddles, penstock, wheel, wheel pit, bearing or millstones. The dam itself was not removed during excavation since the water had no means of escape to the west and the pumps could not cope with the outflow: the relevant area of the excavation would have been drowned (see Illus 5.5.17). A subsequent analysis was carried out on paper to discover if the dam area could have concealed a penstock and wheel pit with sufficient head of water to drive it. This was found to have been technically possible: if the Nendrum layout were transferred to S7, the wheel pit would lie hard up against the dry side of the dam F440, while the penstock would be buried deep within it. If the dam had survived to its original height, the maximum water level in the pond would be at *c* 13m AOD, the mouth of the penstock would need to lie between about 12 and 12.5m AOD and its jet emerge about 11 to 11.5m AOD providing a head of water between a metre and half a metre deep. However, there was no trace of a wheel pit in this position nor of an outflow at the level of the natural subsoil. If there was once a mill in this position, it must have been thoroughly dismantled.

There remain two alternative possibilities. A mill might lie further down the hill, on the course of the stream that still runs to the sea today. A possible location would be the point at which the stream is crossed by the Tarbatness Road, where there has endured the rectilinear stone structure known as the Baptistery well (Tobar a' Baistaidh; OS 1880) at one time serving as the town water supply but which has now been refurbished as a heritage item. There was certainly a megalithic structure in the immediate vicinity, since large blocks were disturbed when the car park for the Tarbat Discovery Centre was created in 1999. No obvious remains of a mill structure were noted downstream from this point.

It does also remain possible that a mill was never built. The hydraulic infrastructure just described would serve a mill, but does not require a mill. A pond would be required in any case to capture water for drinking (humans and cattle) and for industry (vellum and metalworking). It is noticeable that the Period 2 monastic economy was focused on cattle more than on arable; there is only scant evidence for local grain production although barley was eaten (see below, Chapter 5.8, p 222). The rotary querns that were found are of the hand-driven kind and all but one have

Illustration 5.6.1
Period 2 Sector 2 northern workshops, looking north towards the Dornoch Firth. The road S13 runs down the slope from the ritual centre by the church. The vellum-working area is to its west (left)

late medieval contexts. It is concluded for the present, and with a weather eye on future discoveries, that milling technology did not reach Portmahomack at the same time as the other monastic skills, or was not needed if it did.

5.6 The Northern Workshops

Introduction

The 'northern workshops', situated in the northern half of Sector 2, were concerned with the preparation of hides, and specifically of parchment. The industry was integrated with the development that was planned and constructed in the late seventh to early eighth century, and may have formed part of the original blueprint, since it was laid out on a specially prepared site (p 181). The industrial activity was disposed either side of a paved and cambered road (S13) that led down the slope from the ritual centre on the hill (Illus 5.6.1; Chapter 5.5). To the west of the road lay a stone-lined tank (S4), a workshop (S9) and open yard (Illus 5.6.2). The associated distribution of artefacts, animal bone and craft-working residues suggest that these structures were host to the working of skins which, it will be argued, included the production of vellum. To the east of the road lay an open area defined by a stone-and-turf bank with stone-lined pits and large, underground stone-built structures, apparently built in the tradition of souterrains. This area was littered with bones, predominately those of cattle, but with minor fractions of pig, sheep/goat and occurrences of other animals including horse, red deer, roe deer, seal, wolf, fox, otter, whale and porpoise/dolphin (Chapter 3, p 60).

The preservation of structures, finds and the distribution of finds was exceptional. The workshop had been set on fire while still in business and its fittings and equipment had been largely abandoned where they had been used. An array of tools, with flint strike-a-light flakes and small pebbles, surrounded hearths in the workshop and its yard. Serviceable and specialised iron tools and pumice rubbers all appeared to have been dropped in hasty retreat in advance of a conflagration (Chapter 5.11). The area had however also suffered extensive disturbance from developments in the ninth and thirteenth century (Chapter 6, 7). This made the structure of the workshop (S9) in particular hard to read. Some diagnostic hide-working artefacts were found residually in later periods.

The evidence for the industrial activities given by structures, artefacts and residue samples will be presented here beginning with the west side of the road (from north to south) and then the east side. This presentation will include references to the likely use of the features and artefacts encountered. These are reviewed and critically assessed in a final discussion which assembles the arguments for identifying the area as dedicated the making of parchment for manuscripts (first advanced in Carver & Spall 2004).

The stone-lined tank, S4 (OLA 6.2/3.3.3)

S4 consisted primarily of a stone-lined trough or tank (F72) sunk into the ground, surrounded by rammed surfaces of large rounded pebbles (Illus 5.6.3). The whole structure was dedicated to sophisticated water management. To the north, a funnel of angled slabs appeared to collect water, perhaps from a spring, which was supplied to the tank via a stone-lined and lidded conduit (F552). From the opposite side, another stone-lidded culvert (F376) drained liquid away downslope (Illus 5.6.4). A thin layer of green clayey silt was defined in the lowest part of the tank, which ultimately became clogged with a grey clayey silt. From this was retrieved an iron, wood-handled hook (Digest 6.1; 14/2012, 2016; Illus 5.6.5). The tank would have contained about 1,500 litres of liquid. Given its broader context (see below), the structure is interpreted as a facility for the washing and liming of small hides and the object is interpreted as a hook for retrieving pelts from the tank. A truncated pit (F554) at the north-west end of the tank contained a consignment of whelks, proposed, along with periwinkles and *spirorbis,* as a source of lime.

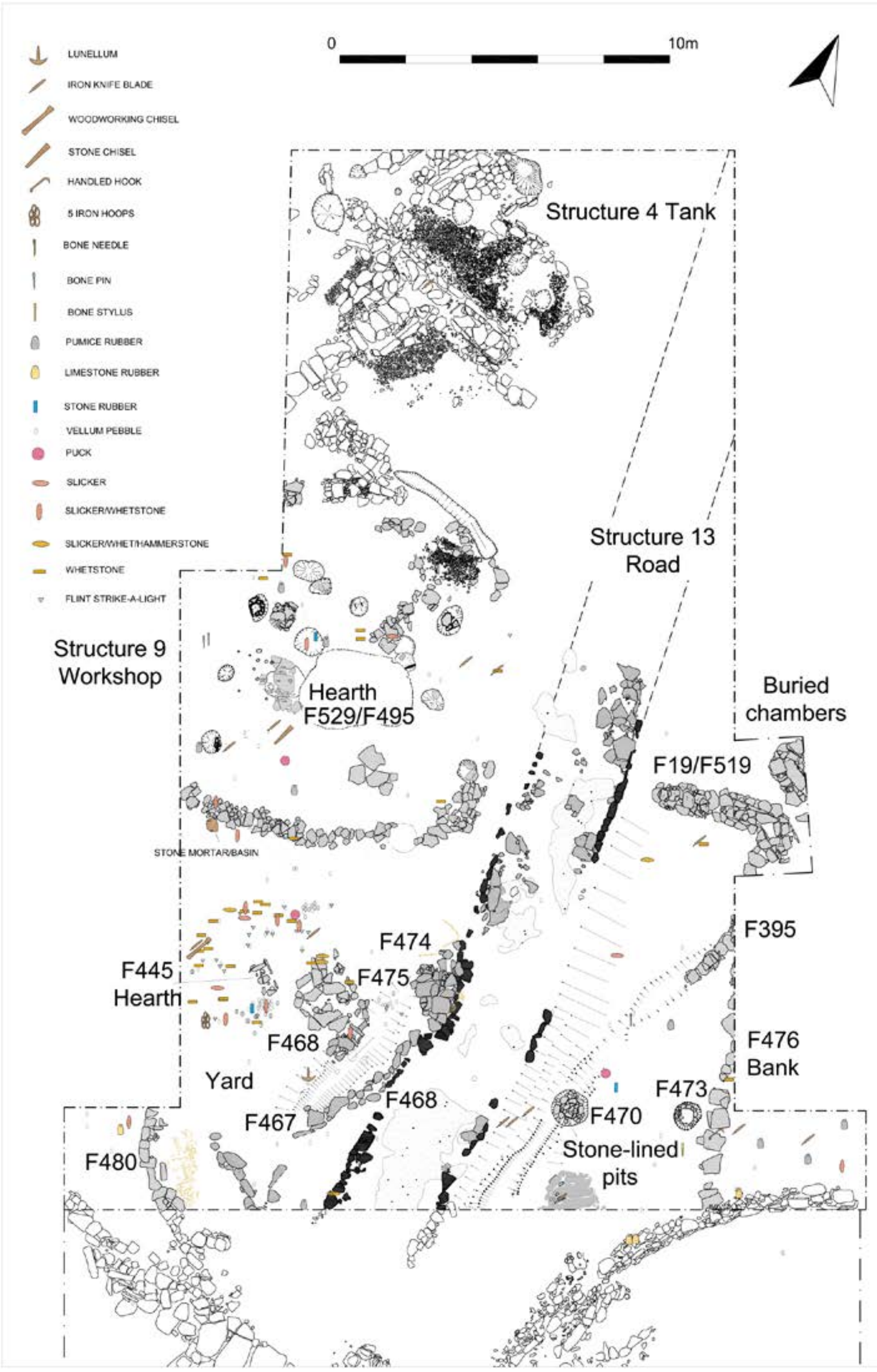


Illustration 5.6.2
Plan of workshop area with structures and distribution of finds related to vellum-working

Workshop, S9 (OLA 6.2 at 3.3.4)

Structure

S9 was a demarcated space shaped like a horseshoe in plan and enclosing a hearth-cum-kiln, two working stances and an earth floor, containing a spread of artefacts. The building was defined by a curving gulley to the north (F31) and a complementary curving terraced wall to the south (F434) (Illus 5.6.6, Illus 5.6.7). Between the two were several post-pits, asymmetrically disposed, but seen as roof supports. On the west side of the space so defined was a hearth that had seen two phases of use (F495). A small area of slabbed and cobbled hard standing (F378) joined S9 with S4 to the north, and was linked within the S9 zone to a kerbed pathway (F522) heading for the central space (which had unfortunately been obliterated by a late medieval well, F13). These arrangements are likely to have provided access to the workshop. The building had been eroded on its east side and the west side was incomplete, further exploration westwards being inhibited by a live electricity cable.

The overall form of S9 was reminiscent of the much better-defined bag-shaped building S1 (Chapter 5.7), and appeared to constitute the battered remains of a building of similar type. Alternatively, the wall and gulley define an outdoor working zone in which the posts supported beams, racks and frames for stretching and drying hides. The architectural viability of workshop S9 is examined with the other buildings in Chapter 5.9, p 228.

Activity in S9

Evidence for activity in S9 was threefold: a focal hearth refurbished during the life of the structure; two clusters of large stones thought to have functioned as working stances; and floor surfaces with artefacts, many of which were in situ (see Illus 5.6.2). The *stone-built hearth* had two main phases of use (Illus 5.6.8). The earliest (F529) consisted of a broad, slightly irregular scoop cut into subsoil, with an initial lining of turf interrupted by cleaning out. Occasional fragments of degraded sandstone suggested that it had been stone-lined at some stage. Its fill consisted of ash represented by brightly coloured clayey silts. In its second phase (F495), the refurbishment of the hearth consisted of the insertion of a base stone and kerbs to north and south with associated working platforms made of sandstone slabs. A small stone hole indicated there was also probably a stone kerb on the west side. To its east, the hearth had been cut away by the excavation of a large medieval well (F13). Surrounding the hearth in its second phase were several post- and stake-holes, suggesting that it had incorporated a hood or a similar structure above it.

The earliest fill of the refurbished hearth contained a distinctive deposit that consisted principally of partially burnt and unburnt winkle shells set in a matrix of soft brown sand. Towards the centre of the feature, burning had rendered the shells grey and soft. Elsewhere within the floor of S9 were ashy deposits that included burnt shells and seaweed, and it was apparent that shells had been deliberately burnt, probably for the preparation of quicklime (see below). The latest hearth fills consisted of bright orange clayey silts containing frequent lenses of pure turf charcoal and occasional pockets of unburnt turf present as decayed brown silt. They also included a small flint chip from fire lighting, a common find in working areas around hearths within the craft-working zone. The very latest fill was a layer of bright white, pink and orange clayey silt that could be related to an episode of intense burning encountered throughout the site. This suggested that S9 fell out of use following the site-wide fire that marks the end of Period 2 (see Chapter 5.11, p 256).

Illustration 5.6.3
S4, washing tank, under excavation looking north-east

Work stances

Clusters of large slabs found in situ within the building were identified as possible *working stances*. To the north of the hearth was a stack of slabs tightly bonded with clay that would have risen to waist height, and suggested a 'table' on which hides could be laid (F512; located on Illus 5.6.7). On the south side of the interior of the building, another possible working stance consisted of five large, flat sandstone boulders set closely together to form a surface *c* 1.5m^2, associated with a small post (F531). These slabs had clearly been collected from the shore, since their upper surfaces were covered with small solution holes. Other than providing a broad, flat working surface, their specific purpose was not identified.

Patches of intact trodden *floor surface* were identified within areas of S9, likely to represent only the earliest layer of accumulating occupation deposits. Layer C2950 consisted of a mid-brownish-grey compact sandy silt flecked throughout with small pieces of charcoal and burnt shell. It varied over large areas, being more sand-derived in places, and darker or redder with no shell inclusions elsewhere. Artefacts recovered from this layer included four iron knives, seven whetstones, stone slickers, vellum pebbles and four pumice rubbers (Digest 6.1). There was also a stone-working chisel that could be associated with the making of sculpture (p 163). The backfill of structural posts to the north and south yielded a slicker/burnishing stone and triangular abrasive stone.

The south yard (OLA 6.2 at 3.3.4)

To the south of S9 lay an enclosed *yard* limited by the road (S13) and a stone-and-turf wall (F480) founded on a raft of butchered animal bone (Illus 5.6.2; Illus 5.5.13a for the animal bone raft). The strata in the yard were identified by micromorphology as reworked and trampled peat-ash midden material (Digest 7.5, location 4). The yard area had been prepared during an episode of levelling using a quantity of mixed clayey silt layers with a component of charred material, animal bone and small fragments of sandstone. Overlying these dirty mixed deposits was a markedly clean layer of bright yellowish-white preparatory sand. This sequence created and maintained a level platform for the deposits forming the overlying floor surface of the vellum-working yard. Subsequently, the surface was overlaid with a convoluted series of ash dumps, some of which accumulated during Period 2 occupation of the yard and may have been a deliberate attempt to raise the ground level within this zone. These deposits contained a mixture of burnt and unburnt material, mainly animal bone presumed to have derived from nearby craft-working hearths (for the use of animal bone as fuel, see Chapter 5.8, p 223).

Hearth

Four unworked sandstone blocks formed three sides and the base of an open-fronted hearth measuring 1.0 × 0.50m (F445) (Illus 5.6.9). Originally there appeared to have been a freestanding 'fireback', a dry-stone construction forming a heat shield and/or reflector at the back of the hearth, which had collapsed eastwards – presumably when the workshop was abandoned, since no

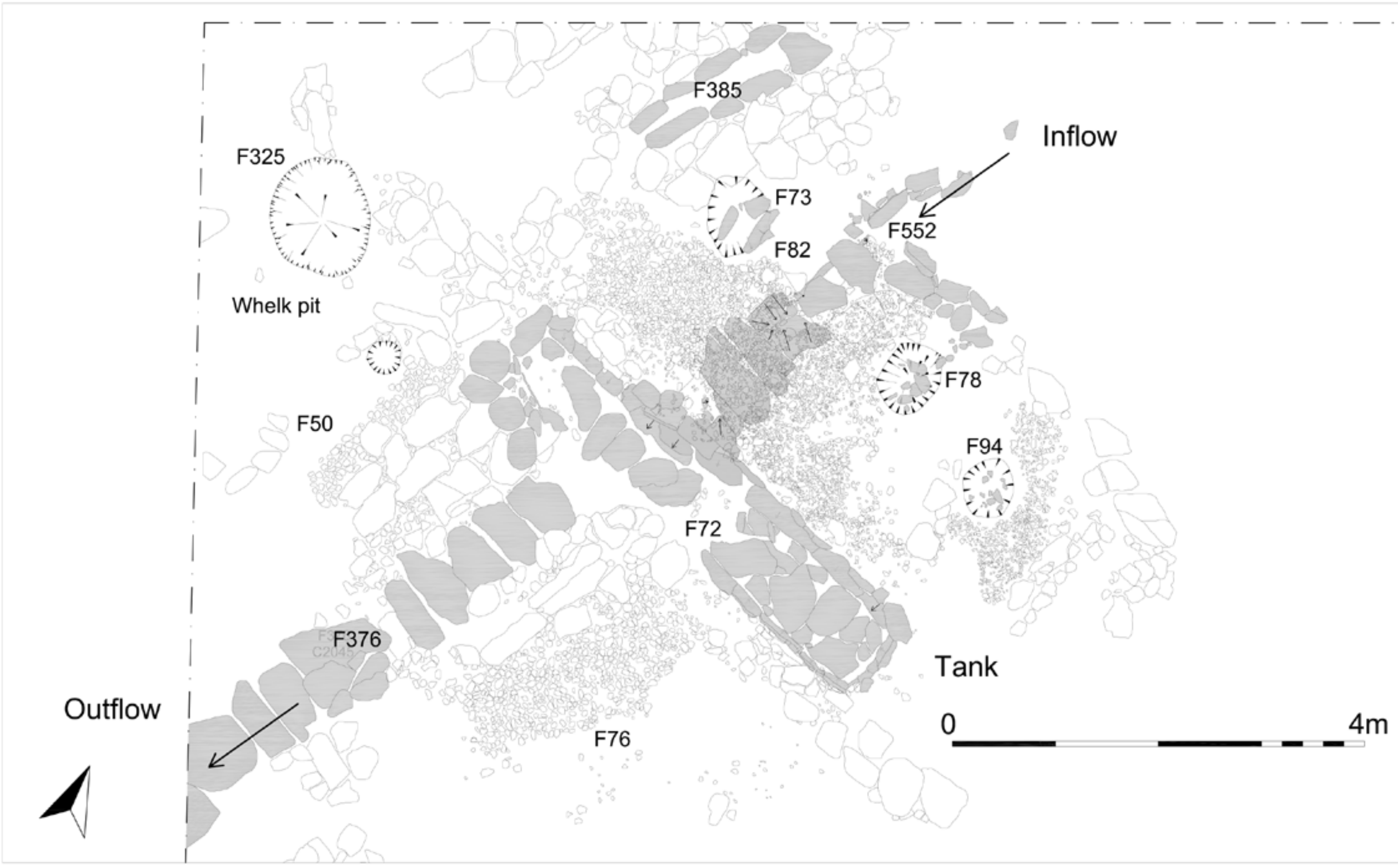


Illustration 5.6.4
Plan of S4

attempt was made to reinstate the feature. While no hearth basestone was identified as part of the primary construction, it seems possible that one may have been incorporated originally, since during the use and maintenance of the feature, at least two linings of sandstone were put in place. Primary ash fills were interleaved among the sandstone refurbishment of the hearth base. The hearth was surrounded by an array of artefacts and large spreads of lime-like residue lay close by.

Features connected with industrial activity in the yard had encroached on the western roadside ditch. Adjacent to the hearth was a slab-built sandstone surface (F474) that appeared to form an area of hard-standing. It was contiguous with a stone-built culvert positioned on the western shoulder of the western flanking ditch, and draining into it (F467). Between the road and its flanking ditch were two stone-lined channels (F468, F475) both also apparently concerned with the management of water (OLA 6.2/3.3.2). In this area there were several concentrations of complete cattle metapodia, set in groups. The collapse of channel F475 had swallowed a large cache and an orthogonal array had been deliberately pressed into the ditch edge (Illus 5.6.10a–b).

A large collection of craft-working artefacts was recovered from the yard (see Illus 5.6.2), many associated with skin-working, including a half-moon knife, twenty-nine whetstones, rubbers and slickers and two iron blades. Many small pebbles were identified as imported into the site and concentrated in the area of S9 and its yard (Illus 5.6.11). A small pit (F399) contained a collection of eighteen small quartzite and four jasper pebbles. A woodworking chisel and a group of five iron hoops suggest the manufacture of wooden apparatus. All these, and the cattle metapodia, can be specifically related to the process of producing membranes for writing (see p 199 below).

East-side industrial features (OLA 6.2, 3.3.4)

The structures encountered in Period 2 on the east side of the road were more enigmatic but contemporary with, and related to, the activities in S9 and its yard, as indicated by the distribution of artefacts. The area was delimited to the east by a *stone-and-turf bank*. At the south end were two *stone-lined pits*, and to the north were two narrow and originally *subterranean chambers*. Within this area a consolidated ground surface was identified, associated with a scatter of butchery waste and a number of craft-working artefacts (Illus 5.6.2).

The *stone-and-turf bank* (F476) provided a N–S division about 4.0m long as defined within an otherwise open area. It

Illustration 5.6.5
Iron hook with wooden handle (14/2012 and 2016) found in tank. Scale in centimetres

consisted of a linear arrangement of large boulders, each propped individually with smaller stones to create an eastwards tilt. Once in position, the stones were packed with soil and covered with turves. Included in the make-up were charred seaweed and shells, as in the hearth and floor of S9 (see below).

Illustration 5.6.6
S9 looking east. The areas of yellow sand are excavated medieval pits

To the west of the bank were two circular *stone-lined pits*. The more easterly, F473, was made of tightly packed beach pebbles and cobbles lining its sides, bottoming out onto underlying deposits. The pit had been backfilled with a loose matrix of dark brown sandy silt with frequent pebbles. The second stone-lined pit (F470) was similarly made with river and beach cobbles packed tightly against its edges and a base formed of sandstone slabs. The function of these features is unclear but F470 had been cut into the roadside ditch suggesting that it was drawing and retaining water from it.

To the north was a set of linked *subterranean chambers* (F19, F519, F395) which appear to have been associated with other features that remain largely unexcavated beneath the churchyard wall (Illus 5.6.12; see Int 26, p 41). The most easterly component (F19) took the form of an underground channel with a stone lid, stone block sides and a stone slab base. Removal of the lid identified secondary backfills over a possible waterborne fill overlying the slab base. The westerly section (F519) also consisted of a lidded stone channel formed by slab sides but notably no base. It butt-ended uphill to the west. There were several secondary backfills consisting of mixed sandy silts overlying deposits that appeared to be related to silting during use. Large stones were placed around the edge of the construction cut, stacked where the feature butt-ended, and capped with sandstone slabs, many of which had cracked and collapsed slightly. Once capped, the feature was sealed with turves and fine sand, manifest as a bright orange 'crust' over all capstones and levelled with pale grey sand; some effort had been involved in carefully sealing and levelling the feature. Dissection showed that it was intended to function as a hollow underground space. To the immediate south, a third chamber (F395) appeared as a free-standing stone-built feature with

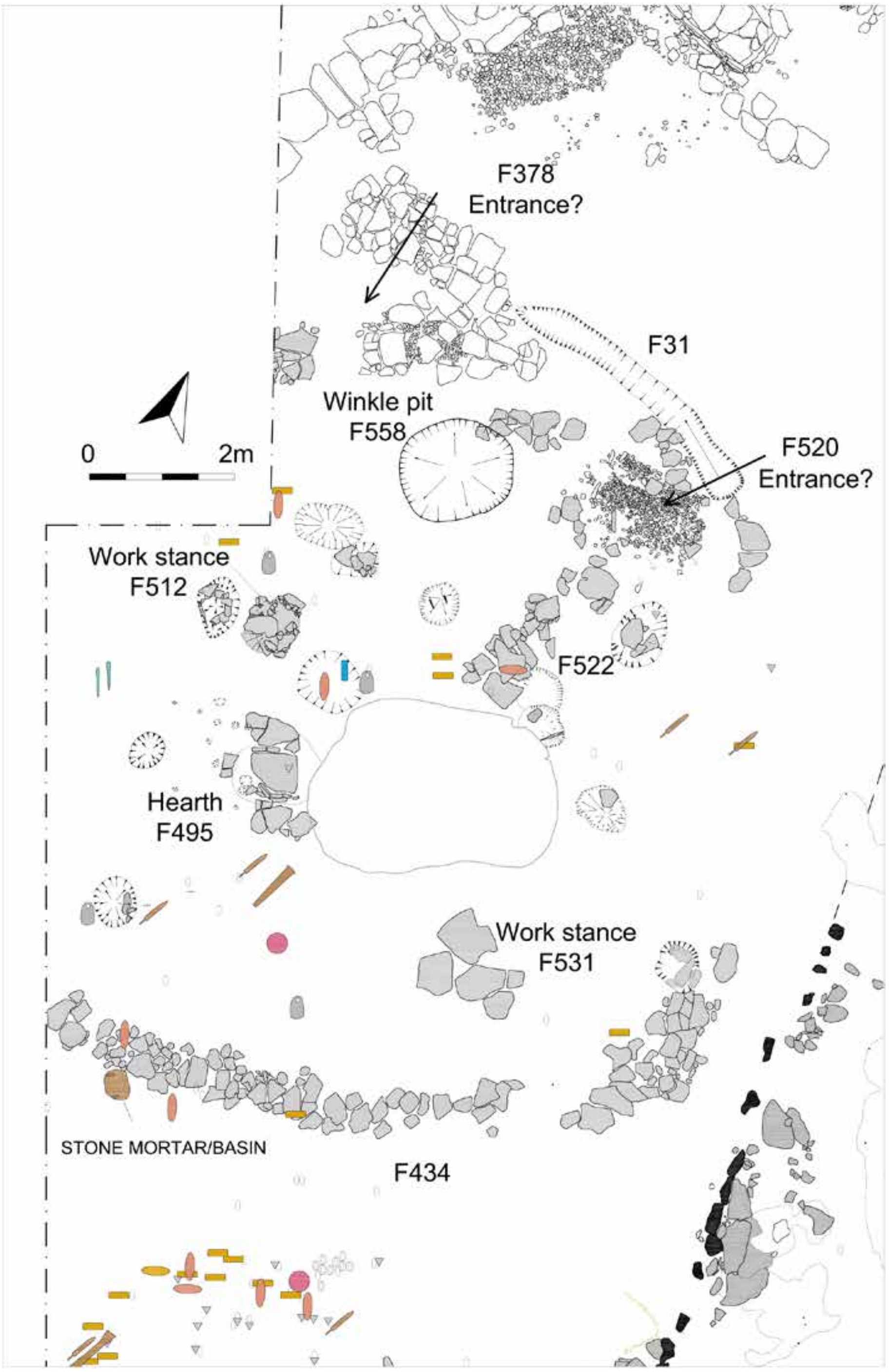


Illustration 5.6.7
Plan of S9. For legend, see Illus 5.6.2

recovered during its excavation. In general these features seem intended to enclose a subterranean space rather than drain it, and are chambers rather than channels. In this they resemble miniature souterrains or storage chambers, and their similarity to cist graves may not be irrelevant.

The stone-built features east of the road were associated with an expanse of *consolidated ground surface*. This layer was very distinct and appeared as a compacted, leathery sandy silt, the upper surface of which was littered with animal bone, identifiable largely as cattle bone (OLA 6.2.1/34). The artefact assemblage included a further four further pumice rubbers, a leatherworking needle, three fragmentary limestone rubbers, six iron blades, six whetstones/slickers, and near the bank, a bone stylus (24/7189/7190).

The area east of the road, with its bank, stone-lined pits and subterranean chambers signals a robust outdoor activity connected with the processing of cattle. The large amount of animal bone, including but not restricted to groups of cattle metapodia, within the workshop yard and adjacent eastern area suggest that animals were being butchered and flayed. The stone-lined pits appear to be collectors of water, making use of the roadside ditches channeling water off the hill. The artefacts, animal bone and calcite ash all suggest links with the activity in S9 and its yard on the other side of the road. The stone-and-turf bank recalls the stance in S9, there more surely associated with the treatment of hides.

The nature of the west-side industry

The ground surface associated with the stone structures east of the road is interpreted as a use horizon for skin-working and is considered analogous, in its composition and its assemblage, to contemporary layers within S9 and its yard and with S4 to the north. Although separate from each other, these three areas are depositionally and stratigraphically equivalent (see Illus 3.13). While an association of all three areas with processing cattle hides is reasonably certain, acceptance that this workshop was also intended for the preparation of writing membrane requires further argument. The broad material toolkit for producing manuscripts in insular Britain and Ireland is reasonably well known: the hides used are mainly calf and (especially in England) sheep. The animal should be bled rapidly

walls and capstones covered or sealed with turf. Secondary soft, sandy silt backfills were excavated from within the channel of the feature (C2445) but appeared to have accumulated naturally by percolating through the lid, post use. It was plugged to the south but appears nonetheless to have drained into the roadside ditch (F462/472). A complete leatherworking needle (3680) was

Illustration 5.6.8
Hearth in the workshop; in its first phase F529 (a) and second phase F495 (b) and a section (c)

to avoid marking the membrane with veins, then skinned and the skin soaked in lime. Stretching on a frame is an essential stage in the production of parchment (as opposed to leather). Here the skins are stretched taut and scraped with a curved knife, before being smoothed with rubbers and 'pounced' with pumice or an equivalent degreaser (Gameson 2011b, 14–17). Contacts with each aspect of this process can be demonstrated at Portmahomack.

There are four sets of evidence for the industrial activity encountered: evidence from structures, evidence from artefacts, evidence from animal bones and evidence from lime residues. While only few of these items, taken individually, are specifically diagnostic, taken together the assemblage and its associated structures provide a comprehensive testimony for vellum production.

Evidence from structures

The structures recorded on the west side of the road were the stone-lined tank S4, the enclosed area S9 with hearth and 'stances' and the yard to the south with a hearth, stance and water-management features. On the east side there was a stone-and-soil bank and a set of three subterranean chambers probably clad in turf. The east side was also host to two stone-lined pits, while the surface was littered with the bones of animals, predominately cattle, indicating that they were slaughtered in the vicinity. While the northern subterranean chambers acquired water and the southern channel drained it, their original design would appear to have involved the exclusion of air by lagging with turf. The preservation of hides (as other organic materials) can be achieved by immersion in acidic and/or anaerobic deposits, as in the case of bog butter, a form of food preservation known in Scotland since the second century AD (*New Scientist* 20 March 2004). These airtight chambers may have been intended to create similar conditions for the preservation or conservation of skins using salt, fat or the acid percolating through the turf roof to preserve a roll of skin awaiting processing.

On the west side, the tank S4 was clearly intended for the immersion of something in water that could be let in and let out again. Washing bloody hides and their immersion in a preservative liquid are likely uses. A paved surface led to the S9 area where there was a working surface at waist height, suitable for repetitive jobs such as scraping or smoothing. Elsewhere a set of horizontal boulders offered another kind of working stance – a flat drained surface at ground level. The central hearth had been used to roast shells, to extract the lime. The space as a whole was covered, if not roofed (see Chapter 5.9, p 246).

The south wall of S9 provided a terrace that dropped down a level from the floor of S9 to that of the south yard. The yard was open space bounded by the terrace wall, the road and the boundary wall F480. Within it was a hearth and a working stance, a supply of water from the roadside ditch and a route for effluent down it. The hearth, washing area, rows of bone pegs and the scatter of artefacts evoke artisans working freely in the open air on a sandy surface, but with method and neatness. Assuming this was a space where hides were pegged in timber frames, it implies work that would best suit long summer days.

Illustration 5.6.9
Hearth in the yard, F445

Evidence of the artefacts

The artefacts from the workshop zone may grouped into six: knives, pucks and slickers, needles, stone rubbers of various materials, small white pebbles and bone pegs (for description, dimensions and provenance see Digest 6.1). Many of these can be seen to have to do with the working of hides, but at a particularly delicate level of application.

Knives

The *lunette* or *half-moon knife* or *lunellarium* (24/4575) is complete and measures 73mm blade to tang and 68mm wide with a double-bevelled curved bladed edge (Illus 5.6.13). Evidence for the use of convex curved blades or 'half-moon' knives in skin-working is ancient and diverse. Convex lithic scrapers for skin-working form part of Aurignacian toolkits (Rahme 2011, 40) and depictions date from *c* 1400 BC, when a tomb painting at Thebes shows a panther skin being cut using a half-moon blade (Waterer 1956, 150). Lithic scrapers are replicated in metal in the Early Iron Age in Britain with ten copper-alloy socketed leatherworking blades recovered from across England (Pitts 2012, 7). Images of lunette leather-cutting tools are later depicted on Roman shoemakers' tombstones, and an iron example has been recovered from the tannery in Pompeii (van Driel-Murray 2011, 79). Tanged examples almost identical to the Tarbat tool have been recovered from the Anglo-Saxon site at Flixborough, Lincolnshire (Ottaway 2009, 278–9) and from Hedeby (Westphalen 1993, Taf 27, 8), where they are attributed to leatherworking. The tools may be seen in images of leatherworking guilds into the post-medieval period and in nineteenth-century tool catalogues (Salaman 1986). Examples are depicted in various medieval manuscripts, three of them directly in association with the preparation of vellum. The convex curved skin-workers' blades were used for cutting and trimming, for paring and splitting and for cleaning and thinning. The lunette knife thus performs as both a knife and a scraper, and here the presence of four other knives (Illus 5.6.13) suggests the craftsmen had recourse to other ways of doing the cutting.

Pucks and slickers

Convex blades may be connected to a group of five stone discs recovered from Period 2 deposits (8/211; 14/3558; 24/4577, 4732, 7830) and a large group of slickers/whetstones (Digest 6.1). The discs have a close affinity to modern axe 'pucks' used for

Illustration 5.6.10
a–b: Cattle metapodia lined up for use, as found on site

Illustration 5.6.11
Excavating vellum pebbles in the western road ditch

sharpening the convex curving blades of axes and are identified as circular whetstones. By analogy, the Tarbat pucks may relate specifically to the maintenance of convex skin-working blades. A total of twenty-eight stone slickers/whetstone/hammerstones were recovered from S9 and its yard. Many show signs of having been used to sharpen blades (visible metallic residue), to polish skins (brown blooms) and as hammers (pock-marked ends). A similar group of these multi-purpose stone tools was recovered from a cache at Dunadd (Lane & Campbell 2000, 178–9).

Pumice and limestone rubbers

Ten pieces of pumice were recovered, of which eight were near complete or identifiable fragments of shaped rubbers commonly perforated for suspension on a thong (Digest Illus D6.1.6). With one exception (11/1063) the pumice finds came from the workshop area (14/3958; 24/4019, 4752, 4793, 6784, 7307, 7308, 7704, 7710). A close parallel to the pumice rubbers was recovered from Birsay (Curle 1982, 70, Illus 45:601a). According to Anthony Newton, pumices similar to that found at Portmahomack are dacitic in composition and have been related to eruptions from the Katla volcanic system in southern Iceland (Digest 6.16). It is likely that the pumice was retrieved from either local contemporary or ancient raised shorelines. Three naturally abrasive stones were also recovered and were probably exploited as such, being fine-grained, hard garnet mica schist and amphibolite (14/4011; 24/5245, 6994). Four fragmentary limestone rubbers were also identified, again all with perforations (24/6214, 6656(2), 8468). The rubbers are characterised by their chalk-like powdery surfaces and could have been deployed in whitening and finishing. A natural limestone lump (24/7858) and fragment of quaternary peripheral sponge (24/6214) may both have been similarly exploited.

Needles and styli

Also recovered from the terrace were three bone needles, identified by their eye and round section (24/4616, 14/3560 and 14/3680), and two styli (13/53 and 24/7190) (Illus 5.6.14). These have been examined, identified and reported on in their British context by Steve Ashby (see Digest 6.4, Section 3.2, p D88). Bone styli are less common than those of copper alloy, but they have been shown to serve adequately for use with a wax tablet, using the point to write and the broad end to erase the script. The Portmahomack styli find a parallel at Whitby (MacGregor 1985, 124), and the use of styli in general is a characteristic of east-coast establishments, whether determined as monastic or not. In contrast, styli are rare on northern and western monastic sites where scratch marks on slates were used for writing practice, as at Inchmarnock (Campbell 2010, 140; Lowe 2008). In Scotland, objects of similar form from the multi-period settlement site of Skaill, Deerness in Orkney were identified as ‘spatulate-headed pins’ (Porter 1997, Fig 8.3), and it may be that the evidence for early writing in various media will increase with further exploration.

Vellum pebbles

A total of 238 small, smooth pebbles, primarily white, red and rose-coloured quartzite or quartz, but also including porcelanous jasper, chalcedonic quartz and polished granite pebbles, were recovered across the terrace, primarily from around the hearth in the yard, including from an immediately adjacent pit and tumbled into the western ditch of S13 (see Illus 5.6.11; Illus 5.6.15). The pebbles had clearly been collected selectively and imported into Sector 2, and are here referred to as ‘vellum pebbles’, due to their interpretation as part of the apparatus for suspending skins (see below, p 209). Pebbles played an important role in Pictish life as shown by the cult of the painted pebble – an example of which was found residually in the workshop area (Illus 6.5a, p 266).

Evidence from animal bones

The animal bone from the workshop area was overwhelmingly of mature cattle (three years old plus), but other animals present in small amounts (goat, seal) may also have been exploited for their skin. There was evidence for a range of specialist implements in use for butchering, along with refined and systematic cutting practices (Digest 7.1). The tools inferred were predominantly knives – potentially with steel cutting edges. Skinning marks were noted on otter, and a high frequency of cut marks registered from marine mammals. The metapodia aligned in the yard, which were in primary association with the production there, were from mature cattle aged between eighteen and thirty-six months. However this need not imply that such cattle were also the subject of processing. These metapodia were stored in arrangements that suggested a specific function (as pegs, see below).

While the majority of cattle were mature, calves were exploited, with Period 2 prominent over other periods both in the number of calves and the number of neonates. It was concluded that the Period 2 herd produced both cattle hides and calf skins

Illustration 5.6.12
Subterranean structures west of the road: F519 (a); F19 (b); F395 (c)

in significant quantities. This is discussed in the context of the monastic economy in Chapter 5.8, p 225.

Evidence for lime burning

There were several indications that seashells were being used for the preparation of quicklime in the S9 zone, as revealed by analysis of grey, greasy ash found in the hearth (F495) and on the floor. This has been reported as containing fused, slightly calcareous glassy ash with spirorbids, sometimes fused into ash clasts. Also present were burnt marine mollusc shell, including periwinkle, *Littorina* and charred plant material from seaweed and burnt and unburnt turf (Digest 7.4, Table 1, C1917). Similar material was also found in the bank (F476) on the east side of the road (Digest 7.4, C3171). Allan Hall concludes that 'the assemblage as a whole points to imported seaweed and shells, presumably burnt to produce a form of lime for processing skins' (ibid). Lime burners evidently extracted a lime-rich ash from seaweed and the minute *spirorbis* shells that cling to it. Elsewhere, collected shells had been stored. There was a deposit of whelks next to the tank (above), and adjacent to the (northern) entrance area of S9 were two *winkle pits* (F558 and F575), each lined with dark brown sand and containing a deposit of pure winkles. *Nucella lapillus*, the dog whelk, produces a purple dye used in manuscript illumination (Gameson 2011b, 89), but the Portmahomack shells appear to be examples of *Buccinum undatum*, the common whelk (Digest 7.3) more likely collected for lime production. To produce quicklime (calcium oxide), the calcium carbonate in the shells would need be heated to 825 degrees Celsius in a reducing atmosphere; this requires an apparatus akin to charcoal burning, with a flue and chimney (Wingate 1985, 70–1). This may explain the unburnt turf-and-winkle component in hearth F495 and the stake-hole arrangement around it (above). Equally, the use of smoke and heat to preserve hides should not be ruled out and the purpose of the stake-built structure may have been twofold.

Quicklime is used primarily to make mortar and plaster, which are known components of specialised stone building in the eighth century: for example, plaster at Wearmouth/Jarrow (Cramp 2006a, 2–18), a mortar mixer at Wearmouth (Cramp 2005, 93–5) and another in the Northumbrian royal centre at Dunbar (Perry 2000, 63–4). Dolomitic limestone does occur in northern Scotland at Assynt and Durness, which would be a near source of lime mortar, and limestone objects did reach Tarbat (above, p 202). But if knowledge of mortar-making was exported

Illustration 5.6.13
The parchmenter's toolkit: lunette knife 24/4575; blades (24/6596; 24/670; 24/7673; 24/7681). Scale in centimetres

to the far north as part of the monastic package, it would have been unlikely to rely on shells, and the production at Portmahomack suggests a more specific small-scale application. Slaked with water, quicklime produces a strongly alkaline solution of calcium hydroxide, which is caustic to the touch and used for dehairing and degreasing pelts. This interpretation converges with that of the assemblage from the workshop as a whole.

Parallels

The difficulty in interpreting the Portmahomack industry lies in its currently unusual character and lack of parallels. Large-scale excavations where manuscripts are known to have been produced have not apparently chanced upon a vellum workshop, or even offered a diagnostic assemblage, other than a high proportion of calf bones (see below, 'Source of hides'). There are echoes, however, from sites not known to have been producing manuscripts. The assemblage from Dunadd included seaweed as well as neonatal cattle (Campbell 2010, 142; Lane & Campbell 2000, 223, 226–7). At Deer Park Farms, Ulster, the finds included seaweed (Lynn & McDowell 2011, 520), eighty water-rolled pebbles (ibid, 285), a small trough (ibid, 394), a 'bed-end' with a line of pegs in slotted beams (ibid, 423–5; 116) and an iron hook (ibid, 285; Fig 15.13; 295). These objects were declared enigmatic ('No directly comparable objects are recorded from contemporary sites in Ireland') but possibly connected with textile working and dyeing (ibid, 618). At Jarlshof, seal bones were 'extremely prolific' in the post-broch levels and the excavator comments, 'in this connexion the small stone discs found on broch and wheelhouse sites may be associated with some industry such as the stripping and curing of skins. The curiously shaped rubbers, or polishers, also give the impression of tools employed in the processing or softening of pelts, while the whalebone pegs from Shetland sites may well have been used in the drying and stretching of skins upon a ground frame' (Hamilton 1964, 69).

The processing of animals naturally produces meat and blood as well as bone and hide, cattle in particular giving a considerable variety of by-products (lard, intestines, sinews, hooves, horn, hair) all of which could be pressed into service as conserved food, thongs and glue. It may be that the stone-lined pits and underground chambers had some role in the storage or treatment of animal products. The presence of whale and dolphin in the bone assemblage brings to mind the extraction of oil. At Finnmark, excavators defined slab-lined pits as used for extracting oil from marine mammals. The pit was filled with hot stones and blubber thrown onto them, the oil collecting in the pit (Olsen et al 2011, 90–1).

Numerous modern practitioners have experimented with parchment-making, often by drawing on evidence from contemporary traditional communities. These may be useful in opening up the variety of treatments that are possible. In experiments well informed by Inuit, Sami and native American practice, Susanna Harris described how a hide may be conserved by drying and oiling rather than immersion. She worked on the dried skin using flint end-scrapers, often retouched to give them more bite; the membrane came off like sawdust and left the skin white. It was then conserved with emulsion and held in the smoke of an open fire to make it 'more chemically stable' (Harris 2012). In the case of early medieval Britain, the argument relies more securely on analogies nearer to home, in particular European practice as recorded in documents.

Documentary accounts of vellum-working

Written accounts of how to make writing membrane survive from Rabbinical texts from the end of the third century BC (Reed 1972, 99) and include great variation in production, but for medieval Europe they begin in the eighth century whence they coalesce into an established medieval method that can be traced through the following centuries into the modern workshop. The tradition recorded in these sources allows us to establish the pedigree of the medieval craft.

The earliest European source is the Lucca Manuscript written in a northern Italian monastery in the eighth century, which describes as follows:

> How parchment has to be prepared: place (the skin) in lime water and leave it there for three days. Then extend it on a frame and scrape it on both sides with a sharp knife and leave it to dry (*Codex 490*) (Reed 1972, 133)

This is the earliest reference to the use of lime as a treatment agent in skin-working in the literature, with earlier traditions referring to vegetable-based substances (Reed 1972, 135–8). The use of lime in leather production did not in fact become commonplace until the later medieval to early post-medieval period when liming pits are regularly encountered archaeologically (Thompson & Mould 2011), only becoming de rigueur in the modern tannery since the introduction of chromium tanning. Subsequent medieval texts for parchment-making also stipulate repeated applications of lime, and during these early centuries it can be seen to be peculiar to the preparation of writing membrane and not, as the traditional assumption would have it, to any and all leather production.

A riddle in the tenth-century Exeter Book provides a more complete, if oblique, account of making a Bible in Old English:

> An enemy came and took away my life and my strength also in the word; then wetted me, dipped me in water; then took me thence; placed me in the sun, where I lost all my hair. The knife's edge cut me – its impurities ground away; fingers folded me. And the bird's delight with swift drops made frequent traces over the brown surface; swallowed the tree-dye with a measure of liquid; travelling across me, left a dark track. A good man covered me with protecting boards, which stretched skin over me; adorned me with gold. Then the work of smiths decorated me with strands of woven wire … Ask me my name. I am a help to mortals. My name is a glory and salvation to heroes, and myself am holy.

In the twelfth century, Theophilus provided the following description for goatskins, highly prized by the parchmenter. His account includes greater detail on the applications of lime, soaking and washing, controlled drying and wetting during stretching and indications as to the use of pumice:

> Take goat skins and stand them in water for a day and a night. Take them and wash them until the water runs clear. Take an entirely new bath and place therein old lime and water mixing well to form a thick cloudy liquor. Place the skins in this, folding them on the flesh side. Move them with a pole two or three times each day, leaving them for eight days (and twice as long in winter). Next you must withdraw the skins and unhair them. Pour off the contents of the bath and repeat the process using the same quantities, placing the skins in the lime liquor and moving them once each day over eight days as before. Then take them out and wash well until the water runs quite clean. Place them in another bath with clean water and leave them there for two days. Then take them out, attach cords and tie them to the circular frame. Dry, then shave them with a sharp knife after which leave them for two days out of the sun. Moisten with water and rub the flesh side with powdered pumice. After two days wet it again by sprinkling with a little water and fully clean the flesh side with pumice so as to make it quite wet again. Then tighten up the cords, equalise the tension so that the sheet will become permanent. Once the sheets are dry, nothing further remains to be done (Reed 1972, 74).

The twelfth century also provides an early manuscript image of a tonsured monk with curved blade and sheet suspended in a frame, and into the thirteenth-century production by the laity for a number of consumers including monasteries themselves is depicted (de Hamel 1992, 12–13) (Illus 5.6.16a, b). Sources that post-date Theophilus are more numerous but reiterate the method. Parchmenters in thirteenth-century Bologna rehearsed this process of repeated liming, thorough washing and extended soaking in fresh water followed by stretching (Thompson 1956, 25). Similarly, a further late thirteenth-century source states:

Illustration 5.6.14
The parchmenter's toolkit (continued): three needles (24/ 4616, 14/3560 and 14/3680), and styli (right) (24/7190, 7665, 13/53) (for scale drawings see Illus D6.1.7)

Illustration 5.6.15
'Vellum pebbles' from the yard area (for scale drawings see Illus D6.1.6). Scale in centimetres

> Likewise concerning skin: how parchment may be made from it: The flayed skin from the calf is placed into water. Lime is mixed in which bites into all the raw skin. This should fully clean it and remove the hairs. The circular frame on which the skin is stretched is made ready. Let it be placed in the sun so that the fluid is removed. Approach with the knife which tears away the flesh and hairs. It quickly renders the sheet thin.
>
> (*De animalium natura,* quoted in Reed 1972, 134)

The same source goes on to describe the application of pumice and chalk to sheets being prepared for binding into quires. The transition to lay production is also attested in the fifteenth century, when a *Pergamentmacher* can be counted among *der Zwolf Brüder* and is depicted using the distinctive curved blade (Treue et al 1965, 63) (Illus 5.6.16c), the name of which is provided for us by Paul of Prague in his *Liber viginti artium* – a *lunellarium* (Thompson 1956, 26).

With the advent of paper-making and printing we can trace the beginnings of a decline in the craft and by the Enlightenment *Diderot et d'Alembert* record parchment-making as a *metier disparu* and provide drawings of every conceivable piece of equipment for a *parcheminier* and stages of production (Illus 5.6.17). In Britain, parchment workers were recorded at work before the Second World War (Salaman 1986, 330), but the William Cowley Parchment Works, Newport Pagnell, Northamptonshire is the last surviving British producer whose longer-term survival was recently helped by the rejection by Parliament of proposals to substitute goatskin vellum for Acts with archive-stable paper; the proven longevity of parchment cannot be rivalled easily by other media. The William Cowley Parchment Works provides evidence for continuity of craft-production techniques in spite of some elements of mechanisation through the late nineteenth to twentieth century, many of which are still undertaken in the modern workshop (Illus 5.6.16e, f).

Implications for practice

There are some further necessities of the craft that these sources elide. An animal pelt intended for writing membrane requires swift, efficient and thorough bleeding. If blood stagnates in arteries the pelt will be marked by veined blemishes, so the decision to turn an animal hide or skin into a writing membrane would ideally have been made prior to slaughter to avoid this flaw (Gameson 2011b, 16). Without intervention, a pelt is attacked by bacterial processes within twenty-four hours of death (Covington 2009, 72). For leather production such flaws would not preclude use, but for writing membrane some form of preservation such as drying or salting or swift immersion in lime would need to have been implemented very soon after flaying.

Accumulatively these sources establish the baseline for the craft, which can be underpinned by reviewing the underlying chemical processes (for an account see Thompson 1998, 1–2). Briefly, the three layers of the make-up of a skin or hide – epidermal, dermal and subcutaneous – require either chemically assisted removal or alteration of their molecular make-up to achieve the desired product. The epidermis, which hosts the hair root system, is essentially made of keratin, rich in an amino acid based on strong sulphur-sulphur bonds, which are broken in alkaline conditions facilitating mechanical removal. The subcutaneous layer, the fleshy layer of fat and muscle, is also more easily removed following alkaline treatment. The dermal layer, or corium, which forms the finished product, is made of complex helical bundles of long collagen fibres in a matrix of non-collagenous proteins, which without swift intervention putrefy after death. Putrefaction is suspended by the removal of the non-collagenous proteins to prevent clumping of the collagen strands through alkaline treatment, essentially allowing them to be washed out. Critically, this pre-tanning treatment is where leather-making and parchment-making diverge: if leather is desired the skin must be submerged in a substance designed to replace the washed-out protein matrix with tannins; if parchment is required, drying and thinning under suspension must follow. This chemistry underpins the persistent and characteristic references to liming, dehairing or scudding, sluicing and washing skins in the historic accounts of parchment-making.

Interpretation: Portmahomack's parchemenerie

Workshop complexes such as this are rarely encountered in situ and much of the challenge of interpreting the Period 2 findings lies in their novelty. With assemblages of such significance it is incumbent on us to not merely state the uncontentious – that skin-working was taking place – but to see whether the evidence will allow a focus on the preparation of vellum and offer greater insight into its method, processes and practice. The Latin inscription

(TR10, see p 4), has long intimated that book production was possible at Portmahomack. But this association is not cited in the argument that follows, which relies solely on the archaeological evidence recovered in context.

An assemblage dedicated to leatherworking only, familiar from the Middle Ages and later, is less evident here. There are no incontrovertible signs of *tanning*, such as bark, a series of layaways, or an 'indicator package' of plants and insects (Hall & Kenward 2003a; 2003b; 2011). No leather offcuts were present within the excavated sample, despite the fact that preservation conditions at Tarbat were favourable. Our interpretation does not aim to preclude leather production – after all, books would need to have been bound in something and carried in satchels, feet shod and bodies clothed, all requiring leather – but rather to explain the nuances of the particular environmental, structural and artefactual evidence encountered in the production site by the road in Sector 2.

The eastern workshop

The preponderance of bones of mature cattle implies that large numbers of cattle hides were produced in this area. Some objects, like the convex and other knives, could find a role in the cutting of hides for a variety of purposes, many of them heavy duty. There is little doubt that such a workshop must have been part of the establishment at Portmahomack, and had played a major role in its economy, as is discussed in

Illustration 5.6.16

(a) Monk using a *lunellarium* (Staatsbibliothek Bamberg MS Patr. 5 f1v). Mid-twelfth century; (b) Monk inspecting a sheet of parchment (The Royal Library, Copenhagen GKS 4, 2°, vol 2, f. 183ra). Thirteenth-century; (c) Monk using a *lunellarium* from *Das Hausbuch der Mendelschen, Zwölfbrüderstiftung zu Nürnberg* (Stadtbibliothek Nürnberg Amb. 317. 2°, f. 34v); Fifteenth century. (d) Preparing the surface of vellum from 'Parchemenier' in *Diderot et d'Alembert's Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts et des Metiers* published 1751–77. Eighteenth century; (e) Scraping vellum in a frame from Charles Tomlinson's *The Useful Arts and Manufactures of Great Britain* published 1848. Mid-nineteenth century; (f) Vellum preparation on a frame, courtesy of Jesse Meyer, Pergamena Parchment and Leathers, Montgomery, New York. Twenty-first century.

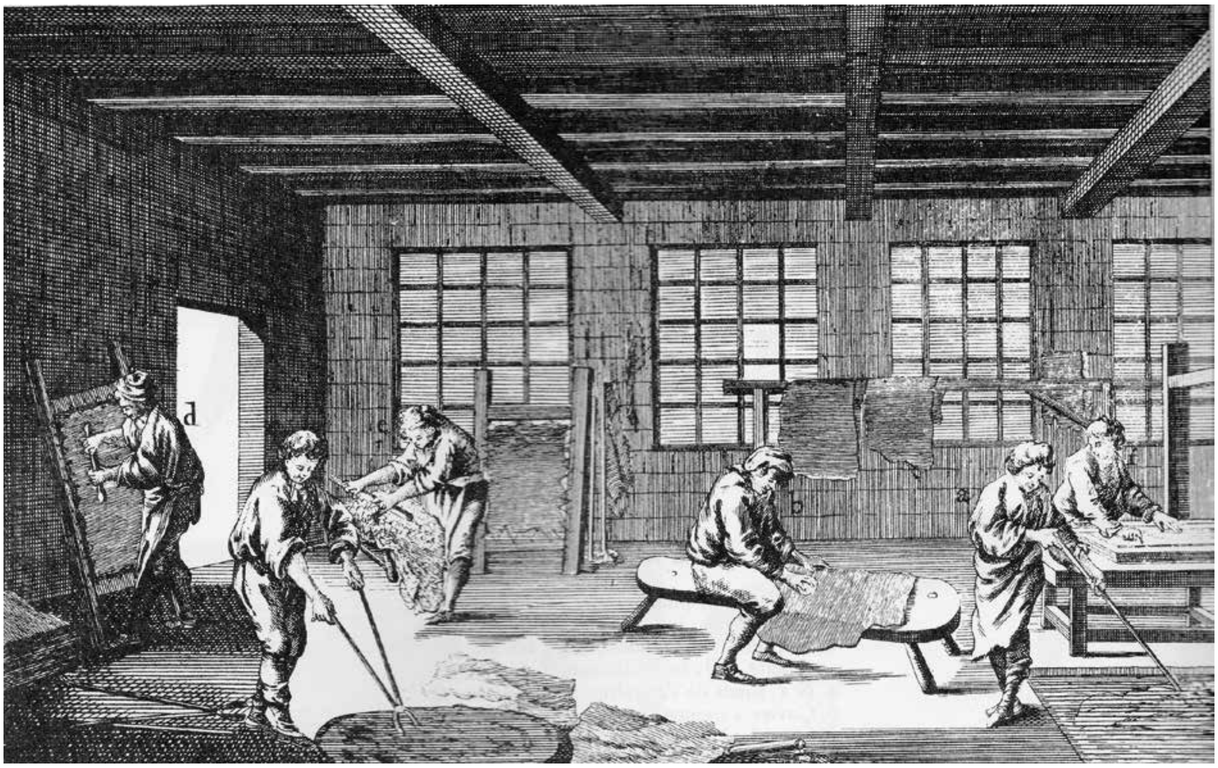


Illustration 5.6.17
The parchment-making process (Diderot & d'Alembert 1751, 'parcheminier')

Chapter 5.8. It is possible that the structures on the east side of the road could have lain within the domain of leatherworkers as well as butchers. The subterranean chambers provided storage for animal products, and the large bank provided a working surface. But in general, the making of leather goods at Portmahomack was inferred rather than observed, and in the absence of tanning pits, offcuts in the pool or tools such as awls and drawknives, must have taken place elsewhere. The eastern side of the area might be seen as a distribution point in which a wide variety of animals were processed for specific products, including food, skins, furs and oil. Among these products may also have been a small group of items of interest to those who made books: calfskins, goatskins, glue, sinews and bone styli. Since it lay just across the road, it is hardly surprising that objects and detritus strayed across from the western workshop. Few vellum pebbles were found, but there were four pumice rubbers, the limestone rubbers, two bone needles, a proliferation of small iron blades and a stylus, all suggesting a finishing activity on the east side.

The western workshop

LIMING

The workshop on the western side is markedly different in character, being organised, specialised and dedicated. Here the structures, artefacts and residues converge towards one interpretation, namely the production of vellum. S4 was clearly used as a washing tank in which skins were soaked and rinsed, a process likely to have been frequently repeated. Endorsement that this treatment included soaking in a lime solution to loosen flesh and hair is provided by evidence for the production of quicklime on site from burning shell in a reducing atmosphere. The tank itself is relatively small (4.4 × 0.80 × 0.40m deep), not really large enough for multiple cowhides or oxhides, but adequate for batches of calf, goat or sealskins. Wet skins may have been lifted and moved with the aid of handled hooks such as the example recovered from the tank. This object is particularly appropriate given the caustic nature of lime.

Shell has the advantage of being a very pure form of calcium carbonate (Wingate 1985, 20). The burnt lime (quicklime) can be activated by the addition of varying quantities of water to make calcium hydroxide or slaked lime with the consistency of a loose paste, a cloudy liquid known as 'milk of lime' and from that by settling into a saturated solution known as 'lime water' (Wingate 1985, 6). The main deposit found at the north end of the yard was a laminated accumulation with a greasy, almost soapy feel, presumably the result of saponified fats from hide and skin. This suggests that hides were being scraped clean and re-treated with lime at that spot, perhaps in the lee of the building or leant up against it. Given evidence for the emergence of lime-based treatment of writing membrane in the eighth century, this substance is especially diagnostic of the craft at the time. The same agent would also have served to whiten skins. Four pumice rubbers were recovered within S9 suggesting the sloughing of skins and hides with pumice on the stone stances, and probably on benches and in frames. The historic accounts imply that controlled drying, both in and out of the sun, including superficial rewetting, was a carefully controlled stage for which S9 provided an ambience.

Outside the south wall of S9, a small stone-cut basin was found (Illus 5.6.18). On its upper side, the smooth convex cavity suggests the holding of water or use as a mortar for blending pastes; on the underside are two parallel grooves indicating some supporting device, such as two vertical slabs that would make it accessible at waist height, for example to assist delicate washing, dyeing, scouring or mixing operations. Alternatively it could have been supported by a trestle in the manner of a simple folding camp-stool, with struts about 15cm long. While a tripod would be more stable, a bipedal frame could support a heavy basin.

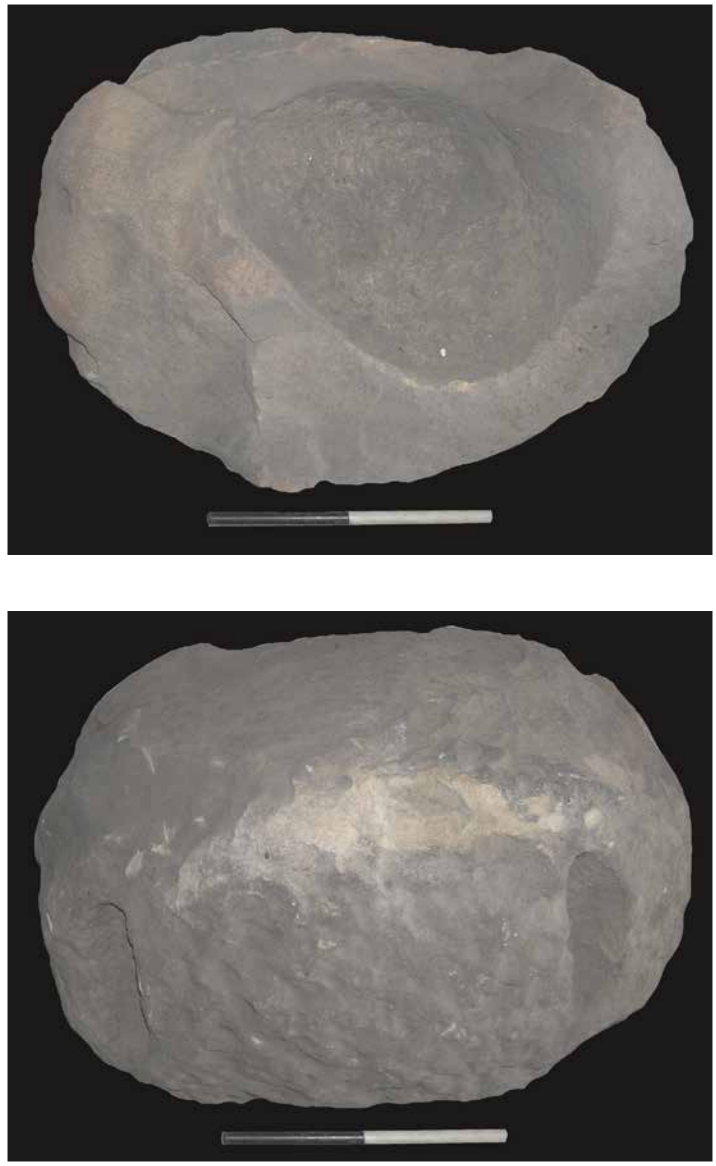


Illustration 5.6.18
Sandstone mortar or basin found in the area of S9. The rim has been broken off on one side

STRETCHER FRAMES

The next part of the process requires the skins and hides to be stretched on frames for cleaning, thinning and smoothing. This was deduced from the occurrence of several diagnostic artefacts. Evidence for the treatment of suspended hides takes the form of the distinctive assemblage of *vellum pebbles* along with worked metapodia which may have acted as *bone pegs*, and a significant group of stone rubbers. The hearth in the yard was clearly a focal point, indicated by the density of the scatters of flint chips, vellum pebbles and skin slickers/whetstones. A mineralised crust of wood shavings on the iron tools recovered from the floor of the yard and a long-handled chisel shows that woodworking was an allied craft, as might be expected with the requirement for wooden frames. The medieval depictions of parchment-makers show that the lunette blades were used to scrape the skin while suspended, which is likely to be the stage at which the Tarbat *lunellum* was deployed. The array of stone rubbers and whetstones from this zone is also significant. Diderot and d'Alembert depict a stone (*quevre*) used to sharpen curved blades (Planche III, Fig 20) as well as a similar stone tool which closely resembles the elongated stone whetstones/slickers which they identify as a skin peeler (*pierre à peler les peaux*) (Planche III, Fig 3; Illus 5.6.17).

The use of small smooth pebbles in the suspension process is attested in modern practice (Reed 1972, 138). Wim Visscher of William Cowley is recorded using them in his modern workshop (de Hamel 1992, 11), while John Seymour (1984, 121) recorded an Australian sheepskin-worker who folded pebbles into the edge of skins tied in with binding lanyards to avoid cutting slots. The frame depicted in the *Hausbuch der Mendelschen* also appears to use small toggles in the suspension method. Diderot and d'Alembert illustrate the use of small wooden dowels (*brocher*) threaded through the edge of the pelt to distribute the stress of tensioning (Planche IV, 13–15) and the use of small balls of skin peelings known as pippins has also been recorded (Salaman 1986, 331–2). The general principle is to avoid piercing the skin by wrapping the corner around a pebble with a cord, the other end of which is secured to a peg on the frame. This avoids creating a hole, which would enlarge under tension.

Diderot and d'Alembert depict wooden pegs (*chevilles*) used to tension skins in suspension (Planche III, Fig 6) and the use of wooden pegs was probably more commonplace. Steve Ashby comments on two of the bones (14/4499 and 14/4500): 'They have been cut from the distal ends of cattle metapodials, and show signs of wear around the condyles. Though they are not diagnostic in isolation, they are arguably consistent with a use in the stretching out of hide that constituted a key component of the process of vellum manufacture. The smooth areas between the condyles of the distal articulation and the broken point at mid-shaft may relate to wear from a thong or cord of some sort; this is consistent with the proposition that the pegs were turned in order to increase the tension under which a hide was being held, in a manner somewhat akin to the tuning pegs of a stringed musical instrument' (Digest 6.4, Section 3.2.2). Although no frames were recovered, the bones were prepared and stuck in the ground in rows, giving a strong impression that they were awaiting a systematic employment in set numbers (see Illus 5.6.10a–b). Bone-rows have been found on other early medieval sites, where they have been encountered forming edges to hearths (Malcolm et al 2003, 23–4; Mulville et al 2003; Sharples 2012). Post-medieval bone alignments have also been associated with flowerbeds (Armitage 1989, 147–60) or floor surfaces (Divers et al 2002, 61–75). None of these examples offers a convincing explanation of the Portmahomack bone-rows.

Various treatments of writing membrane with stone tools while stretched in frames are suggested by an array of rubbers recovered from the workshop area. Historic accounts of treatment include chalk and pumice, both while the skin is suspended and also as ground into a 'pounce' for application in paste or as a grease-absorbent and abrasive powder. Pumice is valued for its abrasive qualities and the rubbers often showed signs of wear on their faces; notably, several rubbers incorporated a white residue in their vesicles. Their use on writing membrane is supported by Theophilus' description of its use in cleaning the flesh side of a sheet. Its association with use in manuscripts is also strengthened by Willibald's eighth-century adventure during which he witnessed a volcano erupting on Lipari and saw the pumice 'which writers use' floating on the sea and being collected (*Hoedeporican* sourced in Levison 1946, 44; Wright 2011, 23 and note). Diderot and d'Alembert also show raw chalk and pumice together (*morceau de chaux non-éteinte* and *pierre-ponce)* and depict their deployment in the workshop on the *table à poncer* on which a sheet is being rubbed.

SOURCE OF HIDES

There has been a long-held assumption (as implied by the word *vellum* from the Latin *vitellus,* calf) that book production will result in a large deposit of calf bones. This equation is by no means inevitable. At Jarrow, where the giant *Codex Amiatinus* was made, the faunal assemblage was dominated by sheep and 'the cattle bones show an almost complete absence of bones from neonatal and juvenile animals'. On the other hand, there was a 'relatively high frequency of shellfish' including 117 periwinkles (Cramp 2006, II, 560). Iona had its own leather workshop making shoes and using the hides of cattle, horse, red deer, seal and hairy sheep/goat. Of the cattle leather in the ditch, only 6% was calfskin. There was no evidence (in the remains from the ditch) of the specialist preparation of calf hides that would have been necessary to produce vellum for books (McCormick 1997, 62). On Lindisfarne, where at least one celebrated codex was produced, excavations by Deirdre O'Sullivan at Green Shiel (unpublished) located 'a dump of juvenile and neonatal calves under the floor of Building E', claimed as evidence that calfskins were being produced for the monastic scriptorium (O'Sullivan & Young 1991; O'Sullivan, D 2001, 42). At Hartlepool a 10% cull of calves was considered small, but adequate to supply parchment (Daniels 2007, 118, 207). At Flixborough where styli were used in the ninth century, a small number of calves killed before weaning were identified in the bone assemblage and have been tentatively cited as evidence for vellum production (Dobney et al 2007, 234–5).

The size of all these assemblages are overshadowed by the numbers of folios required for the larger codices, assuming they use only calves. A total of 185 hide sections were needed for the Book of Kells, perhaps requiring a herd of 600 cattle to sustain a breeding population (Campbell 1999, 33), but the calves need not have been culled in the same season and could have been drawn from a numbers of herds as tithe rent. Deconstruction of the length of time required to prepare the *Codex Amiatinus* and its two companion volumes suggests that such a project would have taken up to twenty-eight years to complete, suggesting that the requisite folios (*c* 1,550 calf skins) may also have been prepared over a number of years, probably undertaken on a seasonal cycle, while works of smaller magnitude may have required up to thirty hides a year (Gameson 1992, 3–9). Gameson calculates that the production of all the fifty-five surviving volumes of the Salisbury scriptorium would have needed the provision of only twenty-eight calf or sheepskins a year (Gameson 2011b, 21). In this light it is easier to conceive how scattered monastic granges in the Cheviots could have sustained the demand from Lindisfarne.

Parchment may also be properly made from sheepskin, but at Portmahomack goat rather than sheep was always identified, indicating that this comparatively hardy animal was favoured by the Tarbat terrain and its herdsmen (Digest 7.1). Goatskin, rather than kidskin, is highly prized by the skin-worker as it can be dehaired more cleanly than a fleece and makes both high-quality leather and writing membrane. The seventh-century Cuthbert gospel (formerly the Stonyhurst Gospel, acquired by the British Library in 2012) is bound in dyed goatskin.

By-products of animal processing would have provided glue and sinews for binding from across the road. Oak gall for ink, orpiment and madder for colour and a variety of quills to service the exquisite penmanship were not encountered in the Portmahomack workshop. However these requirements of the finished codex are more likely to have been deployed in a calmer, more sheltered space within the inner precinct near the church (Gameson 2011b, 74–89).

Conclusion

The preservation of writing membrane in British archaeological contexts is exceptionally rare and confined to special circumstances (Spall 2011, 97). Since it does not involve tanning it remains highly susceptible to decay in damp or wet conditions. Among the few exceptions is the Faddan More Psalter preserved by interaction between proteins and amino acids within its sphagnum peat bog environment in much the same way as a bog body is preserved (Covington 2009, 455). Consequently, to date, evidence for vellum and parchment production has been sought most commonly in animal bone assemblages, often at monastic sites known for book production. This analysis has been heavily influenced by a quest to identify the production of the finest quality calfskin vellum because it is expected that insular membrane constitutes just that, based on the study of great surviving works, and limited historical texts. The rare mention of *abortivum* in medieval texts has resulted in the equation of thin writing membrane with uterine vellum whether or not aborted calves were actually exploited (Thompson 1956, 27). However, there are growing calls for a review into the analysis of book-making technology and recent studies conclude that 'a great many codicological conclusions have been based on . . . incorrect

Illustration 5.6.19
Fragment of cast copper-alloy sheet with insular ornament (14/1286). Late eighth/early ninth century; perhaps from a book plaque

identifications' (Clarke M 2011, 25–6) and that the 'identification of the main animal species used is often unreliable' (Pickwoad in Neate & Howell 2011, 11).

The distinction between calfskin and mature hides in leather, which undergoes significantly less working than writing membrane, is known to be difficult (Mould et al 2003, 3265). In spite of the existing consensus, 'the study of the materials used for making books is in its infancy' and 'we remain remarkably ignorant about the materials of the conventional early book' (Clarke 2011, 25–9). Not until a greater body of data is confirmed by scientific analysis can understanding of how the manufacture of writing membrane interacted with animal husbandry practice in the insular world be authoritatively explored. Indeed, at early medieval sites across Britain whose economies are based on cattle, often specialised milking herds with a consequent surplus of young calves, we have set ourselves an almost impossible task. O'Connor discusses the relationship between assemblages of butchered bones and skin-working practice and concludes that it remains hard to define (O'Connor 2003, 3231–4). In practice it is possible that hides of older juvenile cattle may have been split and that the skins of goats and sheep were also used. This requires new thinking in the interrogation of bone assemblages as evidence for writing membrane. The choice of material may extend beyond the first hand evidence provided by the surviving deluxe codices. At the same time, the excavation of the Portmahomack workshop has generated a new range of correlates: tanks, pebbles, pegs, slaked lime and tools ranging beyond the *lunellarium*.

Found in the overburden near S9, one last object hints at the making of books at Portmahomack and the date that they were made. This was a small fragment of copper-alloy sheet carrying insular ornament (14/1286; Digest 6.1; Illus 5.6.19). The pattern has not been deciphered, but the combination of asymmetric curved limbs and open lattice recalls Mercian motifs of the late eighth to early ninth century, such as that on the Witham pins, Hedda stone or Barberini Gospels (Alexander 1978, Illus 171, 175; Webster 2012, 138–44; Illus 88, 95). The sheet itself may have derived from, or been intended for, the metal cover of a book, adorned as was the Lindisfarne Gospels by Bilfrith the Anchorite (Gameson 2011a, 8; Gameson 2011b, passim; cf Gameson 2011c, 721). This is a small reminder of the range of artistic ideas being shared at Portmahomack with masterworks that have survived from the same period all over the islands of Britain and Ireland (see Chapter 5.3, pp 167–8).

The evidence indicates that vellum-making at Portmahomack combined imported technology with a knowledge of local resources and their chemistry. A case for the specialised production of membrane for writing has been argued, without assuming a monastic character for the site. But since the production of books was a craft typical, if not exclusive, for monasteries in the early medieval period, one identification does lend support to the other. Once the evidence for vellum manufacture is accepted, it is permissible to imagine much of the accoutrements with which such establishments are credited: a scriptorium, a special book on the altar decorated with Pictish art, a library containing sumptuous volumes donated from elsewhere, the maintenance of annals and the manufacture of codices to supply other houses. Although anonymous today, Portmahomack potentially functioned at the level of learned and high-status European Christian centres already famous in history, and would have been accepted as their peer.

5.7 The Southern Workshops

Introduction

The components of the southern workshops are the building (S1), the well (S8) and a zone of craft activity captured by subsidence into the previously backfilled inner enclosure ditch (S15) (Illus

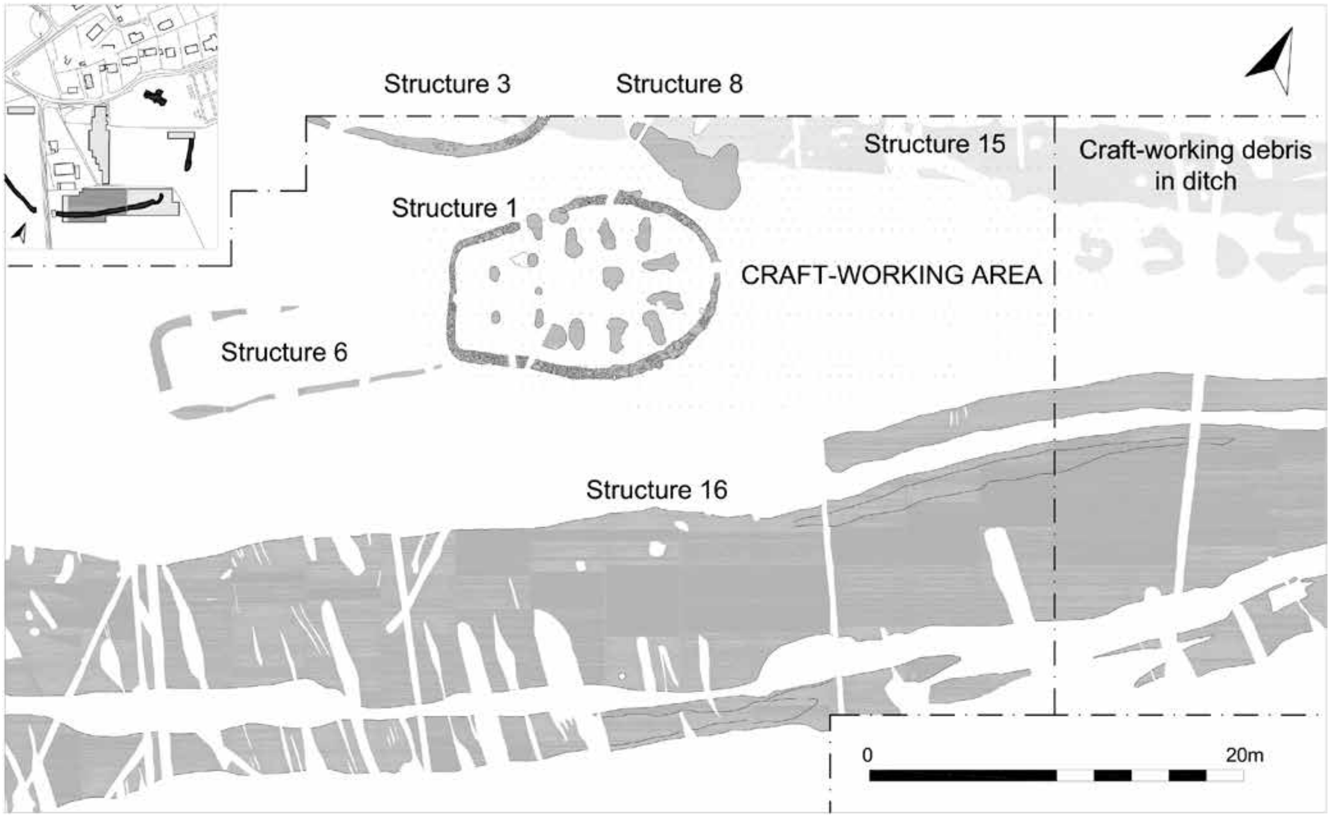


Illustration 5.7.1
Map of southern workshops, showing S1, S8, S16 (second enclosure ditch) and craft debris over S15 first enclosure ditch

Illustration 5.7.2
Craft-working area captured by first enclosure ditch (S15), in course of excavation

5.7.1). The majority of the diagnostic objects for metal- and glass-working came from contexts in the ditch (see Digest 6.1), but there were sufficient finds in the neighbouring area to show that workshop activity was fairly widespread and that the bag-shaped building (S1) stood within it. There was also a dense surface scatter of animal bone focused on S1, which is interpreted as deriving mainly from bone used as fuel (*bone coal*: Chapter 5.8, p 223). Although surface features such as furnaces and kilns had been erased by later ploughing, there were enough indications in the rich assemblage to show that the occupants of the Period 2 settlement had been engaged in the production of high-status composite objects of copper alloy, silver and glass, with an emphasis on the special equipment required for Christian ceremonies.

Period 2 craft-working deposit captured in the enclosure ditch, S15

A deposit 10cm thick, rich in craft debris, had been captured in a depression in the backfilled inner enclosure ditch (F179) (Illus 5.7.2; see Chapter 5.5, Illus 5.5.2c for the craft-working deposit viewed in section). This deposit had survived the ploughing of subsequent centuries that elsewhere had removed early medieval strata down to the natural subsoil. It yielded the most indicative evidence for early non-ferrous metal-, glass- and enamel-working from the site. Notable were clay moulds bearing intricate cross or peltaic designs probably used for making composite glass-and-metal objects (25/687, 25/855). Two glass studs were recovered, one of dark blue glass containing silver wire cells filled alternately with yellow or red enamel, the other a simple opaque white stud with negative geometric design (25/686, 25/1452). A fragment of glass-working crucible (11/3551) and a heating tray covered with opaque yellow enamel were also retrieved (11/3469). The assemblage is discussed below.

The area of the upper backfill of the ditch was investigated at very high resolution (Level E, see p 23), in the hope of defining structural features or hearths (Illus 5.7.3). At the east end, F203 proved to be a circular, steep-sided post-hole containing a number of fills suggestive of installing and removing a post. Seven fragments of ceramic mould had fallen into it. Due west of F203, a possible double post-hole (F202) seen during horizon mapping, but not subsequently excavated, yielded two fragments of crucible and a fragment of clay mould from the upper fill during cleaning. To the north a further post-hole (F219) was identified and excavated, revealing an oval cavity containing possible packing stones. A fragment of crucible and two fragments of unidentified fired clay had entered after the post-hole was disused. Adjacent to these structural features were further features: a small scoop F216, a stone setting F218 and a possible butt-end of a gulley (F34). Feature F216 proved to be a shallow scoop filled with a variety of craft-working detritus including five fragments of crucible, three fragments of clay mould and multiple unidentified fragments of fired clay including probable clay mould or daub. Stone setting F218 consisted of two small red sandstone slabs, one set vertically, the other tipping inwards. Covering the flat slab was a concentration of charcoal lumps and small fragments of clay mould. The remains are too fragmentary to identify them with any confidence as a working stance, although the components are suggestive of hearth material, albeit possibly redeposited or dispersed by the plough.

Some distance to the west was a butt-ending linear feature filled with ash-rich silt in three separate deposits. This feature (F34) may represent part of a more extensive linear feature or discrete scoop; in either case it received craft-working waste, some of which was very small and unlikely to have travelled far. Included in the range of material recovered were several fragments of crucible, daub, slag, a fragment of clay mould, small iron objects and a droplet each of copper alloy and dark blue glass.

The objects from the upper fill of the enclosure ditch are described in Digest 6.1 and reviewed below. The assemblage was

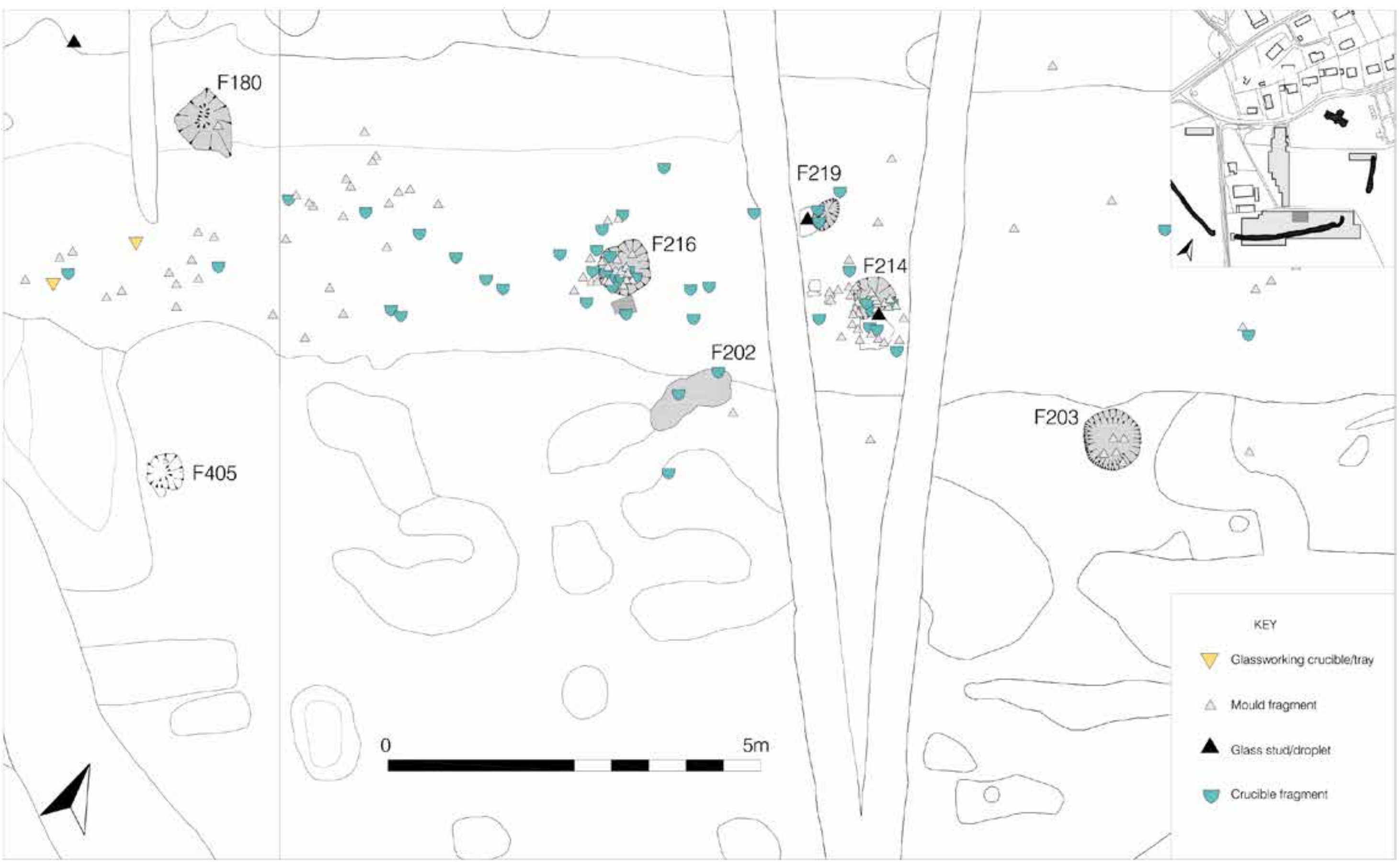


Illustration 5.7.3
Plan of captured craft area showing findspots of Period 2 metal- and glass-working debris

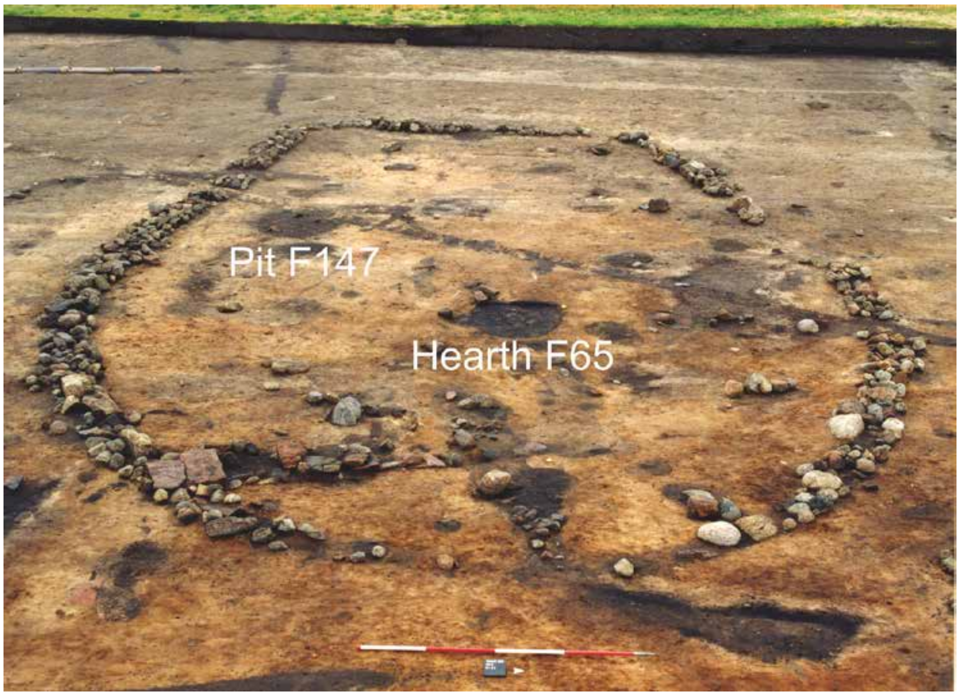


Illustration 5.7.4
S1 defined, before excavation

the richest encountered at Portmahomack, but its survival was fortuitous and the area was not resolved into a comprehensible working space (OLA 6.1 at 3.3.2). By contrast its near neighbour, S1, had the best preserved ground plan of any structure, although the assemblage here had been largely dispersed.

Structure 1 (Illus 5.7.4)

The set of features assigned to S1 consisted essentially of a cobble-filled foundation trench establishing a bag-shaped plan, and a series of internal post-holes. It took the form of a semicircle joined to a trapezium with the post-holes marking five internal bays. A set of four post-pits marked the site of an entrance on the north side. It was shown to have had two phases of construction, assigned to Periods 2 and 3 (Chapter 3, p 38; Illus 3.6). In Period 2, the building used single posts and a central hearth; while in Period 3 it had double post-holes, perhaps

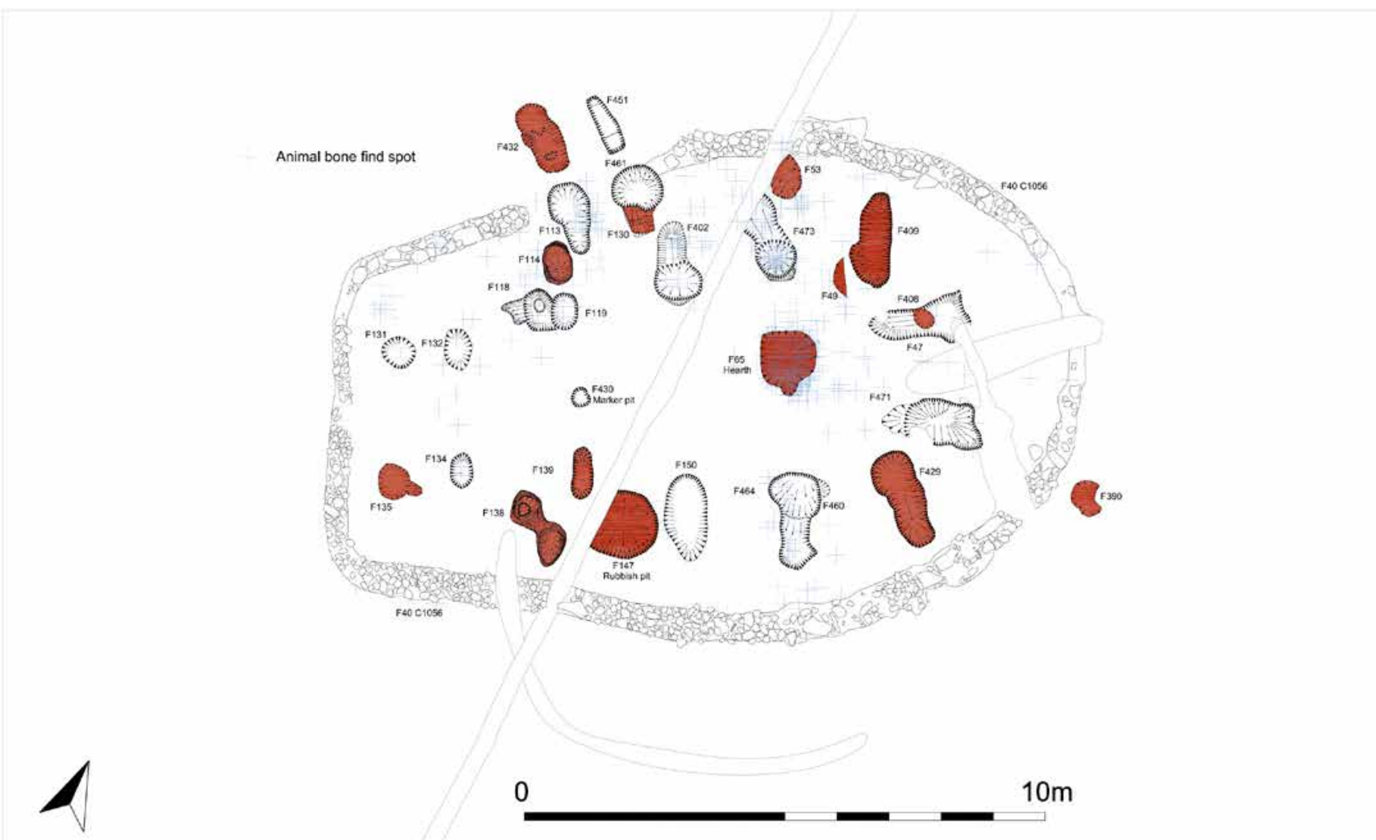


Illustration 5.7.5
Plan of S1 showing location of finds relating to metal- and glass-working (in red) and animal bone (in blue)

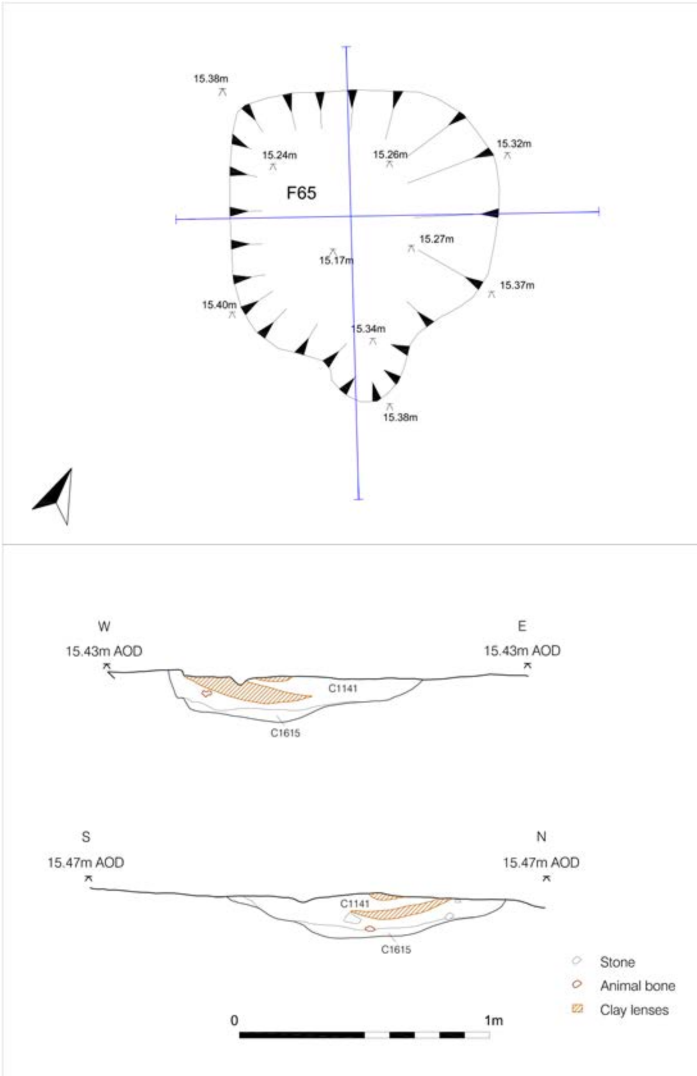


Illustration 5.7.6
Hearth F65 plan and section

supporting an upper storey, and an internal heated flue (for the architecture of S1, see Chapter 5.9, p 235).

Internal non-structural features

Investigation of the building demonstrated an association with metal- and glass-working through material captured in its hearth, in later post-pits and in a large pit on the south side, F147 (Illus 5.7.5). Central to the eastern end of S1 was a *hearth*, which measured *c* 1.5m in diameter and survived as a steep-sided concave scoop *c* 0.3m deep (F65) (Illus 5.7.6). The assemblage included animal bone, burnt and unburnt, small quantities of slag, occasional small fragments of copper alloy and iron objects, shell fragments (notably winkles), burnt nutshell and a burnt flint scraper. Testing of the flotation residues with a magnet attracted material, some of which was hammerscale. Radiocarbon dating of a fragment of calcined animal bone from hearth fill C1141 produced a calibrated date of AD 700–940 (95%) (Digest 3.2). The flint scraper (11/592) probably represents residual prehistoric material rather than an object made for metalworking in S1.

The *pit* (F147) was defined as a circular feature, straight sided with a concave base, measuring 1.2m in diameter, and truncated to the west by a field drain (Illus 5.7.7). The earliest deposit appeared to form the remains of a possible clay lining within the feature, which then accumulated a mixed fill with frequent charcoal, lenses of clay, slag, daub and 400g of mixed animal bone. A distinct dump of pale yellow clayey silt (C1540) was deposited within the pit and contained fragments of daub, a fragment of ceramic mould (11/3580), calcined animal bone and occasional charcoal. A final deposit of bone-rich dark brown silty sand contained over 1kg of mixed animal bone and some daub.

Three post-holes of S1 produced pieces of thin, translucent muscovite mica sheet in the order of 15×25mm (11/4467, 4468,

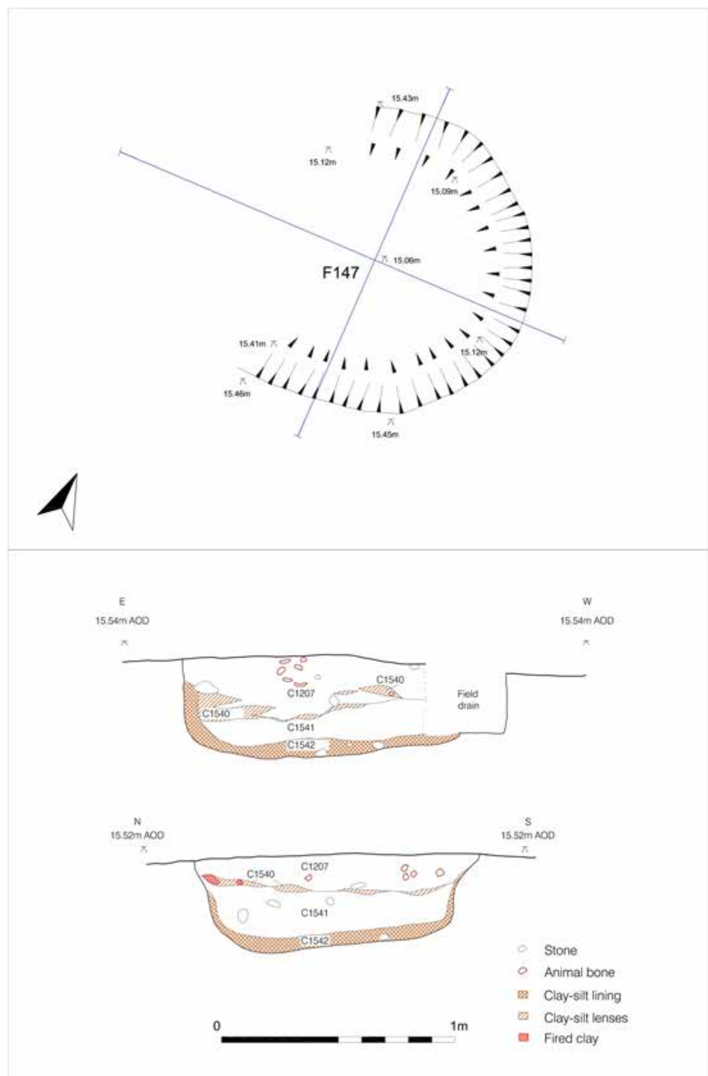


Illustration 5.7.7
Pit F147 plan and section

4469, 4470). The nearest potential source of muscovite mica of this size is the Fearn granite outcrop further up the firth (Noel Fojut, pers comm). The importation of the mica sheet to the site and its recovery from a building with craft-working associations is noteworthy since the use of sheet mica has been noted in insular metalwork. The Moylough belt shrine uses transparent mica to enable a glimpse of the leather belt that it contains (Youngs 1989, 59).

The features of S1 produced about a kilogram of slag, comprising hammerscale, smithing slag and a smithing hearth bottom (Digest 6.9/4.2; the features are marked in red on Illus 5.7.5). Animal bone recorded in the ploughsoil was strongly patterned over the hearth in S1 and the south side of neighbouring S3. This bone is interpreted as belonging to Period 2, and its association with metalworking is explained by its use as bone coal (Chapter 5.8, p 223).

Structure 8

Situated between S1 and the backfilled enclosure ditch was S8, a well, initially timber lined (in Period 2) and latterly rimmed with stones (in Period 3) (for location see Illus 5.7.1; analysed Chapter 3, p 39, 40; Illus 3.7, 3.8). The original construction of S8 consisted of a large circular 'bowl' measuring 3.0m in diameter narrowing to 2.30m at the its base, *c* 0.30m into pink boulder clay being a total of 1.20m deep. It had a lobe worn down in use by overflow, an attempt to encourage the water to rise or an access point for people or cattle. Two post-holes were sited in positions suggestive of support for a well-head bucket. Here clean water was accessible to the occupants of S1 and also the craftsmen working on the other side in the depression over the backfilled enclosure ditch.

Assemblage: eighth-century metal- and glass-working (see Digest 6.5 and 6.6 for detailed descriptions, dimensions and scale drawings)

Largely due to the depositional history of the Period 2 assemblage, crucibles and moulds tended to be fragmented to a point where only broad identification was possible. Nevertheless, the working of copper and silver alloys has been signalled by EDXRF analysis of crucible fabric (Digest 6.5), and sufficient fragments survive to allow characterisation of crucible technology and a unique assemblage of glass-working waste, trays, moulds and studs that survive in remarkably good condition. Cast objects implied by moulds show that escutcheons, discs and studs of silver and copper alloys were being produced, alongside glass studs with metal wire inlay, and glass cabochons. The evidence points to the production of highly accomplished composite pieces and items mostly referring to existing contemporary ecclesiastical objects.

Metalworking

The *crucibles* represented among the 108 fragments from Period 2 are identified as Heald Types A1, A/B1 and G1. Heald Type A crucibles are pyramidal or triangular-mouthed with a V-shaped profile and pointed or slightly rounded bases; Heald Type B crucibles are conical, round-mouthed with a V-shaped profile. A1 and A/B1 are common, long-lived forms used in Scotland from the Early Iron Age until the eighth century (Heald 2003, 50) and also known from a range of early historic sites in Ireland, including Lagore, Cathedral Hill, Armagh, Garranes and Garryduff among others (Comber 2004). Heald Type G crucibles are small, deep vessels formed around a thumb or finger with a handle modelled by pinching overlapping wall fabric into a small lug handle (Type G1 crucibles have handles horizontally pinched, Type G2 are vertically pinched and Type G3 has a handle pinched from the side to form a tear-shaped vessel). Type G1, dateable in Scotland to the seventh to eighth century, is associated at other sites with both copper and silver alloy working (Lane & Campbell 2000, 141; Curle 1982, 40–1). It was the predominant identifiable type in the Period 2 assemblage, with a minimum of nineteen vessels. Type A/B1 has similar associations and five vessels were clearly identified, although more of both types were probably in use. EDXRF analysis confirmed that the Period 2 crucibles in the Tarbat group were used to work with copper alloys, possibly quaternary alloys, and silver alloys, and there is an apparent emphasis on silver-working.

Only eleven of the Period 2 metalworking *mould fragments* gave indications of the object cast. Identifiable objects included a stick pin with horned head and collar (25/1401), a small sub-rectangular hoop possibly from a small buckle or link (11/3546), and a simple strap end and link (11/3643). The assemblage also included seven simple plain discs or the rear valve of decorative escutcheons (11/3548 and 3569; 25/759, 761, 899, 1433, 1486).

Illustration 5.7.8
Period 2 geometric disc mould 11/4269; 25/855

Most notably, two conjoining fragments of upper valve including part of an ingate were recovered, deriving from the casting of a small domed disc measuring *c* 23mm diameter. The mould bears an eroded geometric interlace matrix and would have produced a sunken, grille-like pattern probably to receive an inlay of contrasting metal, enamel or glass (11/4269 and 25/855) (Illus 5.7.8).

Slags (Cecily Spall, with Catherine Mortimer Digest 6.9)

Slags recovered from Period 2 deposits and features included seven *smithing hearth bottoms*, *dense slag*, *undiagnostic slag* and *vitrified furnace lining*; small occurrences of possible *tap slag* were also recorded. More than half of the ironworking slags recovered from Sector 1 derived from Period 2 deposits and frequently from features belonging to S1 (see above). Nearby Period 2 deposits trapped in the sinking fills of the inner enclosure ditch (S15) produced over 4.5kg of slags including dense slag (recorded with adhering vitrified furnace lining), smithing hearth bottoms, vitrified furnace lining and a single possible instance of tap slag, although given the make-up of the associated assemblage and that the fragment is isolated and small it most probably represents fayalitic run slag from smithing. Nearby Period 2 features F34 and F401 produced 5.6kg of slags including five smithing hearth bottoms and vitrified furnace lining.

Glass-working

Glass-working evidence dominates the Period 2 assemblage and takes the form of moulds, crucibles and heating trays, glass studs, waste droplets and trails of blue, opaque white and opaque yellow glass (see also Digest 6.7). Glass arrived as cullet, often

Illustration 5.7.9
Period 2 glass moulds and heating tray: (a) 25/687, 1431, 855, 4269; (b) 25/1432/1496; (c) 11/3447, 3448, 3602; (d) heating tray 11/3469

reworked Roman glass (see Campbell, below) and may have travelled from far afield. That found at Jarrow was acquired from the Mediterranean and the Near East (Cramp 2006a, 154). A total of seven *glass moulds* were present in the Period 2 assemblage (Illus 5.7.9). The moulds are distinguished from metal moulds as they are 'open', i.e. they do not show signs of uniting with another mould. Nor do the interiors of the moulds show signs of reduction, which is common in moulds that have received molten metal. A good example of this technique in action is the one-piece clay mould with delicate stepped-cross ornament recovered from Lagore, Co Meath, which retained its stud of pale green glass in situ (Hencken 1950, Fig 62; Youngs 1989, 205).

Two of the glass *stud moulds* are very similar to that from Lagore and to three stud moulds of identical compass design from Iona (Graham-Campbell 1981, 24, Fig III.Ib). The Tarbat stud moulds both have elaborate cross ornament, of floreate and geometric form, on small circular matrices (25/687 and 25/1431) (see Illus 5.7.9a). The moulds are characterised by a raised rim, which is often largely broken away or eroded, but can be easily surmised especially when compared to the well-preserved Lagore mould. Mould 25/1431 is concave in profile and bears a geometric cross design so familiar elsewhere as to 'go unremarked on insular cross-marked stones' (Henderson & Henderson 2004, 109) and which can be found in repoussé form on the underside of Bowl Nos 5 and 6 from the St Ninian's Isle treasure (Small et al 1973, Bowl Nos 5 and 6). The matrix would have produced a slightly domed glass stud; comparanda proliferate on ecclesiastical metalwork, notably the Ardagh Chalice and Derrynaflan paten and wine strainer (Youngs 1989, 206), and a domed glass stud also decorates the house-shrine mount from Llangorse Crannog, Powys (Redknap 2008, 364–5).

The largest glass mould is of notable size and can be identified by four fragments bearing the matrix of a circular, spiral-decorated disc (25/1432 and 25/1496) (see Illus 5.7.9b). The diameter suggests the casting of a flat glass disc *c* 44mm in diameter. The spiral-and-peltae design contained within a moulded border is shallow, and eroded, but partly legible. Peltaic and spiral decorated discs in metal feature regularly in the insular metal repertoire, such as the basal escutcheon from the St Ninian's Isle hanging bowl. The St Ninian's Isle disc is *pressblech* but is similarly ornamented and of comparable diameter (Small et al 1973, Bowl No 8), likewise the possible lead model disc from Birsay again of similar size and in the same tradition (Curle 1982, 48–9, 117). A fragment of red glass disc with triskele decoration recovered at Dunadd showed flow lines in support of the method of manufacture of these items. Although this item measured only *c* 19mm in diameter, its presence, along with a possible lead backing disc, was interpreted as evidence for the dismantling of a fine piece of metalwork 'of the calibre of the Ardagh Chalice' (Lane & Campbell 2000, 174–5; Henderson J 2000b). A mould for casting a metal disc from Eilean Olabhat has a similar diameter (45mm) and bears decoration in the form of three raised spiral bosses surrounded by trumpet spirals (Armit et al 2008, 82–7).

All these glass moulds would have produced glass studs with diameters ranging from 32mm to 44mm and this large size makes them difficult to parallel closely in existing pieces. They must have been used to adorn correspondingly large items of metalwork to which they would have been attached using a bezel of hammered sheet metal probably united to the parent object via a rivet. Their size precludes use on items of personal ornament and it has been posited that flat glass discs may have been suitable for fitting onto the foot of a sheet metal vessel (Youngs 1989, 206), which is noteworthy in terms of understanding how 25/687 and 25/1432/1496 may have been deployed in the Period 2 workshop.

Four Period 2 glass moulds form a group. Each mould appears to have been sliced off a rolled tube of clay and where the matrices survive small simple cells can be identified; the finished products would have been small, domed, square, circular or triangular glass studs (see Illus 5.7.9c). Dimensions of the moulds are consistently 5mm for the sides of both square studs and the axes of triangular studs, so perhaps they were all to adorn to a single item. Similar moulds were recovered from the glass-stud workshop at Lagore where again simple circular, triangular, square and sub-rectangular studs were being produced (Hencken 1950, Fig 62). Many items of high-status insular metalwork are embellished with simple glass studs imitating semi-precious gemstones or cabochons. No other examples of such moulds are known from Scotland, but glass studs of smaller order survive on Pictish metalwork such as on a number of items from St Ninian's Isle, and brooches from Rogart, Aldclune & Clunie (Small et al 1973; Henderson & Henderson 2004, 99–105).

Glass analysis
(see report by James Peake and Ian Freestone in Digest 6.8, and especially Appendix 1 to this report for colour photographs of the glass)

An assemblage of glass fragments from the Tarbat monastery excavations were analysed by SEM-EDXA, four of which were early medieval: blue stud (25/686) and three pieces of opaque yellow waste glass – trail (25/1385), driblet (25/1458) and patches on the heating tray (11/3469). The stud is made of a glass of Roman type that is likely to represent reuse of early material. This type of glass was decoloured using manganese and antimony oxides (eg Jackson 2005). The blue colour may derive from small amounts of cobalt present in the glass not detectable by EDXA (Freestone et al 2008). The remaining three glasses (all opaque yellow) are unambiguously consistent with early medieval glass technology. Before the fourth century, opaque yellow glass was largely based upon the use of antimony oxides, and the lead-tin yellow pigment found here is characteristically early medieval. It was produced by adding pre-formed yellow pigment to a soda-lime-silica glass, which, in some cases at least, was recycled material.

Excerpt from the report on the Portmahomack glass by Ewan Campbell (see Digest 6.7 for full report)

The collection of glass-working debris from Period 2 deposits at Tarbat is so far the most extensive in Scotland for the entire medieval period, and is important in showing the range of glass-

Illustration 5.7.10
(a) Period 2 opaque white glass stud 25/1452 (diam 5mm); (b) Period 2 blue glass stud 25/686, showing silver wire inlay (diam 11mm); (c) Detail of stud from Derrynaflan paten

working processes: it includes raw glass, molten droplets and trails, crucibles and heating trays. Similar collections are known from contemporary monastic sites in England and Ireland at sites such as Glastonbury (Bailey J 2000), but the same range of glass-working activities also took place on secular high-status sites such as Lagore and Garranes (Henderson J 2000a, 144–7). Glass was almost certainly not made from its mineral constituents in north-west Europe at this period, but was manufactured in the Mediterranean on an industrial scale, and the raw material exported as lumps of cullet broken from massive slabs. The cullet was then melted down to make vessels or other items such as beads and inlays (Freestone et al 2008, 32–3). The material can be divided into two groups, one of deep blue glass, and the other of opaque yellow.

The first stage in the glass-making process was the acquisition of cullet. Lumps of raw glass rarely survive from this period. There is one large block of red glass from near Tara, and a yellow one from Moynagh Lough crannog excavations, both in Co Meath, Ireland (Youngs 1989, 201), and much smaller shaped slabs from Glastonbury Abbey (Bailey J 2000, 171; Evison 2000, 189), but all that is usually found are glass mosaic cubes and selected sherds of glass, collected and destined for melting down (Campbell 2007, 92–6; Hill 1997, 296). A small spall (11/362) and a glass droplet (11/4136) are probably derived from melting down this cullet. The glass stud 25/686 may have been one of the products of this blue glass-working.

The other pieces are related to working of opaque yellow glass. The crucible fragment 11/3551 would probably have been used to prepare the opaque yellow glass by mixing lead-tin ores with raw glass, as was found at Dunmisk, Co Tyrone (Henderson J 1988; 2000a, 144). There are traces of metal ore within the glass adhering to the crucible wall. The thickness and curvature of this crucible show that it would have been quite large – the ones from Glastonbury held up to two litres of glass (Bailey 2000, 170, Fig 13). This is larger than the general metalworking crucibles of the period such as those from Dunadd (Lane & Campbell 2000, Illus 4.40). The driblet of yellow and green glass (25/1385) may have been associated with this stage of the process. The heating tray (11/3469) would then have been used to re-melt the prepared opaque yellow glass (Illus 5.7.9d; Digest 6.8, App 1 for colour photograph). The stirring marks where trails of glass have been lifted are still visible on the base of this tray. The eyed shape of this tray is unusual, though it is clearly related to 'dog-bowl' types found on many sites (ibid, 134, Type B), and some of the Birsay and Clatchard Craig examples are oval (Curle 1982, Illus 25; Close-Brooks 1986, Illus 27, 107). The fragment of trail or rod (25/1458) is a remnant of one the trails lifted from this type of tray, possibly used to create a reticella rod by twisting with another of natural-coloured glass (see Digest 6.8, App 1 for colour photograph).

The two decorative *domed glass studs* are the most spectacular glass finds, and are important in showing the type of material that was produced at Tarbat. The similarities in design of the two studs suggest they derive from, or were intended for, a single composite piece of metalwork. Both designs are based on a tripartite division of the circular stud using a combination of arcs and straight lines to form pseudo-cloisons which would have been filled with silver. The smaller of the two (25/1452), in

Illustration 5.7.11
Comparative objects:
Derrynaflan paten (above);
Ardagh Chalice (below)

opaque white glass, has grooves for silver wire decoration, but this is now lost or had not been applied, while on the larger (25/686) the wire survives and can be seen on X-ray to be almost complete (Illus 5.7.10a, b). The pattern of decoration, a doubly tripartite division, one of arcs and one of straight lines, sometimes stepped, is paralleled in more elaborate versions on some of the smaller studs from the Derrynaflan paten (Ryan 1993, 30, Pl 14; Ryan & Ó Floinn 1983, Plates 55, 57, 59, 61), and the same decorative elements are used in other studs. While some of these studs have a quadripartite decorative scheme, many others are tripartite. The central triangle with concave sides, which is so prominent in the Tarbat stud, is a particular feature of the Derrynaflan studs on Frames 1, 12 and 5 (ibid). These studs use blue and red for the decorative scheme, and this may have been the original colour scheme of 25/686 (as red enamel often fades to white), but blue and yellow is another possibility. The larger stud (25/686) is similar in size to the Derrynaflan studs, and the Tarbat stud is clearly in the same workshop tradition, if not from the same craft-worker. Very similar studs are seen on secular metalwork on the back of the 'Tara' brooch from Bettystown, a piece conventionally dated to the early eighth century, but otherwise most surviving artefacts with these studs are ecclesiastical, such as the Ardagh Chalice, Moylough belt shrine, and the Derrynaflan wine strainer.

The smaller Tarbat stud has a similar decorative scheme, but in a simplified form without any stepped elements. The small size would seem to preclude its use on large items like a paten or chalice, but slightly smaller studs almost identical to those on the Derrynaflan paten are seen on the rear of the 'Tara' brooch (Youngs 1989, Pl on 77 upper), though it is difficult to find a parallel for such a small stud. It may have been from a small brooch such as that from Co Westmeath (Youngs 1989, 206, No 211) which has small studs of about 7mm in diameter on its front face, or may have been a subsidiary stud like those on a possibly ecclesiastical mount also probably from Westmeath (Youngs 1989, 147, No 141). Most of the parallels quoted above probably date to the eighth century. The only comparable piece from a well-dated archaeological context is a detached stud with gold wire inlay that was found in an early eighth-century deposit at Deer Park Farms, Co Antrim (Youngs 1989, 206). An eighth-century date is likely for both the Tarbat studs.

The production of inlaid glass studs is attested at a number of secular and monastic sites, including Lagore and Iona, where moulds have been found, and at Garryduff and Dunmisk where unfinished studs were found (Henderson 2000a, 146). Thus it seems that this type of stud was not made in an exclusively ecclesiastic milieu, but was also produced on high-status secular sites.

Conclusion

The areas of Sector 1 examined had been occupied by an eighth-century workshop in which the emphasis was on the manufacture of composite decorative objects requiring highly skilled, time-consuming manufacture, assembly and finishing. Comparison with the products of workshops from secular sites shows that moulds for the manufacture of items such as the brooches, finger rings and dress pins are rarities at Tarbat in Period 2; indeed penannular brooch moulds which form such a dominant component of comparable assemblages from Birsay and Dunnadd are absent from the repertoire. By contrast, the metal and glass studs being produced at Tarbat can be found on contemporary ecclesiastical pieces including chalices, a paten and wine strainer, and shrines including those of house and belt form, all items which represent highly specialised items rich in symbolic art suited to the celebration of the Eucharist and the curation of relics (Illus 5.7.11).

5.8 Economy

Introduction

Like communities of any kind, the Pictish establishment at Portmahomack required to operate an economic system in which resources and subsidies were balanced with subsistence and output. It was certainly successful: from its small beginnings by a marsh, the settlement greatly expanded its area and its industries and flourished for a brief and brilliant century. If it is reasonable to assume that this monastery, here as elsewhere, was established by a gift of land, it remains to see what they made of it. Could the community have become rich by means of production? If so, via which commodities, and how was the surplus reinvested? Here we review the natural resources as known today, and then the evidence from the excavations, particularly the plants and animals, and explore the question of how far the community was dependent on gifts, self-sufficiency, delivering services or profit-making. Hypothetically, an early medieval monastery could operate either on the redistribution of assets, like the secular elite, or the sale of spiritual benefits, like a merchant, or a blend of the two.

Resources

Portmahomack lies almost at the centre of an arc of sandstones that extend from the south shores of the Moray Firth, across the Black Isle and northwards in a thin coastal strip of sandstone towards Helmsdale where a mass of granite emplaced during the late phase of the Caledonides separates the strip from the extensive Old Red Sandstones of Caithness. The Tarbat peninsula, apart from the hill of North Sutor, is composed of Devonian sandstones belonging to the Old Red Sandstone supergroup. The coastal strip from Tain eastwards towards Portmahomack and Tarbat Ness is comprised of Upper Old Red Sandstones of the Balnagown Group (UORS), whilst sandstones exposed along the coast from a little south of Shandwick and extending northwards along the southern coast of the peninsula to Wilkhaven are comprised of Middle Old Red Sandstones of the Strath Rory Group (MORS). The base of the UORS is conjectural, but is thought to run on a line from Nigg Bay to Hill of Fearn and then north-east to Pitkerrie, Meikle Tarrel and on the coast at Wilkhaven. Middle and Upper Jurassic sediments of clayey siltstone, sandy siltstone interbedded with calcareous siltstone, and coarse, poorly fossiliferous bituminous siltstone are exposed on the foreshore south of Balintore (Illus 5.3.24; Ruckley in OLA 7.1.12).

These rocks contained no metals, but the underlying solid geology of iron-oxide-rich Old Red Sandstone coupled with the wet, boggy conditions of parts of the site from the Iron Age onwards would probably present suitable conditions for formation of iron ore. Iron smelting was identified across the firth at salvage excavations within the historic core of Dornoch in deposits of eighth to fifteenth century date, from which fragments of bog ore were positively identified (Coleman & Photos-Jones 2008, 13–15; for medieval iron extraction see Chapter 7 and Digest 6.9).

In its recent history the peninsula is described as a favoured place: 'there are no lakes or rivers in the parish, but there are a number of small lochs or natural ponds, which become dry in summer; and fresh water springs are to be found in every corner, particularly in parts near the sea. One of them at Portmahomack is remarkable for the lightness of its water' (FSA, 635). At this time (1799) the land was fertile. The parish produced more corn than was needed by its inhabitants (ibid, 639) and exported the surplus south by sea from Thomas Telford's harbour (Chapter 7, p 319). Exports from Portmahomack increased greatly between 1827 and 1836. Oats and bere barley were grown in rotation, with wheat 'for the gentry' and ploughs were made almost entirely of wood. Lime was obtained by burning seashells (Mowat 1981, 23–48). All the same, this was a downturn compared with the big yields of barley and honey obtained in the warmer weather before 1780 (FSA, 390).

The principal fuel had been peat, but this was now becoming scarce: 'The privilege of the scanty mosses in the parish is restricted to a few families living on the properties to which they belong' (FSA, 646) and 'the common people burn turf, a few peats, and some heath, carried from a distance of eight miles' (FSA, 388). But by 1845, 'the tenants do not now, as they did (not many years since) occupy the greater part of the summer in cutting and carrying home peats and turf from the mosses of the parish of Loggie' (SSA, 37).

The late eighteenth-century snapshot provokes a reasonable expectation that arable farming could have prospered in the first millennium. However the climate underwent several changes since then, and it is likely that the operations of Fearn Abbey between the twelfth and sixteenth century would have significantly improved the overall yield of cereals. The local developments included the reclamation of land and the importation of soil (p 247). The introduction of fertile soils from elsewhere ('plaggen soils') has been identified as an early medieval agricultural signature (Lowe 1998, 204–5; Barber 1981, 359), although there was no evidence for it in Period 2, and indeed little for cereals, in contrast to meat and dairy products.

Farming

Site survey demonstrated that the St Colman's site was well supplied with water in the eighth century. It flowed from lochans to the east and ran over an impermeable sand-clay subsoil. The occupants tapped into the water table using wattle, plank or stone-lined wells (pp 92, 37–40). The monastic community dammed the flow down the central valley to create a pool, and collected water from the hillside via the enclosure ditch (Chapter 5.5).

Although there was archaeological evidence for cultivation from Period 1, in the form of plough pebbles and burnt grain (Chapter 4, p 94), there was very little in Period 2. This was endorsed by botanical analysis of hearths and pool silts, which offered records of plants but few of the normal foodstuffs. There were small quantities of barley grains from S9 and S1 (Digest 7.4) and research on pollen in the pool showed that cereal values were rising at a time probably to be equated to Period 2 (Laura McHardie in OLA 7.4.4.). This might imply that a crop was growing at a little distance away. Micromorphology showed that soils were mobile and there were several deposits of windblown sand, some probably provoked by stripping turf for building or burning (Digest 7.5). In the immediate area of the monastery, in both Sector 1 and 2, there was a wealth of animal bone, dominated by cattle, but also including pig, some sheep/goat and a range of wild creatures including sea mammals. These animal resources supplied the bulk of the *diet*, but were also used for *building* and as *fuel* to support the on-site industries.

The study of the main enclosure ditch (Chapter 5.5) indicated that it was accompanied on its inner side by a bank topped by an elder hedge and in Period 2 the neighbouring land was under pasture. Subsequently the still-open ditch received cereal remains as well as heather and marsh plants brought in from elsewhere. But this latter stage is thought to belong to Period 3 (Chapter 6).

Plant remains

The main sources of plant remains in Period 2 were the hearths in S1 and S9, the sequence in the pool and the filling of the main enclosure ditch. Hall and Kenward report (Digest 7.4) that evidence for plant foods at Tarbat was meagre. The records for wheat, with a single exception, and for rye, are all from Period 1 deposits, other cereals present then being barley, with (occasionally) oats. From the Period 2 hearth (F65) in S1, oat and barley grains (but no wheat) were recorded, and five samples (from three contexts) furnished charred hazel nutshells. Barley grains were found in hearth F445 in the yard of S9, and in the ultimate pool levels.

Starch caught in calculus showed that two individuals buried in Period 2 had been eating barley, and oats or wheat (Walters, Digest 4.5). Considering the large quantity of soil that was excavated and subjected to flotation from numerous contexts and the likely preservation provided by the pond and the fire, the quantities of grain are small and certainly not as might have been expected if cereals were grown or processed and a mill was operating in the immediate area (see Chapter 5.5, pp 193–4).

Wood burnt as fuel in the hearth of S1 (F65) comprised alder, birch, hazel, *Pomoideae* (perhaps rowan or hawthorn, for example), with hazel, oak, and willow/poplar/aspen being the most frequently recorded (Hall in Digest 7.4). Heather root/basal twig fragments were recorded in six samples, with other parts of heather plants noted in several of them: buds, flowers, twigs – presumably from cut or pulled heather brought as fuel or from recycled heather thatch, for example. There were occasional fragments of charred root/rhizome and herbaceous material, which may have arrived with surface-cut turves. The context from which these taxa were recovered (a site-wide fire) indicated that they had been employed in construction: oak for frames, hazel for wattle panels, turf for walls, and heather and rushes for thatch (see Chapter 5.9, pp 228–46).

Hearths in S9 showed that turves had also been deliberately employed as fuel; patches of surviving *mor humus* imply the use of surface turf. Micromorphological analysis of the ash reported the burning of a silty, moderately humified peat. Some of the ash clasts are dominated by biogenic silica, implying remnants of peat that had been subject to relatively high temperatures (>600°C) resulting in the combustion of nearly all of the organic matter (Simpson et al 2003). In contrast, the clasts dominated by charred and burned organic matter have not been subject to such high temperatures and combustion is incomplete. One explanation of the different temperatures is that the peat was utilized for two different purposes: burnt at a high temperature for 'industrial' use, such as the smelting of iron, while a lower temperature was adequate for domestic use (Digest 7.5).

Faunal remains

The largest assemblage of animal bone by period (NISP = 7820) was recovered from Period 2, and this formed the main focus of analysis (Seetah in Digest 7.1; OLA 7.3.1; Chapter 3, p 60). The principal contexts producing animal bone were within the workshops in Sector 2, and a dense scatter associated with Structures S1 and S3 in Sector 1 (Illus 5.8.1). Cattle were overwhelmingly the dominant species at 75.69% of the domestic meat species identified, with pig at 12.60% and sheep or goat 3.31% (Chapter 3, Table 3.6). Also exploited in Period 2 in significant amounts were red deer, roe deer, goose (*Anser* sp) and seal, as well as dogs; and present in small amounts were horse, cat, fox, wolf, otter, chicken, raven, gull, shag, gannet, capercaillie, whale and porpoise/dolphin (see Chapter 3, Table 3.8).

Age diagnostics indicate that cattle were generally slaughtered at three years or more (with evidence for 'senile' animals also indicated by the tooth wear profile). This points towards secondary product exploitation in cattle – milk, butter, cheese – a conclusion reinforced by the presence of a sizeable component of neonate and juvenile animals (see below). All the cattle would have provided significant quantities of meat. Pathological changes associated with traction were noted on some seventeen individual elements. These were predominately on cattle distal limb bones, with five examples of eburnation (hardening) (OLA 7.3.1 at 3.4).

The body part representation indicates that all carcass units were present on site (OLA 7.3.1 at 4.3) showing that the animals were raised locally or brought in on the hoof. The metrical data shows very little variation between individual animals, suggesting that the animals themselves were drawn from a relatively restricted geographic region (OLA 7.3.1 at 5.2). Slaughter by poleaxing was noted in the Tarbat assemblage on a skull bearing a slightly off-centre 'puncture' with associated circular and spiralling fracture marks. The fractured (but still attached) bone just above the circular indentation indicates that a punch point, with blunt force, was used rather than an actual cut. Very sharp knives were used in butchery: the evidence from detailed microscopic analysis of

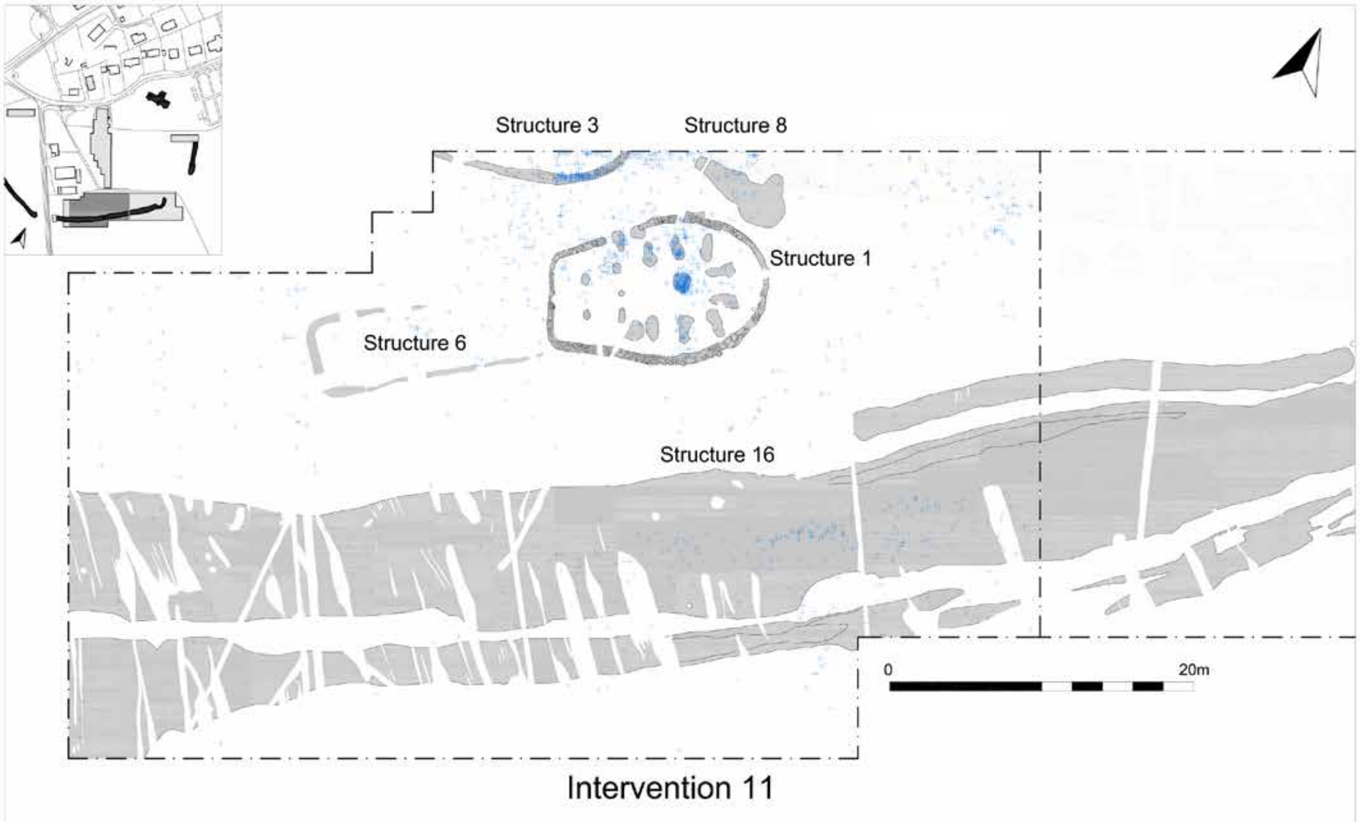


Illustration 5.8.1
Sector 1 animal bone distribution

the surface of the marks themselves would suggest that some of these blades potentially included steel technology (OLA 7.3.1 at 3.3). Cut marks were noted on both fur-bearing animals (otter) and game (red and roe deer). Despite the frequency of cut marks noted on cattle, the highest occurrence of butchery relative to the number of specimens was recorded on marine mammals from all size categories.

A direct association between cattle farming and vellum production can be seen in the twenty-five adult metapodials found in the vellum workshop, lined up for use as pegs (Chapter 5.6, p 201). Since vellum is made from calfskin, there is an expectation that a monastic assemblage should be dominated by calves, with the corollary that an assemblage showing a high proportion of calves points to the production of vellum (see Chapter 5.6, p 210). However, the relationship may be less direct. At Portmahomack, Period 2 produced thirty juveniles (nineteen neonates), as opposed to Period 3's twenty-five (twelve neonates) and Period 4's twenty (nine neonates). Of the eleven juvenile mandibles that were noted as having the deciduous premolar present, none were recovered from Period 1, six derived from Period 2, with a further three from Period 3, and two noted from Period 4. The specialist commented that 'although these figures are small, they would seem to suggest a greater representation of calves in Period 2, and a decline in Period 3' (OLA 7.3.1 at 4.2 and 5.1). An association between vellum-making and the calf cohort was endorsed by their relative age: 'The finds of juvenile bones certainly support the presence of vellum processing. In fact, the majority of juvenile cattle bones are neonatal, falling into an age range between 185 and 255 days (Prummel 1987). A few examples are older, based on tooth eruption, but overwhelmingly the calves are very young individuals' (Seetah in OLA 7.3.1 at 5.3). It can be concluded that while a preponderance of young calves may be a pointer towards vellum production, a small number does not preclude it. A stronger argument that vellum was being produced on site may be composed from structures, materials and tools, as developed in Chapter 5.6 (p 211).

Calcined animal bone was found in hearths related to both lime burning and metalworking, where it was identified as fuel. The use of 'bone coal' to achieve high temperatures has been explored in Scandinavia where bone has been found in Iron Age forges, smithies and iron bloom (Gansum 2004). When mixed with charcoal, the bone helps to carbonise iron, so making steel. Terje Gansum detects a deeper symbolic meaning in the use of animal bone in manufacture, whereby animals or ancestors lend their attributes to swords and other weapons through the forging process (ibid; Hedeager 2011, 140).

A smaller but still sizeable quantity of animal bones was retrieved from Sector 1, where it was concentrated on S1 and its immediate surroundings. The majority of the bones were found in Period 3 contexts but their focus on the S1 hearth suggested an origin in Period 2. Overall, cattle dominate at 96% of the assemblage, and the quantities and association with S1 suggest a use of the bones as fuel (Illus 5.8.1; Chapter 3, Table 3.7). Only the bones captured in the metalworking scoop in ditch S15 were of a mixed proportion suggesting diverse exploitation: eighteen bones of cow, twelve of pig, six of sheep/goat, one of red deer and one of seal.

Wild animals

The most abundant non-domesticates were red and roe deer, although figures for red deer are inflated due to the presence of a relatively large number of antler fragments. Fur-bearing animals included dog, fox, wolf and otter. The number of wolf finds is significant: wolf finds are notoriously rare, therefore the recovery of bones from four individual animals over Periods 2 to 4 may be suggestive of an enduring local population. The finds of capercaillie would almost certainly have made their way into the assemblage via hunting, given the type of habitat – dense coniferous upland – that it requires. Geese were recorded in greater numbers than domestic chicken; however, this component included individuals from a range of species as opposed to domestic geese only. From the materials present it was not possible to refine the identification of the geese component to species level. One 'wader' was recorded and this was likely a grey heron (*Ardea cinerea*) (Seetah in Digest 7.1).

The marine mammal cohort, although found in small numbers when compared to the overall size of the assemblage, showed a particularly noteworthy level of diversity. Unfortunately, fragmentation – particularly of the largest whale species – and the state of preservation made concrete identification problematic. However, it was clear that large (minke whale sized), medium (porpoise sized) and small (dolphin sized) cetaceans, along with seals (common/harbour seal, *Phoca vitulina*, and possibly grey seal, *Halichoerus grypus*) were all present (OLA 7.3.1 at 3.1.1).

The community at Iona had ownership of a neighbouring rookery of seals (LC I.41; Sharpe 1995, 143; O'Sullivan, D 2001, 46), and beached marine mammals were regarded as acceptable food (Bieler 1963, 9, 177). Dolphins, porpoise, whales and seals were also exploited in Pictland; Cuthbert was provided with a miraculous meal of roast dolphin on a midwinter visit there (*Prose Life of Cuthbert* II.4; Colgrave 1940, 83). While it is usually assumed that the main purpose of obtaining marine mammals was to eat them (Gardiner 1997), a rather more valuable commodity would have been oil (Loveluck 2007, 93). Cetacous oil could be burned to give light (Lebecq 2000, 129), which is maybe why a dolphin was depicted on Roman lamps. A Christian community had ritual obligations that required oil: the maintenance of the altar light and as chrism to anoint the newborn and the dying.

Fish

The fish assemblage, although small, included freshwater or marine char, oceanic cod and mackerel (Holmes in Digest 7.2). Char are present in deep glacial lochs in Scotland, and could have been caught in the highland lochs Morie or Glass, *c* 26 miles away by land, or loch Ness, *c* 30 miles away by sea (National Library of Scotland 2012). However, all three species are available in coastal waters or further out to sea. The increase of cod in the eighth to ninth century is consistent with the increase in cod fishing in the Viking age period (ninth to eleventh century) (Barrett et al 2000, 151; Barrett et al 2004, 624).

Shellfish

Shellfish from Period 2 came from discrete features (Holmes in Digest 7.3). There was a concentration of whelks in and around pit F554 in the S4 area, and winkles gathered in a pit were recorded further to the south, also in association with the vellum-working yards (Chapter 5.6, p 203). Although the use of dog whelks (*Nucella lapillus*) for the production of purple pigment for manuscript production has been documented as occurring in Anglo-Saxon Britain, little direct evidence has been forthcoming (Biggam 2006, 2). Unfortunately, the only whelk shell from this site complete enough to be identified to species was that of the common whelk (*Buccinum undatum*), which is distinct from the dog whelk. Common whelks are found on the lower shore, and could be easily exploited. Limpets, oysters and cockles were less commonly recorded. With the exception of two flat winkles (*Littorina obtusata* or *Littorina fabalis*), the rest were identified as the common or edible winkle (*Littorina littorea*), both of which species inhabit the middle and lower shore areas. Native British oysters (*Ostrea edulis*) were present, and could have been picked from freshwater, estuarine or marine beds. Cockles and limpets are also common finds on the middle and lower shoreline.

Resources: available or acquired?

The diet of the monastic community, as suggested by animal and plant remains, consisted predominately of beef, its dairy products (milk, butter and cheese), with minor contributions from pigs supplying meat, and sheep/goat (mostly goat) for dairy products. There were traces of barley, nuts and an uncertain quantity of fruit and vegetables. A limited amount of fish and some dolphin were also apparently eaten. These conclusions are endorsed by stable isotope analysis on the skeletons of individuals buried in Period 2: the early medieval monastic community were consuming a significant amount of terrestrial animal protein, but with one exception they were not ingesting marine protein (fish, sea mammals, shellfish) (Curtis-Summers in Digest 4.3). The barley was consumed most likely as bannocks and beer, but there was little evidence in this period for large-scale cultivation from the excavated area. The land in the vicinity was mainly pasture, with the enclosure marked by a ditch, a bank and a hedgerow (p 280).

Documentary evidence for diet in early Celtic monasteries records an ideology of practice that purported to regulate consumption within an abstemious regime. Recorded rules determine what is eaten, when and how much: 'Let each be given a loaf, thirty ounces in weight'; 'the ration of bread is not reduced when a piece of fish, some curds, a little cheese, hard boiled egg or apples are allowed. If the apples are large, five or six will suffice with the bread. But if small then twelve may be allowed … The following are allowed by way of relaxation at Easter: eggs and fat, with the meat of wild deer and wild pig … The cook, milker and kitchener are to do extra penance when guilty of spilling produce, whether milk or grain' (O'Maidin 1996, 24). The principal foodstuffs mentioned by Adomnán are cereals, and the monks appeared to have lived mainly on bread and cheese, with onion, carrot, watercress, wild garlic, cabbage apples, plums and hazelnuts (Murray et al 2004, 180–1). Where meat is mentioned, it is that of red deer or wild boar (ibid). Venison appears to have been a deliberate preference at Iona (ibid, 186).

This ideal regimen is curiously at odds with the lavish high-protein diet of beef and dairy products reported here. But the protein-rich beef eaters of eighth century Portmahomack were not alone; nearly every monastic assemblage in Scotland and Ireland is dominated by cattle, while in England it is sheep (McCormick F & Murphy 1997, 605–7; Loveluck in Daniels 2007, 206–7). However, much of the written information cited above comes from ninth-century documents serving the reformist movement of the Célí Dé, the objective of which was to 'restore monasticism to its rightful place' after a period of notoriously relaxed practice (O'Dwyer 1981, 192). On these grounds, it seems legitimate to draw a distinction between the eighth century and the ninth. The archaeological evidence for eighth-century diet aligns with that of the secular elites, making it easier to see the monasteries as the home of a spiritually propelled aristocracy (see below and Chapter 8, p 339). The devotional initiatives of the ninth century would have introduced a degree of fastidious regulation in Ireland and Scotland, this at a time when the *Rule of Saint Benedict* had yet to be adopted in Rome (Ferrari 1957, 407). At Portmahomack, cereal returned as the staple in Period 3 (ninth century), although the evidence for the continuation of monastic life in that period is markedly slight.

The faunal evidence, combined with the evidence of the infrastructure, shows a developed management strategy predominately using locally based resources. The emphasis is on cattle, used for traction, dairy products, meat, blood and hides (including vellum from calfskin). Pig (for meat) and goat (for dairy products) are present in marginal numbers. Wild species may play a small role in the subsistence of the early monastery (cf McCormick & Murray 2007, 104), but they were selected for crucial uses: fur from mammals, feathers (quills) from birds, lime from shellfish and seaweed.

The archaeological evidence reveals a community well able to exploit local sandstone, beach cobbles, timber and turf in a major landscape development (Chapter 5.5) and the construction of buildings (Chapter 5.9). The community was also engaged in three intensive industries: the production of sculpture (Chapter 5.3), vellum (Chapter 5.6) and metalwork (Chapter 5.7). Stone for carving was quarried on the east side of the peninsula. Vellum-making drew on the cattle herd and the collection of shells, seaweed and pebbles, and presumably quills and gall for ink and dyes for illumination. Peat, turf, wood and bone coal were all available locally to stoke fires. Only the metalworkers would certainly have needed to acquire non-local resources: glass, bronze, silver and gold, and perhaps iron, all of which would need to be imported. For precious metals it might come as recycled coinage or other Roman or Byzantine artefacts, while the glass came as cullet from the Mediterranean or the Near East (Chapter 5.7, pp 217–18). The supply of raw materials or the means of buying them may have been acquired by donation: for example treasure or weaponry donated by secular lords. However, the expansion of the monastery to encompass the whole peninsula and the demand for more books and vessels to furnish daughter foundations suggests the need for a liquidity beyond gift aid.

There are indications of each of the economic strategies mentioned in the questions that began this section. We can assume that the land at least would have been donated (Chapter 4, p 104). The plant and animal evidence supports a vision of subsequent self-sufficiency from local resources. The establishment may have been primed with non-local raw materials (copper, silver), but in the long term would these require to be purchased on the back of a surplus? In the argument that follows, the suggestion is that such a surplus would come most readily from cattle farming and the sale of spiritual benefits.

A model for the monastic economy

In an economic sense, a monastery is a settlement like any other, and its occupants must eat, even when the control of their diet is abstemious to the point of fetish. The foundation is enabled in the first place by the gift of productive land, and, at a basic level, that is all that is needed from a sponsor to secure the presence of a college of holy persons in the neighbourhood. However, a preliminary endowment would kick start the investment, in this case, for example, a herd of cattle. The establishment can anticipate further sources of income, namely the rendering of spiritual services in exchange of donations, and the profits that result from successful farming. Economists Ekelund et al (1996, 42) comment: 'In the corporate structure of Christendom, the medieval monastery operated as a downstream franchised firm, receiving quality assurance and name-brand recognition from the church of Rome in return for certain payments (upstream).' Their study of the Cistercian monastic economy showed that the delivery of spiritual benefits in exchange for endowments included marriage licences and fees for teaching children, as well as donations for the support of the souls of the departed. We need not doubt that these were seen by donors as the purchase of real benefits with a high level of quality control, and maintained as such, even if in monetary terms they were not actually earned from any visible production or result in any verifiable reward. Or, as an economist is disposed to put it: 'As a dominant-firm monopolist in the salvation industry, the medieval church could be expected to pursue demand maintenance policies, including the establishment of rules and regulations governing the interpretation of church doctrine' (Ekelund et al 1996, 86). In other words, this was a market that wrote its own rulebook. However, the production industries were also potentially profitable. The cost of labour was minimal, since even lay brothers agreed to trade wages for religious advantage. Combined with the knowledge, particularly agricultural knowledge, embedded in the monastic package, this encouraged a rapid advance from subsistence to surplus.

It is not clear how far such an economic system, as observed in Cistercians, would have obtained in the monastic movements of the sixth to eighth century. In any new community that was adopting the Christian form of governance, especially one that had never been a Roman province, the endowing of monasteries was economically much simpler than the quasi-imperial episcopal pyramid with its diverse ranks of employees. The members of that latter hierarchy would all need salaries, of a kind that could only be found, as it had under the empire, by taxation. An ability to tax and redistribute liquid benefits would always be a challenge in a non-monetary economy. Besides, there is some evidence that the 'college of specialists' was a format already familiar, and so more acceptable, to Late Iron Age communities in the north and west (Carver 2009a).

Notwithstanding the hypothetical importance of donors and the frugal consumption of its inmates, it is unlikely that a large establishment even in its earliest days could function solely on subsistence and gifts. The Célí Dé exercised a system of tithe, where a herd was led through a passage and every tenth animal taken for the monastery (O'Dwyer, 1981, 82, 91). Services to the monastery could be rewarded by board and lodging: 'Monks of the priestly order get house, garden and bed, sack of meal and its condiment; a milch cow every quarter. In return he is to provide baptism and communion. The teacher of donated children gets a milch cow after teaching 150 psalms. Also the bishop who marks the young man gets supper for a party of five' (O'Maidin 1996, 35). It is likely that donations, including that of more land, would follow the rise of the Portmahomack monastery during the eighth century, and that bullion arrived in the votive manner suggested above. But specific fees and returns for prayers, masses and devotional intercessions designed to benefit donors are largely undocumented in our era. This leaves the evidence on site from which to reconstruct the economy, and especially to work out whether it required subsidising, was self-sufficient or generated a surplus.

In this respect it is logical to focus on the principal commodity suggested by the assemblage, namely cattle. Cattle were raised locally at Portmahomack which is likely to have offered plenty of grazing (p 186). The output from the live herd would be milk, butter and cheese, and calves. The cattle provided traction for pulling carts laden with sacks of grain or dragging rocks for carving up from the beach. The peninsula also had land suitable to grow barley, with the bulls and cows available to pull ploughs of unspecified type.

Tribute or rent might be due from tenants, payable in livestock (Murray et al 2004, 181), but once the whole peninsula became part of the monastic estate (p 255) there was less to pay to landlords and surplus could increase. Shells, pebbles and metapodials were available for collection locally. There might be some outlay on special stones for smoothing, inks and dyes, precious metals as scrap or coinage, and coloured glass to turn into church plate. These things should have been available within the monastic network that stretched from Ireland, western Scotland and Northumbria to France and Rome, but a reliable supply would still need to be paid for. Indications from Clonmacnoise are that the monastic demand could be considerable: 'Silver, copper, gold, semi-precious stones … amber, lignite and E-ware pottery … were all brought to the site … references to merchants from Gaul importing wine to Clonmacnoise indicate that the monastery was part of both an inter-regional and international trading network' (King 2009, 344). However there was no indication as to how such merchants were recompensed.

It might be assumed that profit could be maximised because monastic labour was 'free' in the sense of being given freely. The monastic use of slaves is argued to be a crucial part of their economic viability on the continent (Carver 2015, 17), but their role in the Celtic north is equivocal. Enslavement of both sexes was practised in Ireland from at least the fifth century to the twelfth. The Irish laws relating to the seventh and eighth century contain many references to slaves, so it may be concluded that they carried out much of the manual labour in establishments that could afford them. Herding (cows, pigs, sheep) was a particular job for young people. Adult male slaves were used for wood cutting, while female slaves prepared milk, butter, cheese and bread (Kelly 2000, 438–9). Slaves were also commodities used for gift and exchange: a milch cow was equivalent to one ounce of silver, while a girl slave fetched three milch cows (ibid, 58). It need not be assumed that the Celtic monk had an interest in slave girls, equivalent, say, to his contemporary in a Baghdad palace, but there were unpaid servants in a monastery supported by subsistence payments gilded by spiritual benefits. At Portmahomack such persons are not visible in the cemetery, where women and children are absent, and the men who are commemorated in a ritual manner also bear the scars of physical labour (Chapter 5.2, p 119). As we have it, there is some reason for regarding the devotional community as coincident with the workforce, whether engaged in metalworking, carving or husbandry.

Even so, an ever-growing army of monastic farmers, artisans and experts (smiths, carvers, herders, ploughmen, butchers) would need to be fed, if not paid. Although it is hardly feasible to calculate how far surplus kept in advance of liabilities with any precision, there is every sign of increasingly conspicuous expenditure in the form of the monumental crosses, each one of which would have required several man-months from extraction to installation. The production centres uncovered by the excavation were dedicated to books and church vessels, neither of which were necessarily saleable; rather they may be seen as supporting the expansionist project, producing the essential equipment (book, chalice, paten, ciborium, reliquary) for newly formed convents budding off from Portmahomack.

Assuming the main monastic capital was held in cattle, it is not excluded that butter and cheese were exchangeable assets. Cheese can be made in a robust, portable form and Irish butter is recorded as arriving in early medieval Bobbio, northern Italy (O'Sullivan et al 2014, 266); butter was a taxable commodity in the northern isles, having twice as much fat as cheese and drawing down more revenue in consequence (Challinor 2004). However, the most likely items of surplus that could be turned into portable and storable capital were the hides of mature cattle, which must have been available regularly and in large quantities as the herd was renewed. The kind of tough leather produced had a number of mainstream applications in the Celtic zone, including shoes, belts, straps, bridles, bags, coverings for tables, beds and the inside of a chariot, and surfaces for flailing grain

(Kelly 2000, 54). Leather was also used to clad boats, the joints being smeared with butter (ibid, 55). Leather was fashioned into tankards and wine skins and sinew was used to make the thongs required to lash the timbers of nail-free buildings (eg Walker in Lowe 2006, 184). The export of hides from Ireland is mentioned by Giraldus Cambrensis (Kelly 2000, 55). At Portmahomack, organic preservation was rare in Sector 2, but fragments of leather found inside the overflow culvert of the dam (24/7810) were interpreted as coming from a hide shoe of a kind encountered in British and Irish early historic sites and in Anglo-Scandinavian York (Thomas in Digest 6.13). This suits its context, lying within a culvert blocked in the eighth/ninth century (see Chapter 6, p 192).

The use of cattle hide as an instrument for running an economy surfaced in recent history, providing an interesting analogy for the early medieval north. The early nineteenth-century ranchers of the American west used cattle hides as currency, dubbing them 'Californian banknotes' (Sheffer 2013). Hides and tallow were more important than the meat, which was sometimes left to rot in the sun. The leather was not merely a form of currency, although it was that too: 'in addition to [being] a form of exchange, hides had myriad uses as beds, blankets, saddles, shoes, furniture, luggage, door and window coverings, fencing and rope' (ibid). To these can be added armour, since before the indigenous peoples had easy access to rifles, the Europeans clad their horses in leather skirts that protected them from arrows (Mitchel 2004). By 1830 the extensive grazing on offer meant that Texas had become a cattle powerhouse. Disputes over the control of this resource with its owner, the now independent Mexico, led to the annexation of Texas by the United States in 1845 and war with Mexico in 1846 (Sheffer 2013).

Returning to the early Middle Ages, a recent study emphasises that cattle have long been valued more for their hides than their flesh (Campbell J, 2009, 52, citing Adam Smith, *Wealth of Nations*, I, 319–21). In 1007, a tax of one hide was levied on every farmer in Meath to pay for the high altar at Clonmacnoise. Hides were also used as the unit of tax over a large part of Iron Age and Roman Britain, and this continued: the English system of assessment in hides was in place by the seventh century and had a long future ahead of it (ibid, 53–6). As demonstrated by Michael Spearman, cattle products, and hides in particular, were the principal currency and the mode of storing wealth as late as the twelfth century in Scotland, when they provided liquidity for the early Scottish burghs (Spearman 1988a, 1988b). As with the earlier monasteries, and the later ranchers, this too was an attempt to capitalise assets in a non-monetary economy. Tanning, a large scale and obtrusive industry, was only marginally signalled at the Portmahomack northern workshop (see Chapter 5.6, p 200). If, as suggested by this hypothesis, large numbers of tanned hides were being produced for currency, the activity must have had its focus elsewhere in the monastic park.

Finbar McCormick has shown that in the west the cattle economy was a feature of both monastic and lordly centres in the seventh/eighth century, but that it began to lose its primacy to grain after AD 800. As at Portmahomack, the eighth-century community at Iona focused on cattle rearing, while also hunting red deer and collecting winkles and whelks (McCormick in Barber 1981, 318). The highest cattle concentrations in Ireland are the two early phases at Clogher and Phase 8 at Knowth, where beef accounted for over 80% of the meat consumed. McCormick considers that the explanation is economic: 'the faunal assemblages are reflecting a national value system in which cattle, particularly dairy cows, are the basis of wealth' (McCormick & Murray 2007, 105). He sees the creation of 45,000 ring-forts as relating primarily to the need to protect cattle (ibid, 109). At Knowth, the ring-fort became redundant in the ninth century as the status of cattle decreased (ibid, 110). A new prescription is reflected in an increase in the number of horizontal mills and the conversion of pasture to arable after AD 800 (ibid, 115). In Viking regions 'old value systems based on cattle ownership gave way to a value system

Illustration 5.8.2
Family of cattle depicted in an eighth-century carved stone panel from Portmahomack (TR28/35, detail)

based on silver bullion' (ibid, 7). It seems likely that in a period that saw exchange becoming more essential to the distribution of wealth, grain offered a more versatile and divisible subsistence asset, while silver (and bronze) provided the currency. This aligns well with Period 3 at Portmahomack.

Conclusion

Provided the initial endowment included a herd of cattle, the economic system of the monastic phase at Portmahomack would have offered some self-sufficiency and potential for surplus generation from its inception. The cattle provided sustenance, traction and leather, and the community clearly regarded them with affection (Illus 5.8.2); for another cow portrait in the region, see Illus 5.3.48c. Once local leather needs were served, hides constituted an item of surplus that could be deployed as portable wealth or stored capital. It could be used to buy in precious metals to make church plate, which, with homemade vellum, provided the essential kit for the foundation of new houses in the monastic network. As increased grazing was assigned by donation, capital and wealth also increased. At some point it became theoretically possible to lease back monastic land and so acquire paying tenants, whose rent would also need to take some storable form beyond labour. Increasingly ostentatious expenditure, focused on the lofty purposes of an exclusive enclave, will no doubt have attracted its own comeuppance. At the same time, increasing liquidity will have aided the trend towards a more commercial circulation of goods destined to make its appearance in Chapter 6.

5.9 Architecture of the Bag-shaped Buildings

Introduction

Construction at Portmahomack in the pre-monastic period (Period 1) comprised round buildings, probably contrived of turf and timber, discussed in Chapter 4. Construction in the monastic phase (Period 2) saw a radical departure from roundhouse technology. It comprised a possible stone church (Chapter 5.4) and major infrastructure, including a kerbed and paved road, a dam of dumped clay and branches capped with stone, boundary walls of uncut rubble and turf, a tank, culvert and pits constructed of stone slabs, and a bridge over the culvert of megalithic capstones (Chapter 5.5). The monastic builders also created two or possibly three examples of a new type of open hall, with a ground plan shaped like a bag or more precisely a sporran. The form and viability of these structures (S1 and S9) is the subject of this chapter.

Early medieval buildings in the north of Britain are notoriously individual in their shapes, and buildings of the Pictish period more than most. In the west and the northern isles, the complex Atlantic roundhouses (CARs) are slab built, figure of eight or lobed, often the result of modifying brochs and wheelhouses, as Old Scatness 7 (Romankiewicz 2011; Dockrill et al 2010). In the south and east, roundhouses morphed into circular sunken hollows, as Easter Kinnear (Driscoll 1997), or byre-houses, as at Pitcarmick (Carver et al 2012). All these diverse types have been claimed as Pictish (eg Ralston 1997), but it can be argued that the variety is a product of regional difference and inheritance for which a Pictish label might be inappropriate (Carver, forthcoming a). In the case of monasteries we enter another kind of *terra incognita,* where architectural innovation might be expected but not easy to discern since there is little to compare with it. Our structures do not refer directly to the large roundhouse at Iona (Barber 1981) or to the rectangular barns of Hoddom (Lowe 2006, 173), the cells of Hartlepool (Daniels 2007, 32–3) or the grand halls of Jarrow (Cramp 2005, 207).

Early medieval buildings can be disconcertingly irregular, with semi-random posts and scatters of stones. One approach to their resolution is through ethnographic study using the observed practices of the eighteenth to twentieth century, in which the names of Alexander Fenton and Bruce Walker are paramount (Fenton 1999 [1976]; Fenton & Walker 1981). Particularly helpful in this regard is the suggested use of turf and crucks (Highland *cuppils*) lashed with rawhide, which explain the irregular spans and spacings encountered (Fenton & Walker 1981; Fenton 1968; Walker & McGregor 1996; Walker 2006; Lowe 2006, 183; Walker in Lowe 2006, 184). A second is through experiment (Noble 1984, and see the ongoing examples constructed at the Highland Folk Museum). A third approach is through archaeological study, attempting to search for the rationale of early medieval construction in its roundhouse ancestry. There are examples of a roundhouse apparently morphing into a longhouse, as at Carn Dubh (Rideout 1995, 153–5; see Harding 2009 for the last years of the roundhouse in Scotland). A potential derivation is implied where roundhouses are superseded by rectangular houses, as at Camlin 3, Co Tipperary (Flynn 2009). At Clonmacnoise, habitation was reorganised in the late seventh and early eighth century, when post-and-wattle roundhouses gave way to stone-based roundhouses, to be superseded in turn on the same plots by rectangular buildings (King 2009, 345). The trend in Ireland, and probably in Scotland, is that round gives way to rectangular around 800 (O'Sullivan et al 2010, 34) occasionally via hybrid variations (Harding 2009, 189–92).

The investigation in this chapter will be focused mainly on the building at Portmahomack that was best defined on the ground, namely S1. By good fortune, the remains of this building were virtually intact at foundation level, and on detailed excavation its plan proved unusually regular and symmetrical. We begin with a review of the building materials available, with suggestions as to how they may have been employed, then examine the plan, form, and function of S1 and the rationale of its design. Lastly, we review the more partial remains of the important but badly conserved structure that can be seen as complementary (S9).

Materials: stone, timber and turf

There were no complete standing buildings of the Pictish period at Portmahomack, so reconstruction relies on inferences drawn from ground plans and from comparisons with other archaeological and ethnographic examples in the form of verbal or photographic reports. There were, however, some constructions of the Pictish period, all in stone, which should give an indication of the architectural and engineering capabilities of the Portmahomack community. In the sixth century, cist graves were furnished with stone slabs measuring up to 0.5m long and 10cm thick (see Illus 4.8, p 84). In the eighth century, a road was constructed with kerbs and paving, with a bridgehead constructed of megalithic capstones up to 40cm thick and estimated to weigh up to a ton (Illus 5.5.18, p 190). Revetment or terrace walls, constructed with rubble laid in dry-stone technique rose to some 1.5m freestanding (Illus 5.5.13). These structures were founded on cambered gravel in the case of the road, and on dumps of animal bone in the case of walls on marshy ground. The culverts that provided overflows to the pond were not mortared, but tightly fitted to make a smooth square-sectioned channel (Illus 5.5.17). None of this stone was masoned, but there is first-hand indication that cutting sandstone into squared blocks presented no problem of technique: at least four monumental crosses were made in the eighth century, faced on four orthogonal sides and carved in relief with geometric precision (Chapter 5.3). At the same time, simpler grave markers were more roughly shaped (TR33) and some (TR25) not shaped at all.

It can be concluded that the local people were aware of the properties of the stone available, and designed their responses to structural challenges according to the demands of prestige as well as function. It seems clear that expertise was also subject to ranking; that is, some structures (the cross-slabs, the road) demanded rigorous and expressive design and execution, while others (boundary walls, grave markers) were allowed to proceed pragmatically with a free hand. It is not excluded that some skills were imported, but that is true of the whole monastic enterprise. It does not imply that masonry was the work of foreigners, and jerry-building of the locals, since the Picts had ownership of every aspect (see p 167).

The stone available locally was (and is) comprised of large beach cobbles made smooth and round by the breaking waves, and sandstone from the softer Upper Old Red Sandstone (UORS) and Middle Old Red Sandstone (MORS) bedrock on the peninsula (Digest 6.10). Being sedimentary, the sandstone may break off naturally in slabs or be helped on its way by a wedge hammered or a crowbar levered into a fissure. It was demonstrated experimentally that eight reasonably able-bodied young adults can carry a stone measuring *c* 650 × 1100 × 150mm, if with difficulty and only as far as a Land Rover (Illus 5.9.1). Larger stones than this, which included all the cross-slabs and the bridgehead capping, would have needed to draw on those enigmatic methods of megalithic transport surmised for prehistoric tombs, which may have been still current. The modern stone quarries that are known (and have been used to make cross-slab replicas) lie on the east side of the peninsula at Geanies and Cadboll (see Chapter 5.3, p 137). If stone slabs were anciently quarried there, then transportation by boat from beach to beach would be the most feasible way of supplying Shandwick, Nigg and Portmahomack.

As the name implies, the UORS sandstone is predominately red, but occasional bands of the MORS are orange and may be yellow in tone. There are indications that MORS was sought after for high-prestige projects such as cross-slabs (Chapter 5.3, p 138). UORS was used to construct the first medieval church (Church 2), while the later medieval churches used the MORS. A specially selected stone was used for the seventeenth-century belfry of Church 5, which achieved a distinctive golden colour. This too is thought to have derived from a local source in the MORS on the peninsula (Digest 6.10; OLA 7.5.1/1.3.3).

These preliminary remarks are intended to indicate that the Picts knew how to source, transport and, when necessary, to cut stone. Such structures as we have suggest that most building made use of rubble and selected natural slabs. But the use of ashlar for prestige architecture (such as a church, Chapter 5.4) is not excluded, since the same techniques were employed to fashion cross-slabs.

There is no direct information on the size of available trees in the Moray Firth area, and thus of the roof space that could be spanned without intermediate support. In early modern times the spanning and roof support of vernacular buildings has been noted to employ the 'Highland crucks' – two matching timbers ('cuppils'), naturally grown or contrived, which together form an arch (Fenton & Walker 1981, 45).

Illustration 5.9.1
Crew of strong individuals attempting to transport a slab of stone from the beach at Geanies to a vehicle (destined to be carved as the replica of TR1)

At Portmahomack there is direct evidence for the use of squared oak timbers and wattle panels. A surviving timber post in Period 1 (F438), burnt posts (eg in Int 26) and the ghosts of posts in post-pits (eg F114, F454 in S1; F486, F491, F508 in S9) indicate the structural use of squared oak timber. Oak used in the vellum-working area could have been standing for 150 years when it was destroyed by fire (Chapter 3, Table 3.1). The shadows of planks were seen in the well (S8). A wattle fence and wicker-lined well show that structures of woven rods were in use from Period 1 (p 92). The rods were taken, or perhaps coppiced, from alder, willow or from hazel (implied by a hazelnut in S11). From the hearth in S1, there were fragments of charcoal from alder, birch, hazel, *Pomoideae* (perhaps rowan or hawthorn, for example), oak, and willow/poplar/aspen. Hazel, oak, and willow/poplar/aspen were the most frequently recorded (Digest 7.4).

When the northern workshops were burned down in the late eighth/early ninth century, they left evidence of robust long-lived wattle-work and heather roofing. The hazel roundwood was shown to have come from well-grown plants typically 15mm in diameter implying the management of woodland producing poles suitable for hurdles (providing long straight specimens) (Allan Hall Digest 7.4). The charred samples from S9 suggested that the burnt roof was largely a pegged heather thatch perhaps with cut turves as underlay (ibid). Other candidates for roofing material were 'charred herbaceous stems, perhaps from some large sedge-like plant such as bulrush or sea club-rush (*Scirpus lacustris/maritimus*) and most likely material from a thatched roof' (ibid).

Illustration 5.9.2
Reconstruction at Highland Folk Museum in 2013: turf-and-stone alternate coursing

Thus far, the material equips a carpenter to build with squared oak timbers (earth fast or framed), infill with wattle, and roof with turf and pegged heather. However, there was no direct evidence on how walls were made: no trace of daub or clay cladding and for this reason it is necessary to examine the viability of using turf. Burnt turf was certainly present in both the northern and the southern workshops (ie S9 and S1), but its use in making walls needs to be distinguished from its use in roofs or as fuel. Traces of turf in hearths imply use as fuel, but turf associated with the site-wide fire could have derived from walls (Hall in Digest 7.4).

The use of turf as *bonding* within the west boundary wall (F480) was inferred from a dark layer resembling a turf line (C3637; Chapter 5.5, p 189). The same wall, erected on wet ground, was founded on a raft of animal bone. There was little evidence that constructors had made use of clay or clay and bool (rubble bonded with clay; Walker 1977). A sandy clay was available beneath the sand subsoil and would have been excavated from the enclosure ditch in large quantities, but was apparently not used for building: baked clay displaying the negative imprints of cobbles or wattles was absent from the area of the Sector 2 fire. The fibrous nature of turf, also used as a fuel at Portmahomack, means that it could disappear as ash and we are more than usually dependent on analogy and inference to suppose its employment in building.

Ethnographic turfing

Although the Norse are credited with promoting the use of turf as a building material in the North Atlantic region, there are good reasons for accepting that its use in Scotland was well developed before the ninth century (see Chapter 5.8; *Orkneyinga Saga* (7; sa 891–4) Sharples 2005, 183). It is highly probable that good quality turf grew in the Moray Firth area, and that the Picts made use of it. Since it survives poorly on archaeological sites, it will be worth briefly summarising some of the ethnological evidence, if only to assess the likely method and feasibility of its employment.

The traditional use of turf in Scotland to make walls and roofs is a recurrent theme in the literature of vernacular architecture: 'In Scotland, and especially in the northern and western parts, turf was pared from the fields and used to make walls, whether alone, in layers alternating between stones or as a thick core to stone linings' (Fenton 1968; Brunskill 1982, 134). 'In remote parts of northern and western Scotland both thatch and turf roof was hung as "divots" diamond set at low pitch. Thatch was often of heather rather than straw, was renewed each year and was also laid to a low pitch but secured with the aid of coarse rope nets tied to stone weights or projecting blocks' (Brunskill 1982, 137). Turf and heather for roofing has been documented in Scotland in the recent past (Walker et al 1996).

Turf is essentially earth bonded by fibre, and as such can be cut to shape and deployed in versatile ways. The tradition remains strong in Iceland, where Skagafjörður Heritage Museum documents the techniques (Sigurthardottir 2008). For walls, the turf is cut in rhomboidal blocks and left to dry for about two weeks, and then laid one by one across the wall width; this gives the face of the wall a zigzag (or herringbone) appearance (*glaumbaer*) (ibid, 11). Skimming the surface turf provided thin plates of *reithingstorf*, originally placed under a saddle, but used too for covering stone benches. For roofing, the thinner turfs are laid in long overlapping strips parallel to the ridge (ibid, 8).

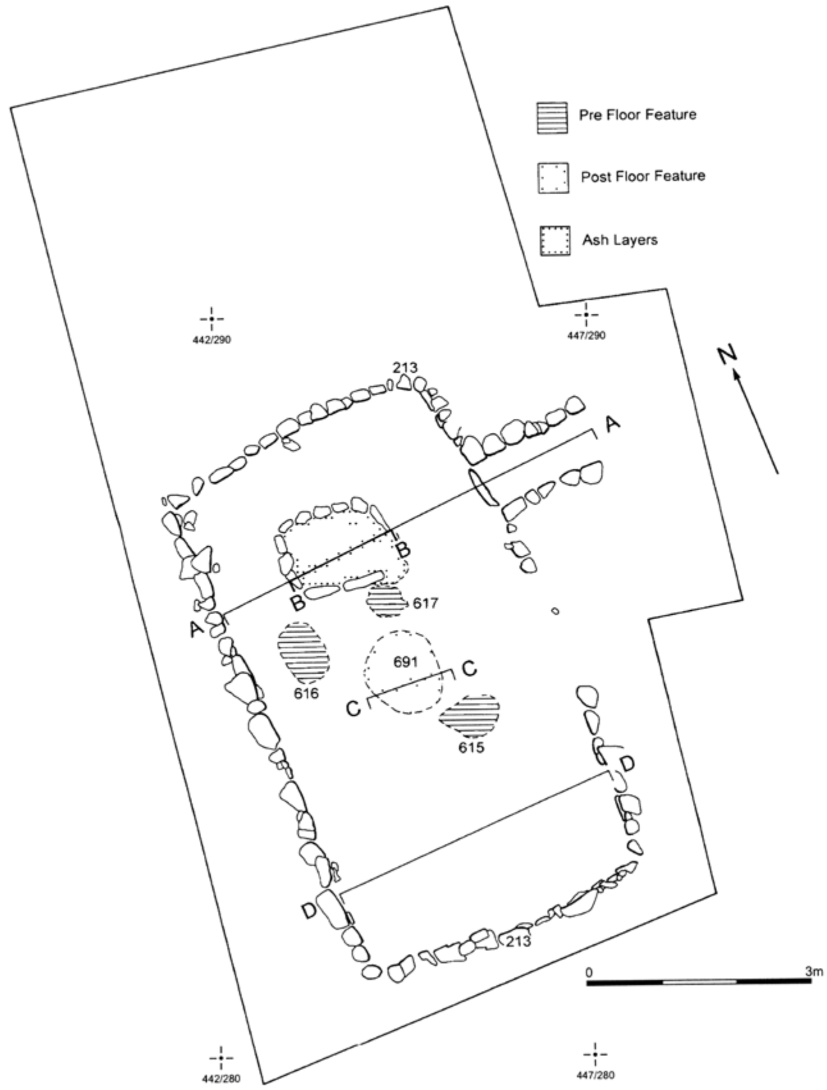
Examples recorded in Scotland manifest certain features: the turf blocks are laid on a stone foundation or a dwarf wall, and the wall faces are clad either side with wattle panels ('stake and rice'). In theory turf walls can rise to two storeys and carry a roof, but in Scottish examples the roof is supported not on the wall plate but on rafters borne by paired crucks (highland cuppils) (Walker & McGregor 1996, 7–14). The feet of the crucks may be embedded inside the turf wall: 'It is more common to find the lower portion of the cruck built into the wall and standing on a large stone in the base of the wall to form some protection from rot' (Fenton & Walker 1981, 45).

The walls of blackhouses recorded in western Scotland in the nineteenth century were 1.5–1.8m high, the lower half of stones, the upper of turf, and the walls revetted internally with coursed stones (Fenton & Walker 1981, 75). But an all-turf house could also stand: one has been noted at East Geirinish, South Uist (ibid, 74), and turf buildings were recorded in the Highlands until the late 1700s. Pennant noted houses made entirely of turf when he passed through Moray in 1759 (ibid, 75).

Supposing a bonding role for turf can help explain the viability of walls seemingly composed of unstable stacks of unshaped boulders that occur on early medieval sites, and abound at Portmahomack (for example the boundary walls, p 187). Building methods using alternate courses of turf and stones were noted by Alexander Fenton (1968) and have since been recorded in gable walls in Angus, Aberdeenshire, Perthshire, Cromarty and a church in Sutherland at Ach-na-h'uaidh (Fenton & Walker 1981, 27, 73–7; Walker & McGregor 1996, 17). The walls are founded on a course of stones and made up with two layers of turf to each layer of stone, to form a 'many-decker sandwich' (ibid). Stone-and-turf alternate coursing has also been noted at Skatastathir in Austurdalur, Iceland, a method said to be preferred where cows or horses were to be stalled (Sigurthardottir 2008, 20–1).

The method of construction could start with the roof or the walls. In Irish examples, the roof frame was erected first and the 'sod wall' raised around it. The roof covering consisted of wattling interwoven with straw, over which strips of thin turf were laid and pegged down with wooden pegs (White Marshall & Walsh 2005, 25). Turf-and-earth houses are said to be easy to erect and to benefit from speedy building using lots of hands. Turf walls are said to provide 'unfailing insulation from the cold' (Sigurthardottir 2008, 4). Modern architects report that earth houses have low R-values – that is they absorb heat easily, but a high K-value, that is they store it well (Easton 1996, 33–5).

Illustration 5.9.3
Reconstructions at Highland Folk Museum in 2013: (a) couples supporting a porch; (b) upright post and tie-beam; (c) dwarf wall of turf on stone



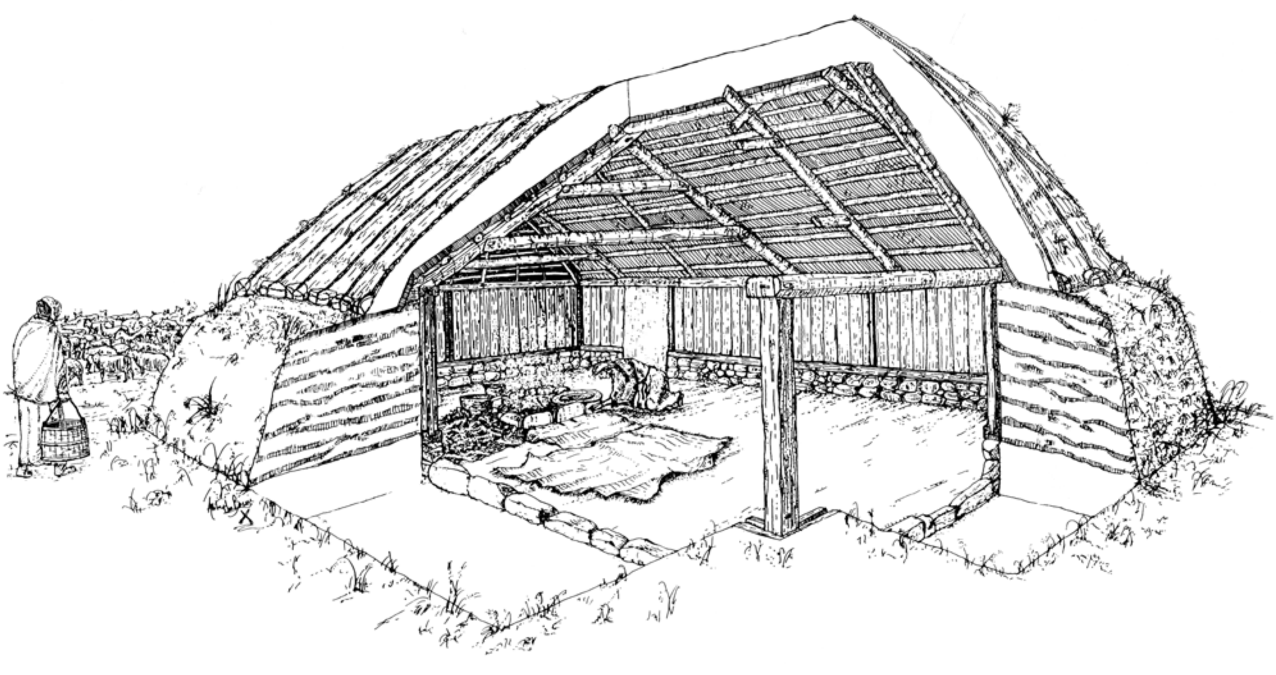


Illustration 5.9.4
Plan and reconstruction of the Viking house in Trench D at Bornais (Sharples 2005 (illustration by Ian Dennis), Figs 36, 107)

Illustration 5.9.5
S1: overhead view of centre and east end on first definition

Illustration 5.9.6
S1: overhead view during excavation, showing stone-filled perimeter trench F40

Experimental turfing

An experimental turf wall constructed at the Highland Folk Museum in the 1970s was made of turves laid grass to grass and earth to earth, was 4ft (1.22m) wide and rose vertically on the inside and battered on the outside. It 'stood up well to subsequent abuse, including school children climbing on it, a severe flood which undermined a small part of it but left the bulk standing intact, and the constant attention of sheep and goats' (Noble 1984, 72). It settled only 6in (15.2cm) in its first year. A second wall with two vertical faces was inherently unstable and could be pushed over. A turf building was erected based on battered walls with pairs of crucks and rafters supported by purlins. This modest construction was demanding on grassland: the walls of a *c* 12m long building required the stripping of an acre of turf (0.4ha). It was also learnt that it was inadvisable to build in winter, as there was a price to pay in spring when frozen turf thawed. The main architectural problem was how to give stability to short ends, whether hipped or gabled (ibid). More recent reconstructions at the Highland Folk Museum demonstrate the viability of turf-and-stone walls, all-turf walls, and cruck and post-and-beam roof supports (Illus 5.9.2; Illus 5.9.3a, b, c).

Archaeological turfing

The use of turf in prehistoric buildings has been surmised, based on these or other analogies. The analogies are reasonable since, as Bruce Walker (2006) points out, turf construction would have been familiar in early medieval Scotland from its use in Roman forts and the Antonine wall, and there are good reasons for supposing that the practice has deeper roots than the Roman. Denis Harding's review of the Iron Age roundhouse notes

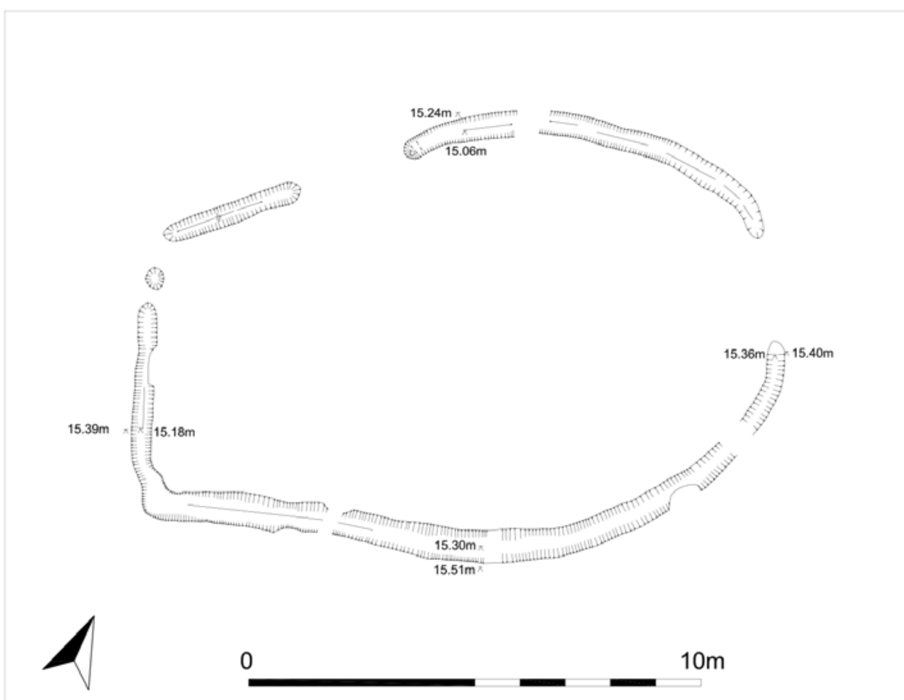


Illustration 5.9.7
S1: plan of the perimeter trench F40

Illustration 5.9.8
S1: excavating a post-pit

holes at the gable end to support the roof (White, Marshall & Walsh 2005, 15, 23). At Pitcarmick, the Pictish 'Pitcarmick-type' houses were dated to the seventh/eighth century and argued to be longhouses, or rather byre-houses, constructed of walls made with turf-and-stone coursing 2m wide, as implied by depth of the 'porch' and the width of the surviving east end of Building E1. Internally they were divided into two, a dwelling area with hearth at the east end and an area for cattle or sheep with a central paved drain to the west. The round ends were thought to have indicated a curved gable supported by 'stabiliser posts', as used experimentally in the 'craftsperson's house' at the Highland Folk Museum (Carver et al 2012).

At Bornais, Mound 3, the Viking house in Trench D survived as an incomplete rectangle of stones marking out an area 4 × 7.3m internally, with no internal post-holes. There was an entranceway 1.7m long on the east side (Sharples 2005, 53). The perimeter stones made a foundation 30–50cm wide, which was thought inadequate to support more than a dwarf wall, and the excavator reconstructed the form of the house by supposing that these dwarf walls supported a timber frame joined by vertical timber cladding, and the whole was embraced by a turf wall (ibid, 183; Illus 5.9.4). The width of the wall was suggested by the length of the entrance, which was seen as a passage rather than a porch.

There is therefore some reason to suppose that wall-building in turf, or stone with turf bonding, had been a traditional method of construction in Scotland since the Bronze Age, and during the early

that upright slender stone slabs may imply revetment for turf walls (2009, 51). The use of stone-and-turf coursing was also claimed for Bronze Age roundhouses at Pitcarmick, Perthshire (Carver et al 2012).

Upright slabs were also held to imply turf or sod walls at the early medieval monastic site on Illaunloughan Island, Co Kerry, where they were employed in the construction of two conjoined circular buildings (Huts A and B) and a rectangular oratory, all of the seventh/eighth century AD. The oratory had three post-

Illustration 5.9.9
S1: examples of primary post settings

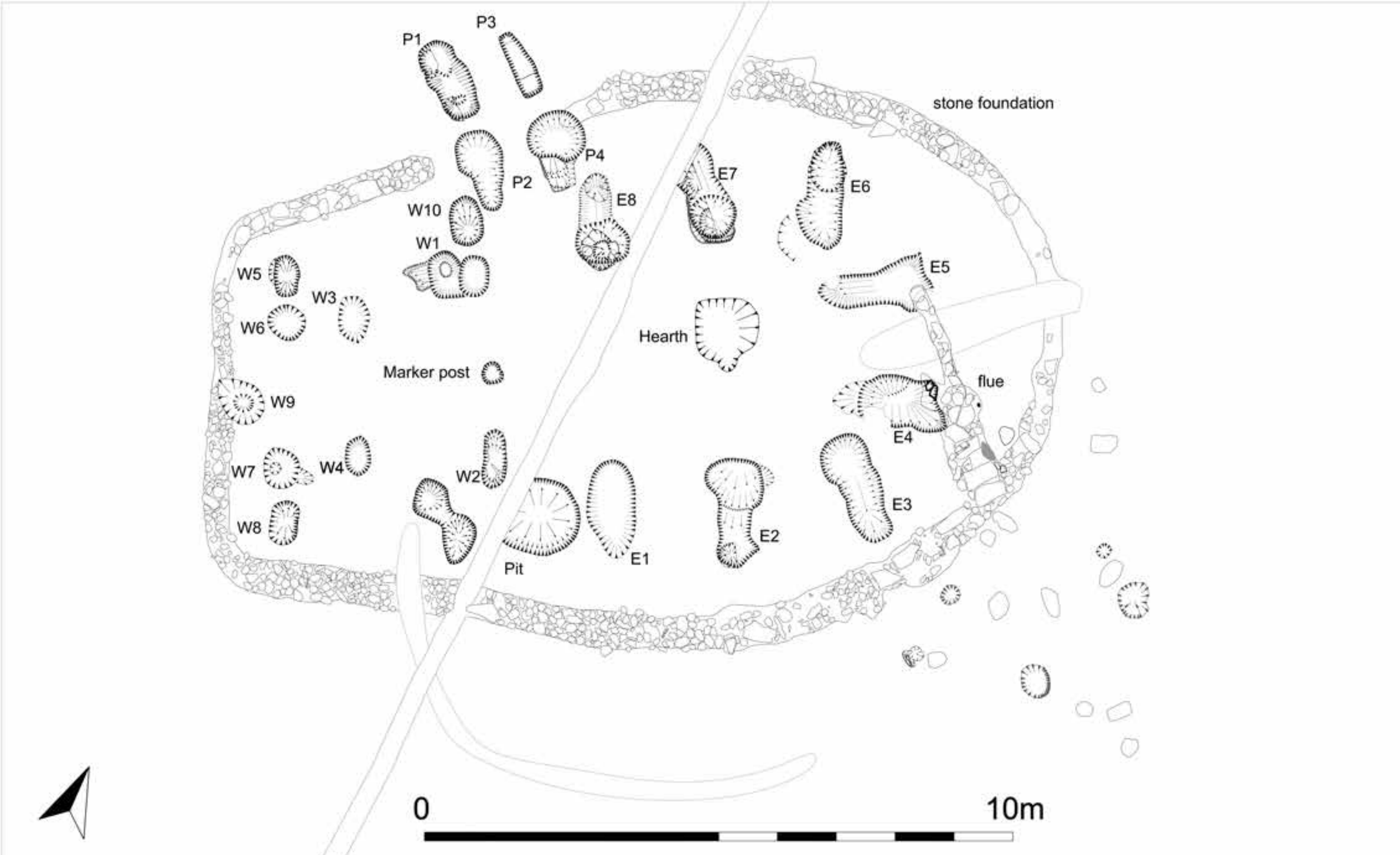


Illustration 5.9.10
S1: master plan

Middle Ages had received additional impetus from the Romans, the Irish and later from the Norse. Structures that have post-holes but no above-ground walls (like S1 and S5) can be seen as more solid and better insulated where a thick turf jacket is employed. Dry-stone walls that appear inherently unstable, for example the boundary walls of the northern workshop, become more credible if proposed as turf bonded. In the northern workshop there is good evidence that turf was also used to cover a stone-cored bank and subterranean structures or culverts (as in Sector 2, Period 2: p 203). The numerous plough pebbles associated with the boundary wall F149 have been attributed to their arrival with turf used as bonding (p 96).

It remains to review the architecture of the major buildings at Portmahomack, and propose how they were constructed and used.

Structure 1

The set of features assigned to S1 in Sector 1 consisted of a cobble-filled foundation trench (F40) giving the bag-shaped form, and a series of internal and external post-holes. It was defined at Horizon 2 (p 20), as a group of post-pits cutting early ard marks and surrounded by a rubble wall (Illus 5.9.5, 5.9.6). When excavated the plan of the rubble wall was shown to be bag-shaped (Illus 5.9.7). The post-pits, many of them double, contained stone slab pads (Illus 5.9.8, 5.9.9). The spatial layout was unusually clear and symmetrical. A number of other features were assigned to S1 or are considered to represent contemporary activity: a hearth central to the east end of the structure (F65), a stone-lined flue (F79), a large lined pit (F147) containing metalworking debris and a cluster of post- and stake-holes outside the building, thought to represent the position of a stoke-hole for the flue. All these features are shown on the composite plan (Illus 5.9.10).

It was demonstrated by stratigraphic analysis that this composite plan represents two phases of building, the first assigned to Period 2 and the second to Period 3 (Chapter 3, p 38; Spall in OLA 6.1.1 at 3.4.1; Hummler in OLA 6.1.2). The original posts were distinguished by being circular and supported on a stone pad, and having clean sand backfills. Post P4 was cut by the perimeter stone foundation, showing that the stone foundation was an addition to the initial post array. The post-pits of Period 3 mostly held double posts, some with square scantling, cutting through the earlier post-pits and replacing their posts. The stratigraphic history of each is given in Table 5.9.1. The flue had cut through the line of the perimeter stone foundation, indicating

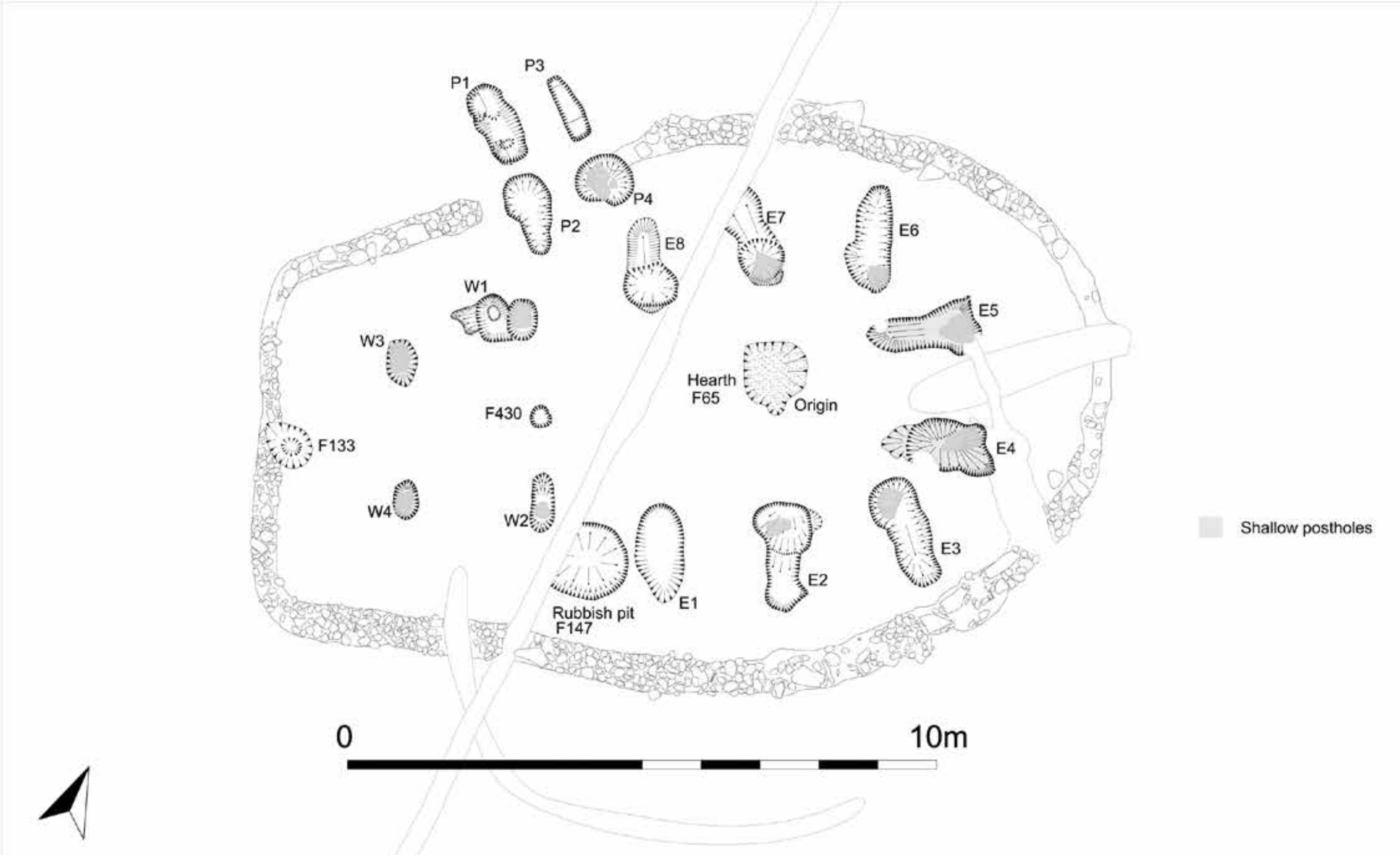


Illustration 5.9.11
S1: plan in Period 2, showing the posts at the east end (E), the west end (W) and the entrance posts (P)

that it belonged to the second phase, and by implication making the hearth redundant. The pit F147 was assigned to the first phase by virtue of its content, which places it with the metalworking of Period 2 (see Chapter 5.7).

On this basis, the Period 2 building consisted of an internal array of single posts, with an entrance and a central hearth (Illus 5.9.11). In the Period 3 layout, the principal roof posts were replaced by double posts, posts were added at the west end, a flue replaced the hearth and an upper story is implied. Here we consider the architecture of S1 in Period 2. Its form in Period 3 is presented in Chapter 6, pp 276–8.

Design of Structure 1

The ground was not terraced, and must have been deemed to be level by the builders. The heights of the post-pads reflected the slope of the subsoil, gently down from 15.0m AOD in the south to 14.71–14.78m AOD in the north. The base of the stone foundation trench also showed a difference in height from 15.20m in the south to 15.10m in the north. This shows that the depths were standardised, but measured from the surface. It is likely that the turf would have been stripped off and stacked, and possibly the topsoil too, leaving a construction surface roughly equivalent to the surface of the subsoil. Any subsequent accretion of occupation levels had been removed by the plough so that, in effect, the building was excavated from the same ground level at which it had been built.

Post array

The layout of the building showed a precise and unusual symmetry (Illus 5.9.12). A semicircle of six single posts on the east side (E2–7), having its point of origin at a stake-hole to the south of the hearth, was joined from its diameter by three pairs of posts on the west side, forming a trapezium (E1/8; W1/2; W3/4). There was a pair of post-holes either side of the doorway (P2, P4) and a matching pair to the north-west (P1, P3). These four posts formed an entrance. Where measurable from their voids, the posts were circular in scantling. It was not just the spatial arrangement that was symmetrical, but also the depths of the original posts as determined by the voids in the posts pits. Deep post-holes are matched with deep post-holes on either side, while shallow post-holes face each other and even the presence or absence of pad stones is mirrored on each side (see Table 5.9.1). Red sandstone post-pads also formed a distinctive signature of the first phase ('Ps' on Table 5.9.1). The colouration and striation

Table 5.9.1
Structure 1: structural components (Source: OLA 6.1.1, 6.1.2)
(with the shorthand labels E1, E2 used on the plans)
Key to post structure:
Ps – padstone; Cr – circular scantling; Sq – square or rectangular scantling; 400mm – diameter or width of post where known; *480mm* – depth of post from subsoil (including post pad)

	Original (Period 2)	**Refurbishment (Period 3)**	**Dismantling (Phase 3)**
East end E1	F150 (Cr 400mm, Ps) (*480mm*)	F148 (making double; Ps) (*480mm*)	Removed (F149)
E2	F460 (Ps) (*610mm*)	F426 (Ps) (*310mm*) F427 (buttress) (*260mm*)	Removed
E3	[F429] (Ps) (*480mm*)	F442 (Cr 400mm) F448 (buttress; Cr 400mm)	Replaced by F439, F441 (buttress)
E4	F472 (Ps) (*360mm*)	[F472] and F471 (buttress)	[F470, 467 – unrelated]
E5	F47 (Ps) (*320mm*)	F47 (replacement) and F408	
E6	[F409] (Ps) (*510mm*)	F49 (*320mm*) and F52 (buttress?) (*200mm*)	
E7	F455/473 (Cr 40cm, Ps) (*560mm*)	F466/462 (Ps) (*360mm*) and F463 (buttress) (*210mm*)	
E8	[F402] No Ps (*650mm*)	F129 (Cr 30cm) (*440mm*) and F128 (buttress) (*110mm*)	
West End W1	F118/9 (Cr, Ps) (*700mm*)	F117 (Sq) (*370mm*)	
W2	F443 (Ps) (*430mm*)	F453 (*300mm*)	Removed
W3	F132 (Cr 300mm, Ps) (*150mm*)		
W4	F134 (Cr 250mm, Ps) (*210mm*)		
W5		F435 (buttress to W6); Angle of buttress 60 deg (*500mm*) F115 (Cr replacement) (*260mm*)	Removed
W6		F131 (Cr 300mm) (*650mm*)	
W7		F135 (Cr 300cm) (*650mm*) F438 (replacement)	
W8		F136 (buttress to W9) Angle of buttress 56 deg. (*520mm*)	
W9	F133 Marker post	F133 (Cr 40cm) *(450mm*)	
W10		F114 (Sq, Ps; buttress to W1) Angle of buttress 60deg (*500mm*)	
W11		F138 (N) (Cr 25cm) (*720mm* F138 (S) Buttress (Cr 400mm) Angle of buttress 70deg. (*570mm*)	
Porch P1 P2 P3 P4	 [F432] (*560mm*) [1767] (*800mm*) [F451] (*400m*) F461 (Cr; Ps) (*750mm*)	 F110 (*300mm*); F445 (*250mm*) (buttress) F113/C1783(Sq) (*600mm*) F454 (*200mm*) (Sq); F450/459 (*250mm*) (buttress); F130 (*650mm*)	F126 Removed
Perimeter wall	F40 (1056)		
Heating	Hearth F65	Flue F67/79	
Marker posts	F430 F133	 F133 (*450mm*)	

Top of subsoil at 15.10–15.52m AOD

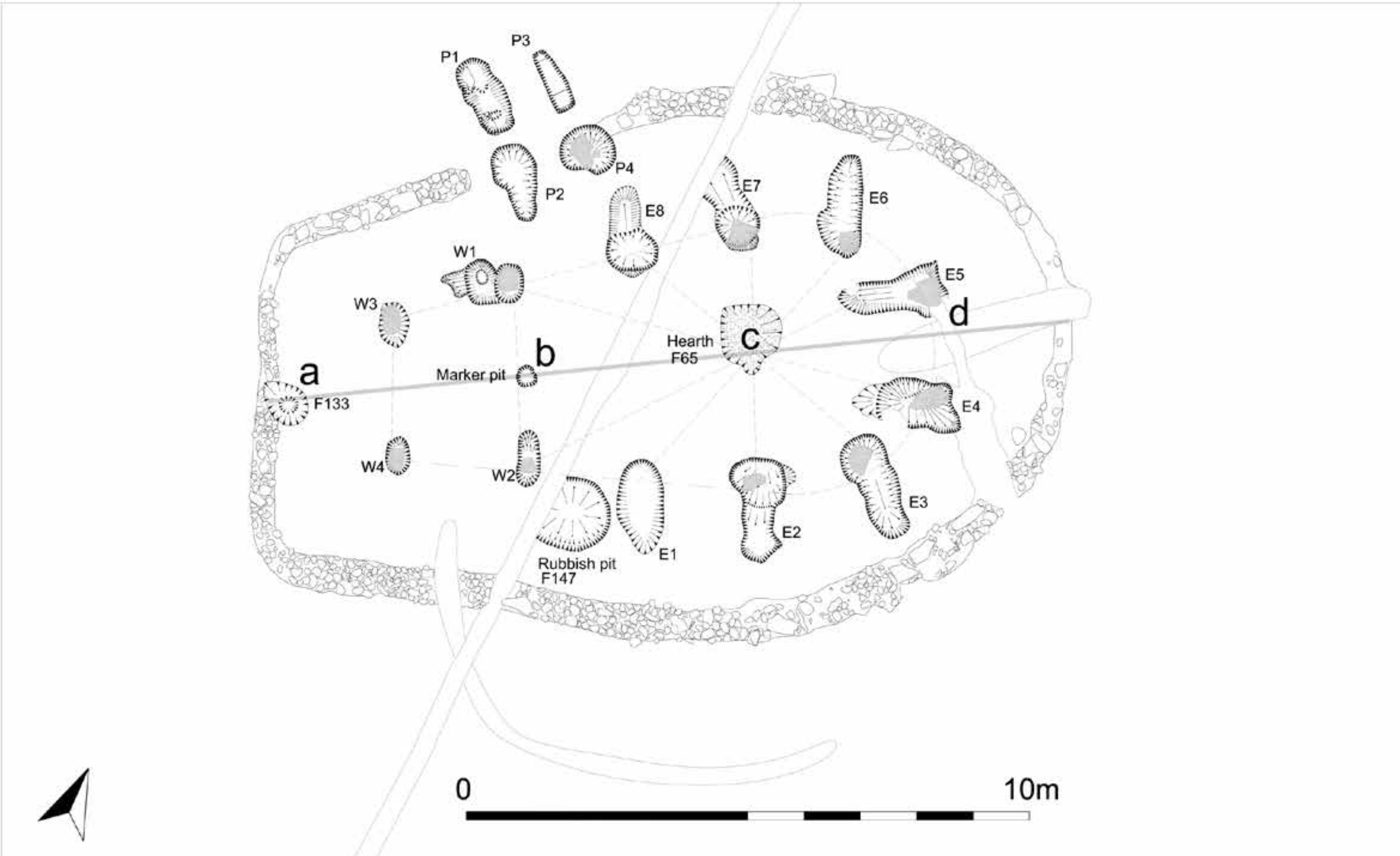


Illustration 5.9.12
Nodal points for calculating the metrology of S1

of the sandstone slabs used for post-pads in some post-holes appeared to match closely, and to have been split along bedding planes from the same original block.

Construction procedure

The hearth is offset from centre, but a small stake-hole lay on its southern lip (see OLA 6.1, Plate 26), which lies at the centre of the semicircle of eastern posts. Taking this point as the origin, the six posts at the east end were laid out on a radius of 5.1m at approximately thirty-six degree intervals. The east end thus resembles a roundhouse with an opening leading out to the west. The post-pits are teardrop-shaped in plan with the deepest, roundest part nearest the hearth. These appear to be primary so should denote the method by which round posts, 400mm in diameter, were pushed upright with their feet on a post-pad. E1–3 and E6–8 are robustly founded at 480–650mm deep. The couple at the east end (E4, E5) are markedly shallower at 320mm and 360mm. These may be posts with a different function to the others, or perhaps they have suffered more from truncation, for example by the insertion of the flue, or later erosion that also removed the eastern part of the perimeter wall (Illus 5.9.6). However, the recorded heights of the top of the subsoil only reflect the expected gentle slope of the subsoil. The possibility is that these two posts were originally omitted to provide more space, and added during the use of the building in Period 2. This has implications for the design of the roof.

West of the origin post by the hearth lie the sockets of two more marker posts (F430 and F133) each at an interval of 4.1m. These pits belong to the primary planning of the building and mark out its long axis. The post-pit at the west end (F133) was recorded as both cut by the perimeter trench (OLA 7.7, 15), and cutting it (OLA 6.1 at 3.4.1); and possibly both are true. It first served as a mark and then in Period 2 as a larger pit 450mm deep (W9) to support a structural post. A fourth post might be expected on the same axis and at the same interval, but this would be very close to the later (Period 3) flue, and may not have been seen.

This axial line suggests that a curvi-trapezoid form was intended in the initial design. Beginning with the two posts either side of the hearth (E2 and E7), the building continues westwards in three pairs of diminishing span (E1/8; W1/2; W3/4)

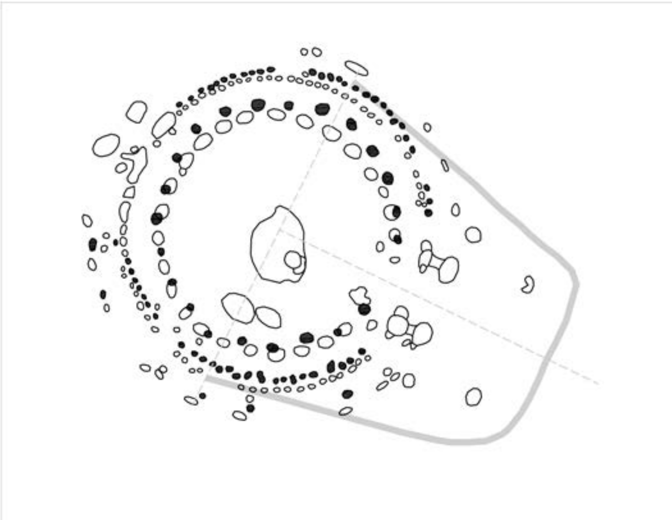


Illustration 5.9.13
S1 as an adaptation of the Pimperne House (based on Harding 2009, 58, Plate 16b)

forming, with the west wall, four bays. The depths of the posts is about half a metre except for E4/5 at the east end (320mm, 360mm) and W3/4 at the west end (150mm, 210mm). There is some uncertainty about which period to assign the four posts at the west end of the building (W5, 6, 7, 8). The setting that omits them has the virtue of symmetry – the perimeter wall is then added at the same distance from all the posts (Illus 5.9.12). The two centre posts W6 and 7 are robust and deep (at 650mm) and they would offer a symmetry of their own to the layout, especially without the shallow pair W3, W4. On the other hand, these posts did not have pad stones (which W3 and 4 do), and are set with a pair of buttress posts (W5, W8) of similar size that suggests a single design. The four western posts have therefore been assigned to the Period 3 rebuild (p 276).

The two door posts, P2 and P4, were massive at 750mm and 800mm deep and are set opposite the second bay. At Period 3 there were certainly two outer posts, such as would imply an entrance porch, and they were elaborate, employing both an upright and a raking buttress. The evidence for two outer posts in Period 2 was more elusive, but the number of recorded cuts and complex stratigraphy suggests that there had been an original outer pair, P1 and P2, in the same place as their successors (OLA 6.1.2 at 5.3.6).

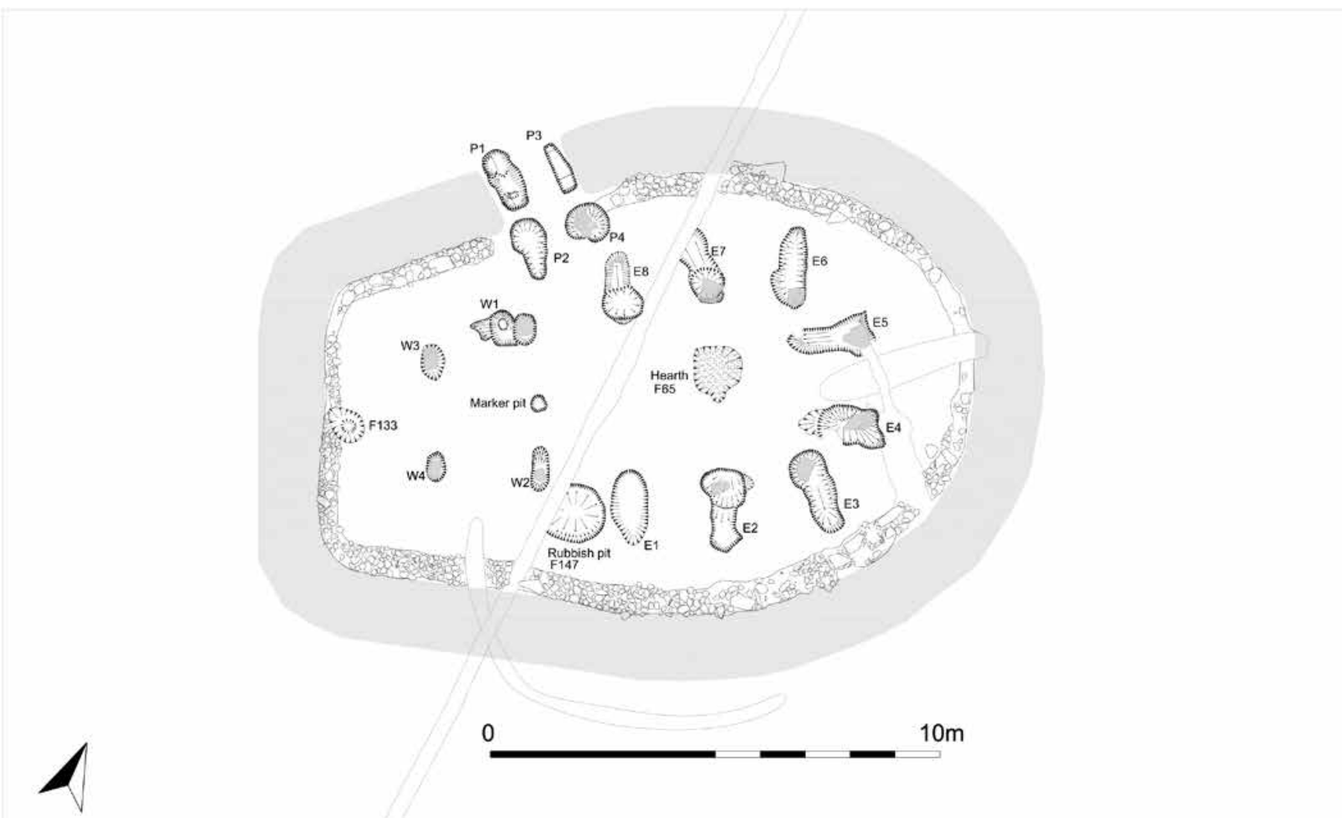


Illustration 5.9.14
S1: reconstructed plan with a turf jacket

Perimeter wall

The form of the perimeter trench consisted of a bowed east end and a straight-ended west end with splayed walls interrupted by an entrance to the north (see Illus 5.9.7). It measured 14.44m at its longest by 9.85m at its widest, internally enclosing an area of *c* 110m². The profile of the ditch containing the stone wall was U-shaped, and varied in width between 0.15m and 0.45m and in depth between 0.25m and 0.30m. The fill consisted of tightly packed hard round stones set in a soft silty sand matrix; the cobbles were interlocked, resisting excavation. The most likely source for the pebbles and cobbles is the beach: a large piece of eroded whalebone found its way amongst the cobbles in the foundation trench. The wall trench cut door-post P4, implying that the timber posts were erected before the wall was founded. The sandstone slab fragments, some quite substantial, were similar to those used in the post-hole construction and may represent waste from splitting and dressing packing and pad stones.

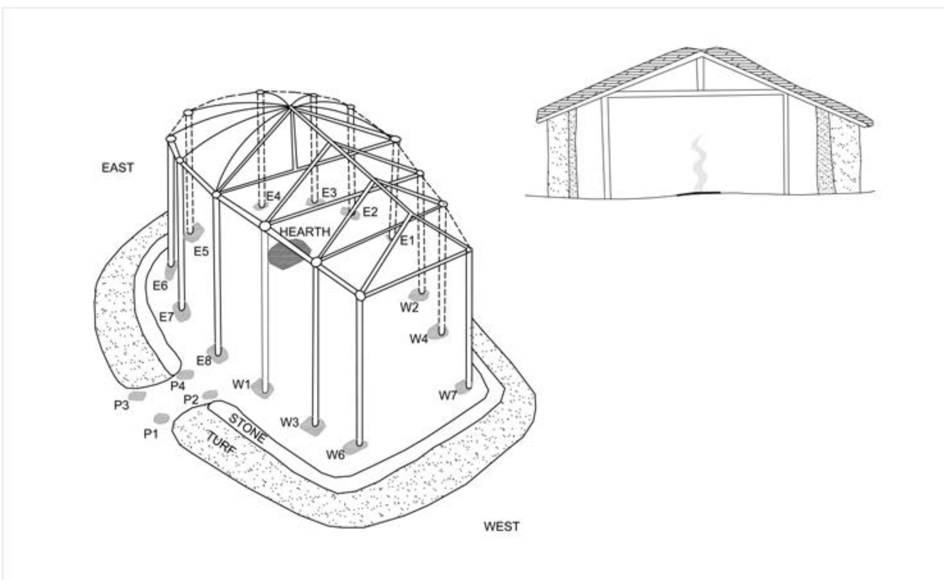


Illustration 5.9.15
S1: three-dimensional reconstruction

Interpretation

Accepting the plan shown in Illus 5.9.11 and 12, we can advance some ideas for the walls and roof of such a building, in the absence of its superstructure. Armed with the analogies and microfloral evidence from the site (above), it would be logical to propose that the post array (built first) supported a roof of heather thatch and/or turf, and the walls depended on turf and wattle for cladding, revetted by a stone or plank wall on a stone foundation, as at Bornais (above, Illus 5.9.5). One solution for the roof would be to suppose that all the major post-pits were actually seating for crucks of variable span. This would work for the three pairs of the trapezium, and possibly for the three pairs around the hearth (ie all apart from E4 and E5). As indicated above, the variable span could be explained by the availability of different-sized crucks, controlling not only the width of the building but the height of its roof. In this case the roof would run down westwards and eastwards from a high point over the hearth.

An alternative that respected the integrity of the circular design would be to treat the east end as a roundhouse, with a western extension attached as an exaggerated, elongated porch. The rafters would rise from the ground like a tent, bound together at the top, and deriving their principal support from a ring-beam carried by the circle of posts, as at Pimperne (Harding 2009, 38, 58, pp 200ff; Illus 5.9.13). This results in the maximum free space around the hearth in the centre. At Pimperne, an outer ring of small post-holes or stake-holes suggests a 'stake and rice' wattle wall, and outside this a turf jacket for which this provided the 'wainscot'. The porch was joined to the roundhouse using short stout posts to create a rectangular lobby, like the entrance to a circus tent. It would have a gabled roof joined to the roundhouse roof by interweaving the thatch (ibid, Plate 15, 16). Once this is achieved there is no reason why the porch should not continue for some distance. It would terminate in this case with a wall rather than an entrance (our entrance being in the north wall).

The feet of the long rafters implied by this 'long-nosed roundhouse' could be anchored in the stone filling of the perimeter ditch, which could also function as a soakaway. The perimeter ditch could also serve as the foundation for a dwarf wall, on which a turf wall was erected (as proposed for the seventeenth-century building at Inchmarnock: Lowe 2008, 232, 238–41). But at less than half a metre across it would not provide a substantial platform. Here we propose that it marks the inner revetment of a broad turf wall, providing a soakaway and supporting panelling to provide the wainscotting for the interior turf jacket. Accepting the example of Bornais (above), the four entrance posts would form not a porch but a covered corridor through the turf wall, which would in consequence be *c* 2m thick (Illus 5.9.14).

An alternative adaptation of roundhouse architecture might use upright posts lashed to a continuous ring-beam and tie-beams between posts. The tie-beam, especially at the east end, could be equipped with a king-post to help carry the weight of the meeting point of eight rafters. From the outside this would look much the same as a cruck frame, but would require more carpentry, particularly the cutting, shaping and joining of timbers (Illus 5.9.15). The disadvantage of proposing such a scheme is that it stands out from both the later (Scottish) ethnographic tradition and the earlier buildings in the Pictish heartland (ie at Pitcarmick), both of which invoke crucks as the preferred method of roof support. It would require us (as at Pitcarmick) to look south as well as west for exemplars. The meticulous excavation of Brian Hope-Taylor at Yeavering revealed a striking level of architectural sophistication and engineering precision in seventh-century Northumbria, and so opened a door that cannot easily be closed (1977, 147). His trail has been followed by a number of studies that exemplify or refine his conviction that early medieval building in Britain was architectural and followed a measured design (Millett & James 1983; James S et al 1984; Marshall & Marshall 1991; 1993; Hamerow 2012, 22–3). While the rectangular double-square plan, opposing doorways and load-bearing plank walls of the English examples will not be invoked here, other innovations such as frames of upright jointed squared timbers set in deep post-holes, tie-beams, rafters and repeated metrology deserve to be given a hearing. Since the works of sculptors and metalworkers reveal close contact between north and south there seems no good reason to deny it to the architects that housed them.

Metrology

In Chapter 5.7 we argued for the use of S1 in Period 2 as a workshop for metal-smiths engaged in making sacred vessels. For this reason, it need not surprise us if a passion for geometry and elegance of form was applied to their building. We have already noted some geometrical niceties in the way the ground plan was conceived and laid out using measures of length and angles. Its remarkable symmetry has also been suggested to indicate an example of metrology, in which the spacings and span of the post setting follow a simple mathematical concept (Carver 2008a, 128–32; cf Hope-Taylor 1977, 122–47). The lengths on the ground between post settings were recorded archaeologically in metres, and it was found that these lengths could be converted to whole numbers using a unit of measure equivalent to twelve and a half English inches – dubbed the Tarbat foot, equivalent to 31.75cm. Distances in *Tarbat feet* embodied in the building are shown in Table 5.9.2 (see also Illus 5.9.12). Given that the original marking out of post positions has vanished, we should not count on a precision of finer than 100mm for the distances between them. However the distances as paced out are clearly symmetrical so we are permitted to believe they were measured, and if measured, meaningful. Although the figure given for the Tarbat foot claims no great authority, let alone ubiquity, it is a legitimate way of expressing the chosen lengths used in S1, and more particularly the ratios between them. The intention is only to respond to a case of evident cognition and explore a little the methodological mind that was plainly operating in the eighth century.

The modules used for laying out can all be obtained from a single standard length (= 1), doubled to give twice as long, and each length added to the previous, so 3, 5, 8, 13, 21, 34 … It is these numbers, rather than simple multiples, which appear to feature in our table. These numbers will be recognised as the beginning of the Fibonacci series, which works on this principle (each number being the sum of the two previous). The ratio between one number and the next in the series eventually tends to the Golden Section (0.618), the proportion in which a line is divided 'so that one segment is to the other as that to the whole' (Chambers Dictionary; $1.618 \times 0.618 = 1$). Together with its inverse, the Golden Number (1.618), the Golden Section has been valued by artists for millennia. Fibonacci used his series to express the rate at which rabbits multiply and show it would eventually stabilise, but the series occurs also in plants and notably in shells, where the spiral is a progression of curves of increasing radii, in which each radius is a multiple of 1.618 times the one before. The plan of our building is a semicircle joined to a trapezium, where the base of the trapezium is coincident with the diameter of the semicircle. The ratio of the shorter side (the west wall, 21Tf) to the length (34Tf) is 0.62. The ratios of the spans used in the trapezium is 0.625 (10/16) and 0.615 (8/13). This is not to say that anyone was working in decimal points or even by multiplying or dividing these numbers. If a piece of twine is folded in half, and added to

Table 5.9.2
Measurements of post-hole spacings of S1 in Tarbat feet (1Tf = 31.75cm)
The length of the stone foundation (external) was 14.44m and its width across the hearth 9.8m

Length	Metres on the ground (to nearest 10cm)	English inches	Tarbat feet
Span E2–E7	5.1 [radius 2.55]	200	16 [radius 8]
Span E1–E8	4.1	162.5	13
Span W1–W2	3.2	125	10
Span W3–W4	2.5	100	8
Span of Entrance	1.6	62.5	5
Width of Perimeter aisle	1.6	62.5	5
Length of W wall	6.6	260	21
From F133to F430 (a–b)	4.1	162.5	13
From F430 to origin (b–c)	4.1	162.5	13
From origin to end (c–d)	2.55	100	8
Length from West end to perimeter of east circle (a–d)	10.75	425	34

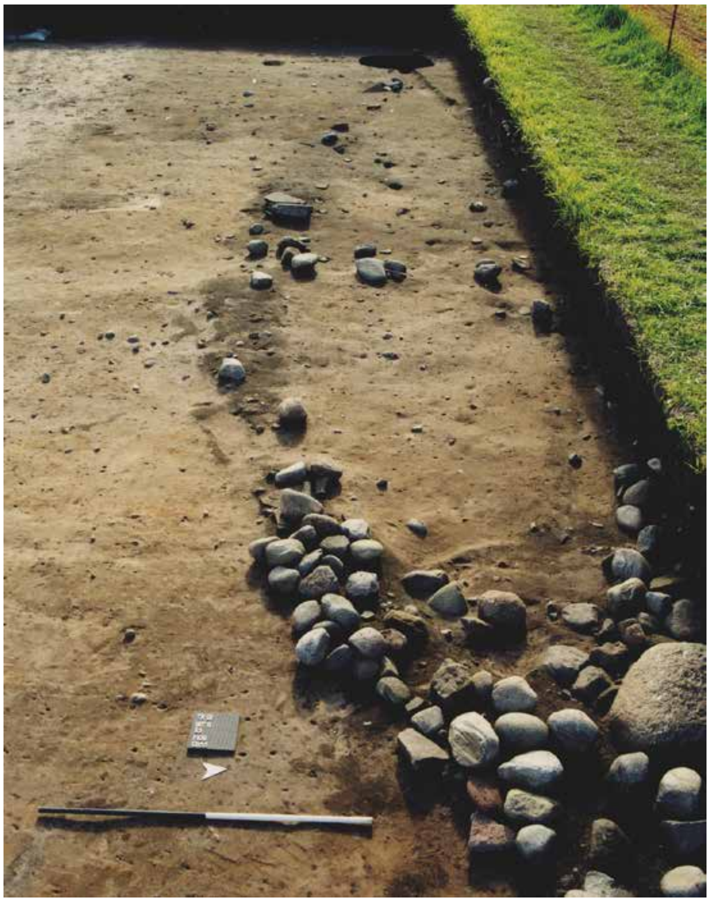


Illustration 5.9.16
Perimeter wall of S3

half itself (making three) and added to the original (making five) and this is added to the three (making eight) and this to the five (making thirteen) and so on, a builder has a number of measures that, without attributing to them any figure, bear a satisfying relationship to each other.

As well as having a practical function, it is not improbable that these natural properties had sources in traditional spirituality, and maybe they should be numbered among the intellectual gifts of Christianity. Given the context in which the Period 2 smiths were working, the resemblance of S1 to an apsidal church can scarcely be accidental. However we should also recall what our research has continually striven to recognise: the prehistoric roots of even so abstruse and monkish a matter as metrology. Metrology has been sought and found in monuments from the Neolithic onwards, with greater or lesser conviction. In the present instance we could simply note the Iron Age propensity for axial symmetry, and note Denis Harding's opinion that there seems to be good evidence for the use of metrical conventions in the grander timber roundhouses and brochs (2009, 59). These conventions may be of a learned or Mediterranean character (ibid, 295), but it seems as likely that early art and architecture derived its rules from relationships long observed in nature, like those in a spiral shell, and incorporated them into their own contributions to creation. A study of the Hunterston Brooch implied the use of a metric in metalwork that was aware of both Roman and Irish practice (a foot measuring 32.64cm was recognised: Whitfield 1999, 311).

In S1 it is possible to see a genuine piece of architecture, in which the mechanics of building are harnessed with devotional lore to create an elegant, warm environment suitable for the creative motor of the worker in precious metals.

Structure 3

S3 was a curvilinear feature filled with cobbles which echoed the form of the S1 perimeter wall in plan and composition. Most of it lay beyond the northern limit of the intervention to the north, and no post-holes were seen (Illus 5.9.16). It was probably of Period 2, sharing with S1 an attraction for animal bone (Illus 5.8.1). The implication is that S1 did not stand alone (OLA 6.1 at 3.3.3).

Structure 9 (OLA 6.2.1, 3.4.4)

S9 was the focal space in the northern workshops (Chapter 5.6, p 195; Illus 5.6.2). It had been greatly disrupted by subsequent activity meaning its plan was hard to read (Illus 5.9.17). This

Illustration 5.9.17
S9 under excavation, seen from the west

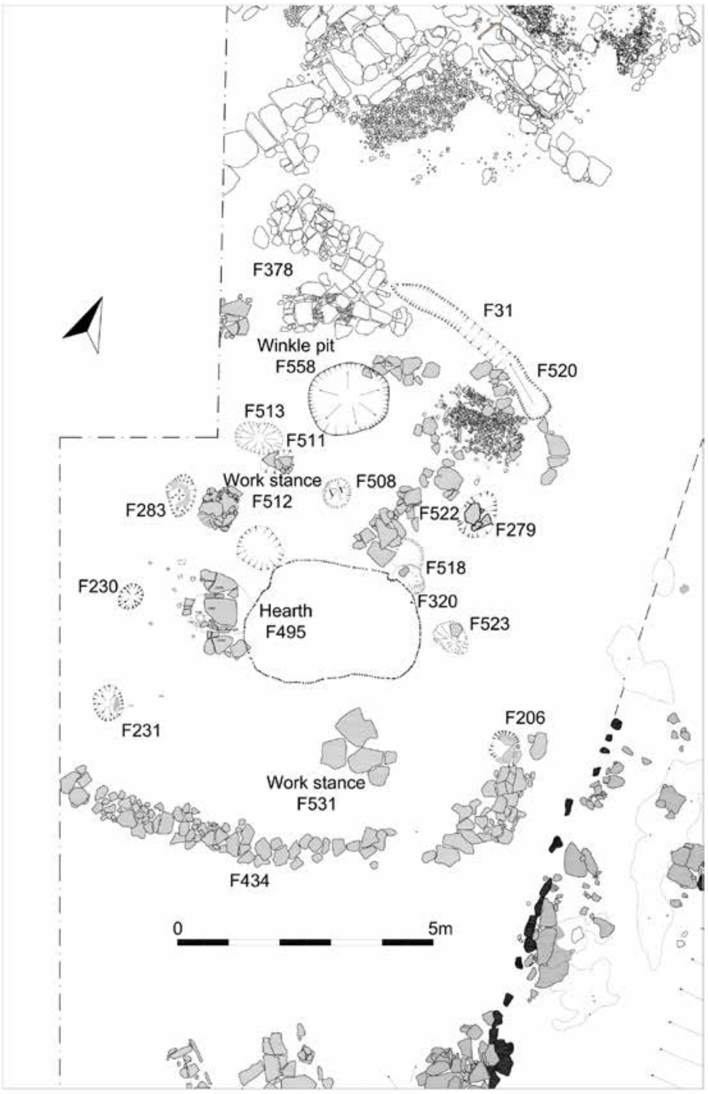


Illustration 5.9.18
S9: plan showing principal structural elements

was in contrast with the other purpose-built workshop, S1, but there were hints that S9 was a building contrived from similar materials and possibly having a similar form. S9 was defined in the north by a curving gulley (F31) and a platform of slabs (F378), in the south by a curving dry-stone wall (F434), and in the centre by nine major post-holes (Table 5.9.3) and a hearth (F495). The east end was largely missing where it meets the road and the west end remained inaccessible beneath the baulk. Taking the south walling and the north gulley as a guide, the area encompassed a semicircular zone with a radius of 4m (compared with the 4.9m external radius of S1) and an axis NW–SE (Illus 5.9.18). The post-holes within this locus present no obvious pattern, and the stance F512, not the hearth F495, would lie at its centre. On analogy with S1, three pairs of posts would be expected within the semicircle. The structure is aligned to the south-east where it just touches the road. Again on analogy with S1, its entrance would coincide with the metalling of S4. By the same token, the exit culvert of S4 would pass into, through or under the western bay of S9. If the form of these features recalled that of S1 (above) it was less clear how the S9 structure stood up, or indeed that it was a structure. The use of the S9 area as a workshop was intensive, and the same area was subject to repeated visitation in Periods 3, 4 and 5. Defining the character of the structure proved harder than determining the nature of the craft practised within it (Chapter 5.6).

Preparation

Overlying Period 0 buried soil and possible podzol was a thin, patchy layer of charred organic material identified tentatively as burned scrub, overlaid by spreads of redeposited sand and gravel subsoil. Clear views of these levelling deposits were afforded by the excavation of the hearth, which showed them to be confined to the south interior of S9 and particularly beneath terrace wall F434. Conversely, to the north of the building, a slight depression in ground level coincident with the line of the northern post-holes

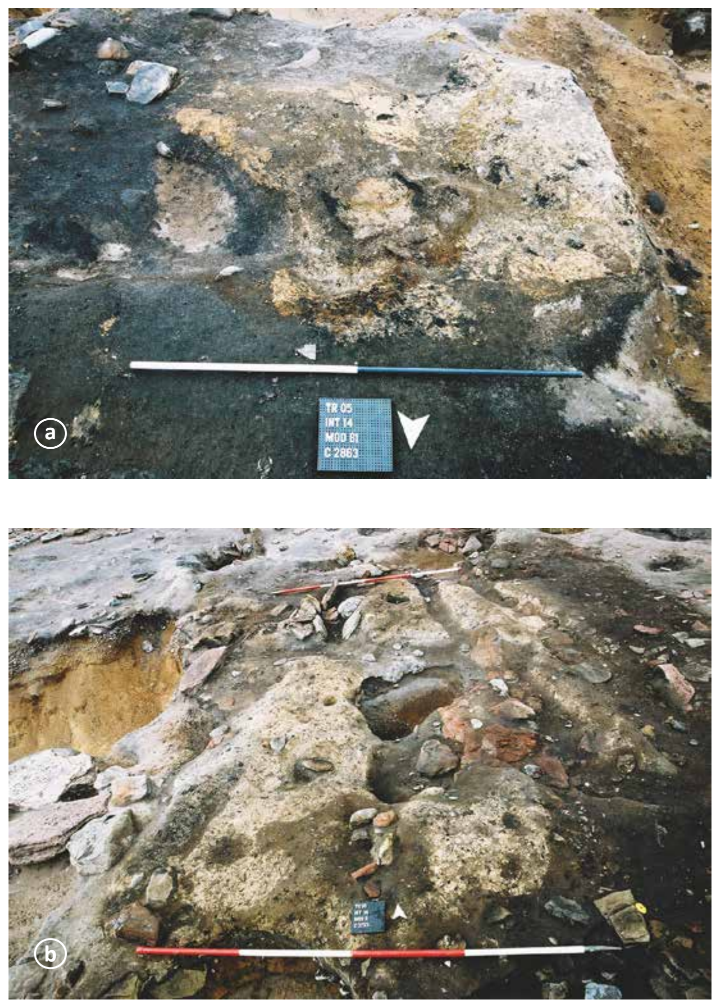


Illustration 5.9.19
(a) and (b) clay silts representing burned turf walls in S9

Table 5.9.3
Structure 9: post-holes

Feature no	Contexts	Description
F206	*packing* C1566 *post void* C1579 *backfill* C1566	possible principal on southeast side, 0.40m × 0.30m × 0.30m deep
F230	*backfill* C1615	principal on west side, truncated, 0.45 diameter × 0.20m deep
F231	*backfill* C1616 *post void* C1697	principal on west side, truncated, 0.70m × 0.60m × 0.35m deep
F279	*backfill* C1706; C1679; C1716 *packing* C3463	principal on north side, 0.95m × 0.70m × 0.70m deep
F283	*packing* C1825 *backfill* C1696; C1824	principal on west side, 0.85m × 0.60m × 0.55m deep
F320	construction backfill and packing C1821 post-void backfill C1772	internal and possible pair or replacement with F518, 0.70m diameter × 0.55m deep, possibly related to threshold
F508	*construction backfill* C2881 *primary burning over* C2863 *post-removal levelling* 2880	internal, 0.60m diameter × 0.50m deep, signs of charring during primary burning, possibly related to threshold, post removed
F511	*construction backfill* C2978 *packing* C2953 *backfill* C2979	internal or possible pair/replacement of principal F513, 0.60m × 0.40m × 0.25m deep
F513	*backfill* C2980 *post-pipe backfill* C2981	principal and possible pair with F511, 0.95m × 0.60m × 0.50m deep
F518	*construction backfill* C3006 *packing* C3004 *burning over backfill* C2992; C3003	internal, 0.50m diameter × 0.50m deep, possible double post-hole or replaced by F320, possibly related to threshold
F523	*construction backfill* C3101 *packing* C3102 *post void* C3100 *backfill* C3098	internal, 0.70m × 0.60m × 0.50m deep

of S9 was detected. The footprint of S9 has therefore been prepared by creating a terrace demarcated to the south by the line of small slabs that constituted F434.

Post-holes

Several post-holes within S9 cut directly into the levelling layers and contained only material derived from them in their backfills. These provided the primary criterion for membership of the S9 group, and they are listed in Table 5.9.3. A series of post-holes have been defined as *principal posts* defining the wall lines of the structure (shaded in Illus 5.9.20), while a second group delimited by the first seem to define *internal* structures. Two sets of post-holes (F511/513 and F518/320) were located close together and may represent double settings or alternatively the replacement or removal of posts during a building's life. Many of the post-holes, both principals and internals, were identified by the presence of sandstone packing around a likely square timber post, all of which had been removed. Others were not supported by any packing stones, although neither type was consistently deployed in plan.

A curved western alignment of principal posts (F231, F230, F283 and F511/513), embraces the hearth and stance (F512) and appears to respect them. A curving row to the north-east (F511/513, 508, 518/320, 523) also suggests structural purpose, perhaps an enduring one since two posts had been replaced. F206 was a post-pit near the apex of the semicircle. Otherwise, posts on the south side were comparatively elusive. Several scoops were excavated immediately to the north of F434 but none could conclusively be said to be post-holes. A number of structures for stretching and drying hides such as beams, racks or frames might be invoked for at least some arrangements of internal posts. Nails and other items of possible structural ironwork found in S9 suggest the construction or repair of a timber frame. The *wall* (F434) was made with level, tesselating sandstone slabs with voids between the slab make-up, filled with small mixed gravel. It was not a foundation, but a shallow slab wall that defined the likely southern limit of a terrace of redeposited subsoil laid to prepare the working area of S9. Burnt bullrushes were found on the floor suggesting the structure was roofed.

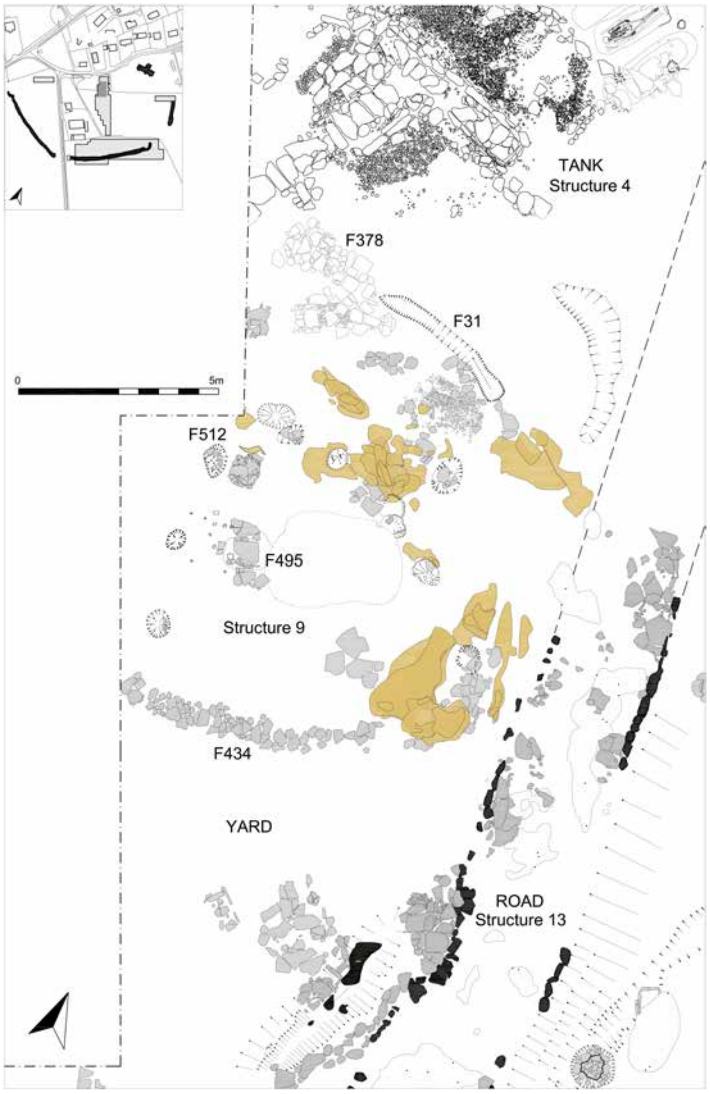


Illustration 5.9.20
S9: plan, showing distribution of clay silts, probably deriving from burned turf walling (ochre stipple)

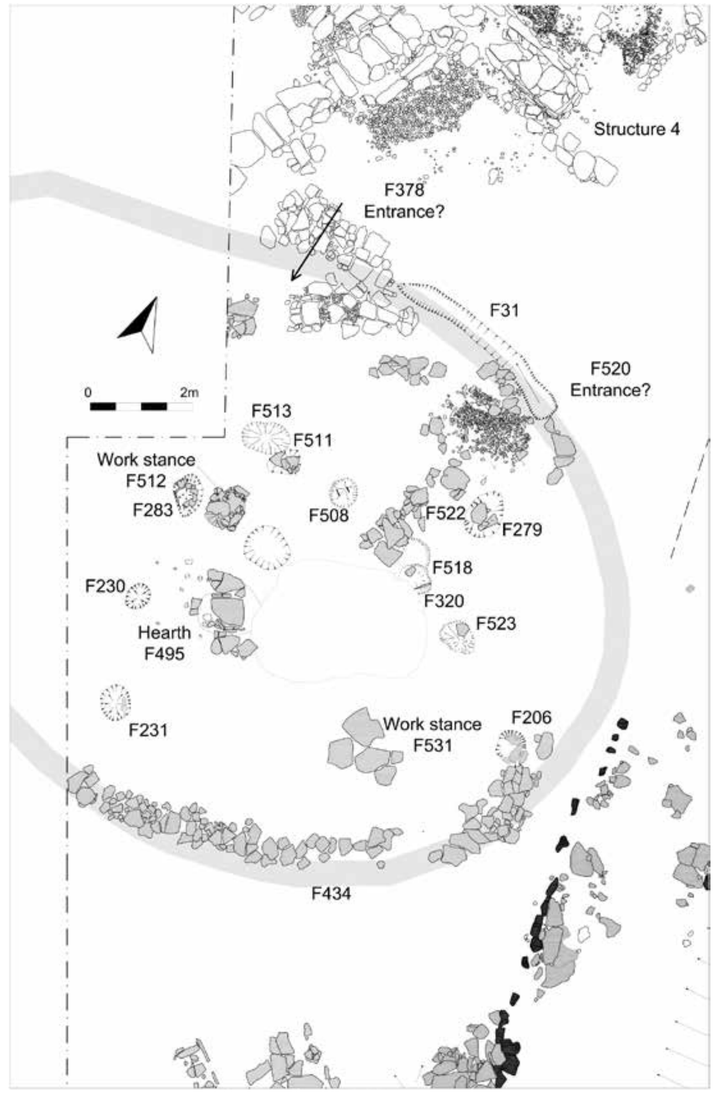


Illustration 5.9.21
Plan showing hypothetical form of S9

A possible *entrance* from the north-east was marked by a small area of slab hardstanding and cobbled surface (F378) that linked S9 to S4. Slabbed and cobbled patches (F514, F520) leading to a series of stepped slabs (F522) suggested one possible itinerary within the building. Surface F520 was made of rammed pebbles consolidating an area measuring approximately 1.50 × 1.0m, with a setting of small red sandstone kerbs, at least on the western side. The kerbs suggest a deliberately laid feature leading to the north of S9. The uppermost stones of F520 were largely level and this had been achieved by stacking the stone make-up increasingly towards the southern end to compensate for the slope down into the interior of the building. The group of features has thus been interpreted as a stone-built threshold and walkway, but it may have had an industrial purpose. Inside the S9 space were two work stances (F512, F531), essentially piles of slabs providing a worktop at waist height, a hearth (F495) and two lined pits filled with winkle shells (F558, F575 the first shown on Illus 5.9.20). The function of these features is discussed in the context of vellum-working in Chapter 5.6.

Turf walls

The hypothesis for the superstructure of the building is based on the premise that turf was probably employed as a primary building material. Clayey-silt ash consisting of turf- and peat-ash was encountered in many places in and around the northern workshops (Illus 5.9.19). Interpretation of these deposits was usually guided by their immediate context. In hearth fills, they were interpreted as fuel (p 222), but elsewhere they occurred as layers of made ground often interleaved with dark silts, including as ad hoc surfacing of the road. These are residues attributed to the site-wide fire that consumed the workshop area. Within the

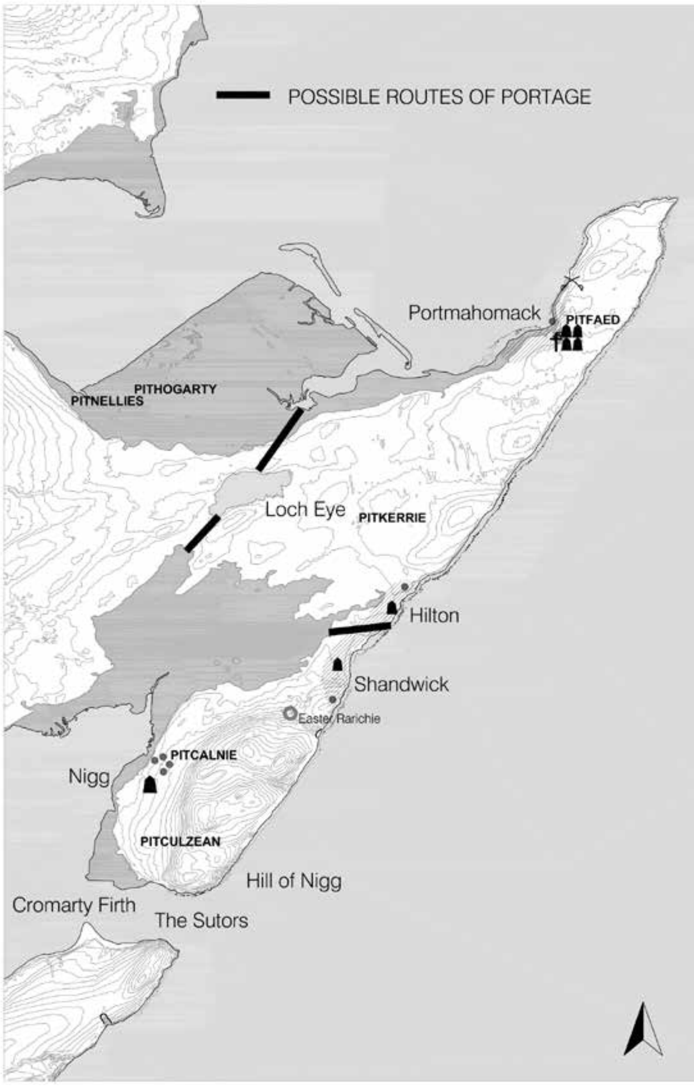


Illustration 5.10.1
Model of the geography of the peninsula in Period 2, showing Pictish places and possible route of portage

area of S9, their distribution follows the footprint of the building, raising confidence that they are owed to the conflagration and collapse of walls largely raised in turf (Illus 5.9.20).

Assessment and verdict

The form of S9 remains uncertain. The patterns offered by the posts were neither straight nor circular and did not resemble the configuration of S1. The lines of neither gulley F31 nor wall F434 were true curves onto which a form like S1 could be mapped, and neither constituted a solid form in the manner of the S1 perimeter wall. If S9 continued in the manner of S1 it would collide with the exit culvert from S4.

A possible alternative is that S9 represents an outdoor yard similar to that contiguous with it immediately to the south. Such an upper yard, on a levelled platform demarcated by wall F434, would represent a major workspace serving the tank S4, to which it had once probably enjoyed fully paved access. The structural posts may possibly have supported two curving windbreaks protecting the hearth area from the north-east and north-west, or racks for suspending hides. Turf could have been stacked and dried for fuel or employed in cladding the windbreaks. It might be concluded that the processing of hides and the generation of astringent ash are activities more appropriately and more agreeably conducted out of doors.

However, post-holes 500mm across and 500mm deep (the principals) ought to have been load bearing. The burning pattern left by the fire is a good indication that turf structures were employed. The area of S9 defines a persistent space with a long-lived hearth near its centre and the delicate work of preparing high-quality hides for parchment, as argued in Chapter 5.6, would demand shelter. Our verdict is that S9 was a building, probably not unlike S1 in its original form, but frequently modified during its life and destroyed by fire (Illus 5.9.21).

5.10 The Peninsula

Introduction

Three famous carved stone Pictish monuments of the Tarbat peninsula stand at Nigg, Shandwick and Hilton of Cadboll (Illus 5.10.1). They are among the largest and grandest of the known Pictish cross-slabs, each up to 3m high and 1m broad, carved in relief with elaborate ornament and pictorial scenes. All three have been thrown down and re-erected at least once, and their original sites remain uncertain, although the cross-slab at Shandwick is thought to be at, or very near, its original location.

Together with Portmahomack, where four large crosses stood, these indicate four sites that were certainly active on the eighth-century peninsula. Their locations coincide, or nearly, with the main concentrations of Iron Age burials, which in turn

Illustration 5.10.2
Map of the Tarbat peninsula by John Speed, before 1610

map on to the most accessible beachheads on the north-west, east and south-west sides (Chapter 3, p 61). Inference of a Pictish presence is given by the site of Easter Rarichie, a site of probable Iron Age date that was still significant in the Middle Ages (p 318). Four place-names in '*Pit*–' may indicate former Pictish estates. The name of the peninsula itself, Tarbat, is derived from Gaelic *tairbeart* (overbringing) implying its use as a portage. (The place-names and monuments on the peninsula are assembled in Digest 8.)

It was suggested in Chapter 2, p 28, that the form of the Tarbat landscape in the first millennium and earlier was more evidently that of a peninsula, with a broad isthmus linking it to Tain and the mainland. The eastern seaboard is a continuation of the geological fault that runs across Scotland as the Great Glen. By virtue of its geographical situation at the south-west end of the peninsula, the Nigg area is likely to have been the principal focus of settlement on the peninsula in the early prehistoric period (Illus 4.28). It is sheltered by the Hill of Nigg, and lies adjacent to the strait between the North and South Sutors that provides an entrance to the Cromarty Firth from the open sea. There were landing places in the Bay of Nigg and probably at North Sutor where the ferry now comes in. It had the earliest cluster of prehistoric burials near the North Sutor, and the grand cross-slab (and the medieval chapel) face the Bay of Nigg.

Read from the recent contours, the Hill of Nigg was itself nearly an island, joined by a narrow isthmus to the rest of the peninsula. At the south end of this isthmus was the fort of Easter Rarichie, and the Shandwick cross-slab overlooking Balintore bay. At its north end is the Hilton cross-slab, the Chapel of St Mary's and the deserted medieval village of Cadboll Fisher. Here there is a shingle beach that has periodically acted as a landing place. There are other potential landing places for small light boats, provided by inlets and flat rocks at many points along the long east coast of the peninsula. But the best landing place on the peninsula is that at Portmahomack, with a broad sandy beach at the back of a bay looking on to the relatively sheltered Dornoch Firth. In the first statistical account it is recorded as the haven where vessels running to Dornoch or Tain may take shelter when overtaken by storms, and 'there is not in the northern part of Scotland, and what is called the low country, a place better calculated than Portmahomack, if so well, for a fishing station, from convenience of its harbour, its nearness to the sea where the fish is to be found, proper ground adjoining whereon to erect houses, and plenty of excellent freestone at hand to build them' (FSA, 643).

There is much still to discover about the Pictish presence on the Tarbat peninsula. Here we review briefly the known character of the four main sites preceded by the possible route and period of operation of the portage.

Portage

The *prima facie* case for a portage lies in the coincidence between the place-name and the geography of the peninsula. The greatest advantage to a mariner would lie in a route between the Cromarty and Dornoch Firths, since this would connect two areas of relatively calm waters and avoid running round the Ness and through the Sutors. Speed's Map of the early seventeenth century implies that the Bay of Nigg was then deeply indented (Illus 5.10.2). Assuming that land has acquired a mantle of sand since then, there is a case for supposing that bays both north and south of the peninsula once offered sheltered access to the firths. The southern part adjacent to the Bay of Nigg is the area most likely to have been reclaimed through the importation of soil by Fearn Abbey (see p 221). Given this more accentuated landscape, a second portage suggests itself beginning at Hilton, connecting the eastern seaboard directly with the Bay of Nigg. Since at least the Iron Age, the three main centres of population, as indicated by burial, would appear to have been Portmahomack, Balintore/Hilton and Nigg. These are the places marked by the great cross-slabs in the eighth century, and also the most likely landing places, so a connection by portage is not improbable.

A portage route that connects the Dornoch and Cromarty Firths can take advantage of the perched lake of Loch Eye, formerly Loch Slin (or Flynn). Loch Eye today is only eight feet deep, raising the possibility that it was created or enlarged by digging, as at the Norfolk Broads, created through peat extraction by medieval monasteries and averaging less than thirteen feet deep (Lambert 1960). This might align with landscaping operations instigated by Fearn Abbey, including the introduction of plaggen soils (above). However, the contours support the existence of a natural depression at this point, which could therefore have provided a long-lived water catchment. Pont's Map of 1583–96 shows a river channel running from Loch Flynn (Slin) southward to the Cromarty Firth, implying that this was a routeway in the Middle Ages (Carver 2008a, 184–5).

As an exploratory study, the following survey tracks a hypothetical route from south to north, making no assumptions, but using the terrain as it is today.

Cromarty Firth to Fearn Abbey

The route that follows the lowest contours is now taken by 'the Canal'. It rises 10m in 4km (1:400). At the Abbey, the mill works have obliterated any previous arrangement. They remain visible 50m north-west of the abbey nave as a narrow burn coming in under a single-arch bridge at NH 837 774, and as a splayed outwash at NH 835 773.

Fearn Abbey to Loch Eye

The likely route follows the present ditch/burn running from the Abbey Mill to Loch Eye where the boat could be put back in the water. It rises 5m in 2km (1:400).

Loch Eye to Inver

Here there is a steep bluff down to Inver. If the argument for the route depends mainly on the gentleness of the contours, then there are three candidates. Route A passes between Lochslin Farm and Lochslin Castle then along a lochan to Newton Cottage (where there is a chapel) and then down the track to the Fendom Burn. This has the advantage of suggestively old places en route. The distance is 2.4km. Route B is longer and passes along the ridge before turning to the ford at Inver. The distance is 3.4km. Both these routes actually run at a height of 20m AOD for much of their length. The distance from the ridge is 700m in both cases, so the slope of portage is 20m in 700m, or 1: 35. Loch Clais a' Chreadha once lay between Wester Arboll (NH 875 813) and Cockle Hill (NH 862 815). Its southern limit is probably 'Watertown' on the 1885 OS Map. This would imply a Route C which left the Inver channel at Inver links or Arboll and passed E or W of Gallow Hill into the loch at Choc [Cnoc] a' Mhuillinn Ghaoithe (NGR 874 815) [Hill of the mill stream?]. From this loch it might be water all the way to Loch Eye. The journey can be calculated as 0.7m at 1:35, 1.7km flat, 0.7km by water and 8.3km at 1:400, giving a total of 11.4km. But this could come down to about 8km if a higher sea access is assumed.

It can be seen that numerous uncertainties attend the mapping of the portage, due to the appearance and disappearance of lochans and the alterations in the landscape likely to have been executed by the Abbey of Fearn. The portage could not easily function once the Abbey mills were built at Fearn (ie after 1238–42). At the same time it can be seen that the overland route was never likely to suit large vessels, which, on the other hand, had less need of it. The historical context favours its use in the first millennium by Picts and by Gaelic speakers (who named it)

Illustration 5.10.3
Valley north-west of Nigg Church

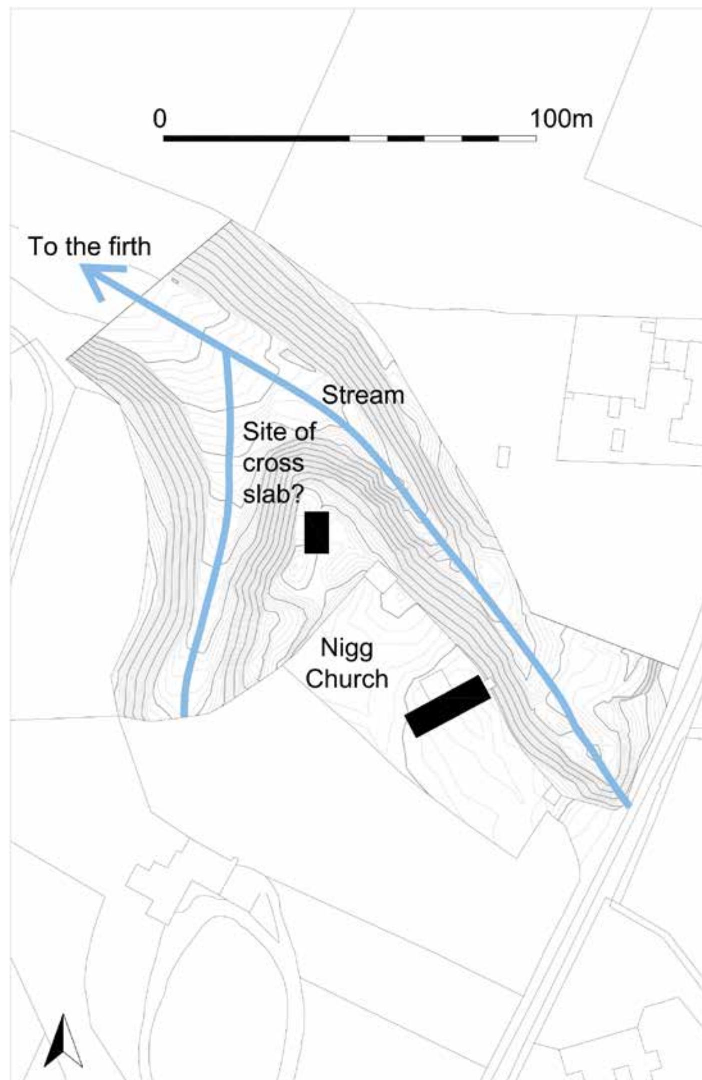
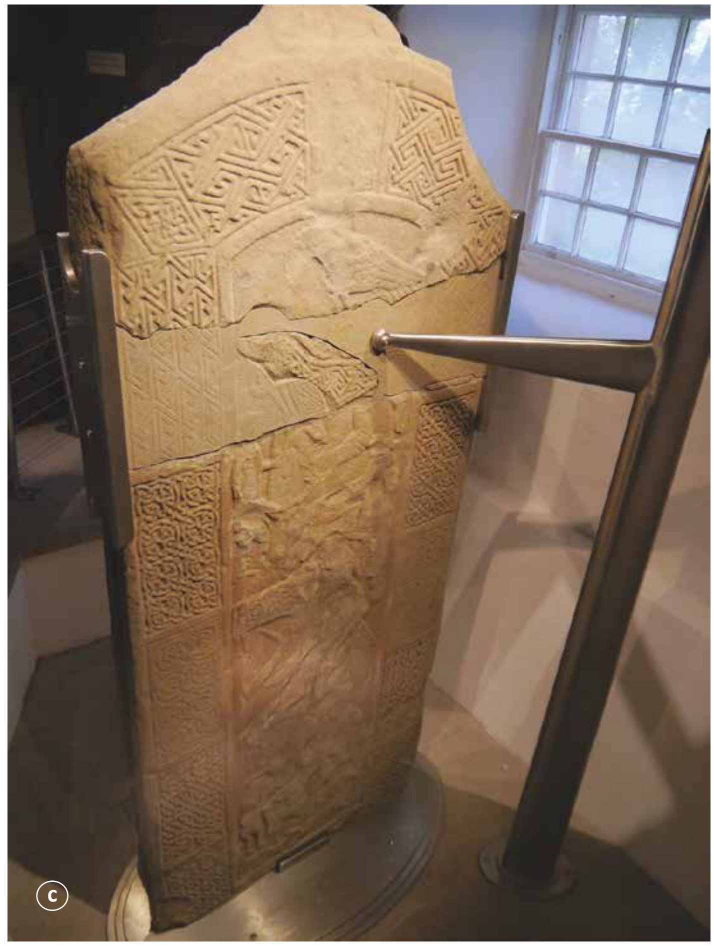


Illustration 5.10.4
Contour survey of the locality of Nigg Church with the possible original location of the cross-slab (conjectural)

Illustration 5.10.5
Nigg cross-slab: (a) cross-side (detail), the story of Paul and Anthony; (b) cross-side (detail) snakes and bosses; (c) David side. The modern mounting of the cross presents a challenge to photographers



rather than by Norse. A skin boat, being of itself portable, could be carried from Inver to Loch Eye, a total of 2–3km, after which it could slip down to the Cromarty Firth generally waterborne. Both proposed portages are in the nature of short cuts, where travellers on foot carrying or towing light craft crossed from beach to beach via marshy ground and low upland. They would facilitate a community in which traffic mainly passed over water. In this respect, the landfalls of Nigg, Shandwick and Hilton (and Balintore which lies between them) and Portmahomack would naturally serve as nodal points.

Nigg

The site at *Nigg Church* (NH 856 747) consists of a promontory flanked by two re-entrants, today much overgrown, that converge to form a steep narrow valley, resembling a forked hollow way, which leads to the shore of the Cromarty Firth (Illus 5.10.3, 5.10.4). The north-easterly re-entrant is narrow and steep and a small burn runs along it. Persons on foot or pack animals can make their way from the summit of the promontory down either of these converging valleys to the foreshore on the Bay of Nigg. The first statistical account reports that 'behind the church' there were foundations above 90ft in length that went under the name of the 'Bishop's House' (FSA, 592). Nigg may mean 'promontory' in Gaelic (FSA, 588), but it is interestingly also recorded as Wigg (SSA, 18). The area was provided with some twenty wells.

The church at Nigg was a parish church dedicated to St Fiacre in 1626, but the earliest reference to a church here is 1255–6 (cf Portmahomack). The present church, a mainly eighteenth-century building, lies NE–SW across the promontory surrounded by a fenced churchyard. The cross-slab was seen there by Petley in 1811/12, by Hugh Miller in the 1830s, by Stuart before 1856 and by Allen and Anderson before 1903 (Petley 1831, 352; Miller Sr 1835, 41; Stuart 1856, 11; ECMS ii 75–8). Its original position is not remembered, but it was said to have 'always' stood in the churchyard when it was blown down during a storm in 1727 (FSA, 594 gives the date as 1725). It was subsequently placed up against the east gable of the church until the end of the eighteenth century, when it was removed to gain access to the family vault of Ross of Kindeace. During this operation it fell and broke into several pieces. When Petley saw it in 1811/12 it had been restored with the larger piece of the slab erected upside down, so he had it taken down and reassembled the right way round. When seen by Allen and Anderson at the turn of the twentieth century, the upper and lower pieces had been joined with cement and fastened with metal clamps. However, a third section about eight inches (200mm) high, originally belonging between the other two, parts of which had been seen by Petley, was missing (ECMS ii, 77, 81). In this condition it was erected, according to Allen and Anderson 'in a new stone base at the W end of the church immediately outside the vestry, at the top of a very steep slope' (ECMS ii 76). There is some confusion about the cardinal points in Allen and Anderson's account. The church is oriented SW–NE, so that the vestry, outside which the stone was re-erected overlooking the very steep slope, lies at the north-east (not west) end. A porch was subsequently erected over the stone at the north-east end. At the foot of the slope beneath, a piece of the missing section was recovered from the burn by Niall Robertson during a site tour conducted by Isabel Henderson in 1998. The stone has now been again restored to take account of the missing section, and re-erected inside the church at its south-west end (RCAHMS No. 231; NH 804 717). On analogy with the church of St Colman at Portmahomack, the earlier church at Nigg may have been aligned NE–SW with a 'north' aisle added on the north-west side at the Reformation. The stone is now housed inside the church at its south-west end and has been recently restored, presenting something of challenge to photographers

Illustration 5.10.6
Shandwick cross-slab: (a) the 'paradise' scene, with Ewan Campbell; (b) spiral explosion, of fifty-two spirals; (c) the cross is now protected in a glass box. Aidan MacDonald and Roger Mercer admire the cross-side in the company of Jean Mackenzie, Trustee (see also Illus 1.5, Illus 1.6)

(Illus 5.10.5). The original siting of the Nigg monument, if in the churchyard and subject to strong winds, is likely to have been in the centre of the promontory at its forward end.

The ornament and iconography of the Nigg monument is among the most elaborate of the entire Pictish corpus and has been extensively studied (Henderson & Henderson 2004, passim; Meyer 2005, Chapter 2; Meyer 2011). It is a rectangular slab 2.36m high (as currently restored), 1.03m wide and 130mm thick. As it stands now, the cross-side faces south-east. It is infilled with fret pattern, and geometric and zoomorphic interlace. It is flanked by panels of spiral bosses and interlace bosses around which snakes coil. Above the cross a pediment contains a vignette representing St Paul and St Anthony in the desert, fed with a circular loaf by a raven and accompanied by docile lions, perhaps those who helped St Anthony bury St Paul (Illus 5.10.5a; Ó Carragáin, E 1989). On the back, surrounded by an arched frame of interlace and fretwork panels, is a composite scene featuring, from top to bottom, a bird of prey, a Pictish beast, a spearman following animals, King David with sheep, harp and lion, and a figure brandishing two cymbals behind a horseman and a hunting dog pursuing deer (Illus 5.10.5c; Henderson & Henderson 2004, 127).

Henderson and Henderson draw an analogy between the cross-side and a page of illuminated manuscript, and propose that the bosses might symbolise the Old and New Testaments (Illus 5.10.5b). Meyer sees in the Nigg serpent bosses a reference to a metal reliquary or a local saint's shrine and surmises that there was an actual reliquary at Tarbat containing a relic of St Columba (Meyer 2005, 198–200; see also OLA 7.1.8.2). The back face resembles a consular diptych, featuring the figure of the 'Master of Animals' carrying a pelt, for whom Henderson and Henderson propose deep roots in Pictish art and thinking. King David (perhaps in some measure the local successor to the *Master*) is represented with his sheep, lion and harp. The man with the cymbals is perhaps an accessory to the hunt denoted by horseman, hound and deer, frightening the animals out of their lairs (Henderson & Henderson 2004, 67, 138–9, 125–8, 131).

Shandwick

The monument at Shandwick (NH 856 747) stands on the 25m contour in open ground above Shandwick village and beach. A chapel is thought to have stood nearby, although it has not been located (Macdonald & Laing 1970, 137). Watson (1904) records a number of places in the area: Tobar Cormaig (Cormac's well, at Shandwick farmhouse) and nine paths leading down to the shore (Digest 8). He retails the story of the three Danish princes that survived in folklore as an explanation (in the Gaelic community) for the origin of the three great cross-slabs of Shandwick, Nigg and Hilton. He relates,

> 'At Nigg Rocks, below Cadgha Neachdain, there is a graveyard, now covered in shingle. Here the Danish princes were buried. Their gravestones came from Denmark and had iron rings in them to facilitate their landing. So local tradition. This most unlikely spot for a graveyard was not selected without some good reason, the most probable being that hermits once lived in the caves, whence the place was reckoned holy ground … At Clach'a Charaidh, [the Shandwick stone] all unbaptized infants of the parish were buried up till fairly recent times. It is now cultivated.'

He also states that at Easter Rarichie, 'the curate of Nigg lived and the field behind his house is called "raon a chlaidh", the graveyard field. The plough goes over it now and formerly used to strike the gravestones, but these are now removed' (ibid, 56, 57; Digest 8). Surveys were carried out in 1998 but without useful result.

Illustration 5.10.7
St Mary's Chapel, Hilton of Cadboll (photograph by Ian Keillar taken June 1985)

The cross-slab was seen by Charles Cordiner in 1780 who described it as surrounded at the base with large, well-cut flagstones, by Petley between 1811 and 1812, by Hugh Miller in the 1830s, by Stuart before 1856 and Allen and Anderson before 1903 (Cordiner 1780, 65; Petley 1831, 346, Plates XVIII, XIX; Miller Sr 1835, 41; Stuart 1856, 10; ECMS ii 68–73). The stone had been damaged before 1811 (Meyer 2005, 93) and was blown down in about 1846, according to Allen and Anderson, when it broke into two pieces. It was subsequently clamped together and re-erected 'on a circular stepped base that conceals some of the sculpture at the bottom' (ECMS ii, 68). In 1988 an area 8 × 8m was excavated

Illustration 5.10.8
St Mary's Chapel, Hilton of Cadboll. Site survey by FAS in 1998

around the base, and a steel and glass protective shelter erected. No features were reported from the excavation (Graham Robins in Carver 1998b; James H 2005, 95–7).

The slab is now 2.97m high but at least another 200mm is thought to lie below ground. It is 1m wide and 190mm thick (Illus 5.10.6). The cross-side faces east across the sea, and takes the form of a jewelled cross flanked by cherubim and seraphim (Henderson & Henderson 2004, 152). Below these are two animals seen as lions, one of which has a cub, brought back to life, dangling from its jaw in an allusion to the resurrection (Meyer 2005, 123). The lions, and the serpents below them, are seen as recognising the power of Christ. On the back face contained in a series of panels are represented (from top to bottom) a double disc inlaid with spiral ornament, a large Pictish beast sheltering two small sheep (Illus 1.5), and a busy scene featuring mounted horsemen, two warriors sparring on foot, a crouching archer and a dozen animals or birds all moving from left to right (Illus 5.10.6a). Below this is a virtuoso panel of spirals exploding from four small spirals at the centre through widening circles of eight, sixteen spirals of increasing size, completed with four pairs of spirals in the corners (Illus 5.10.6b). The lowest visible pair of panels containing fret pattern and knotwork are now partly hidden. The Pictish beast is seen as benign and protective, and the populated panel as a reference to the Last Judgment and a description of the otherworld (Henderson & Henderson 2004, 77; Meyer 2005, 131). The back face of Shandwick certainly lends itself to interpretation as an evocation of paradise, and one with ancient roots. The cross-slab overlooks the Moray Firth, but is now enclosed in a protective glass shelter (Illus 5.10.6c; Illus 1.6).

Hilton of Cadboll

The cross-slab at Hilton of Cadboll is associated with the site of St Mary's Chapel located at NH 883 791 (RCAHMS 1979, No 210), on the foreshore north of the present village of Hilton (Illus 5.10.7). It is not known for sure where the monument was first erected, but recent excavations and detailed study of the stone's 'biography' have increased confidence that it stood near the present site of St Mary's Chapel, which itself was founded in a place that was originally Pictish (Foster & Jones in James et al 2008). An archaeological evaluation of the site was commissioned by Tain Civic Trust from the present authors in 1988, with the collaboration of RCAHMS and Graham Robins (Carver 1998b; OLA 8.2; summarised in James et al 2008, 391–8). Earthworks and geophysical anomalies

Illustration 5.10.9
Hilton of Cadboll cross-slab: (a) upper part, in the National Museum; (b) lower part, reverse; (c) lower part, cross-side; (d) the Hilton replica, cross-side, with visitors in 2007: (left to right) John Bradley, Heather King, Bernard Meehan, Jill Harden, Rosemary Cramp, Airlei Hindmarch, Laura Hindmarch, Betty O'Brien and Niall Brady

mapped in this survey located a series of features surrounding the chapel, which stood within an enclosure (Illus 5.10.8). These were interpreted as belonging to a deserted medieval village, and equated with the documented settlement of Cadboll Fisher. By 1478, the names Catboll-fisher, Cadboll-abbot and Wester Cadboll apparently refered to the present Hilton, Balintore and a settlement to the west respectively (ibid, citing *OPS*, 442–3). In 1561 to 1566 the seashore site was known as the Fishertown of Hilton, and furnished fish to Fearn Abbey, suggesting that the foreshore was specially developed as a fishing village. By 1610 it was known as Bail' a' chnuic, 'cliff town' (Gordon & Macdonald *c* 1988, 18). The Cadboll Estate Maps of 1813 show a 'Hilltown' located 'behind the eroded cliffline at the back of the raised beach' with 'Fishertown of Hilltown' on the present site of Shore Street. It thus seems likely that there was once a settlement above the cliffs called Cadboll, which subsequently spawned two others, Hilltown in the same place and Fishertown beside the beach. The chapel itself and its earthworks fit well with Cadboll Fisher, a daughter settlement of the Abbey of Fearn dating to the thirteenth century and later. Although the place-name 'Hilton' has been adopted by the present seaside settlement, it should originally have been on a hill as pointed out by Watson in 1904. Such a hypothetical antecedent village is unlocated, but it raised the possibility that the Hilton cross-slab was transported in antiquity with its collar stone, perhaps in connection with the dedication of the seaside chapel, from an adjacent hilltop site (Carver 1998b; cf James 2005, 101).

The Hilton of Cadboll cross-slab, perhaps the most famous of all Pictish carvings, has been associated with the St Mary's Chapel site since the seventeenth century (Illus 5.10.9a). It is likely to be the 'obelisk' blown down in a gale in 1674 (Foster & Jones in James et al 2008, 206). It had certainly been taken down before 1676 since it was broken at the base, while its front side, which may have once carried a cross, had been shaved and carried an inscription of that date commemorating Alexander Duff and his three wives. Before 1780, the stone was said to have stood near the ruins of a chapel dedicated to the Virgin Mary, 'under the brow of the hill on which the farmhouse of Cadboll is situated' (Cordiner 1780, 65). By 1811, it was lying near the seashore face down when Cordiner is said to have discovered carving on the underside and had the stone turned over (ECMS ii, 61). Before 1856 it was lying 'in a shed, the wall of which was believed to have formed part of an ancient chapel' (Stuart 1856, I, 10). By 1903, the stone had been removed to Invergordon Castle, where it stood on a modern base in the grounds at the side of the carriage drive half a mile south of the castle. In 1921 Captain Macleod of Cadboll sold his property and donated the Hilton stone to the British Museum. It arrived there by 3 February but following protests in the press, Macleod agreed it could be returned to Scotland and donated to the National Museum in Edinburgh, where it remains (the fully documented biography is related in Foster & Jones in James et al 2008, 238ff).

The Hilton of Cadboll monument exhibited in the NMS was evidently only the large upper section of the monument, since the ornament was discontinuous at both top and bottom, and there had been some speculation as to the whereabouts of the other parts as well as the shavings from the front face. Excavations by Historic Scotland in 2001 revealed a substantial lower part of the cross-slab on the west side of the chapel ruins (Illus 5.10.9b, c; James 2005, 97–101; James et al 2008, 27–74; see also Chapter 2, p 29). This 'stump', the original base of the monument but minus its tenon, was in situ in a pit supported by packing stones, including one half of a notched collar stone (Setting 2). An earlier setting (Setting 1) was located 30cm east of the first and took the form of a pit containing massive packing blocks. A second notched slab, likely to be the other part of the collar stone (032) was found 2m away on sand that gave an OSL date in the twelfth century. On this basis, the excavator concluded that the monument had been originally set within a paired collar stone (Setting 1) supported by large blocks and edged with kerbstones (James 2005, 100; James et al 2008, 40–9). Although there was no direct dating for this first setting, it was assigned to the Pictish period on the basis of seventh- to ninth-century radiocarbon dates on associated charcoal and two early burials to AD 680–900 (SUERC-9141, GU-13807) and AD 680–890 (SUERC-9142, GU-13808) (James et al 2008, 46–9, 358).

At a given moment, the tenon had broken and was rotated, the collar stone was smashed 'with a hefty blow' and the slab fell (James et al 2008, 44–6). The slab, minus its tenon, was then re-erected and reset in a pit packed with blocks and thin flat slabs (Setting 2; ibid, 50–2). OSL analysis of sand (042) beneath a discarded piece of collar stone (032) gave a date in the early twelfth century: AD 1100 ± 70. Sands associated with the lower portion (the stump) also gave dates in the twelfth century: AD 1120 ± 70 (016) and AD 1140 ± 70 (019) (James et al 2009, 344–5). The chapel is likely to have been constructed at this time, the late twelfth century (or in the thirteenth century, ibid, 55). Human burial (re)commenced at this point. A layer with fragments shaved from the face (007) gave an OSL date in the late sixteenth century: AD 1570 ± 25 (ibid, 345). Large amounts of chippings were recovered from the area.

This sequence complements that at Portmahomack, suggesting there was a Pictish foundation at Hilton beachside within a time span equivalent to Period 2 (the long eighth century). The cross-slab, a highly individual and prominent investment, was erected there in the late eighth or early ninth century. It was thrown down by force sometime in the ninth to eleventh century (Period 3), and then re-erected, minus its tenon in the context of a revival of the twelfth to thirteenth century (Period 4). Subsequently, the re-erected cross-slab was desecrated between the late sixteenth and late seventeenth century and discarded by the early nineteenth century. Over the millennium, the people of Hilton certainly visited their vacillating loyalties on this unfortunate piece of stone (cf Jones in James et al 2008, 232 ff).

A replica of the Hilton of Cadboll upper stone was initiated by Jane Durham in 1994 and a tender obtained from the sculptor and stonemason Barry Grove in 1997 (Carver 1998b). Barry Grove carved one side of the recumbent stone while it was housed in a shed at Balintore, copying the extant reverse side of the monument

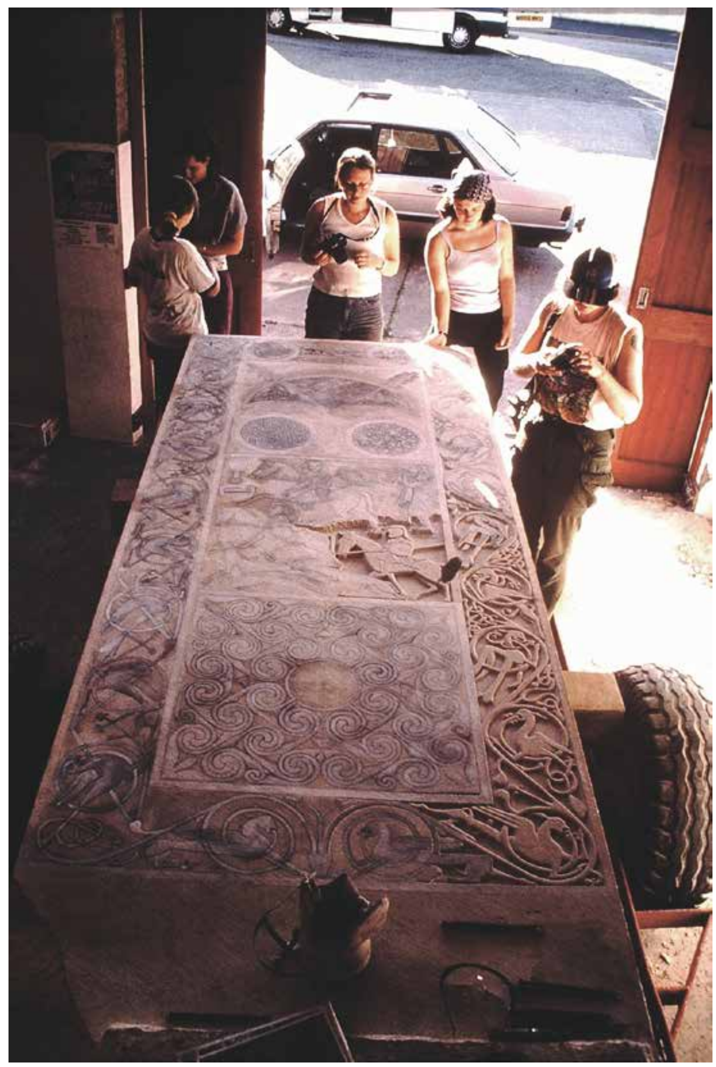


Illustration 5.10.10
Students visiting the salmon shed where Barry Grove carved the replica of the Hilton of Cadboll cross-slab

as it was then known (Illus 5.10.10). This took fourteen months in 1998–9, after which the stone was erected at the west end of St Mary's Chapel. Subsequently (2003–5) he was commissioned to carve a cross on the obverse side, following a design of his own making, but making use of pieces recovered in the 2001 excavations (Illus 5.10.10; James et al 2008, 254). All the pieces are in the care of the National Museums of Scotland, but at the time of writing the upper Hilton cross-slab has yet to be reunited with the excavated stump which has been claimed by members of the local community and is held in the Seaboard Memorial Hall.

The upper part of the Hilton stone measures 2660 × 1400 × 240mm and contains two panels framed at the sides by inhabited vinescroll and at the base by spirals. The upper panel contains a double disc and Z-rod symbol above a crescent and V-rod, inlaid with spirals and fret pattern. Below are two isolated discs containing knotwork. The lower panel features the famous scene of a horsewoman accompanied by a man with a big nose (largely hidden but riding beside her), two armed horsemen, two trumpeters on foot, two hounds and a deer. A symbolic mirror and comb are placed in front of the lady's horse. The base stone measures 850 × 1400 × 210mm and features on the back face the continuation of the vinescroll frame, and on the front face a stepped platform for a cross ornamented with fret pattern and zoomorphic interlace. It can be deduced that the cross-slab originally stood 3.5m above ground level, and that the base was at least 30mm thinner than the upper part – actually more since the upper part had been trimmed.

The vinescroll on Hilton is very close to that on TR1 and the zoomorphic ornament on the base is strongly reminiscent of the Gandersheim Casket – Mercian work of the eighth century (Henderson & Henderson 2004, 42, 73, 113). The iconography of the hunting scene is seen by the Hendersons as deriving from Classical exemplars, such as the Sasanian lion hunt, perhaps as depicted on a Roman sarcophagus (Henderson & Henderson 2004, 128–9). As such it is a 'literary construct not a literal account', not so much a hunt as a parade, symbolic of the good life and good leadership, rather than evidence for secularity or a conjunction between church and state: 'the tension is there, but it is between the ethos of a heroic past being transferred into a Christian present within an art form' (Henderson & Henderson 2004, 128–9). The woman could certainly be the person who is celebrated: Boniface thought a mirror and comb were gifts fit for a queen, so the Hilton figure echoes the queen of Carthage who rides out with horsemen and hounds, her purple cloak clasped by a gold fibula as described in *Aenead* Book IV (ibid, 128–9; Bede II.11). For Meyer, the Hilton lady is taking part, more specifically, in a wedding parade (Meyer 2005, 168). In spite of the highly realistic depiction of horses, hounds, weapons and trumpets, the preference has been to treat the scene as richly allegorical, the soul seeking Christ, 'as pants the hart for the cooling stream', or the 'majestic rider' parading to his (her) celestial home (Goldberg in Clarke et al 2012, 152–5). The subject-matter depicted on the front face of the slab is not known in detail, but featured a cross on a stepped base. One of the scenes flanking this cross might have alluded to the expulsion from paradise, as suggested by a fragment among the trimmings, which featured an angel following bare legs (Henderson & Henderson 2004, 152).

Discussion

It can be inferred that the Tarbat peninsula in the eighth century was a major maritime crossroads with at least four havens and one, or possibly two, portages. It connected waterborne traffic between north and south, and between the east coast and ultimately via the Great Glen to and from the Irish Sea. The landmass of the peninsula is not large, but it is varied and fertile (see Chapter 5.8). Those three areas that feature a concentration of Iron Age burial and have the best landing places are also the sites of the major Pictish monuments: at Portmahomack overlooking the Dornoch Firth, at Hilton and Shandwick overlooking the Moray Firth and at Nigg overlooking the Cromarty Firth (Illus 5.1.2). All the monuments appear to have been erected within a few decades of each other, in the period AD 750–800.

One or two observations may be advanced on the eighth-century peninsula, pending its further research. The crosses were erected as the monastery at Portmahomack was nearing the height of its achievements in the later eighth century, at places corresponding to the points of entry into the peninsula from the sea. This suggests that territory is being marked, and that the territory in question is that of the monastic estate. Since each cross stood near a haven it would be logical if each had a role in helping mariners to find it, that is, as a seamark. Such a function would be most effective if the cross-slab was skylined, as viewed from a boat. This would work well for the original positions proposed for Portmahomack, Nigg and Shandwick, especially if the stones were coloured (Illus 5.10.1).

The economic, political and spiritual purposes of marking the landscape in this way have been demonstrated by studies on the Dingle Peninsula and Inishmurray (Ó Carragáin 2003a; O'Sullivan J & Ó Carragáin 2008). Prime beneficiaries would include pilgrims who might know little of the place, other than by reputation, and would be glad of navigational guidance. But the marking-out signified more than landownership or haven-finding, since these elaborate monuments also acted as signposts to the ritual geography of the landscape. They might also have supported internal perambulation (as at Inishmurray) where each acted as a station in a devotional and penitential round (ibid, 329).

In this event it would be expected that the cross-slabs would have a strong spiritual message, and the iconography makes this very clear, through the prominence of the cross and the citation of the monks Anthony and Paul at Nigg, King David also at Nigg, a possible Daniel at Portmahomack and numerous allegorical references to the teaching of the Old Testament at all four (see the deductions by Henderson and Henderson, Meyer and Goldberg above). At the same time the 'secular' character of the scenes on Hilton and Shandwick has been discussed, and the gigantic undertaking of the carving and erection of such monuments has been seen as inevitably requiring the sponsorship of a royal power. The discussion on the economy in Chapter 5.8 offers a counter to this latter idea: monasteries were uniquely placed to accrue large amounts of capital which could be dispensed *ad maiorem dei gloriam*, for the greater glory of God. The reality of the scenes might be explained as tutelage re-encoded from Roman Christian or Roman Classical sources (Henderson & Henderson, above), but there is undoubtedly an indigenous character in the riders

(Hilton) and fighters (Shandwick) that demands further analysis (Alcock 1993; Carver 1999b).

Given that these monuments were erected at a similar time, in a similar style, for a similar purpose, but are different in content, they do not appear to be the work of a secular patron, and their locations endorse a role in devotional perambulation. Four of the monuments carry Pictish symbols, and a fifth, a Latin inscription (Illus 5.3.44, above). It has been suggested that the symbols represent names (Samson 1992), an idea that receives some endorsement by the similar positioning of the Latin inscription of Cross C and the Pictish symbols on Cross A at Portmahomack. In most cases these names are proclaimed as prominently as the cross, though on the other side. The persons commemorated would therefore be acceptable as holy persons, and the scenes that accompany them as scenes from their lives (Carver 2008a; c). These 'hagiographies in stone' may refer to the better known members of the heavenly hierarchy (Columba, Mary, Martin, Peter, Andrew), but there is an attraction in supposing that, in this case, local saints are being cited. This is implied in the first place by the use of Pictish symbols to spell out the names and in the use of 'clips' that do not immediately map on to known lives or recall existing iconography. The use of local saints, even if long dead or semi-legendary, is in accordance with the tradition-seeking agenda of new religious regimes in the later first millennium (cf the Mercians celebrated by Æthelflæd in her ninth/tenth-century church dedications: Carver 2010b, with references). Naturally the celebration of local saints does not preclude a celebration that uses both allegory and familiar artefacts.

The whole peninsula was a body of sanctity with its beating heart at Portmahomack. There were key touchpoints at the principal places of access, each long settled and commemorated by burials from at least the Iron Age. The major monuments, seamarks manned by saints, celebrated local holiness with equal status. Each acted as a station on an itinerary that beat the bounds of the estate, while bonding the community, advancing its project and welcoming visitors. Each no doubt had a cemetery, perhaps for laypersons: head-box burials have not been reported, although they may not have been recognised. Such a community, not actually on an island but occupying the nearest thing to an island on the north-east coast, probably had a wide catchment that included neighbouring monasteries. We can assume that its mission would have been known, understood and respected in Inishmurray, Iona, Whithorn and Jarrow.

5.11 The Raid

The end of the monastic experiment is clearly marked in Sector 2 by an extensive fire over the northern workshops, and the deposition of freshly broken sculpture. Evidence for a widespread conflagration was identified in the form of discontinuous spreads of brightly coloured scorched sand, burnt stonework and charred organics, including oak timbers, wattle, possible thatch, heather

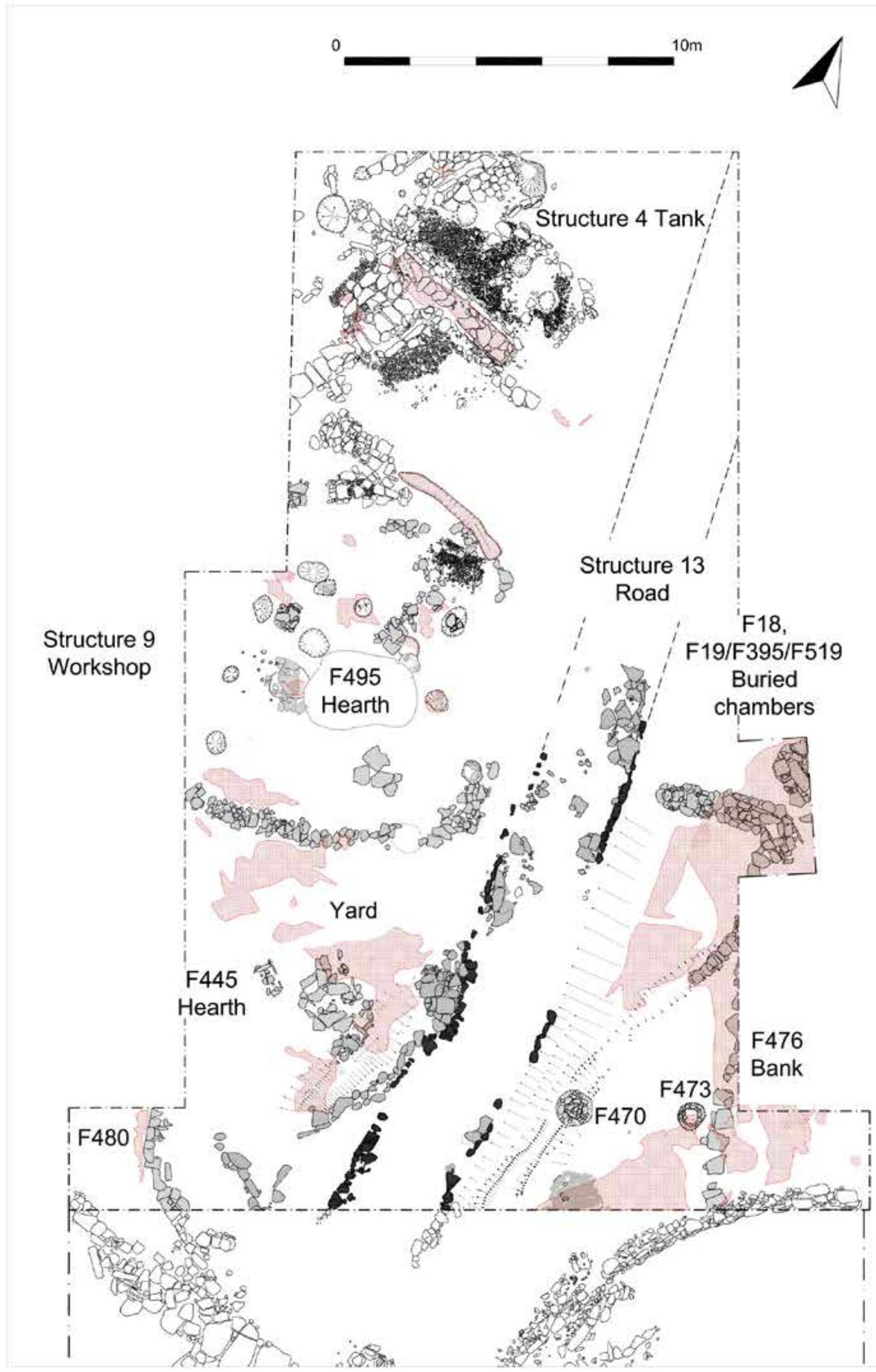


Illustration 5.11.1
The extent of the primary burning

Illustration 5.11.2
Examples of primary burning: (a) adjacent to the eastern boundary wall, context C2704; (b) detail of charred woven wattle within C2704

Illustration 5.11.3
Examples of broken and discarded sculpture in situ: (a) above primary burning on the east side of the road in Int 14; TR74 is visible (b) at the west edge of the pond, TR257. Although found in different places, TR74 and TR257 probably belonged to the same monument (Set 1; Digest 5.1)

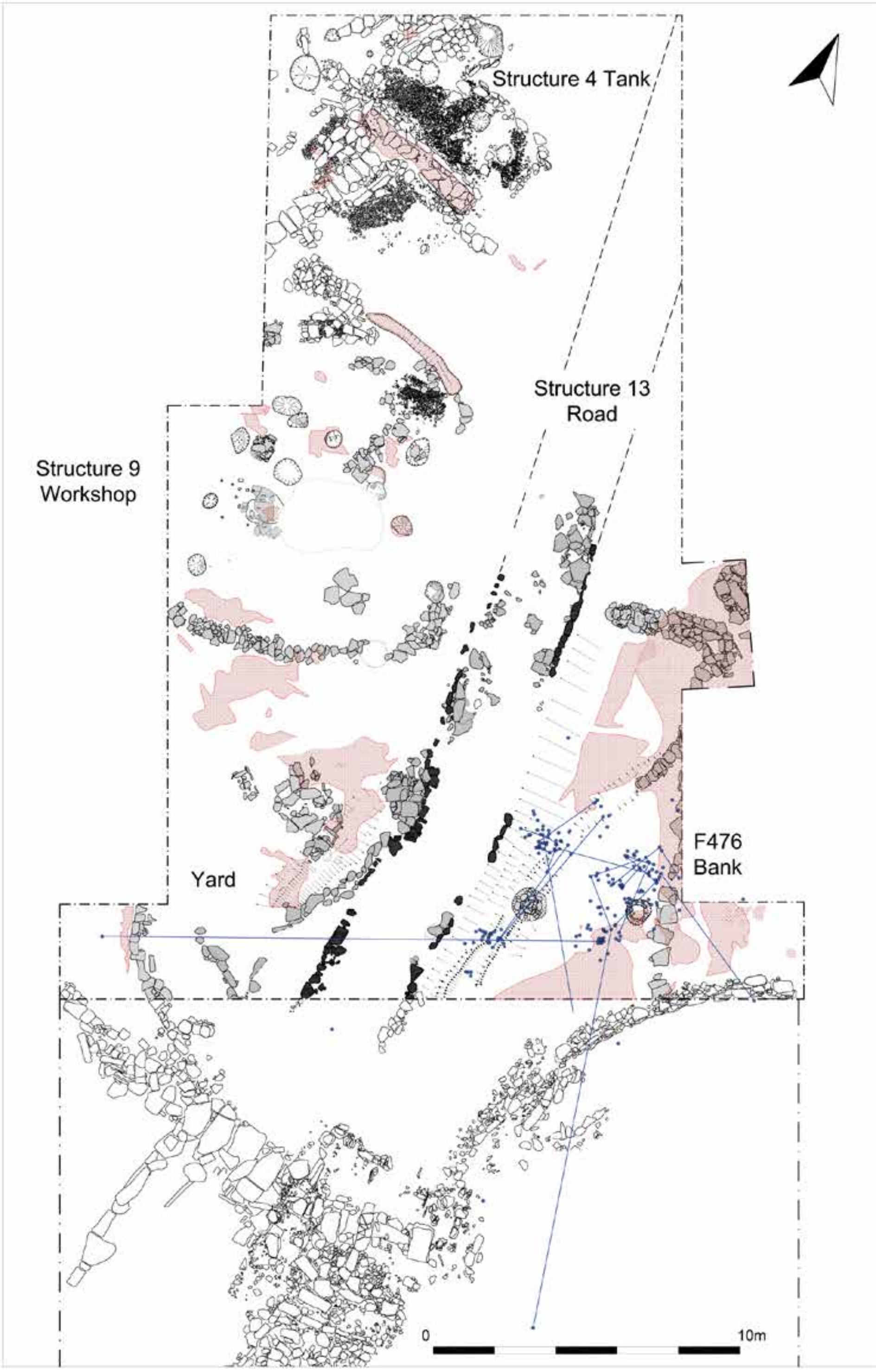


Illustration 5.11.4
Distribution of sculpture fragments

and turves (Illus 5.11.1). These layers and spreads of burning were labelled *primary burning* during excavation, and the term is retained here. There follows a short tour of the damage.

There was no evidence for primary burning on the *road surface* but scorched sand was recorded on the western shoulder of the *western roadside ditch* with small lengths of charred planks. A layer of primary burning was draped within the *tank* (S4), after which it was covered by a layer of windblown sand. The final fill of the hearth (F495) in *workshop* S9 was reminiscent of the burning found elsewhere and the nearby working stance (F512) was marked by burning. The latest fill of gulley F31 consisted of very similar material and would also appear to have been open as a feature when the fire occurred. Three post-holes belonging to S9 were associated with burnt deposits. A squared post-ghost was identified in the pre-excavation plan of post-hole F508 as a charred line, suggesting that this post was extant and at least partly burnt during the fire. Post-hole F518 was also associated with a patch of primary burning and so was the final backfill of post-hole F523, which contained frequent charred rods of wood. Two spreads of primary burning were identified over and to the immediate north of wall of S9, F434. This wall was later covered with a windblown sand deposit that included the skeleton of a dead seabird. Elsewhere smaller spreads were identified in or near the S9 building consisting of bright white, yellow and pink compacted ash with a component of charred organic building material, possibly roofing or flooring material, such as rush or thatch. Within the S9 *yard* a small strip of primary burning was identified to the immediate west of wall F480 and overlying the yard surface.

Good evidence for destruction by fire was recorded on *the east side of the road*, where burning appeared to have been particularly intense over the stone-built features (Illus 5.11.2). Burning was detected in large swathes over extant surfaces as far south as the foot of the *eastern boundary wall*, preserving a variety of charred organics including possible heather rope and collapsed woven wattle. Here the stonework tipped sharply to the north and showed signs of heat reddening and blackening. To the immediate north of the wall was a charred wattle hurdle F483 and a consistent spread of disordered charcoal lumps reminiscent of hurdle poles. A burnt stake was thought to be part of a hurdle. Several plough pebbles were recovered from the area of the boundary wall, many of them sooted. They are thought to be derived from turf used as bonding for the boundary wall (p 96). A 'turf bonding material' was recorded in the immediate locality of the wall (C2737).

Broken sculpture

A total of 230 fragments of smashed sculpture was recovered from Period 3 and later deposits (Illus 5.11.3), by far the majority from spreads of rubble to the east of the road (C1510, C1547, C2701 and C2537; Chapter 5.3). The breaks were generally fresh, implying the use of a heavy tool such as an axe or sledgehammer. Many of the fragments conjoined, including those in the dump within eastern roadside ditch (F180), signalling a common source and a contemporary deposition (Illus 5.11.4). Cross-joins between TR217, 223 and 263 provided a critical link between Period 3 activity to the east of the road and dumping of a rich craft-working deposit to the west of the vellum-yard wall F480 (see Illus 5.3.30). Conjoining parts of the 'Calf Stone' TR28/35 were reused as the lining and cover of a Period 3 culvert (F166; p 134). This indicates that the deposition of the sculpture was part of a clearing up and levelling operation after the raid, as the site was being made ready for redevelopment. Since most of the ornament was crisp and bore traces of pigment, and breaks were fresh the pieces should have been deposited not long after it was made, thought to be in the late eighth or early ninth century (Chapter 5.3, p 165).

In Sector 1 to the south, the raiders did not set fire to S1, although metalworking ceased and the transmogrification of the building into a kiln barn indicated a change of emphasis towards farming in Period 3. On the hill, it is likely that four major monuments were broken up at this time and were reburied or remained in the churchyard (Chapter 5.3, p 123). The church, if it existed, is likely to have met a similar fate (Chapter 5.4).

Date of the raid

The date of the raid is argued from stratigraphy, finds and radiocarbon dating (see Chapter 3, p 34). The stratification was strong in Sector 2 where the primary burning provided a clear and broadly contiguous horizon, separating features related to

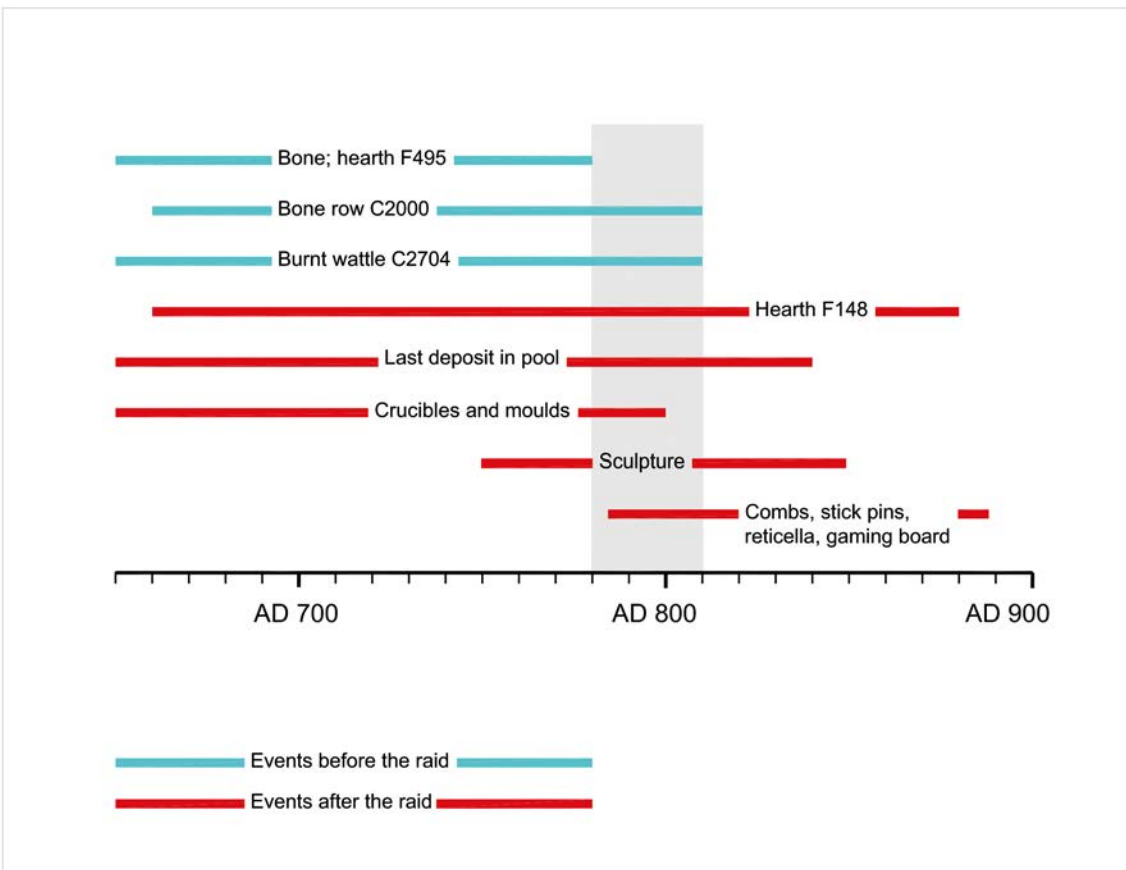


Illustration 5.11.5
Diagram of date ranges supporting the argument for a raid between AD 780 and 810

parchment-making and butchery from the dumped carved stone and then the metalworking industry that followed (Period 3, Chapter 6). The time interval was stratigraphically very short, with no trace of a hiatus. The objects that lay on the burnt surface indicate that the event should have occurred both no earlier and no later than the late eighth or early ninth century. A porcupine sceat from a Period 3 pit (F185) was redeposited from layers associated with the Period 2 road S13 (Digest 6.2). The coin dates to *c* AD 715 to 735, so the raid should have taken place after that. The pieces of sculpture dumped in the northern workshops are very fresh, the latest typologically dated late eighth or early ninth century (see Chapter 5.3, p 167). The metalworkers of Period 3 used crucibles and moulds that occur elsewhere in contexts usually dated no later than AD 800 (p 267). Other objects, including combs, a fragment of reticella vessel and a gaming board were deposited soon after the fire at a date likely to fall in the ninth century or later (Chapter 6, p 262). A copper-alloy stick pin was dropped just before the burning took place and two others were found in the latest levels of the pool. These were of a type considered to be current at the 'time of the Viking raids' (Chapter 6, p 262). The expectation from cross-dating with other sites is that the raid should have occurred towards the end of the eighth century, or at latest in the early ninth.

Direct radiocarbon dating was weakened by early dates (fourth to seventh century) taken from burnt old wood likely to have been cut centuries before or used in earlier construction (Chapter 5.9). The stratigraphically latest events in the workshops of Sector 2 before the fire were the last use of the hearth in the yard (F445), the bone pegs lined up there (F393), butchered bone (C2335) and the last use of the hearth in S9 (F495). There was 95% radiocarbon certainty that these had been deposited before 770 or 780. The latest reliable Period 2 radiocarbon limit seems to be 810 from a cattle metapodial in the yard (C2000/S-13271) and the same date from a piece of burnt wattle on the boundary wall (C2704/S-13275) (Table 3.1, p 69; Digest 3.3). Hearth F493 and its successor F148 were constructed by the eastern boundary wall immediately after the fire. These formed the vanguard of the Period 3 metalworking industry. The radiocarbon date put the last use of F148 before 880. Taking these outer limits as indicators implies that the fire should have happened before 810 and life after the fire should have restarted before 880. Since there was no indication that the workshops had been long abandoned before the fire struck, the terminal date of 780 is significant: the last use of the principal hearth and the latest preparation of bone pegs must have occurred before then, but not so long before as to invalidate all the dates of artefacts, including the sculpture and the sceat (715–35).

There was no stratigraphic hiatus in the cemetery (Sector 4), so burials made before or after the raid cannot be surely separated. Assuming they were broadly contemporary, the three latest burials attributed to Period 2 or the first phase of Period 3 share the years between 780 and 900 (Burials 158, 152, 147); two of these were injured by blade wounds and one died of them (see Chapter 6, p 281).

There were patches of windblown sand over some areas of the workshop (see above), but the stratigraphy in general related a rapid transition and a change of use with no interval of abandon. There was continuity in the cemetery, a redesign and reuse of S1 in Sector 1 and, in Sector 2, the metalworking began immediately over the layers of the fire. Bayesian analysis computes an interval of between five and 150 years after the fire, though possibly half that (Hamilton in Digest 3.1). However, even an interval of seventy-five years is challenged by the Sector 2 hearth F148, which was installed directly after the fire and used the eighth-century metalworking apparatus of the monks to initiate the Period 3 industry. A radiocarbon date likely to refer to its ultimate stoking – 660–880 at 95% confidence (SUERC-13281) – suggests that it had been used and disused before 880.

Illus 5.11.5 shows the date spans provided by radiocarbon and by artefact typology, coloured blue where they relate to deposition made before the raid and red when made after it. The raid and the intervals before and after it are reckoned to be of short duration. Reconciling these factors places the raid between 780 and 810 (in grey). This band defines the interval in which the date ranges of materials stratified before and after the raid can overlap. Naturally there is elasticity in this model, but the window of thirty years helps the different data achieve an equilibrium.

Conclusion

Scandinavian raids are reported in documents from all over east and north Britain and Ireland, ranging from 787 at Portland Bay, 793 at Lindisfarne, 794 at Iona, 795 at Rathlin in Ireland, and continuing on and off for the next forty years. Thus there is plenty of context for a raid at Portmahomack in the late eighth/early ninth century, even if no documented record of the event has survived. Although Ragnall Ó Floinn rightly warns us against attributing every outbreak of fire to the Vikings (1998, 98), in the present case the raid was rather more comprehensive and the Viking Norse are seen as the probable protagonists. The conflagration and the break-up of monuments fit well with the politics of the early Norse campaign, but the archaeology gives less status to the event itself than to the economic changes that followed the raid. Whatever its exact date, it marked a radical change in the character and activity of the settlement, one which might be portrayed as its transformation from a monastic to a trading mode. This is the subject of Chapter 6.

Chapter 6

Trading Farm (Period 3, *c* AD 800–*c* AD 1100)

Introduction

The cultural disruption that marks the passage from Period 2 (eighth century) to Period 3 (ninth to eleventh century) was clearest in the area of the *northern workshops* (Sector 2; Illus 6.1). Here the majority of timber and turf structures were destroyed by fire and the area was then levelled with rubble including broken lumps of sculpture at a date argued to lie between AD 780 and 810 (*The raid,* see Chapter 5.11). After a short interval, (perhaps less than five years), the area was back in action, but in a new guise. The road (S13) was resurfaced with pebbles (F18). The pool (and the bridge) continued to function, at least to begin with. Vellum-making was not resumed: the new activity here was the production of non-ecclesiastical objects in silver and copper alloy, embellished with glass. This industry was short-lived: the toolkit was not augmented beyond that already known in the eighth century and radiocarbon suggests a terminus before 880. The definitive cessation of Period 3 metalworking is marked by the burial of a complete but dismembered cow (F304). The cow burial, radiocarbon dated to AD 820–1020 was sealed by a grey sandy soil C1121 that also sealed pebbled road F18, suggesting the latter had fallen out of use before the early eleventh century. A consideration of the finds associated with the metalworking venture in Sector 2 suggests it endured over a maximum span of late eighth to early tenth century.

In the south field (Sector 1), *S1* was refurbished, provided with an upper floor and a flue and is thought to have now functioned as a kiln barn. The new barn seemed destined to endure: the S1 flue was last used at a date between 1020 and 1210. A superficially similar but smaller and incomplete version of this building (*S5*) was also used to dry grain. The last use of the hearth in S5 occurred before 900, and its associated ditch was filled before 1030. The enclosure ditch *S16* (F132/158) had become choked with vegetation before 940 and one of its neighbouring drains (F18) was defunct before 1020. In the cemetery on the hill where the church now stands (Sector 4), burial continued, if intermittently and in small numbers, following the earlier tradition into the eleventh century. A hoard of ring silver was deposited on the north side of the burial ground in *c* AD 1000 (see Chapter 2, p 16).

The destinies of the three sectors were different, but there is a case for seeing Period 3 as being divided into two main stages. In the first of these (3A, 780–900), the metalworkers flourished, the road was resurfaced, the pool contained water, and barns and driers to support cereal cultivation were built to the south. This community continued to bury its dead in the old monastic burial ground with traditional rites. The artefacts offered no obvious cultural affiliation, Pictish, Norse or Scots, and there were few signals of monastic or even Christian alignment. In the second phase (3B, 900–1050), ditches and pool dried up and the road was finally redundant. Burial occurred spasmodically over the cemetery. A silver hoard buried near the cemetery in around AD 1000 was not retrieved. The written evidence demonstrates that both the resurgence of Period 3A and the bleak silence of Period 3B took place against a turbulent background: the Tarbat peninsula was in a war zone (p 341). It was probably not until the mid-twelfth century that Portmahomack revived with the building of St Colman's parish church (Chapter 7).

Redevelopment in Sector 2 (Illus 6.1–4)

Recovery

The initial activity following the fire was a deposition of spreads of sands and stone rubble covering the destruction horizon. The rubble spreads included 230 fragments of identifiable sculpture (including simple plain-faced fragments) in one instance reusing a relatively large fragment as packing for a sandstone slab surface (Chapter 5.11, Illus 5.11.3). This dumping of hard-core had the effect of drying out the ground formerly drained by the roadside ditches. The road itself (*S13*) was resurfaced in small, well-sorted pebbles, spilling beyond the stone kerbs (F18), the maintenance of the route implying that the bridge remained in service (Illus 6.3). Some areas of the original roadside ditches became partially backfilled but nonetheless visible. The eastern boundary wall was reused in its collapsed state, and the pool continued to hold water, since debris from subsequent Period 3 metalworking was dropped into it.

The culvert that provided the pool overflow (F431) was eventually blocked to within a few centimetres of its roof with a concreted mass of sandstone rubble, pebbles and sand (see Illus 5.5.20). There was no clear indication of how such solid blocking material had arrived beneath the large capstones of the bridge. The verdict is that it was deliberately introduced, possibly to maintain falling water levels. The ultimate fill was identified as in-washed woody material, especially elder, and the beetles recorded in the final fill of the culvert were of terrestrial species, one of which,

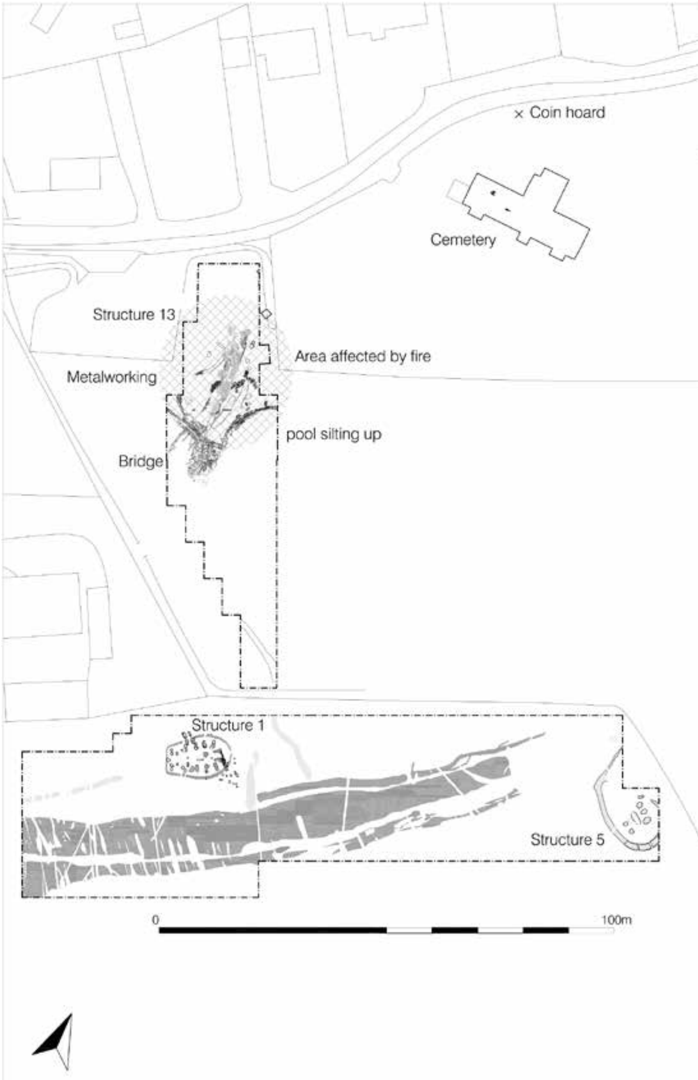


Illustration 6.1
Plan of activities in Period 3

Grynobius planus, is a wood borer and associated with trees (Kenward in Digest 7.4). This suggests that the pool became earthbound and overgrown with elder, as the stream slowed to a trickle.

Dated objects

A group of indicative objects was recovered from layers deposited at the time of the fire or shortly after and should provide a broad domestic signature for the revived settlement (Illus 6.4; Illus D6.1.11; Digest 6.1). A blue glass bead (24/4570) which probably dates to the seventh to tenth century was recovered from the stony disuse of the S7 culvert F432; from a definition layer (C1501) within Period 3 dumps came a fragment of reticella-decorated glass vessel (24/2885) dating to the eighth to ninth century (Campbell in Digest 6.7). Other objects from Period 3 contexts include roughouts for a possible albertite bangle, a cannel coal bracelet fragment and a shale counter or gaming piece (24/2194, 3591 and 4192; Hunter in Digest 6.3). A copper-alloy stick pin recovered from soil spread C1878 (24/4576), which lay immediately beneath Period 2 destruction layer C1662, may belong to a group of pins 'current at the time of the Viking raids' (Laing 2006, 165). Two further examples (24/504 and 527) were recovered from soil layers (C1002 and C1292) in the area of the pool, marking its gradual terrestrialisation. Two fragmentary combs of seventh- to ninth-century date were recovered from grey sandy soil sealing the Period 3 metalworking complex (24/48 and 1548). A further comb side plate dateable to the tenth to twelfth century was recovered over the Period 3 monastic road (14/271) (Ashby in Digest 6.4). From a levelling of Period 2 strata (C2578) came a *painted pebble* (24/6297) of uncertain role. This type of artefact is peculiar to north Britain and the majority of the fifty-five examples noted by 2014 had been found in Shetland, Orkney and Caithness (Arthur & Murray 2014). Those recovered by excavation have been dated to

Illustration 6.2
Dateable objects: (a) comb connecting plate (14/271); (b) copper-alloy stick pin (14/4576)

Table 6.1
Chronology for Period 3 (excerpt from Table 3.1)

DEFINED PERIOD	SECTOR 1 [South Field]	SECTOR 2 [Glebe Field]	SECTOR 4 [Church]	The Tarbat Peninsula
RAID 780–810	 *End: 700–840*	*Burnt workshops* Timber 26/1030 [O-9664] 330-550 (Prob. *c* 800: old wood) Hazel stake F490 [S-13273] 400-570 (Prob. *c* 800; old wood) Wattle on terrace F483 [S-13274] 610-690 (Prob. *c* 800; old wood) *D5*. Burnt wattle 2704 [S-13275] **650–810** Sculpture broken up **after late eighth-early ninth century** *End: 710–780*	*Conjectural victims of raid* Burial 158 [GU-9296] **680–900** [Blade wound, healed] HS Burial 152 [GU-9297] **780–1000** [Blade wound, fatal] *End: 690–790*	
HIATUS *1–5 years*				
PERIOD 3 ninth/eleventh century 3A Resurgence *c* 780–900	*Start: 740–880* *Farming* S1 re-used as kiln barn S5 Kiln barn Disuse of Enclosure ditch F132 [GU-3265, 6, 7] 140-410, 250-530, 350-580 (secondary peat deposit) Last use of S5 Hearth in S5 F13 [S-13283] **680–900** Willow twigs from disuse of enclosure ditch F132 [S- 13286] **680–940**	*Start: 735–965* *Metal-workers* *D6* Metal-working hearth F148 [S-13281] **660–880** *D7*. Latest deposit in pool C4863 [S-14995] **650–840** Crucible and mould typology**, before *c* 800** Culvert F431 blocked	*Start: 720–895* *Cemetery* *B3*. Wicker Burial 147 [O-13485/fish] **720–960**	*The Portage?* *Norse settlement at Cadboll, Arboll, Bindal, Geanies, Shandwick*
3B Abandon 900–1100/1150	Backfilling of tributary ditch F18 [O-9662] **790–1020** Backfill of ditch around S5 [S-13284] **890–1030** Last use of flue of S1, F79 [S-13285] **1020–1210** *End 1025–1250*	Disuse of Road 2: Cow burial F304 [S-13282] **830–1020** *End: 775–1130*	*A5*. HS Burial 136 [S-33406] **970–1040** Burial 156 [S-33411] **970–1040** *C1*. HS Burial 111 [S-33402] **1020–1170** *End: 1025–1175*	*Hoard of ring-silver and coins deposited north of the church in* c *1000*

Illustration 6.3
The resurfaced road (S13, F18)

Hearths

At the south end, the stratigraphically earliest Period 3 feature was a three-sided stone-lined hearth (F493) measuring 0.5m NW–SE by 0.4m NE–SW. An initial remnant of charcoal-rich fill had been cleaned out prior to relining with a sandstone slab. Like all similar hearths at the site, it was subject to careful maintenance and refurbishment. Hearth F493 was succeeded by a second stone-lined hearth F148, which was also made of low stone kerbs (Illus 6.7a). Small lumps of fired clay were found to abut the hearth around its perimeter. The clay-silt fill was laminated, possibly indicating a number of distinct fires. It contained three fragmentary ceramic moulds and droplets of copper alloy.

Close to the western kerb of hearth F148 was an amorphous fired clay lump overlain by two mixed lenses of clayey silt containing high percentages of charcoal, bronze-rich fuel ash and a copper-alloy droplet. Upon excavation it became clear that these represented the disturbed remains of a small clay-lined hearth F479. To the south of F148 was a better defined clay hearth (F353) with a sandstone slab lining and low walls of fired clay, measuring 0.35m north to south by 0.30m east to west (Illus 6.7 b–d; Illus 6.8). Metalworking residues and finds included a bronze droplet, dribbles of cuprous-oxide-rich fuel ash, vitrified crucible fabric and a small undiagnostic piece of iron. Adjacent was a third smaller clay hearth (F484), which appeared as an intermittent circular fired-clay ring measuring *c* 0.25m in diameter. The *fuel* used in hearths (F148, F353) was primarily oak charcoal, with other woods (hazel) and peat used as subsidiary. Calcined bone was found among the clay silts, implying its continued use as fuel in this period.

To the south of the clay hearths was a third stone-lined hearth (F478), which appeared as an arc of sandstone slabs measuring 1.10 × 1.05m. Nearby a small stone lamp or mortar was recovered sitting on the eastern boundary wall (F149; 14/6847) and an iron pricket (for lighting) (14/1394). These hearths were connected by a patchy trample of compacted light olive-brown clayey silt, which contained ash and metalworking debris. A series of dumps and spreads were identified overlying this trample layer, also containing metalworking debris, including crucible and clay mould fragments (contexts listed in OLA 6.2.1, p 47). Finds associated with the debris included a silvered, copper-alloy mount decorated with interlocking C-spirals (14/2134), a Roman carnelian cabochon (24/6452) and a copper-alloy fretwork mount (24/2277) (Illus 6.4; Illus D6.1.12). Some of this material is likely to represent the recycling of pre-existing metalwork.

The northern group of Period 3 features comprised two further hearths and associated scattered features. Hearth F34 consisted of a three-sided stone kerb containing a yellow clayey-silt ash fill.

the Late Iron Age and recovered from various contexts including burial (The Hallow Hill), a decommissioned post-hole (Birnie) and a possible iron workshop (Sandwick, Shetland). A primary origin at Portmahomack within Period 1, 2 or 3 would be equally plausible. Various uses have been suggested, including magical charm or the talisman of a smith (ibid, 7). Painted pebbles, which would make suitable playing pieces, here perhaps imply contact with the northern isles. A stone gaming board with unfinished incised layout (14/3932), anticipated a design of Irish, British or Scandinavian derivation (Illus 6.6; Mark Hall in Digest 6.12). Although a gaming board could have been in use in a monastery (as at Inchmarnock; Lowe 2008, 3), this example was found in a layer (C1660) deposited after the primary burning, in company with a whetstone and should belong with the new initiative of Period 3.

Metal- and glassworkers (OLA 6.2 at 3.4.3)

Period 3 in Sector 2 offered a rare example of metal- and glass-working waste which can be directly associated with a suite of smiths' hearths and working surfaces. The focus of the activity was the area to the immediate east of the road, where a group of clay- and stone-built hearths for metalworking was installed on the area that had been levelled with rubble and smashed sculpture (Illus 6.2). Associated with these hearths were droplets of copper alloy, and crucible and clay-mould fragments, often quite fragmented and recovered from hearth fills or trampled layers. Metalworking waste dumped over the east and west boundary walls, including crucibles and clay mould fragments, are considered to have derived from this activity.

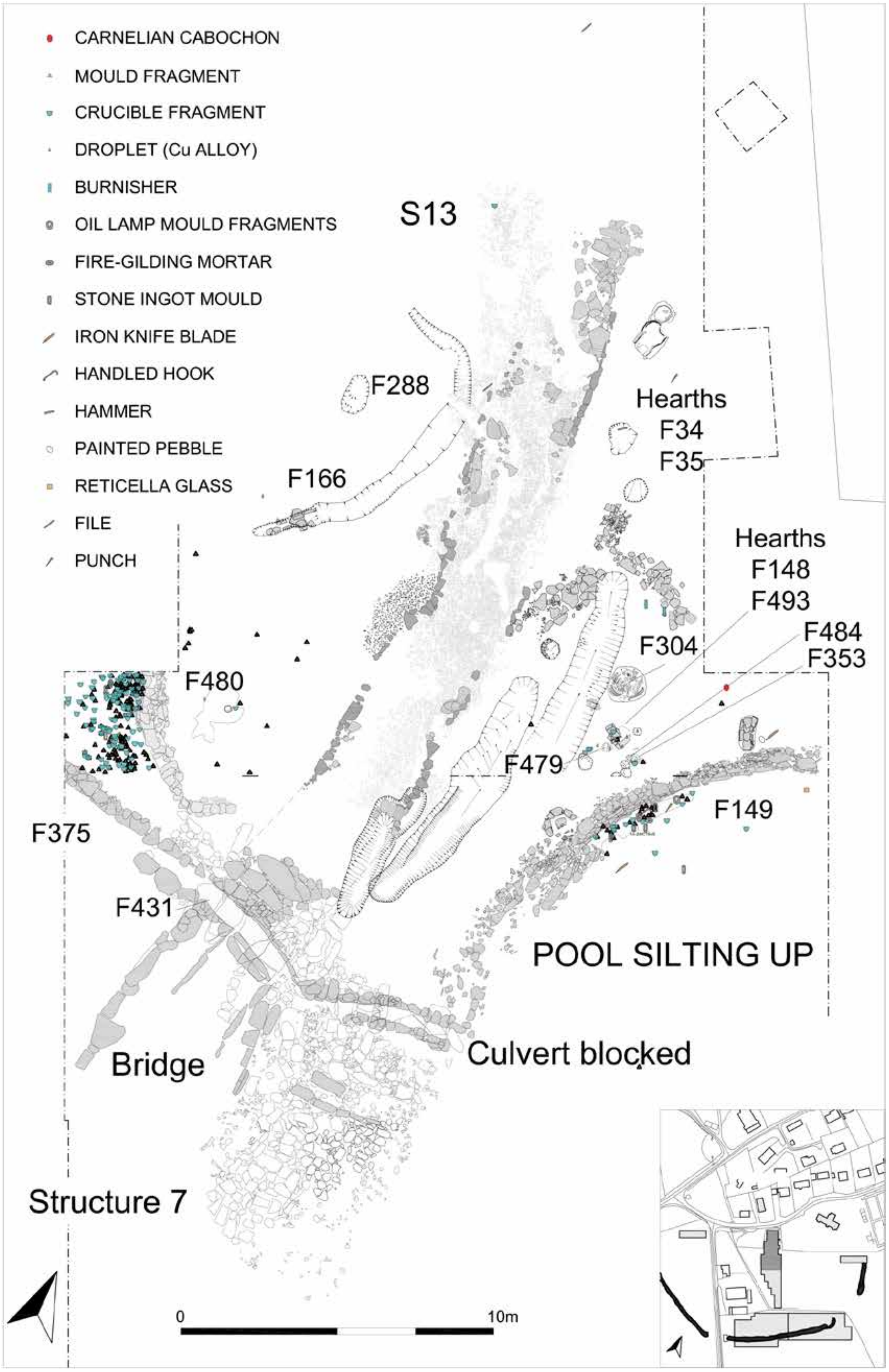


Illustration 6.4
Plan of the Period 3 metalworking area in Sector 2 (north)

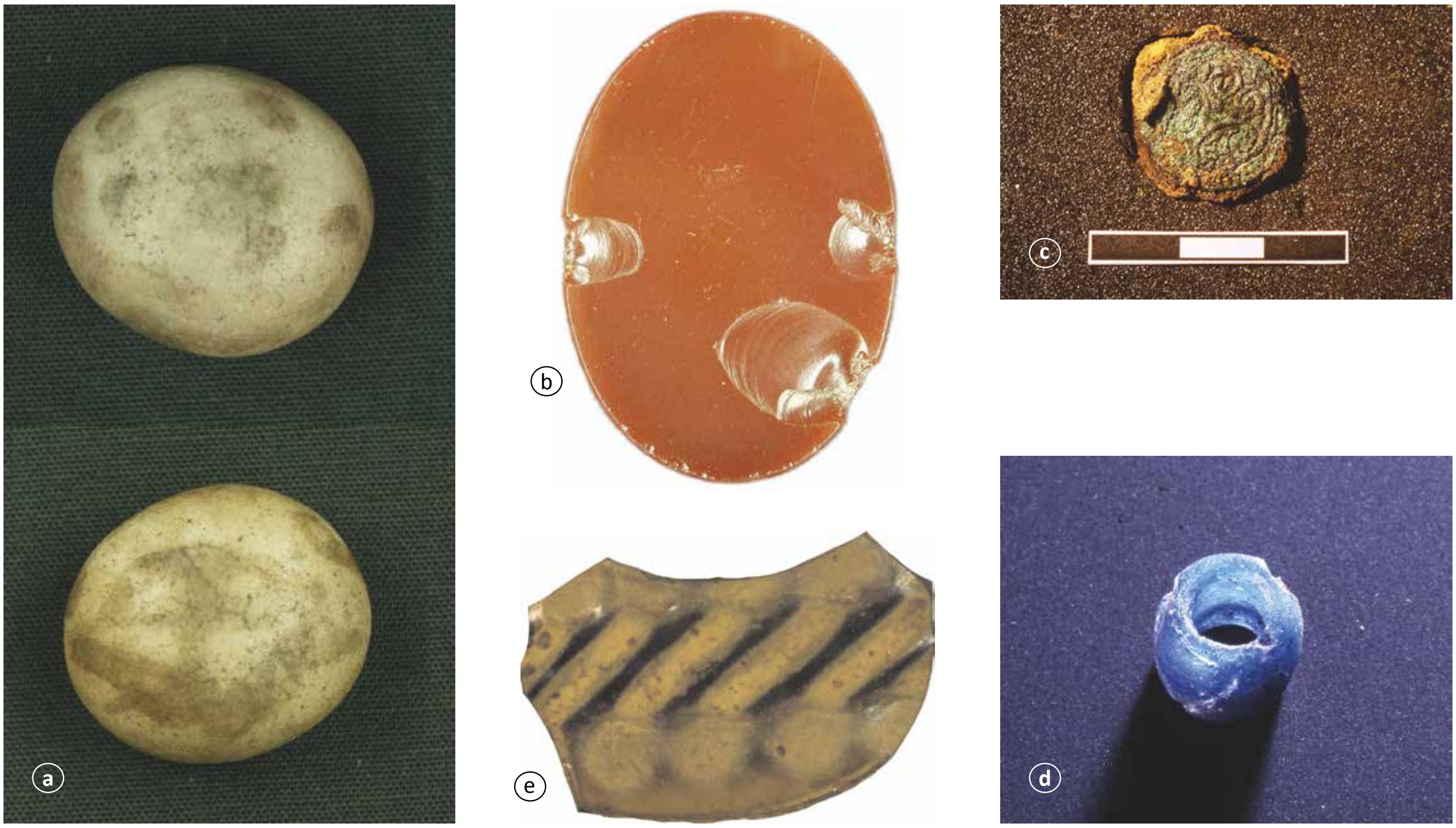


Illustration 6.5
Finds from the metalworking area: (a) Painted pebble (24/6297); (b) Roman carnelian cabochon (24/6452); (c) silver-gilt copper-alloy stud decorated with interlocking C-spirals (14/2134); (d) blue bead (24/4570); (e) vessel glass fragment decorated with reticella trail (24/2885)

Surrounding it was a stone slab surface also covered with patches of yellow clayey-silt ash. To its south-east was F35, a rectangular, partially stone-lined hearth defined by remnants of kerb defining an ash fill. It consisted of a circular platform measuring 0.7m diameter connected to a sub-rectangular platform measuring 1.5 × 0.8m (Illus 6.7).

Period 3 activity to the west of the road was more dispersed but still had metalworking associations. A pit (F288) was remarkable for the quantity of ironworking residues it produced, including 2kg of undiagnostic slag, 0.65kg of hammerscale and 0.1kg of tap slag. The feature is isolated but clearly indicates that iron-smelting and smithing was taking place during Period 3 (see *slags* below). Near it was a culvert (F166) lined and lidded with two conjoining fragments of sculpture depicting a bull, a cow and a calf (TR28/35; Illus 6.9; see also Chapter 5.3, p 146).

The glass and metalworkers' assemblage

Metalworking

Between the western boundary wall (F480) and the north wall of the overflow culvert (F375) a rich assemblage of non-ferrous metalworking debris had been dumped. In the lower deposits, definition deteriorated markedly and the dumping may have taken place in water. The large assemblage recovered from these deposits included 130 crucibles and fragments of crucibles, 177 fragments of clay mould, sixteen stone objects, an assemblage of slag and nine flint chips and flakes thought to represent strike-a-lights. Overall, the assemblage included *crucibles* and *moulds* for casting a wide variety of non-ferrous artefacts, moulds and trays from *glass-working*, a *smith's toolkit* and copious amounts of *slag* (Digest 6.1, 6.5, 6.6, 6.7, 6.9; D6.1.12–20). A fragment of smashed sculpture was recovered from the dumps which conjoins with two fragments from Period 3 preparation deposits to the east of the road (TR217, 223, 263; Illus 5.3.46).

CRUCIBLES

A total of 225 crucible fragments, of which 143 were identified to type, were recovered from Period 3 contexts (Illus 6.10a–d; see also Illus D6.1.14, 15). They are far better preserved than those from Period 2 and more types are represented (for details see Spall in Digest 6.5). Crucibles are identified as Heald Type A, B, a D-Type variant and G (Heald 2003). A total of thirty-four A/B1 type (including probable examples of Type A1) and forty-six A/B2 type (including probable examples, of both A2 and B2) were recorded. A further fifty Type G crucibles were represented along with Type I crucibles, or trays. Radiocarbon dating (see Chapter 3,

Illustration 6.6
Gaming board (14/3932)

Table 3.1) and the dating of the sculpture suggest that the metalworking in Sector 2 may have continued into the early ninth century, which would extend the chronology for Type A/B and Type G crucibles slightly. Not only was the number of crucibles recorded greater than those of Period 2, but the types identified tended to be those with greater capacity, ie Type A/B2 and large G1-types. Analysis of both crucibles and droplets indicate that the same range of alloys was being worked and castings included silver and copper alloys, while the droplets that were analysed were all identified as leaded bronzes.

Clay moulds for casting non-ferrous metals were distinguished among 709 mould fragments, and the objects that had been made were wholly or partially identified (Illus 6.10–13; Illus 6.16–20; for details see Spall in Digest 6.6). These comprised pins, rings, a brooch, buckles, strap ends, mounts and weights. Several valves bore the impressions of *dress pins*, mostly part pin shanks (24/3479, 3486, 4030 (double) and 8225). A near-complete lower valve missing the top end and ingate appeared to represent a stick pin perhaps of brooch-pin style (24/4020), while another appeared to be a part pin-head matrix of possible styliform type (24/5411). Three valves appear to relate to *pins or rivets with zoomorphic heads* (Illus 6.10). A near-complete lower valve retains a matrix of pin shank and irregular form head, which is eroded but may have been zoomorphic (24/8138). A complete lower valve matches another lower valve fragment and both appear to have been impressed with the same model (24/4574 and 4579).

Moulds for rings included five clear examples of *finger rings* with integral cast bezels which formed simple decoration either as a small group of lobes (24/4573, 5410 and 8360) or triangular (24/8121 and 24/8342) all closely paralleled at the Brough of Birsay (Curle 1982, 32–3) (Illus D6.1.17). Eleven simple ring matrices were also identified and probably belong to finger-ring moulds (Digest 6.1). Several mould fragments point to the production of a large *brooch*. Four valve fragments were found to conjoin to form two valve fragments (24/8180 conjoins 8344 lower and 24/8176 conjoins 8383 upper) and also to unite with each other (Illus 6.11). The fragments were identified initially as a group by the unusual pale pink firing and very fine clay fabric. They can be associated with 24/8228, which bears the part impression of three small possible ring or disc matrices. The conjoining and uniting fragments appear to form part of a brooch hoop with possible facets and, while it is not clear how valve fragment 24/8228 is related, the pieces form a distinct family. The unusual clay fabric and the care with which the mould was made suggest a fine and accomplished high-status product that may well have been composed from a number of separately cast elements. A further lower valve fragment was severely eroded but retained the deeper parts of a complicated, possibly bossed item (24/3598). The fragment bears four depressions, one sub-oval with vestigial fine interlace and neck connecting to deeper sub-circular depression in turn connected by a collared neck to a smaller sub-oval depression with a further separate depression. The exact item intended cannot be clearly identified but the piece could represent an elaborate brooch terminal intended to be fastened to a hoop cast separately.

A group of four similar lower valves bears the impression of a possible small *buckle plate and part tongue*, a simple bar with projecting tab (24/3849, 8196, 8373 and 8295 conjoins 8374). Two further valves appear to bear the impression of small *belt fittings* (24/5348 and 8323). A small group of valves which appeared to be related to the simultaneous casting of simple *strap ends and links* were identified (11/3643; 24/3575, 5417 and 8272). A further valve bore a more complex impression of a tab with raised rim containing a series of lobate impressions and may represent part of a strap end (24/3416) (Illus D6.1.16).

DECORATIVE MOUNTS

One example consisted of part of the upper mould of an escutcheon of possible sub-oval form impressed with the part matrix of a dragon-like creature including its head with open jaws and part spiral limb (24/8200) (Illus 6.13a). This animal form is already known in the Tarbat artistic repertoire being represented

Illustration 6.7
Metalworking hearths (east): (a) stone-lined hearth F148 (b) and (c) clay-built hearth F353 (d) lifting F353

on TR20 and TR205 (Chapter 5.3, Illus 5.3.20, 5.3.29). Two other zoomorphic mounts were detected in the assemblage. Two conjoining fragments of upper valve bear the part matrix of a fish with symmetrical tail, part body and fin defined by parallel ridged decoration (24/8258 conjoins 8337) (see Illus 6.13b). The cast item may have been three dimensional or flat-backed. As the former, the complete item may have been mounted onto a large composite piece of metalwork, perhaps the interior of a hanging bowl or in the latter as an appliqué mount. The ribbed style of decoration is similar to that employed on zoomorphic escutcheons on the hanging bowl from the St Ninian's Isle treasure (Small et al 1973, Bowl No 8). The other zoomorphic mount consists of an upper valve with the impression of a tapering strip with gilled decoration from a central spine leading to possible animal-head terminal (24/8343).

WEIGHTS

A noteworthy group of moulds are so far unique and tentatively identified as for casting copper-alloy weights (Illus 6.14). They fall into two types. *Type A* was represented in nine valves, both upper and lower (24/8195 conjoins 8221, 8086, 8273 and 8130), including four valves that unite to form two near-complete Type A matrices (24/8270 unites to 24/8172 and 24/8319 unites to 24/8292). Type A consists of a shape best described as acorn-like with a pyramidal lower half and small rounded knop, and in the case of Type A sometimes with a circular tab at the top of the knop which may have been drilled through following casting (Illus D6.1.19). *Type B* was represented by eleven valves, again both upper and lower although none could be united (24/8194, 8096, 8140, 8093, 8128, 8222, 8324, 8235, 8094, 8206, 8363). The objects cast in Type B valves clearly represent a very similar type of object with a pyramidal bottom half and a much taller knop without clear evidence for a tab (Illus D6.1.20). A further lower valve with deeply impressed object appeared similar in overall form but was unique in the assemblage (24/8152). This valve bore the impression of an object with a squat sub-cylindrical shaft leading to a bulbous terminal. A possible parallel to the made object (in copper alloy) was found at Lejre in 2009 (Roskilde

Illustration 6.8
Hearths F34 and F35

Museum archive LE OPx22; thanks to Jane Kershaw, UCL, for this information).

These metal weights are among the most powerful signs of a change in direction at Portmahomack towards a more commercial ethos. Examples occur in both copper alloy and lead in England, Ireland, Scandinavia and the northern isles (Kruse 1992; Wallace 1987; Owen 1999). A review published in 1992 located forty-three weights of the ninth to eleventh century in England, the majority from Coppergate, York with a handful from East Anglia (Kruse 1992, Table 1). Types included spheres, polyhedrals, pyramids and discs, some stamped like coins (ibid, 78–84). The dating and distribution of the early English weights coincides in place and time with the Scandinavian occupation of Northumbria and East Anglia in the late ninth to early tenth century. The weights have a varied metrology, standards assigned to different countries being found at the same site. At Flixborough, Lincs, among the four lead cylindrical and three disc weights were alignments to the Anglo-Saxon (3.1g), Scandinavian (4.07g) and Dublin (4.43g) standards (Wastling in Evans & Loveluck 2009, 422).

LEAD WEIGHT

Calculation of the standard implied by the Portmahomack moulds would probably be too inaccurate to be useful, but we do have one actual weight of the period, recovered from the topsoil by a detectorist in Sector 1 (11/4158). This was cylindrical in shape, measured 21.8mm in diameter by 7.1mm in height, and weighed 26.3g before conservation (Illus D6.1.12). The weight indicates it was meant to measure the (imprecise) Viking *øre* (ounce) of 26.5g or 24g (Owen 1999). The heavier ounce is thought to have been used in the earlier Viking Age (Digest 6.13). The best parallels to the Portmahomack weight are two from Scar on Sanday both cylindrical and weighing 26.65g and dated AD 875–950 by association with the boat burial excavated there (Owen 1999, 118, 124; Digest 6.13).

Illustration 6.9
Stone-lined gulley F166 (below) with its sculptural capstone (above), as first revealed

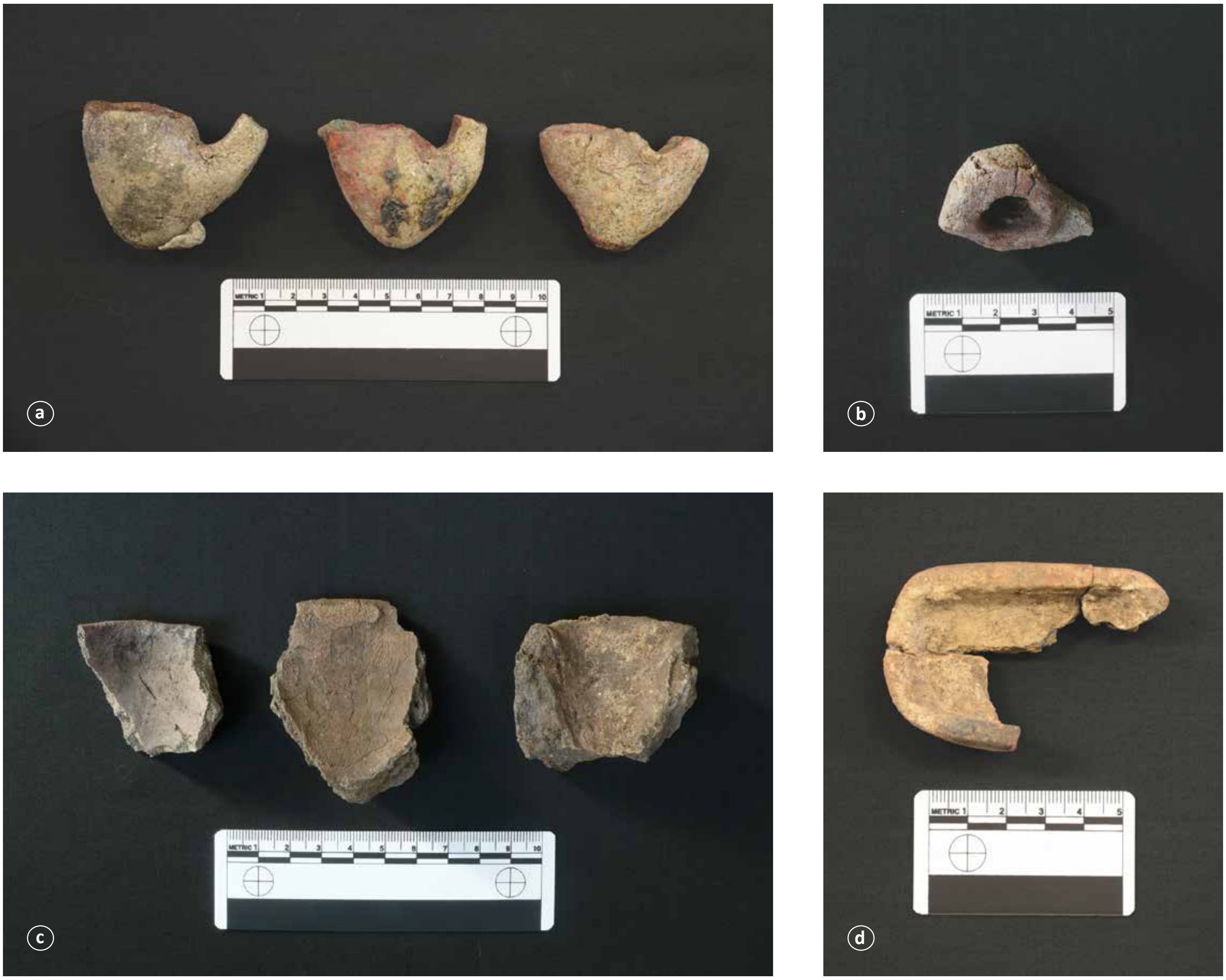


Illustration 6.10
Period 3 crucibles: (a) Type G1 crucibles (right to left 24/4568; 3913; 8089); (b) Small Type G1 crucible (24/8150); (c) Type A/B2 (right to left 24/8298; 8052; 14/3965); (d) Type I crucible or tray (24/4585 conjoins 1612)

OBJECTS WITH TABS

A group of fifteen valves and fragments are linked by a distinctive trapezoidal tab integrated into the object matrix (Illus D6.1.18). The items being cast included small tabbed individual tapering strips (24/8106, 8169, 8174, 8240 and 8371) sometimes paired and united by a single trapezoidal tab (24/5371, 8153 and 8335), tabbed strips with spiral terminals (24/4581 and 8085), and a tabbed strip with T-bar (24/4582). A further three valves could be grouped here since they bore fragmentary trapezoidal tabs (24/4580, 5397 and 8203).

A valve fragment from the Brough of Birsay was identified as having a trapezoidal tab integrated into the matrix (Curle 1982, 35, No 374) and other examples of tabbed matrices can be identified from the site (Curle 1982, 34, Nos 343 and 348). Curle suggested the tab was designed to be folded round another object, which seems a reasonable suggestion, although it does not aid with deciding the purpose of the Tarbat moulds. The production of items of personal ornament including dress pins, finger rings, strap ends and the tabbed items, indicate strong affinities with the technology and in some cases the products of the Pictish level workshop at the Brough of Birsay (ibid).

STONE INGOT MOULDS

Several stone ingot moulds (Illus 6.14) were also present in the metalworking dumps based on sandstone tiles with elongated sub-rectangular matrices (24/3505, 4619, 7840, 4594 and 4618).

Illustration 6.11
Period 3 moulds for pins/rivets with zoomorphic heads (detail) (24/4574, 4579, 8138)

Ingots of this form are present in hoarded material suggesting that the workshop was making metal ingots, probably both in silver and copper alloy, for controlled redistribution. A further mould represented by two conjoining pieces has a circular matrix (24/7846 and 7900). The mould would have produced a shallow disc of metal suitable for hammering into a vessel form such as a bowl.

OIL-LAMP MOULD

A fragmented but complete stone mould was of a kind used to hammer metal into a shaped vessel, in this a case an oil lamp (Illus 6.16a; 24/3503; 4617). It joins the smith's hammer (below) as evidence for sheet-metal working. Two close examples come from early Christian sites, one from Nendrum, Co Down (Lawlor 1925, 135, Plate 10) and another from Garranes, Co Cork which features cross ornament (O'Riordan 1942, 109, Fig 10).

MORTAR, POSSIBLY FOR FIRE-GILDING

A small stone mortar formed from an oval flat beach pebble with a central hemispherical indentation was recovered from C1545 (Illus 6.16b; 24/3502). The indentation is incredibly smooth and only 30mm in diameter by 20mm deep; the quantities ground were clearly small scale. A mortar with close affinities to the Tarbat example comes from the Middle Saxon settlement at Southampton recovered from an early ninth-century craft-working context. It also has a small hemispherical depression and was covered with powdery adhesions which, when analysed by XRF and emission spectroscopy, revealed among other elements the presence of a gold alloy and mercury salts (Hinton 1996, 80–1). Examination of 24/3502 by XRF revealed no traces of gold or mercury (OLA 7.1.6.5). The practice of mercury or fire-gilding is commonly identified in early medieval items from the late fifth to sixth century onwards. In spite of the number of known fire-gilded objects evidence for the actual practice of mercury-gilding is scarce (Spall 2006).

Glass-working

GLASS-WORKING MOULDS AND TRAYS

Glass-working during Period 3 is attested by two open clay moulds (24/5520 and 8020). 24/8020 is a small drum-shaped mould with an eroded oval matrix and may have produced a plain cabochon. 24/5220 bears a geometric decoration based on a tripartite Y-division with stepped arms radiating from the centre (Illus 6.17). The mould would have produced a small stud, *c* 12mm diameter with sunken design, which may have been left plain or been inlaid. The mould reflects the two glass studs recovered from Period 2 and closely matches the size and ornament of the studs on the rear of the Tara brooch.

CABOCHON

A carnelian cabochon without *intaglio* was recovered from dumps of sand over the primary burning and has been dated to *c* second century AD (Martin Henig, pers comm). The gem is damaged having been gouged from its metal setting, which implies recycling of metal rather than intended resetting of the stone (see Illus 6.5a). Reset gems are known in finished items, but examples from

Illustration 6.12
Brooch mould (24/8180, 8344 and 24/8176, 8383)

contemporary craft-working contexts are rarer. Several gems were recovered from excavation in the marketplace at Ribe including carnelian, sard and glass paste gems (Melander 2001). Another, similarly damaged, carnelian intaglio was recovered from a cesspit at the Anglian trading settlement at York (Henig in Spall & Toop 2005). These gems were discarded and rendered unsuitable for reuse having been much damaged during extraction.

Tools

A group of iron tools recovered from Period 3 contexts includes an iron punch (14/1259), two iron files (14/4311, 24/4288), two knives (24/6591, 24/3045), a hammer head (14/2520) and an iron pricket (14/3294) (Illus 6.18; Illus D6.1.13). The *hammer head* was recovered from a Period 3 ash-filled fire pit (F299). It has one sub-square and slightly burred face opposed by a chisel-shaped peen and sub-oval eye for a wooden handle. Small hammers recovered across early medieval Europe are reported as for the working of precious metals, primarily for light, cold working including wire-making, beating out sheet and sheet forming (raising, peening and planishing) and fine chase decoration. Examples are known from craft-working contexts at Hedeby, Sweden (Armbruster 2006, 38), Tjitsma, Wijnaldum, Netherlands (Tulp 2003, 223), Mastermyr, Norway (Arwidsson & Berg 1983, 31), Tattershall Thorpe, Lincolnshire (Hinton 2001, 20), Dunollie, Argyll (Alcock & Alcock 1987, 139) and a jeweller's or cobbler's hammer from Johnstown 1, Co Westmeath (Clarke & Carlin 2008, 80, Fig 4.7a).

TOUCHSTONE

Touchstones assay the presence of precious metal by picking up fragments of gold and silver from the surface of an object and are widely distributed in early medieval north-west Europe (see Ježek 2013 for a recent review). The Portmahomack example is well finished, made of dark metaquartzite and measures 58 × *c* 17.5mm^2 in profile (Illus D6.1.13). It compares well to examples from early medieval contexts including from seventh-century graves in Kent, from ninth- to tenth-century craft-working deposits at Winchester (Moore & Oddy 1985), from Coppergate of ninth- to tenth-century date (Mainman & Rogers 2000, 2497), a possible example from Whitby (Backhouse 1981, 31) and two of fifth- to ninth-century date from excavations of the Frisian terp-mound at Tjitsma, near Wijnaldum (Tulp 2003, 223, Fig 17.2).

The Tarbat stone was submitted for XRF and SEM, undertaken by Jim Tate and Lore Troalen of the Analytical Research Section of the National Museums of Scotland (OLA 7.1.6.5); no traces of gold could be found, although brass alloy was present confirming the object's association with metalworking (Spall 2006).

Ironworking

A total of 109kg of ironworking slag indicated that forging and smelting iron was part of the Period 3 metalworkers' output. Nearly 3kg of tap slag was recorded, showing that smelting was being undertaken, although none could be associated with specific features. A similar quantity of vitrified furnace lining was also present, along with 0.8kg of tuyère fragments including a single, complete tuyère recovered from deposits that made up the Period

Illustration 6.13
(a) Dragon-mount mould (24/8200) and (b) fish-mount mould (24/8258)

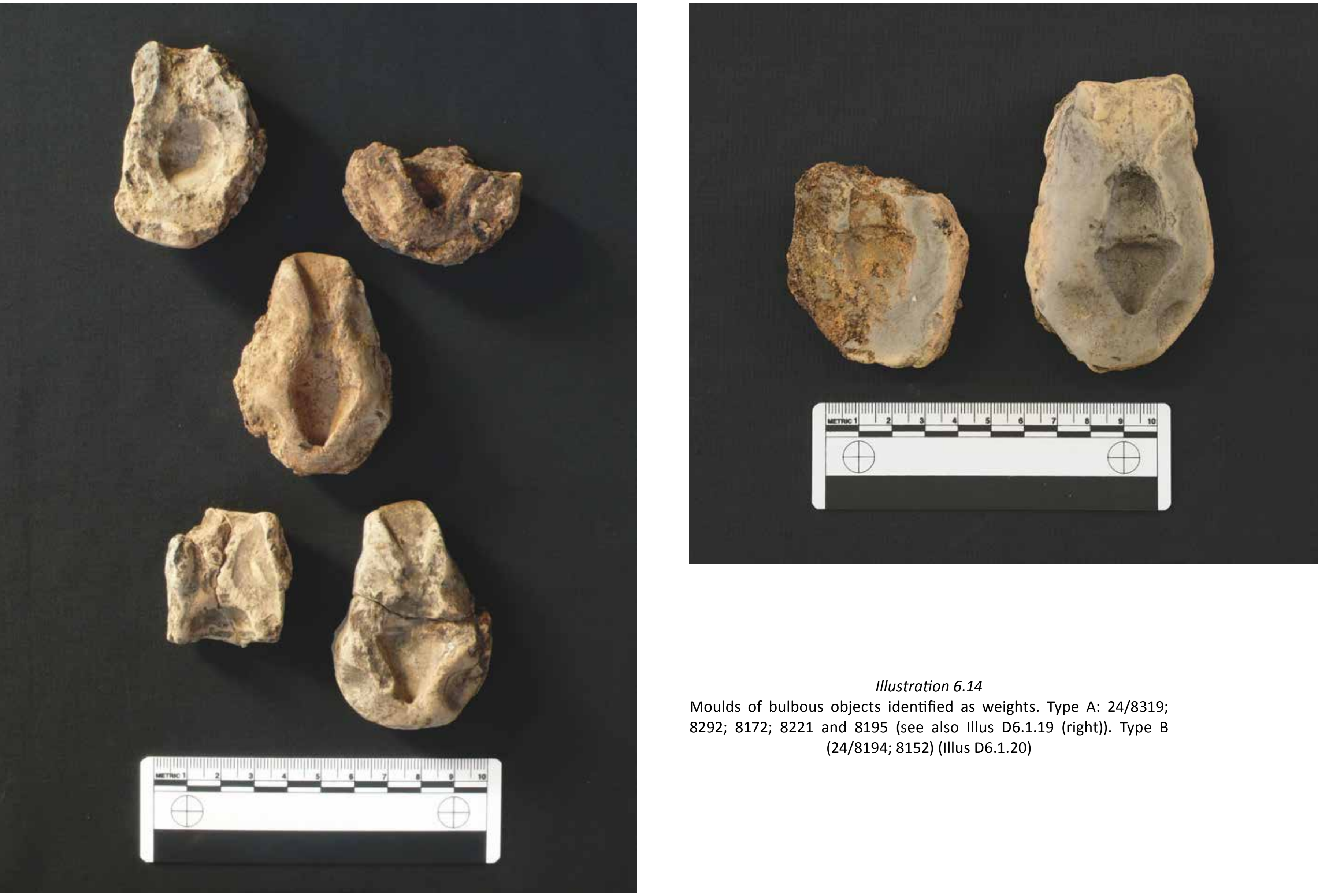


Illustration 6.14
Moulds of bulbous objects identified as weights. Type A: 24/8319; 8292; 8172; 8221 and 8195 (see also Illus D6.1.19 (right)). Type B (24/8194; 8152) (Illus D6.1.20)

3 metalworking terrace. In the excavation as a whole, Period 3 produced the most hammerscale (0.87kg), accounted for largely by a single deposit of 0.61kg from a pit (F288/C1667). The quantity and ratio of 1:10 spheroidal to flake hammerscale (*hs*) signals that fire-welding was taking place nearby. A total of *c* 20kg of smithing hearth bottoms (*shb*) including a notably large example were also identified (240mm (l) × 200mm (w) × 80mm (t); 3.1kg) (Spall & Mortimer Digest 6.9; OLA 6.2/4.3).

The iron-working debris was identified visually and sorted into type, weighed, measured where appropriate and as far as possible identified as belonging to one of the following categories: *dense slag* (*ds*); *ferruginous concretion with hammerscale* (*fc*); *flake or spheroidal hammerscale* (*hs*); *fuelash slag* (*fs*); *smithing hearth bottom* (*shb*); *tap slag* (*ts*); *tuyère* (*ty*); *undiagnostic ironworking slag* (*uss*); *vitrified furnace lining* (*vfl*). The Period 3 assemblage comprised *c* 20kg of *shb* and *c* 26kg of *ds*, some of which is likely to represent shattered *shb* along with 56kg of *uss.* A notably large *shb* was recorded measuring 240mm (l) × 200mm (w) × 80mm (t) and weighing 3.1kg. The cake may represent a large smelting furnace base or indicate that large objects were being smithed. Comparison of the mean mass and dimensions of all Period 3 cakes with those recorded on other early medieval sites indicates that the Tarbat cakes are significantly larger overall (Table 6.2).

Period 3 also produced the greatest quantity of fuelash slag (over 8.5kg). This material generally consisted of very lightweight vitrified material, predominantly with a high silica content where this could be discerned. However, the deposits that yielded quantities of the material could be mapped onto the primary

Table 6.2
Mean mass and diameter of slag cakes from early medieval sites in Britain

Site	Mean mass	Standard Dev.	Mean diam.	Standard Dev.
Tarbat n = 25	991g	747	132mm	35
Coppergate (McDonnell 1992, 475) n = 163	385g	304	95mm	30
Fishergate (McDonnell 1993, 1225) n = 46	460g	265	100mm	20
Wharram Percy (McDonnell 2000, 156) n = 22	369g	–	95mm	–
Brough of Birsay (McDonnell 1986b, 201) n = 21	158g	–	57mm	–

burning horizon, suggesting that its origin was mainly the site-wide conflagration that initiated Period 3 (see above).

Discussion

The spread of Period 3 hearths across the ruins of the Period 2 vellum complex testifies to a determined resumption of activity. The road was resurfaced, but not in an orderly way and the surface spilled out into the part-filled roadside ditches, petered out or was worn away in front of the bridge-head and was encroached upon by hearths at its northern end. There was something peremptory in these arrangements – little or no investment was expended in building structures in which to work. For purposes of control and vision it would be logical to locate metalworking hearths within a structure, but here the indications of shelter were negligible: a few asymmetric settings of post-holes, surfaces of slabs or trample into ashy silts. Whatever the conditions may have been, the Period 3 smiths worked outdoors.

A contrast between Periods 2 and 3 is also apparent in the products, the metalworkers' output now being directed to items of personal ornament and weights. There is continuity in technical competence but greater quantities of metal were being worked in larger crucibles. These commonly melted leaded bronze, but silver was also detected. A new range of objects, including different varieties of weights, oblong ingots and perhaps the base for ring silver were being produced in some quantity. Evidence for fire-gilding, sheet-metal working and separation of precious metals is also present. Ironworking, including smelting from ore, appears definitively for the first time. Glass was worked and also perhaps cannel coal fashioned into bangles (Digest 6.3).

Illustration 6.15
Stone ingot moulds, left to right: 24/4619; 4594, 4618; 3505 (top) crucible 24/4571

Evidence from monastic sites in Ireland and Scotland indicates that many underwent a similar shift in production during the ninth century. An interim overview of excavations at Clonmacnoise indicates a phase of reorganisation and expansion of the ninth to eleventh century (King 2009) to which increased production of small commodities in lignite and bone may perhaps be credited. Excavations in Armagh at Cathedral Hill and Scotch Street (Nos 39–41 and 50–6), have produced contrasting assemblages of fine metal- and glass-working of fifth- to ninth-century date and mass production of amber and lignite objects in the form of hundreds of amber chips and thousands of fragments of lignite (Ryan 1988, 40–2). Dating of the latter is frustratingly broad but may belong to the ninth to tenth century and

Illustration 6.16
(a) Oil-lamp mould (24/3503, 4617); (b) possible fire-gilding mortar (24/3502)

aligns with activity in contemporary urban workshops in Dublin or York. A similar shift was detected at Whithorn when Period III (*c* 845–1000) was characterised by 'a dramatic change in the material culture of the community' (Hill 1997, 185). Hill linked this to a shift in patronage possibly under Scandinavian influence and it followed evidence for fine metalworking in the previous phase. Crafts that appeared at the site during this period included shale and cannel coal-working, spinning and weaving and comb-making. Evidence for fine metalworking waned and silver apparently ceased to be worked.

The promulgation of weights in Britain and Ireland at the hands of the Vikings was one sign of the introduction of a new economy with a stronger emphasis on transferable currency in metal in which the revived site of Portmahomack was clearly a player (see also Chapter 5.8, p 225). The lead weight shows a connection with the Norse of Orkney in the late ninth century when the struggle for control of the Firths was intensifying (see below). The idiosyncratic shapes of acorns and doorknobs, presumably cast in bronze and reproduced in large numbers, may point to the existence of a different trade network, perhaps one that included Denmark.

The change from an ecclesiastical to a more commercial output is balanced by observed technical and social continuities. The apparatus is essentially the same as that used by the monastic metalworkers and there is little reason to suppose they are not the same people or their heirs in skill. Two clay moulds from fine metalworking bearing matrices of a fish and dragon recall the art of the cross-slabs and bring Pictish animals to mind. The design for a large brooch may have included a geometric glass stud in the tradition of the Period 2 glass studs. On the other hand, the ambience has greatly altered: the road resurfaced with pebbles, vellum-making gone and the iconic stone monuments of Period 2 have become the hard-core of Period 3. The craftsmen, and possibly even members of the monastic community, lost no time in putting their expertise at the service of clients having a very different ideological allegiance.

Illustration 6.17
Mould for a glass stud (24/5220). The stud would measure 12.5mm diameter

Redevelopment in Sector 1: the farmers

In Sector 1, the southern field, the working of precious metal seen in Period 2 was discontinued. However, the metalworkers' building (S1) remained standing and was recommissioned as a kiln barn. The well (S8) gradually went out of use. A small bag-shaped building (S5) was erected, also employed in processing grain.

Structure 1 (OLA 6.1/3.4.1)

The modifications that were applied to S1 in Period 3 mainly concerned the insertion of an upper floor and a new heating system (Illus 6.19). The single posts on pads at the east end (E1–8) were replaced with double posts, of which the outer was a buttress post angled to resist lateral thrust outwards (see Chapter 5.9, Table 5.9.1 on p 237 for details). The buttress posts were set between 100mm and 260mm deep. Of the original four posts at the west end, W1 and W2 were replaced, but without buttresses, and W3 and W4 either left in situ or removed as redundant. However six new posts were added, W5–8, W10 and W1. Of these, W6 and W7 were uprights, set deep at 650mm. W5 was a buttress to W6 and W8 was a buttress to W7, always resisting outward thrust. W10 was a buttress post supporting post W1. W11 contained two posts: an upright and a buttress, so it is possible that it bore or shared the load for W2. The

Illustration 6.18
The smiths' toolkit: iron blade (24/6591), hammer head (14/2520), punches (14/1259; 24/537) and files (24/4288; 14/4311)

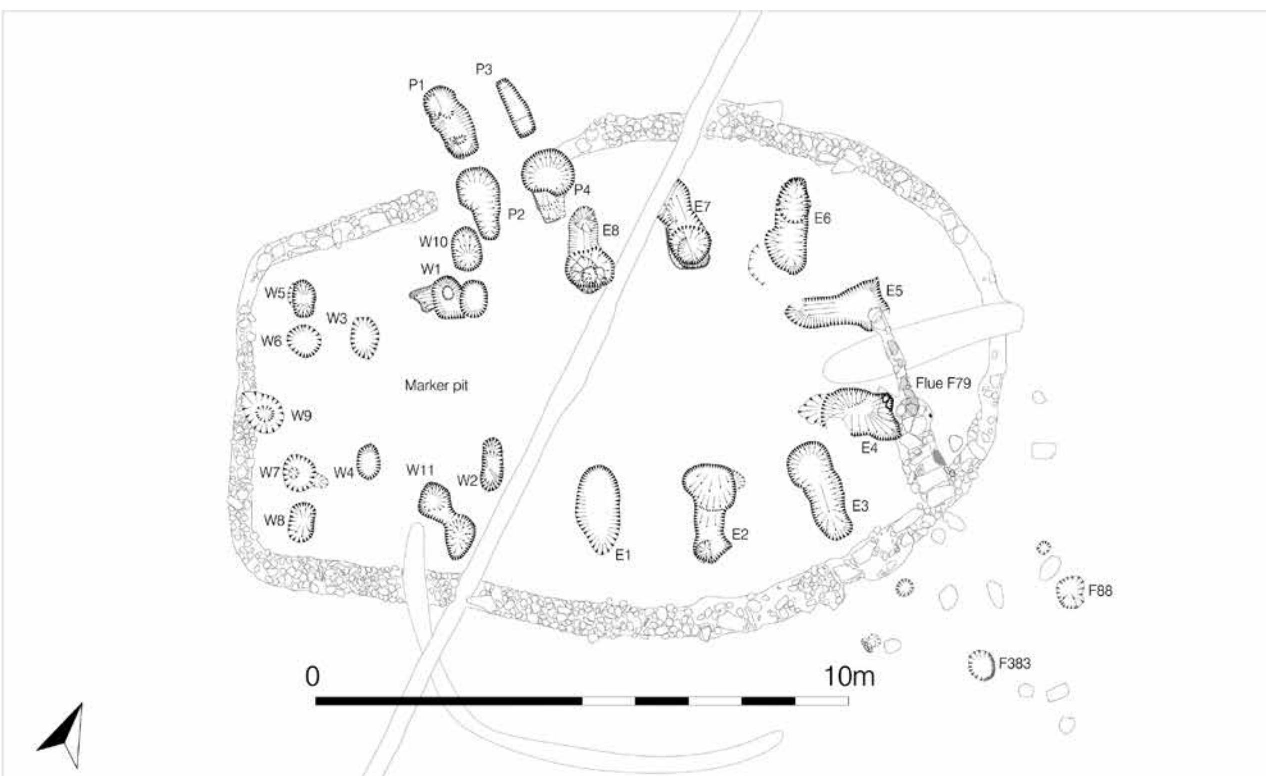
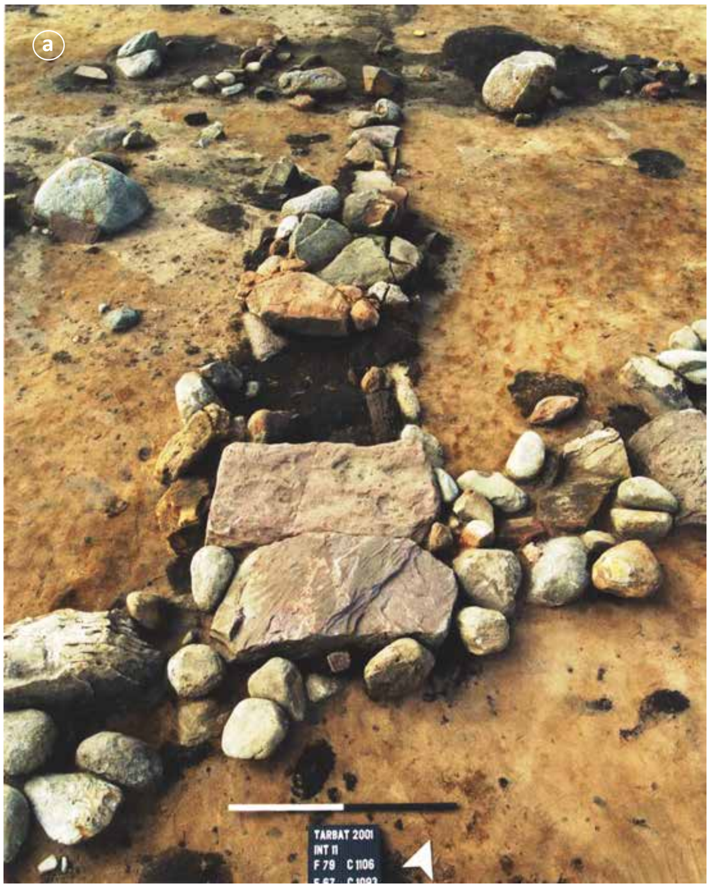


Illustration 6.19
Plan of S1 in Period 3, showing post-pits, flue (F79) and post array at stoke end of flue (F88, F383)



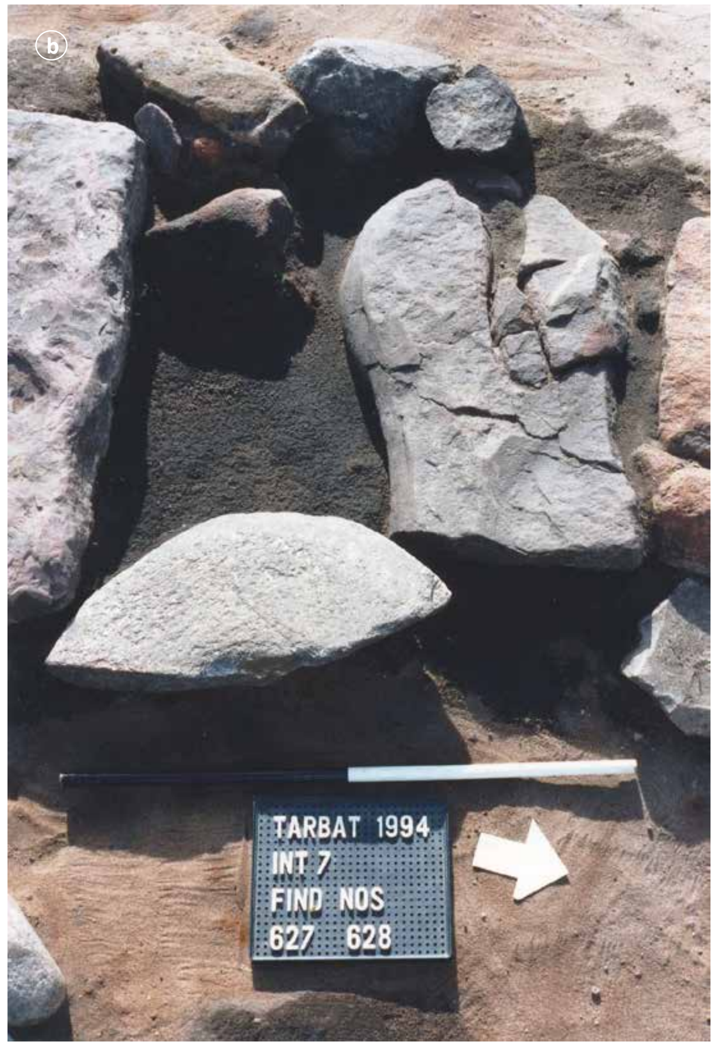


Illustration 6.20
Flue F79 (a) the flue (b) rotary quern incorporated into the make-up

buttress posts were angled between sixty and seventy degrees and set between 500mm and 650mm deep. The four posts at the entrance (P1–4) were also replaced, the new arrangements including buttresses for the two outer posts (P1, P2), also angled to resist thrust pushing outwards. These provisions suggest that there was a requirement to insert an upper floor, one expected to bear the greatest load at the west end.

Flue

The flue (F79) was first identified as a linear channel lined with and covered by large sandstone slabs, with an open continuation running NNW for a further 1.80m, making the full extent of this channel just under 4m (Illus 6.19). The covered section proved to be *c* 0.30m in depth and made of capstones supported by lining stones, becoming more fragmented to the north and displaying some evidence for burning. A number of post-holes clustered around the mouth of the flue, suggesting a covered area to protect the stoke-hole and shelter a fuel store (eg F88, F383).

The earliest fill within the flue incorporated components of pale-coloured ash and charcoal and is likely to represent a deposit accumulating during its life. The feature became filled with collapsing stone elements and then with dark brown silty sand, charcoal and clay. An iron nail and fragmentary animal bone was recovered from secondary contexts within the flue, and a fragmentary rotary quern (627) was reused within the make-up of the flue cover. Radiocarbon dating of three carbonised barley grains produced a calibrated date of AD 1020–1210 (95%) (GU-15019) signalling the end of the life of the feature and possibly the structure itself within this span.

A large quantity of animal bone was associated with S1 and S3, its sister building immediately north (see Illus 5.7.5). Because of the emphatic focus of this material on the hearth it was credited to Period 2 activities, especially the stacking of bone needed for fuel by the metalworkers, but it is not excluded that animal bone was also exploited in Period 3 (see Chapter 5.8, p 223).

Prompted by its flue and upper floor, the preferred interpretation for S1 in Period 3 is that of a kiln barn (Fenton 1999, 100; Fenton & Walker 1981, 138; the original suggestion for S1 was owed to David Clarke). As in its previous form, a timber frame supports the roof, and a stone wall revets the inner face of a turf jacket (Chapter 5.9, p 239). On the upper floors, grain would be stored at the west end and spread out for drying or malting at the east end, warmed by the flue (Illus 6.20). Suggestive similarities in recent practice encourage this interpretation, as in the use of a round-ended kiln barn with dryer and flue on Uist, described by Donald MacEachen to Donald MacDonald in 1974 (Macdonald 1993). According to this account, the curved flue (*sùil*) was provided with a blocking stone (*ceallach*) to prevent a spark carrying to the dried grain. The fuel was peat, and once the fire got going, lumps of turf could be used. The load (*brat*) was threshed inside the warm barn and placed as ears on a drying platform made of sticks and straw (*traghaid*). The owner of the load watched it all night and then threshed it again before taking the grain to the mill and giving place to the next farmer at the kiln barn (ibid).

Structure 8

The adjacent S8, a well, was also remodelled in Period 3 (Illus 6.21). A stone slab blocking F424 was inserted between the main bowl (F36) and the side channel, and a concentration of red sandstone slabs was installed on the southern side. The resulting superficial resemblance to a grain dryer (as Kiln 2 at Inchmarnock; Lowe 2008, Plate 8.7, Fig 8.17, 242, 244), was investigated. It was noted that 'a very black discontinuous layer of desiccated planks was visible in stripes orientated approximately N–S across the feature horizontally' over the disused well (OLA 6.6.1, 51). However there were no signs of burning, or records of burned grain from flotation, and the black layers were probably turf rather than carbonisation. The modification of the structure was probably prompted by the silting up of the main bowl of the Period 2 well, following the decay of its original plank lining. Our verdict is that the well was modified, then continued in use up to the point where it failed to give water.

Structure 5 (OLA 6.1/3.4.1)

Situated at the west end of Sector 1 (cutting S12), S5 consisted of a ditch that was approximately bag-shaped in plan, enclosing a set of five pits surrounding a hearth (F13) (Illus 6.22). Survival was poor; there were no stones in the perimeter trench (F3), but there was stone packing in pits F11, F14 and F16, thus encouraging their symmetrical restoration as a set of six structural post-pits supporting vertical posts. The central hearth was bath-shaped in plan and had a gently sloping concave profile

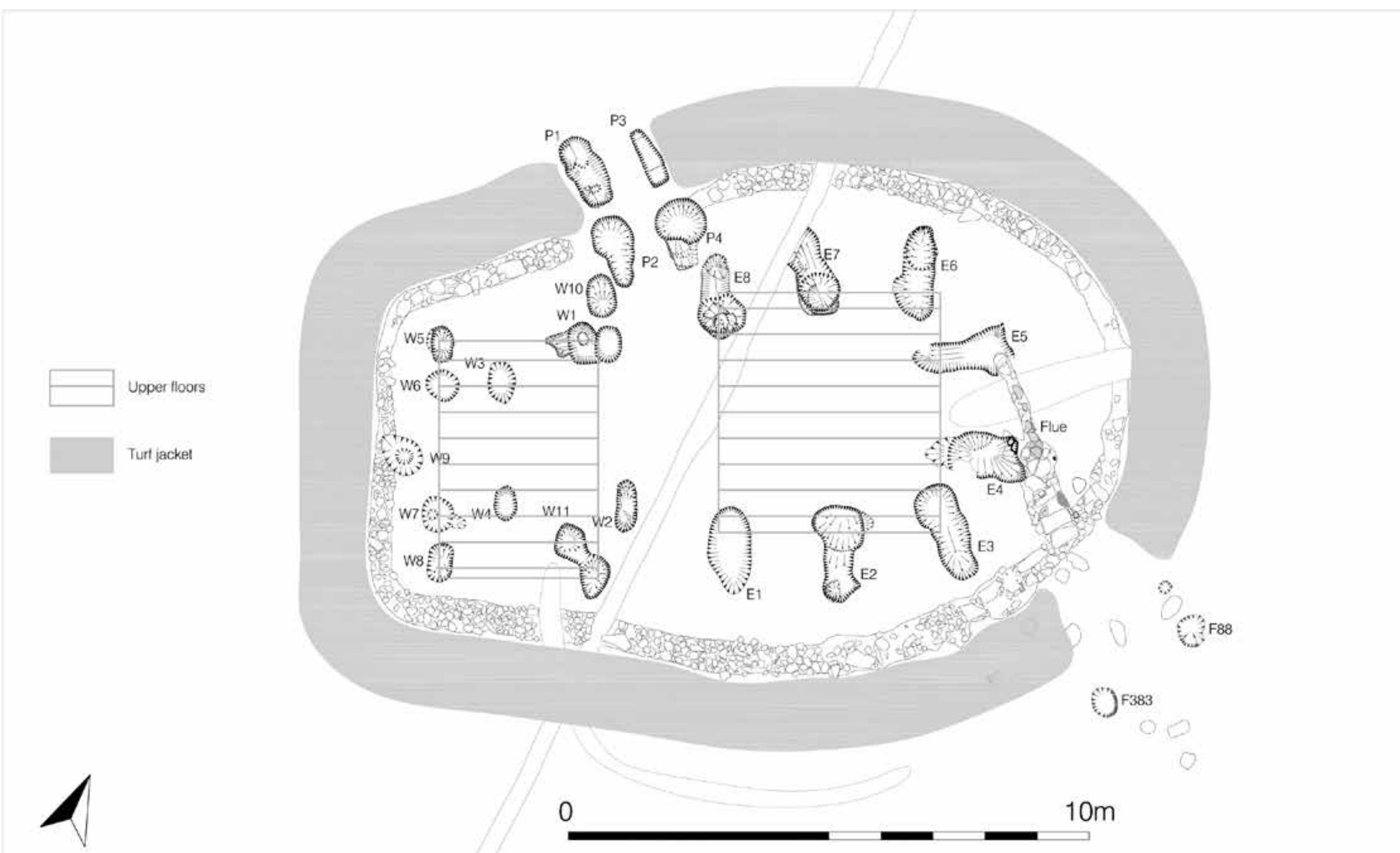


Illustration 6.21
Hypothetical reconstruction of S1 in Period 3, with upper floors for drying (right) and storing grain (left)

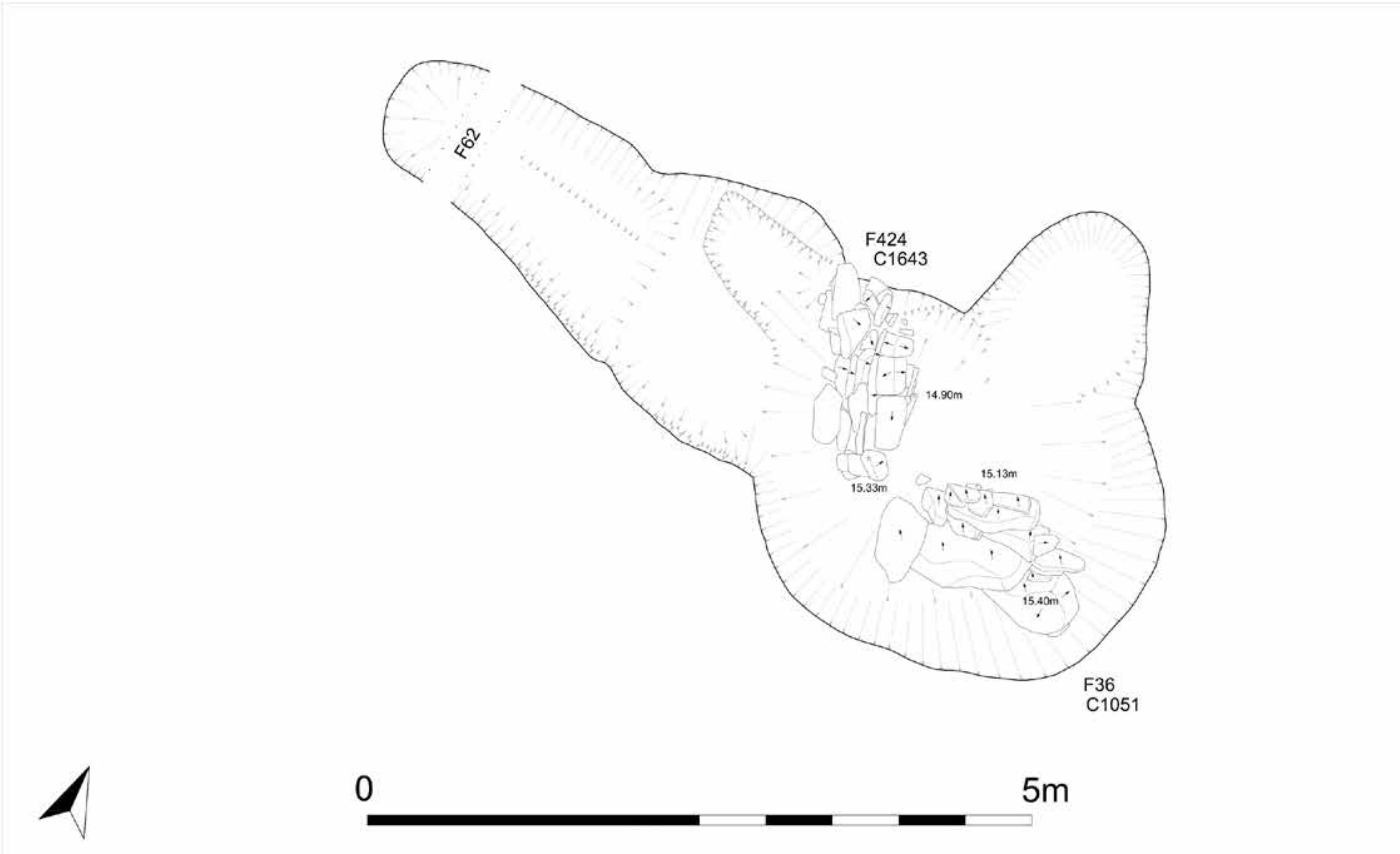


Illustration 6.22
Plan of S8 in Period 3

filled with a highly variable charcoal-rich sandy silt. Towards the base of the hearth were a number of horizontal burnt sandstone slabs sufficient to suggest a stone-lined component. The sediment was most likely burnt peat, and included a little charcoal and charred ?heather root/basal twig, charred heather flowers, some small barley and oat grains and a few wild radish (*Raphanus raphanistrum*) pod segments, the last a cornfield weed contaminant not easily winnowed or sieved from the crop (Digest 7.4). The deposit was sampled from the profile and a charred grain from flotation returned an AMS date of AD 680–900 (95%) (GU-15017).

The ditch (F3) had a broad, shallow concave profile up to 1.8m wide and 0.50m deep which curved from east to west turning slowly north to an 'elbow' at which point the orientation changed to NE–SW before disappearing beyond the eastern limit of Int 25. Its course in the damaged north-east area remained uncertain. The feature was filled initially with windblown sand in which the ancient (charred) remains comprised traces of barley grains and ?heather root/basal twig fragments. This was followed by a slump containing scraps of charcoal, some heather and traces of barley grains, one of which returned an AMS date of AD 890–1030 (95%) (GU-15018). A phase of burning came next, yielding records of oak charcoal, hazel and heather. The presence of charred root/rhizome in the two samples and of sedge nutlets in one of them perhaps points to an origin in burned surface-cut turves. This was followed by deposits interpreted as originating from the erosion of a bank. They included possible burnt peat, possible charred seaweed, heather and barley grains. The latest layers also contained oak charcoal,?heather root/basal twig fragments and barley grains.

The persistent presence of grain indicates that cereals (barley) were being processed within the building. The remains of heather and turf, and the shape of the ground plan, insofar as we have it, are probably adequate to propose a bag-shaped turf building with a heather thatched roof supported by at least six posts. Without stones, half a metre deep and three times the width of that in S1, the ditch does not suggest a foundation or revetment for a turf wall. The 'ditch' would be more credible as a walkway worn by load carriers between a turf windbreak and the fire. The large hearth, post-holes and burnt grain suggests an original grain-drying function. Two radiocarbon dates, one from the hearth and one from the perimeter ditch declare the building active in AD 680–900 and still receiving detritus in AD 890–1030, broadly conforming to Period 3.

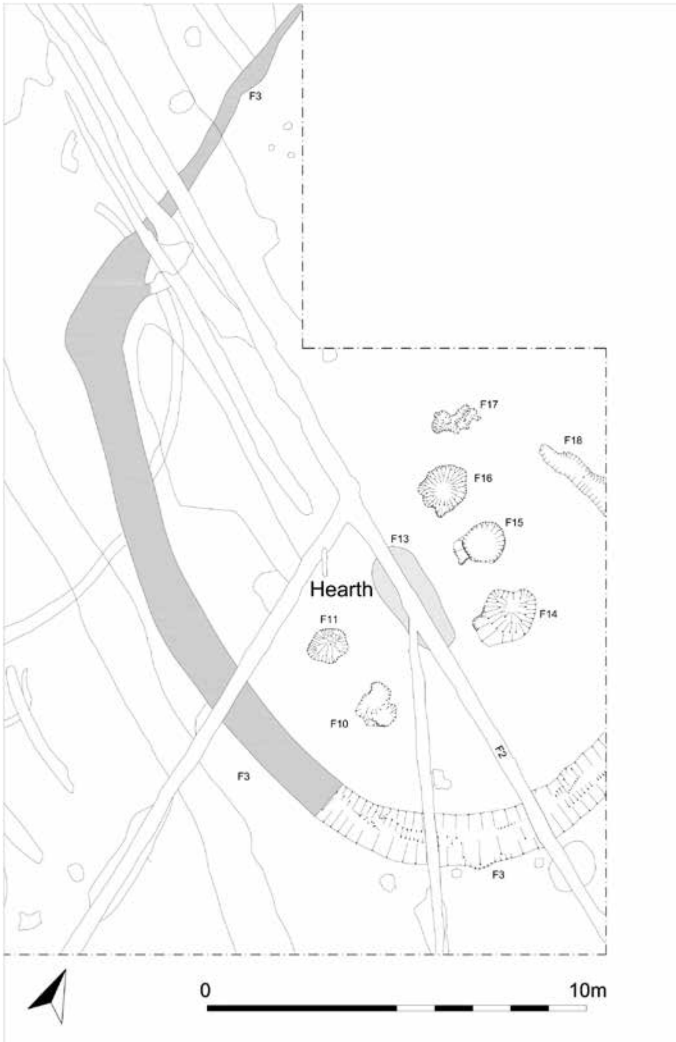


Illustration 6.23
Plan of S5, possibly a grain-drying kiln

Doubtful structures

Structure 2

S2 was defined at Horizon 2 as a series of discontinuous linear features that appeared to form a sub-rectangular enclosure (Illus 3.2). It cut through the S1 perimeter wall in two discrete places, and for this reason was interpreted as belonging to a structure positioned partly over the remains of S1 following its abandonment. Excavation and subsequent study lends no support to S2 having been structural.

Structure 6

S6 was defined at Horizon 2 as a rectilinear gulley forming an elongated U-shaped enclosure of three lengths, measuring 14.5m (south), 8.4m (west) and 8.0m (north) (Illus 3.2). The feature was cut by a Period 3 ditch F330, traversed by two Period 4 furrows and a Period 5 field drain. A length of the southern arm was sample excavated where the feature proved to be a shallow gulley, 0.15m deep with a U-shaped profile and a single backfill of dark reddish-brown silty sand. No evidence for posts or stakes was recorded nor any silting and no finds were recovered.

The second enclosure ditch in Period 3 (OLA 6.2/3.4.2)

A study of the four excavated segments of the structure of the second enclosure (S16, F158, F132) concluded that it was constructed as a bank and ditch in Period 2. The bank might have carried a hedge and the ditch contained standing water with dung beetles providing circumstantial evidence for extensive grazing (Chapter 5.5, p 186). In Period 3 it become choked with vegetation, but still constituted a barrier. The organic debris consisted mainly of pieces of alder and willow probably from trees growing along the edge of the ditch and perhaps in a hedge line on the bank (ibid). Among the plants represented in the backfill were weed seeds diagnostic of arable cultivation, implying a change to cereal production. A radiocarbon date on willow twigs in the latest organic fill shows that the ditch had finally ceased to function before 940.

Subsidiary ditches (Illus 6.23)

Adjacent to the enclosure ditch and the remodelled S1, two short ditches were identified as belonging to Period 3 (F18 and F165). F18 was first identified as a clear anomaly in the magnetometer survey due to its charcoal-rich fills. The feature was subsequently mapped at Horizon 2 as a possible oven, due to the charcoal-rich, black final backfill adjacent to a hard pink boulder clay dump. Upon excavation it was established that the original feature consisted of a length of ditch oriented broadly N–S measuring *c* 12.5m E–W by *c* 2.0m. F18 was assigned to Period 3 activity since it cut partially backfilled Period 2 ditch F154 and F196 and radiocarbon dating of charcoal from a late backfill (C1143) returned a date of AD 780–1020 (95%) (O-9662).

F165 was identified at Horizon 2 as a sinuous ditch oriented broadly NE–SW running from close to the enclosure ditch northwards through Int 11 and reappearing within the southernmost limit of Int 24 (F417), in turn disappearing beyond the western limit of the intervention (Illus 6.1). It thus represents a ditch in excess of 40m long. The absence of pottery from the intensively sampled F165 implied a date in Period 3, since Period 4 is the first ceramic phase, with a significant distribution of medieval pottery. The juxtaposition of F18 and F165 with the southern edge of enclosure ditch F158 and F132 suggests that they would have drained excess water towards the valley.

Period 3 on the hill

In the part of the cemetery sampled within the church of St Colman's, burial was continuous over Periods 2 and 3 without a notable change in ritual. Stratigraphy and radiocarbon suggested that at least seventeen (out of fifty-eight) burials could be earmarked as belonging to Period 3 (see Chapter 5.2, and Table 6.3 below). It is argued in Chapter 5.2 (p 106) that although burial

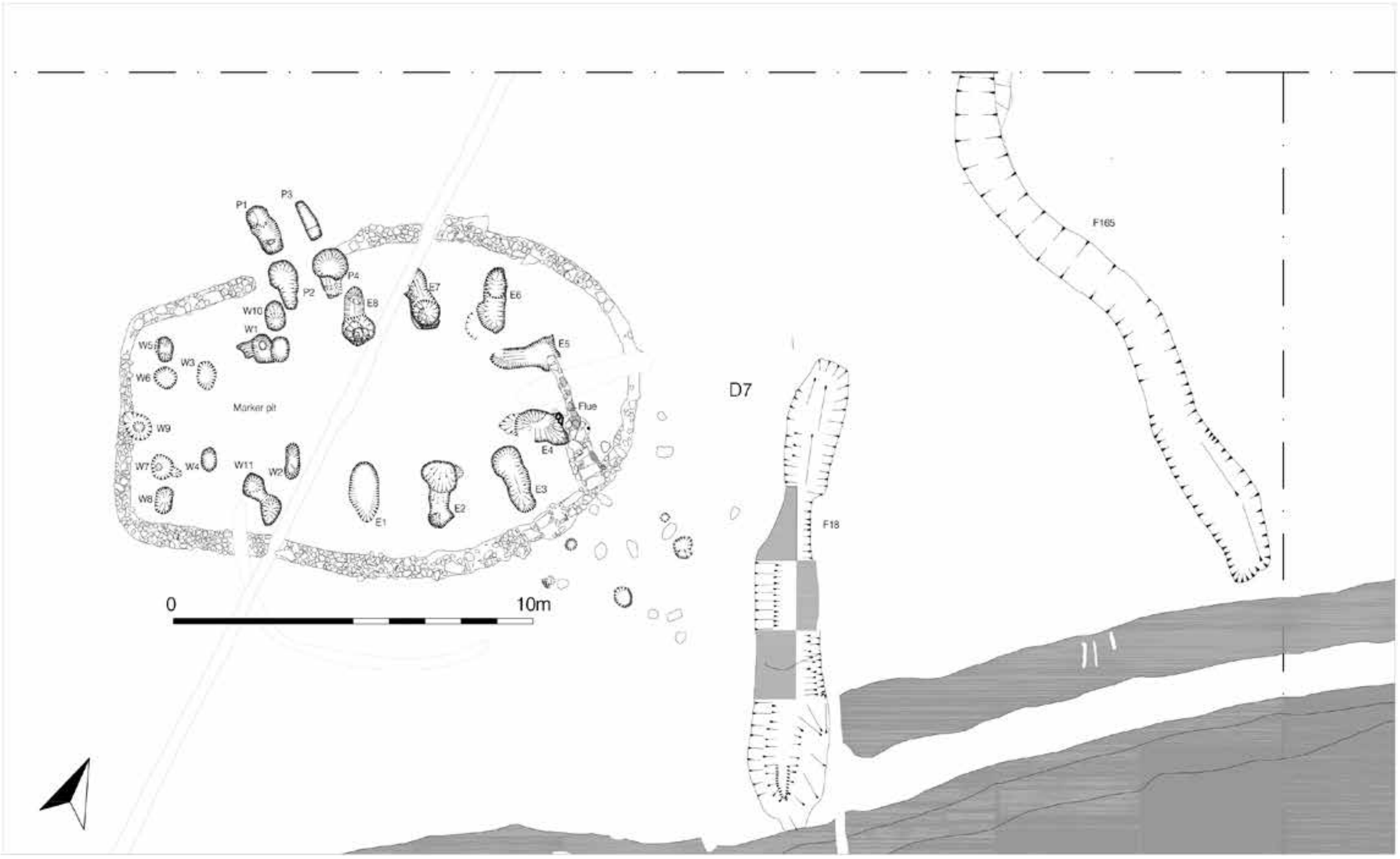


Illustration 6.24
Plan of S1 with ditches F18 and F165

continued after the raid, conformity to the cemetery structure was most evident in the ninth century and had been lost by the eleventh. The head-box burial rite continued to Burials 136 and 111, which were tenth or eleventh century in date. Burial 147 (AD 720–960), an immigrant from the west, introduced the burial rite of a wicker bier. The group of seventeen burials, if it is a group, includes four immigrants, and eight of the total of fifteen persons (47%) that had suffered fractures out of the whole Period 2/3 population (Table 6.3). Burials 152 and 158 had both suffered blade wounds. Burial 152 had been attacked with sword blows to the back of the head and died; Burial 158 was attacked in the face with a similar weapon, but survived (Chapter 5.2, p 119). Both conformed to the orientation of the western row. Our study suggests that burial continued in the monastic cemetery into the ninth century, after which it became spasmodic and lost its orderly rows, although the head-box ritual survived till the end. The implication is that burials broadly kept pace with the intensity of activity in the metal workshops of Sector 2, which is also thought to be losing its energy by the later ninth century. This strengthens the links between the Period 2 monks and the Period 3 metalworkers.

Burial 117, another male who died of blade wounds, is dated very late at 1150–1270 and so might have been buried within the newly erected Church 2 and is assigned to Period 4 (p 290).

Archaeological story: ninth to eleventh century

After the raid, recovery was rapid in Sector 2, a metalworking industry taking the place of the butchers and vellum makers. The artisans seem likely to be the same or closely related to those previously making ecclesiastical equipment in Sector 1. The new products, however, are pins, brooches, buckles and copper-alloy weights, implying a trading place. There were contacts with the northern isles (as indicated by parallels from Birsay) but the assemblage is not markedly Pictish, Scottish or Norse. The typological date of the crucibles, the stone carving and other objects, together with the stratified radiocarbon dates gives this industry a start in the late eighth century and suggest that it has faded before AD 900 (Period 3A). To the south in Sector 1, at the same time, there is the making of a farm in which the growing of grain predominates. Here a barn (the converted S1), a well (S8) and a dryer (S5) endure to the end of the ninth century. After 900 the old monastic infrastructure finally ceases to function: the ditches are choked with vegetation, the pool has become dryland and a cow burial was dug through the metal workshop

Table 6.3
Burials that may belong to Period 3

Burial	Trauma	Burial rite	Isotopes	Radiocarbon
44				
45		HS WSW–ENE		
47		WSW–ENE		
111			Immigrant?	
123	broken finger			
124				
125	fractured tibia and fibulae (healed)	HB		
136/156			Immigrants?	970–1040
142	broken finger			
145	broken clavicle			
147		wicker burial	fish-eating Immigrant from west	720–960
152	three blade wounds (fatal)	HS		780–1000
157		HS		
158	broken ribs blade wound (healed)			680–900
164	fractured ribs	HB		
176	fracture			

(Illus 6.24). The flue in S1 might have continued to function as indicated by a single late date of 1020–1210.

The cemetery continued to serve the community while the metalworking and trading venture thrived, through the ninth century. They suffer disproportionately from injury, and the conventional rites are observed. This includes the orientation within the rows, implying that the cemetery structure persisted and perhaps that a church still stood. Thereafter burials at the old site toll the passing of the years, but in diminishing numbers. By the time the hoard of silver coins and arm rings is buried in AD 1000, there would seem to be little happening at Portmahomack other than the occasional funeral.

Illustration 6.25
Cow burial F304

Context: the peninsula and the Firthlands

The theatre in which these artisans played their part has been described by the Glasgow historian Dauvit Broun as 'impenetrably obscure' (2005, 41–2), and in some ways it is a much darker dark age than the age of Columba and Adomnán, ie the sixth to eighth century, that preceded it. We have some exiguous archaeology and some difficult documentary history to draw on, the first giving the impression of a sea mist punctuated by the occasional stone monument, and the second of Scots, Norsemen and to a vanishing extent the Picts, locked in a struggle of brutal intransigence.

It is not unlikely that a strong Norse interest in the peninsula followed the Portmahomack raid even if Vikings were not responsible for it. The monuments at Nigg, Shandwick and Hilton of Cadboll were not targeted. Of forty-eight place-names on the peninsula noted by Watson, six are pre-ninth century (Pictish), six are Norse and the remainder Gaelic (Scots) (Illus 6.25). Of the six Norse names, Cadboll and Shandwick are landing places

Illustration 6.26
Norse place-names on the Tarbat peninsula

and Mounteagle (and perhaps Loch Eye) may refer to Norse *eith* (isthmus) (Digest D8). Bindal, Geanies and Arbol are all prime farmland today. A Norse break-up of the existing monastic estate seems highly probable. There was a battle at 'Torfness' in 1035 (see below) and a battlefield site is remembered in the place-name Blàr 'a chath a few miles north of Portmahomack.

Norse presence on the peninsula is otherwise poorly documented. No steatite or Norse objects or ornament, as known in the northern isles, were noted in the extensive excavations at Portmahomack. The silver hoard of the Viking period previously noted (p 261) was discovered in 1889 while digging a grave near the east gate of the churchyard, possibly having been hidden within a buried stone wall, 'at least six feet below the ground surface' (Miller & McLeod 1889; Grieg 1940, 109). When discovered, the hoard consisted of two silver penannular armlets and thirteen coins. A further part of this hoard was apparently found in 1892, when digging further graves in the area. The finds were sent to the National Museum of Antiquities of Scotland. Graham-Campbell (1995, 143–4) dates the deposition of the hoard to *c* AD 990–1000. The surviving items are: Four silver penannular armlets (IL 272–5); a silver penny of Edgar (959–975) (IL 276) and five silver pennies of Louis le Bewgue (877–879) (IL 277–81). In 1889 ten pennies of Louis le Bewgue were reported to have been found, as well as one illegible silver penny and another that had broken into pieces (Harden in OLA 5.1, Stage 1) (Illus 6.26). But like the weights from Sector 2, these objects do speak of an active trade network in the Firthlands in the ninth to eleventh century.

The Vikings undoubtedly encountered monastic establishments elsewhere in the broader region. We have yet to find them, but it seems reasonable to anticipate them in places that feature the remains of monumental cross-slabs, box shrines or sarcophagi. On this basis, we could list Reay, Dunbeath, Skinnet (Halkirk), Kincardine, Rosemarkie, Burghead, Kinnedar and Wester Delnies as prime candidates for Portmahomack's sister monasteries in operation into the ninth century. Some of these were no doubt attacked, as at Kinnedar where the sculpture is 'markedly smashed up' (Henderson & Henderson 2004, 146, 212). Others, indicated at present only by a cross-slab, could be put on the reserve list: Clyne Kirkton, Collieburn, Kintradwell, Farr, Lothbeg, Creich, Strathy, Strathnaver, Edderton, Achareidh, Altyre, Birnie and Forres (Illus 6.27; Henderson & Henderson 2004, 196, 212; Carver 2008b, 18–20).

It may be that some of these places continued to develop after the eighth century. For the Hendersons: 'The patently Pictish characteristics of the free standing crosses, and other symbol-less monuments, are evidence for a continuing and developing Pictish cultural input through to at least the end of the ninth century' (2004, 194); and 'Their erection probably signalled the period of the institutional amalgamation of the Picts and the Scots' (ibid, 191). The authors urge the case that the free-standing crosses carrying martial themes were among the latest products of the Pictish carvers (Henderson & Henderson 2004, 190–4). Constantine King of Picts (died 820) was commemorated on a free-standing cross at Dupplin (Forsyth 1995), and his northern interests have lately been emphasised (see below). Sueno's stone at Forres, depicting captives lining up to be decapitated, seems to be an extreme expression of the martial theme. Traditionally this monument is an icon of ethnic cleansing, and depicts real local events, without being too certain as to who are the victims and who the oppressors. Sellar (1993) proposes a celebration of the extermination of Picts by Scots, for whom victories were measured in severed heads. The Hendersons find it less exotic and more learned. The vinescroll links it artistically with Hilton and Portmahomack (2004, 55), and the theme is more likely to have been 'a conscious cultural gesture by a ninth-century patron fresh from a visit to Rome, who wanted the equivalent of the columns of Trajan and Marcus Aurelius on his doorstep' rather than 'regarding the camp scenes, parades and massacres as an intelligible act of local reportage' (ibid, 136).

Nevertheless, it is hard to expunge the impression that an extended three-way clash between Picts, Scots and Norse forms the misty political backdrop to Tarbat in the ninth to eleventh century, even if it is also hard to document it with precision. A

Illustration 6.27
Hoard of coins and ring silver deposited *c* AD 1000 and rediscovered in 1889 in Portmahomack churchyard

1998, 227–38). The St Ninian's Isle hoard (Shetland), containing Pictish brooches and bowls found under the floor of the church, is thought to have been hidden from Viking raiders, and similar circumstances may have attended the Rogart brooches and the three penannular brooches found at Croy, together with two Anglo-Saxon coins pierced for suspension (Graham-Campbell 1995, 3). These should date to the earliest period of Norse intrusion in the ninth century. Later hoards are distinguished by their content: coins, silver rings and hack silver and have deposition dates in the tenth to eleventh century. Tarbat is the only one of this late group in the Moray Firth, the remainder being in Orkney or Shetland.

The documentary sources for the period have been recently reviewed by Alex Woolf, who has argued a case for moving Fortriu from the area of Angus to Speyside, taking its documentary luggage with it (2006; see below). The same author remarks: 'All the same we have been able to say almost nothing about the islands or the mainland north of Ardnamurchan in the west, or the Moray Firth in the east' (2007, 275). From England, by contrast, we have blow-by-blow accounts of the struggles between Wessex and the Danes from the ninth to the early tenth century, itemised in the *Anglo-Saxon Chronicle*. This struggle is described as a war, it involved the whole of south Britain and it lasted nearly half a century before England can be said to have existed as an independent nation. In our area, the documents we have are marred by being too late, as the *Orkneyinga Saga*, or too far away, as the *Annals of Ulster*, or too strange, as the *Prophecy of Berchán* (Hudson 1996; Woolf 2007, 225). But it can be accepted that by the ninth century Picts and Scots were engaged in the political brutality that would result in a Gaelic-speaking Scotland and Pictish dispossession (Wormald 1996). In the same century, the Norse emanated from Norway and first raided then settled the Northern Isles, Caithness and Sutherland. For over two hundred years, the Tarbat peninsula, and for that matter, the Black Isle, were frontier territories in a war as intense and crucial as that in Wessex. Archaeologically, there is every reason to support the view that at both ends of the island, the British were caught in the crossfire between two sets of ruthless incomers: Saxons and Danes in the south, Scots and Norse in the north.

Alfred Smyth (1984, 146) described the Norse process as 'a violent piratical phase as a prelude to more determined and

'pagan grave' at Dunrobin contained two oval brooches, an iron axe and a possible spear socket, and a single oval brooch was found at Ospidale (Batey 1993, 155). Two Hiberno-Norse ring-headed pins (without the rings) were found at Llanbryde four miles east of Elgin (*Medieval Archaeology* 45 (2001), 361) and another, also without its ring less than a mile away at Easter Coxton (*Medieval Archaeology* 46 (2002), 243). The most southerly Viking-type burial, that of Sigurd at Cyderhall, remains up to now in the realm of legend (see below).

Hoards buried in the ground may be taken as signs of unrest (Graham-Campbell 1995, 173–86; Graham-Campbell & Batey successful attempts at colonization'. These attempts were, however, limited geographically. By the eleventh century the Norse had penetrated, as place-names show, not much further south than Dingwall, where they had a *Thing* or assembly place. Following the lead given by Alex Woolf, we may take the references in texts to 'Fortriu' to apply to the Moray Firthlands, with some useful consequences (Woolf 2007, Chapter 1, 3). Constantine, who held the power in greater Pictland between AD 789 and 820, and was commemorated on the Dupplin Cross, was also a king of Fortriu, and must have died just after Portmahomack was raided. If the raid took place about AD 800, all-out war was not long in coming. In AD 839 (according to the AU) the heathens (ie the Vikings) won a battle against the men of Fortriu. Eóganán son of Óengus, Bran son of Óengus, Aed son of Boanta and others 'almost innumerable' fell there. This would have hit these Pictish families very hard, making space for a new aristocracy, particularly from the Gaels of Argyll. In AD 865, AU records the death of the chief Bishop of Fortriu, Tuathal mac Artgusso. In AD 866 'Amlaíb and Auisle went with the foreigners of Ireland and Alba [= Britain] to Fortriu, plundered the entire Pictish country and took away hostages from them'. This would have been another grievous depletion of the Pictish aristocracy. If Fortriu is to be located in the north, then Tarbat lies at its centre, and at the focal point of these events (Woolf 2007, 41–67). The men of Fortriu defeated the Norse in AD 906, but by the time Malcolm I arrived in AD 950, the place he came to was Moray, the sea settlement, and Fortriu is not mentioned again.

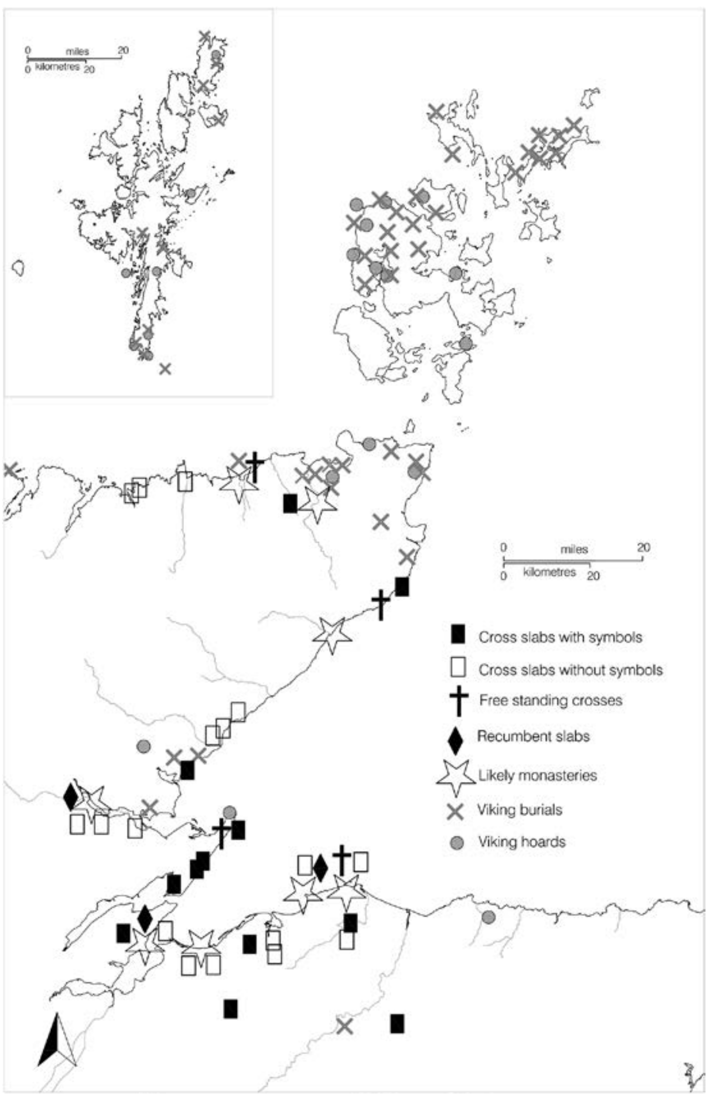


Illustration 6.28
Map showing likely locations of monastic sites in the Firthlands at the start of the ninth century

After Pictish power was broken at the end of the ninth century (Woolf 2007, 87ff), the Scottish men of Moray turned their attention to the Norse, and proved resilient in the task. Legend has it that the late ninth century Moray *Mormaer* Maél Brigte had the distinction of killing his enemy when he himself was already dead. He was worsted in battle by Sigurd the Mighty, who cut off his head and tied it by the hair to his saddle bow. However, on Sigurd's triumphant return north, the head bit him in the leg and gave him blood poisoning from which he never recovered. Sigurd is said to have been buried about AD 892, presumably in Sigurd's Mound (Syvardhoch), a name recorded in the thirteenth century for Sidera (now Cydera) on the Oykell Estuary near Dornoch.

The Norse first mention Tarbat, which they apparently knew as Torfness, in events relating to the years AD 891–4 [*OS*7]. Einar the Turfer 'was the first of men to find how to cut turf from the earth for fuel, in Torfness in Scotland'. He clearly was not, since the people of Portmahomack had already been using turf as fuel and building material for at least two hundred years (p 228). Einar, who died around AD 910, was said to have taken over 'the island territories'. He was 'tall and ugly and one-eyed, though still the most keen-sighted of men' (OS; Anderson 1922, 377). There is some implication here that Einar had control of Tarbat, if not of lands still further south.

Of Einar's successors, his son Thorfinn Skullsplitter and his grandson Sigurd the Stout seem to have kept a strong grip on the Moray Firth during the tenth century and into the eleventh century. Around AD 995 Sigurd the Stout was challenged in Caithness by Findlaech, father of Macbeth, who was defeated (with the unfair intervention of a magic banner). The compliment was no doubt returned, putting the men of Moray under pressure in their new homeland. These events must have had some reflection in major investments such as the 6.5m high Sueno's stone, assuming it cannot be dismissed as a scholarly conceit (see above). Who was beheading whom? With so many enemies, one is spoilt for choice; possibly the Norse did take a firth too far, led by a 'Sven', and met a savage resistance in Moray, as had an earlier Sigurd and Thorstein. Or perhaps the Picts were still able to mount a rebellion and were arraigned for collective punishment and a monumental reminder to survivors that they had been permanently dispossessed. Or perhaps the victims were the nearest kin to the Cenel Loairn among enemies, the nGabráin clan, who had tried, as they were to continue to do, to bring Moray into the control of the southern royal house (Sellar 1993; Jackson 1993; Aitchison 1999, 33–4). Or perhaps none of these things happened, but were nevertheless selected by an eleventh-century ruler with power over the quarries and tradition in stone carving to be fossilised as preferred history.

In the early eleventh century we hear of 'Torfness' again, since a great sea battle took place there in about 1035. The victor was Thorfinn the Mighty, a Scotto-Norse whose parents were Sigurd the Stout and a daughter of the nGabráin. The Moray leader defeated at sea is named by the Orkney Saga as a certain *Karl Hundison*. The saga goes on to recount how Thorfinn the Mighty, a golden helmet on his head, a sword at his waist, and wielding a great spear in both hands, chased the defeated Scots deep into Scotland. He and his men 'went over hamlets and farms and burned everything, so that scarcely a hut was left standing. Those of the men whom they found, they killed, but the women and old people dragged themselves into woods and deserted places with wailings and lamentations' (*Orkneyinga Saga* 20).

Karl Hundason ('son-of-a-bitch') is thought to be none other than the character that Shakespeare knew as Macbeth, son of Findlaech and murderer of Duncan, who was active in the area from about 1030 until his death in 1057 (Oram 2004, 18, 89; Grant 2005, 98; Cowan 1993, 125). Barbara Crawford comments: 'The Tarbat Ness headland is likely to be *Torfness*, where Earl Thorfinn the Mighty met Karl Hundison [Macbeth?] in battle between 1030 and 1035 . . . The victory of the former allowed the consolidation of Norse settlement around the shores of the Dornoch and Cromarty Firths' (Crawford 1987, 73). It seems that by the early eleventh century, control of Easter Ross was in the hands of the Earls of Orkney, and it is not improbable that such control had from time to time already been exercised by Sigurd the Mighty in the ninth century (Fraser I A 1986). Moray leaders from Findlaech onwards obviously felt they had an ancestral claim on the territories to the north, as far as Caithness. But the frontier probably established by the Norse at the Beauly River is one that has endured on the map.

For all his bad press from Shakespeare and his predecessors, Macbeth was no usurper but could claim royal descent in Moray from his father Findlaech and from the line of Malcolm on his mother's side. Duncan, who became king of greater Scotland in 1034, was his second cousin. The battle off Tarbat was part of a wider campaign. Macbeth's eleven warships first attacked Thorfinn at Deerness, demanding tribute for Caithness. But Macbeth was defeated and had to swim for his life. Then he raised an army which included Welsh and Irish soldiers, but Thorfinn responded by mustering 'all the troops from Caithness, Sutherland and Ross', which implies that Ross was already under Norse control at the time (Aitchison 1999, 37, 56).

Macbeth supposedly murdered Duncan in a blacksmith's hut at Pitgaveny, near Elgin in 1040. He was to rule for seventeen years, and a case can be made that these years were happy and prosperous. He made a pilgrimage to Rome in 1050 as did Thorfinn the Mighty – E J Cowan remarking drily 'it is not recorded whether he booked passage with Macbeth' (1993, 128). In Rome, Macbeth famously distributed money with great freedom, and it is not inconceivable that both northern Scottish rulers by this time would think a papal blessing worthwhile – in the manner of getting recognition by the United Nations. Now that he was a monarch of the Scottish house, Macbeth and his lady gave their patronage to a monastery in Perthshire, on St Serf's Island in Loch Leven. In the eighth century, this monastery had had a link with Iona. Revived in the tenth century, it was a culdee establishment that maintained its cartulary in Gaelic (this has not survived, though a Latin summary has). This probably resembled the *Book of Deer*, a holy book with notes in the margin. From the mid-tenth century, St Serf's was dependent on St Andrews and it became Augustinian from 1150. Thus on St Serf's Island, the old world was connected to the new.

Armed therefore with new certainties from archaeology and semi-certainties from history, and old myth-making from Brechan to Shakespeare, we can paint an amateur picture of the darkest of the dark ages in the Moray Firth – the ninth to eleventh century. In the eighth century the area was not just the site of a few monasteries – it was a new Christian kingdom. Tarbat was a holy island, or nearly one, marked by huge cross-slabs, celebrating Pictish spiritual leaders, their names emblazoned in symbols in the Pictish manner. No doubt the incoming Gaelic-speaking nobility were already in the frame as preachers, warriors and wives, integrating with the Picts against a common enemy and emerging as the *Mormaers*. The monasteries were in contact with each other, with Ireland, with Northumbria, with England and with the continent; and where spiritual alliance went, commerce was not far behind. It cannot be doubted that this Christian European union of its day was at least partly what irritated the Scandinavians. Their first raids targeted Lindisfarne in AD 793 and Iona in AD 794. Portmahomack was probably another target of these years, no doubt because it was as important, spiritually and strategically, as these two. Its great monuments, symbolic of ideological restrictive practice, were thrown down and the monastic project went up in smoke. Thereafter, in a dozen skirmishes, the heirs of the churchmen clashed with the Norse. Their monks were murdered, their bishops were killed, their skulls were split. But the survivors at Portmahomack fought back in the best way possible: they put their shoulders to the turning wheel of the age, stopped carving and became suppliers of ornaments and weapons to the warring classes.

Sigurd and Thorfinn and their ilk never achieved their goal of opening the passage along the Great Glen as a short cut to their possessions in the Irish Sea. Just as Alfred, Æthelflæd and Edward the Elder fought back in England, so Finlay and Duncan and Macbeth fought back in Moray. To the victor the spoils: just as the south British lost much of their identity to the intrusive English, so the Picts, north Britons, lost most of their identity to the intrusive Scots. And the Tarbat peninsula, rich farmland, haven, beachhead, portage and frontier post must have changed hands a dozen times.

Chapter 7

Medieval Township (Period 4, *c* 1100–*c* 1600)

Introduction

The arrival of the Middle Ages at Portmahomack is marked by the building of a stone church, the first version of which is termed *Church 2* and dated here to the twelfth century (*Church 1* being assigned to the elusive Pictish church, Chapter 5.4). The church builders levelled the former Pictish cemetery, likely to have been derelict by then, and incorporated many of its grave markers into the fabric of the new building. The remains of cross-slabs A, B and C should have been visible lying in the churchyard. *Church 3* was Church 2 equipped with a chancel. *Church 4* was a relatively grand church with nave, sanctuary, belfry and crypt, founded in the thirteenth century and enduring until the Reformation in the late sixteenth century. The old monastic structures were cleared from Sector 1 and the area given over to ploughing from the thirteenth century. In addition to the growing of cereals, the Portmahomack community had access to a wide variety of meat and fish to support its subsistence. The areas of the former ninth- to eleventh-century workshops and the infilled pool in Sector 2 were intensively redeveloped, initially for domestic occupation in the thirteenth to fourteenth century and latterly (in the fifteenth to sixteenth century) for the working of iron. Thus the medieval settlement grew from a village to a township, while the church provided a burial place for its people and a theatre for their beliefs and challenges.

The sequence over the three Sectors

The period 1100–1600 at Portmahomack has been provided with a chronological framework by stratigraphy, radiocarbon dates, coins and pottery (see Table 7.1). This information suggests a division into three phases. *Period 4A*, the twelfth century, is evident only in Sector 4 where a simple rectangular stone church was constructed (Church 2), and eventually provided with a chancel (Church 3). Some dating support for the building was given by radiocarbon dates on a bell-casting pit (AD 1040–1260) and the single burial (Burial 117, AD 1150–1270).

Period 4B (thirteenth to fourteenth century) saw Church 2/3 replaced by a new building (Church 4), lengthened at each end and provided with an eastern crypt. A thirteenth-century aquamanile from Yorkshire (perhaps in use in Church 2), a chafing dish and a small quantity of Scottish Redware confirm activity in the thirteenth to fifteenth century (Digest 6.18). After an interval of intensive ceremonial use, burial returned to the nave: three of the stratigraphically earliest burials gave dates between the late thirteenth and early fifteenth century. Two burials with grave covers, one decorated and dating to about 1350 were found in situ end-on to the east wall of Church 4, showing that the crypt must have been in existence by then. As Church 4 was developing on the hill, a residential village took shape on the site of the former workshops and dried-up pool of Sector 2. A small group of imported Whiteware suggests some activity of twelfth-century date, but the greater part of the assemblage is Scottish Redware indicating activity of early thirteenth- to fifteenth/sixteenth-century date (Hall in Digest 6.18). The same Scottish Redware was found in the rig and furrow that now overran the filled in ditches in Sector 1, suggesting that the agricultural initiative also belongs to the thirteenth to fourteenth century, our Period 4B.

During *Period 4C*, from the fifteenth into the sixteenth century, there was a fire that scorched stones within the church, followed by a refurbishment that included the addition of a barrel vault to the crypt. Burial intensified, with a focus on the east end around the entrance to the crypt; the four radiocarbon dates, broadened by marine reservoir correction, gave spans from the mid-fifteenth to the early seventeenth century. Some burials were interred over the vault of the crypt. Burial should have terminated in about 1580 when the edicts of the Reformation vetoed the digging of further graves in the nave, apart from those of infants. In Sector 2, a large-scale industrial enterprise of iron smelters, smiths and tinkers arose on the site of the village, with a repertoire that included swords. This lively township was abandoned and ploughed over before post-medieval objects became commonplace.

The numismatic profile from Sectors 1, 2 and 3, although almost exclusively recovered from ploughsoil, echoes a three-part pattern. The assemblage contained no coins minted before the beginning of the thirteenth century: the sequence began with a group of pennies and halfpennies of the thirteenth to fourteenth century. There was a notable gap after *c* 1350 until *c* 1450 when base metal Scottish issues indicate a resumption of economic activity of late fifteenth- to early sixteenth-century date (*Holmes* in Digest 6.14).

Some chronological context for these events can be gleaned from the exiguous medieval records of the region. It is highly likely that the Pictish monastery was remembered in the Middle Ages: when Church 2 was founded, it became the parish church of Tarbat, dedicated to St Colman. In the thirteenth century, a

Table 7.1
Chronology for Period 4 (excerpt from Table 3.1)

Defined Period	Sector 1 [South Field]	Sector 2 [Glebe Field]	Sector 4 [Church]	The Tarbat Peninsula
HIATUS *c* 150 years 1000–1150			*up to 110 years*	
PERIOD 4 **Medieval** **twelfth-** **sixteenth** **century** PERIOD 4A Church 2/3 built 1100– 1200 AD			*Start: 1085–1245* *Church 2/3* **twelfth century** Bell casting pit F107 [O-10536] **1040–1260** *Aquamanile* Burial 117 [GU-9298] **1150–1270** [Blade wound, fatal]	*Parish churches founded* c *1170*
PERIOD 4B Church 4 built thirteenth to fourteenth century	*Ploughed fields* Pottery **thirteenth/fifteenth century**	*Residence S17 and fish middens* Coins **thirteenth century–*c* 1350** Pottery **thirteenth/fifteenth century**	*Church 4 and crypt built* Burial 112 [S-33403/fish] **1280–1420** Burial 110 [O-13490/fish] **1290–1410** Burial 113 [O-13491/fish] **1290–1430** [blade wound, healed] Grave cover **mid-fourteenth century**	*Fearn Abbey founded* c *1235*
PERIOD 4C Church 4 refurbished fifteenth to sixteenth century	*Ploughed fields*	*Smithy S18* Coins ***c*1450–*c*1550** Pottery **fifteenth–sixteenth century**	*Church 4* *Fire; Addition of vault to crypt* Burial 30/36 Burial 101 [S-33401/fish] **1440–1630** Burial 90 [O-13521/fish] **1460–1660** Burial 98 [S-33400/fish] **1420–1620** Burial 97 [O-13762/fish] **1440–1640** Burial 43 Boots of early fifteenth century *End: 1470–1690*	*Church burnt* c *1485*

Premonstratensian abbey was founded at Fearn, which extracted its territory from the larger, older parish of Tarbat. At that time, the peninsula also hosted the seat of the Earls of Ross, at Rarichie. In the fourteenth century, the chapel of St Duthac at Tain commanded religious attention, attracting eminent pilgrims. But on the Tarbat peninsula the service of sanctity still flourished: it had a large number of chapels and holy wells, some coincident with the old Pictish ritual centres. Like St Duthac's and St Colman's, these chapels were probably representative of a late resurgence of mystic Christianity, responding to the oncoming Reformation.

The Reformation arrived in the north-east in the later sixteenth century, coinciding with the installation of new western lairds (the MacKenzies). This family remodelled the church to suit the new liturgy and social relations and provided its early reformed ministers. The site of the former industrial activities in Sector 2 became the minsters' Glebe Land, while the land to the south (our Sector 1) remained under cultivation, as it has ever since. The township and its industries translocated to the harbour. From this time on (Period 5) the information fuelling our narrative story is confined to the church (Churches 5–8) and its churchyard, these providing an index of the social and spiritual thinking of the neighbourhood.

Using this chronological framework, the story of medieval and later Portmahomack is presented in the following sections: the church from the twelfth to the sixteenth century (p 289);

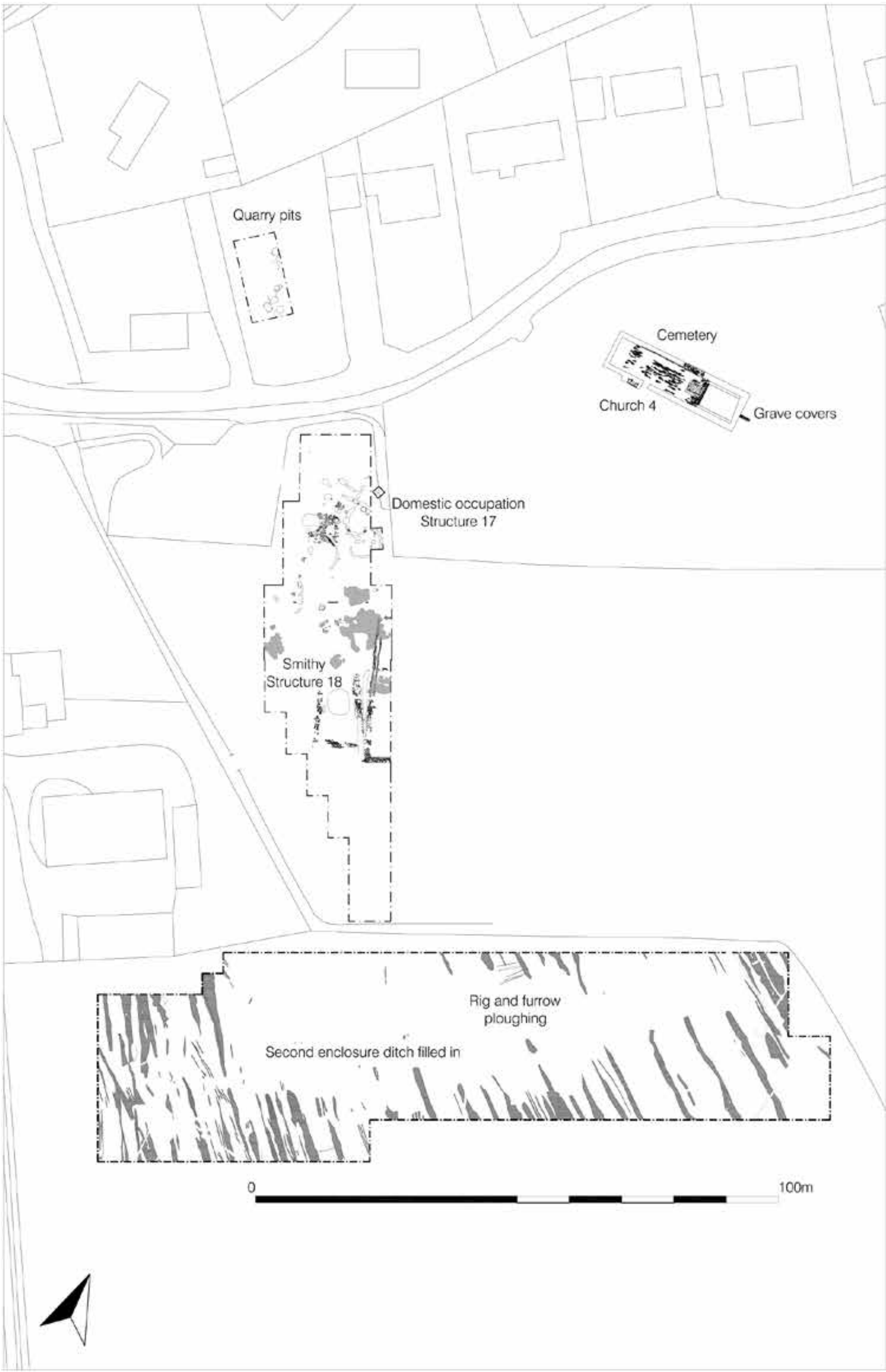


Illustration 7.1
Plan of activities in Period 4

Medieval people: the burials (p 296); Medieval diet (p 308); the village, thirteenth to fourteenth century (p 311); the township and its industries, fifteenth to sixteenth century (p 314); a context for medieval Tarbat (p 316); post-medieval Tarbat, seventeenth to twenty-first century (p 322).

The church from the twelfth to the sixteenth century

The sequence of churches was studied above and below ground, by excavation of the nave and by recording of the exposed fabric as the building was being restored and converted into a museum (Chapter 2, p 27). The full sequence of contexts and features is described in archive (OLA 6.3.1, 6.3.2, 6.3.3). During the Middle Ages, St Colman's Church developed from a unicameral building (Church 2) to acquire a chancel (Church 3) and thence to a fully fledged medieval church with nave, chancel, belfry and crypt (Church 4).

Church 2 (OLA 6.3.1 at 3.4.1)

The preparation for the first church was a layer of rubble that overlay remnants of a buried soil thought to have developed over the Period 2/3 cemetery. Church 2 was a simple rectangular single-cell building with a south door, plastered and lime-washed internally (Illus 7.2). Its east and west walls survived as foundations, while in the north and south walls the fabric that stood above ground was represented by a few courses of ashlar. Together, these walls defined a building measuring *c* 11.5m E–W by 8.0m N–S externally with an internal footprint of 9.0m E–W by 5.5m N–S. The construction technique for the walls of Church 2 consisted of foundation trenches up to 0.5m deep, filled with unbonded, closely interlocking beach cobbles and water-worn sandstone blocks (Illus 7.3a). These were overlain by a course of mortar-bonded, thin rectangular slabs on which rose the first course of interior and exterior elevations formed of large squared blocks of yellow sandstone embracing a mortared rubble core (Illus 7.3b). The yellow sandstone blocks were carefully shaped and very

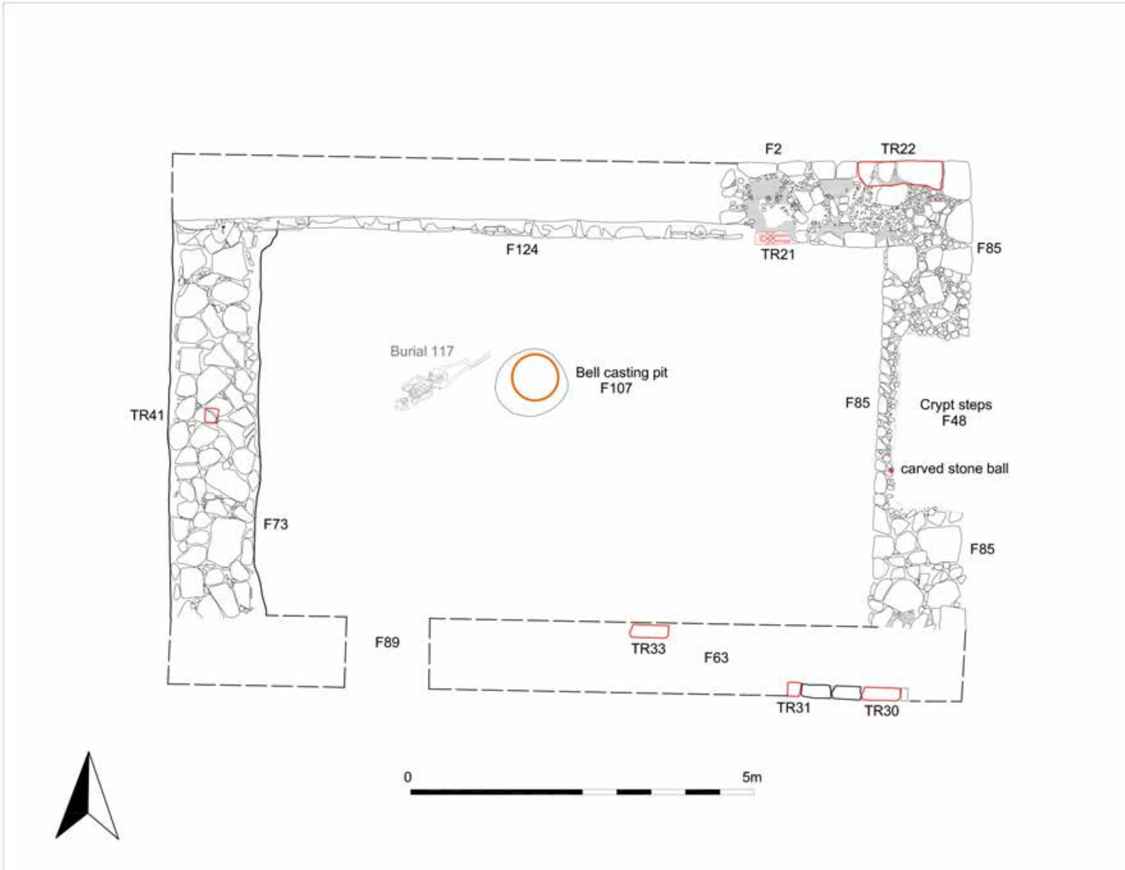


Illustration 7.2
Plan of Church 2

tightly jointed, demonstrating accomplished masonry. This stone was sourced on the peninsula (OLA 7.5.1). The eighth-century gravemarkers TR21, 30, 31, 33, 41 and the sarcophagus lid TR22 were also incorporated as building blocks in the foundations of Church 2 (Chapter 5.3; Illus 5.3.14). These were most likely brought to light during the levelling of the former monastic cemetery.

Something of the internal arrange-ment and appearance of Church 2 can be surmised from the few features assigned to the building. Internally the remains of the slab foundations of Church 2 were recorded as being partially covered with a smoothed, white plaster down to *c* 17.5m AOD and the elevations had at some stage been tooled roughly on the diagonal, possibly to aid the adhesion of wall plaster (see Illus 7.4a). The doorway for Church 2 was located 1.3m from the internal west end of the south wall and was visible as blocked lower door jambs over an in situ threshold stone at *c* 18.0m AOD (Illus 7.4b). Geological inspection of the threshold stone identified it as an extremely fine-grained sandstone, which may have been sourced differently from the stone used in the elevations; it may originate from the south side of the Tarbat peninsula (OLA 7.1.12). The change in height from the threshold at 18m AOD to the level of exposed foundations at *c* 17.5m AOD suggests that the original floor level of Church 2 was sunken. Such indications as we have allow the building to be an initiative of the eleventh or twelfth century, with perhaps a slight bias towards the later twelfth century to align with the documented reforms of David I (pp 317–18).

Bell-casting pit

A bell-casting pit (F107) was identified among the few features internal to Church 2. It was defined in a much truncated state having been cut away by Period 4 Burials 81, 90 and 150. Associated pit features contained ash, charcoal and bronze droplets. The remnants of the feature suggested a pit measuring *c* 1.0m in diameter and a depth of *c* 0.7m, while the internal diameter of the base of the pit suggests a diameter of *c* 0.6m for the cast bell. The fill produced several bell-cope mould fragments and small droplets of bell metal. Bronze-stained charcoal recovered from the pit fill by flotation was submitted for radiocarbon dating and returned as AD 1040–1260 (Digest 3.3).

A burial in Church 2 (OLA 6.3.1/3.4.2)

Associated with Church 2 was a single burial laid out on a NW–SE orientation markedly different from either the preceding or succeeding burials (Illus 7.5). Burial 117 was identified as a male,

Illustration 7.3
Church 2: (a) foundations of the west wall; (b) core and facing of the north wall, with TR21 in situ

aged seventeen to twenty-five years, of local origin. There were three cut marks on his skeleton, one on the back of the skull and two on the back of the femurs, and no evidence of healing, suggesting that the wounds were fatal. The position and nature of the cuts suggested a violent attack from behind, with a sharp weapon such as a sword. The burial had apparently been laid out with some care, with the arms crossed neatly over the lower torso. The grave had cut Period 2 Burials 114, 116 and 128 and had been subsequently cut by Period 4 Burials 141 and 148, but its relationship with Church 2 was equivocal. The skeleton lay at *c* 16.9m AOD, being *c* 0.6m below the postulated floor level of Church 2, and was radiocarbon dated to AD 1150–1270. The verdict is that Burial 117 was interred inside Church 2, and so is included with the Period 4 burials (below).

Church 3 (OLA 6.3.1/3.4.3)

Church 3 was essentially Church 2 modified by the addition of two offset parallel stub walls at the east end surviving to a maximum length of 1.35m (Illus 7.6). The walls are interpreted as the remains of a small chancel that was subsequently cut away by the construction of the crypt of Church 4. The width of the chancel was 3.9m internally and *c* 5.5m externally, but the original length is unknown. A fragment of a Romanesque cushion capital recovered during a watching brief beneath Tarbatness Road in 2007 may have belonged to Church 2/3, and appears to belong to a respond for the springing of a chancel arch (Cait McCullagh in OLA 8.4, Plate 4). Two post-holes, both stratigraphically early features, were identified at the east end of Church 2 (F92, 93; Illus 7.6). Their location, parallel and offset from the east wall by *c* 0.9m, and adjacent to the chancel suggests they may represent the position of a screen or rail at that point. Church 2/3 was possibly provided with ceramic cruets and glazed windows: several conjoining pieces of an aquamanile imported from Yorkshire (D6.18; Illus 7.7) and some fragments of window glass were recovered from the levelling of the chancel walls in preparation for the building of Church 4.

Illustration 7.4
Church 2: (a) external elevation of part of the south wall; (b) blocked threshold in the south wall

Illustration 7.5
Burial 117, in the nave of Church 2

Church 4 (OLA 6.3.1/3.4.4)

Church 4 was a major reconstruction, which stood for three centuries and partly survives today. The upper parts of the Church 2/3 were demolished, and its foundations extended 5.7m to the west and 10.3m to the east, defining a building 27.5m long by 7.7m wide externally (Illus 7.8). A chamfered plinth was a characteristic of the exterior of the new building and its top was recorded in architect's test pits at 17.99m, 17.93m and 17.85m AOD (OLA 6.3.3/2.3; Illus 7.9). The threshold and door of Church 2/3 were retained. A small length of stone wall was also encountered immediately outside the south door of the church (F5). This clearly related to the entrance but its purpose was not determined. Externally at the east end, the wall was seen to have been formed in dressed stonework to 16.8m AOD, suggesting the ground surface dropped away to leave the east exterior of the crypt exposed (OLA 6.3.3/2.2). Two squared stone blocks with square niches, one in situ against the east wall, are interpreted as stone supports for a reredos at the east end of the new chancel.

In Sector 3, on the beach side of Tarbatness Road, several large pits were dug, apparently to extract the fine clean sand, perhaps for making mortar for the construction of the medieval church (see Illus 7.1). In the backfills were four wire-wrap-headed bronze or silver pins and thirteenth- to fifteenth-century Scottish Redware pottery (Illus D6.1.24; OLA 6.2 at 3.5.2).

Crypt

The crypt beneath the extended chancel occupied approximately one-third of the length of the church. It had vertical east and west walls, their interior alignments differing by seven degrees (see also p 171), each abutted by the barrel vault that forms its present roof (7.10; and see Illus 5.4.3 and 4, p 169 for elevations of the east wall). An alcove (aumbry) was let into the east wall, and four lights had been inserted, two in the east wall and one each at the east end of the north and south walls (Illus 7.11a). The steps down into the crypt were cut through the east wall of Church 2 and occupied most of the footprint of the demolished Church 2/3 chancel (Illus 7.12). The medieval entrance from the nave to the steps did not survive, although given its position it is likely to have been furnished with some form of stone coping and rails.

Since the barrel vault was an addition, it represents a secondary development of the crypt which, in its original form, was probably defined by vertical walls on all four sides. A fragment of a Pictish gravemarker (TR29) was reused in the west wall of the crypt. The barrel vault incorporated two pieces of Pictish sculpture, TR20 (the Apostle Stone) and TR26 (in the north light lintel); the first of these carried traces of brown mortar and had probably already been used in Church 2. Set into the south wall of the vault was a section of a window mullion of thirteenth- to fourteenth-century date (Illus 7.11b; Jonathan Clark, pers comm) If the barrel vault was later than the thirteenth/fourteenth-century date implied by the mullion, it was still a medieval structure since it was oversailed by two burials (Burial 34 and Burial 19/31) belonging to the Period 4 group (a correction to the initial interpretation in Bulletin 3 (OLA 5.3) where the vault was attributed to the post-Reformation church, Church 5; cf G Stell in Bulletin 1, OLA 5.1). The original opening from the steps into the crypt had been remodelled and the new door frame carried a mason's mark, as well as sundry bolt holes denoting increased security. In the south-west corner a small 'basin' was recorded as a rectangular mortar patch and reflected in plaster on the adjacent walls.

The east and west walls bore signs of scorching by fire and some fire-reddened stones were also incorporated into the vault (OLA 6.3.1/3.2, *Crypt*). This event occurred before the insertion of the vault and was sealed by the plaster subsequently applied to the whole crypt interior. On the floor, the earliest layer encountered during excavation overlay sand subsoil and abutted the walls. It consisted of a green clay, which may have been preparatory to a stone floor (indicated by the presence of a slab of Old Red Sandstone). The clay surface had many interesting traits: it had been marked by scoring, perhaps with numerals, and was burnt in small discontinuous patches.

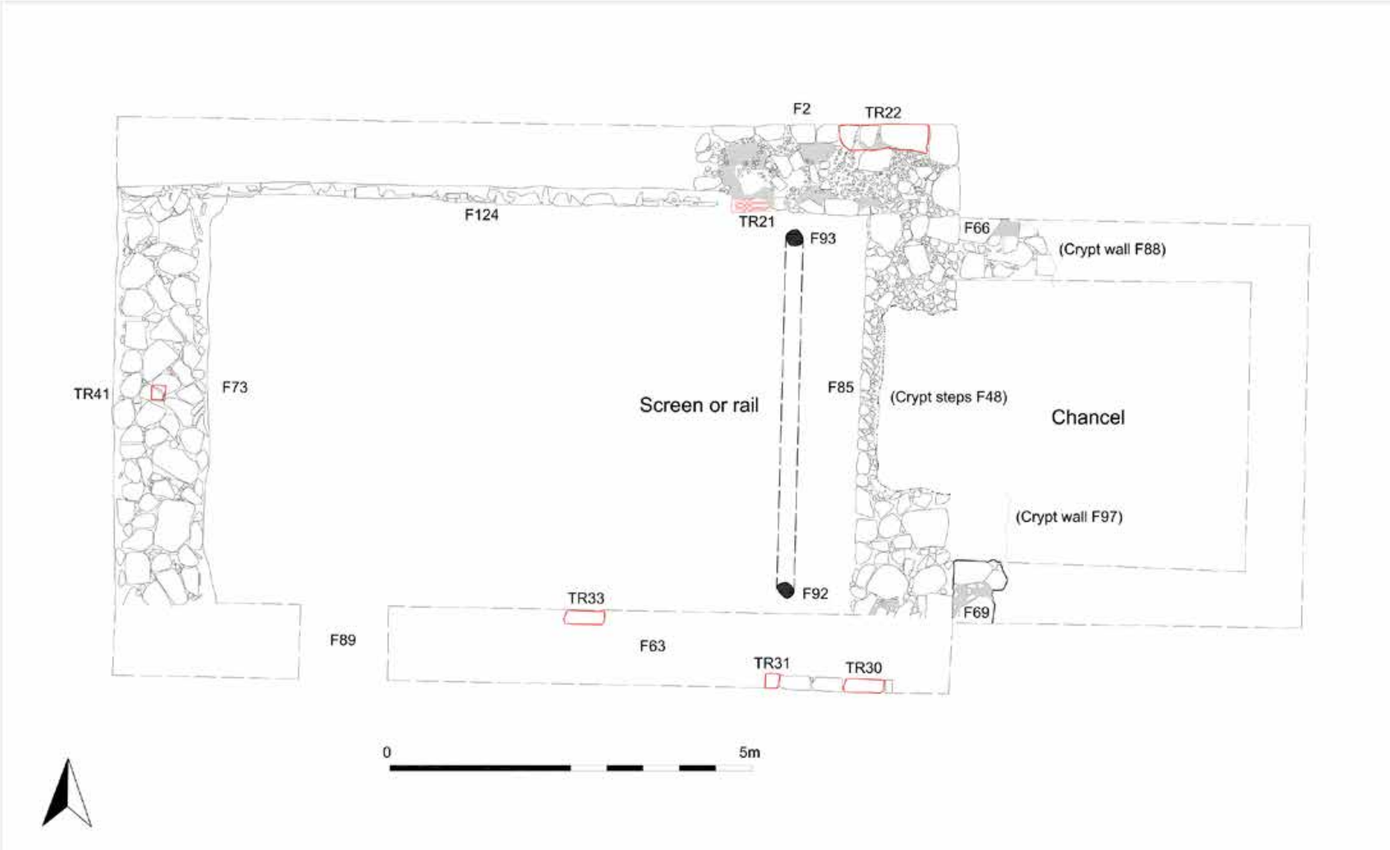


Illustration 7.6
Church 3: plan, with conjectural outline of original chancel

Sculpture

Two medieval grave slab covers were identified during modern refurbishment of the church. A late fourteenth- to fifteenth-century memorial was found bonded with two plain flagstones in the north-west corner of the church beneath the eighteenth-century blocking of the belfry arch of Church 5. The slab depicts a great sword or Claymore and bears a later inscription in the form of the initials 'AMRM' (Illus 7.13c). The presence of a medieval cross-slab grave cover within the church, albeit reset, is noteworthy and may have been originally laid in a floor of Church 4. An elaborate mid-fourteenth-century grave cover was encountered outside and end-on against the east wall of Church 4 (Illus 7.13a). The top of the slab was recorded at 17.1–17.2m AOD, which is likely to represent the fourteenth-century external ground level at the east end of Church 4. The slab carries a low-relief carving of a floreate cross on a stepped base, a great sword and two shields and dates to the mid-fourteenth century (1340–1370; Butler in Digest 5.2). A second undecorated grave cover lay adjacent (Illus 7.13b). Neither grave has been excavated or identified, and both remain in situ.

The sequence within Church 4

The early history of Church 4 was witnessed by a series of stratigraphic events. Within the nave, construction began at the floor level of Church 2 (postulated as 17.5m AOD) and while exposed the inner face of the lower courses of the walls were subject to burning. A first levelling sand was marked by amorphous scoops, patches of burning, a hearth containing a small molten lead mass and spreads of mortar (producing a lead soldering rod, 17/154). These were overlain by a more substantial but very mixed ashy layer (C1147), which contained most of the medieval material recovered by the excavation, including four sherds of thirteenth- to fifteenth-century ceramic and a fragment of locally made chafing dish, perhaps used to heat charcoal for the burning of incense (Illus 7.7; Digest 6.18). There were also thirty-eight fragments of thirteenth- to fifteenth-century window glass including a fragment of painted stick-work border (Digest 6.15). A layer of levelling sand (C1008) finally raised the floor level to 17.9m AOD and it was at this point that burial returned to the nave.

A total of eighty-eight burials were defined in the nave and over the crypt vault, representing a well-stratified sequence of graves of men, women and children (see *Medieval People*, below). Several grave backfills contained artefacts, but the dates were broad: thirteenth- to fifteenth-century ceramic and fragments of medieval glass and coins (Burials 19/31, 26, 27, 41, 58, 93, 101). Burial 34 contained a sherd from a glass hanging lamp of thirteenth- to sixteenth-century date. Burials 14 and 32 contained

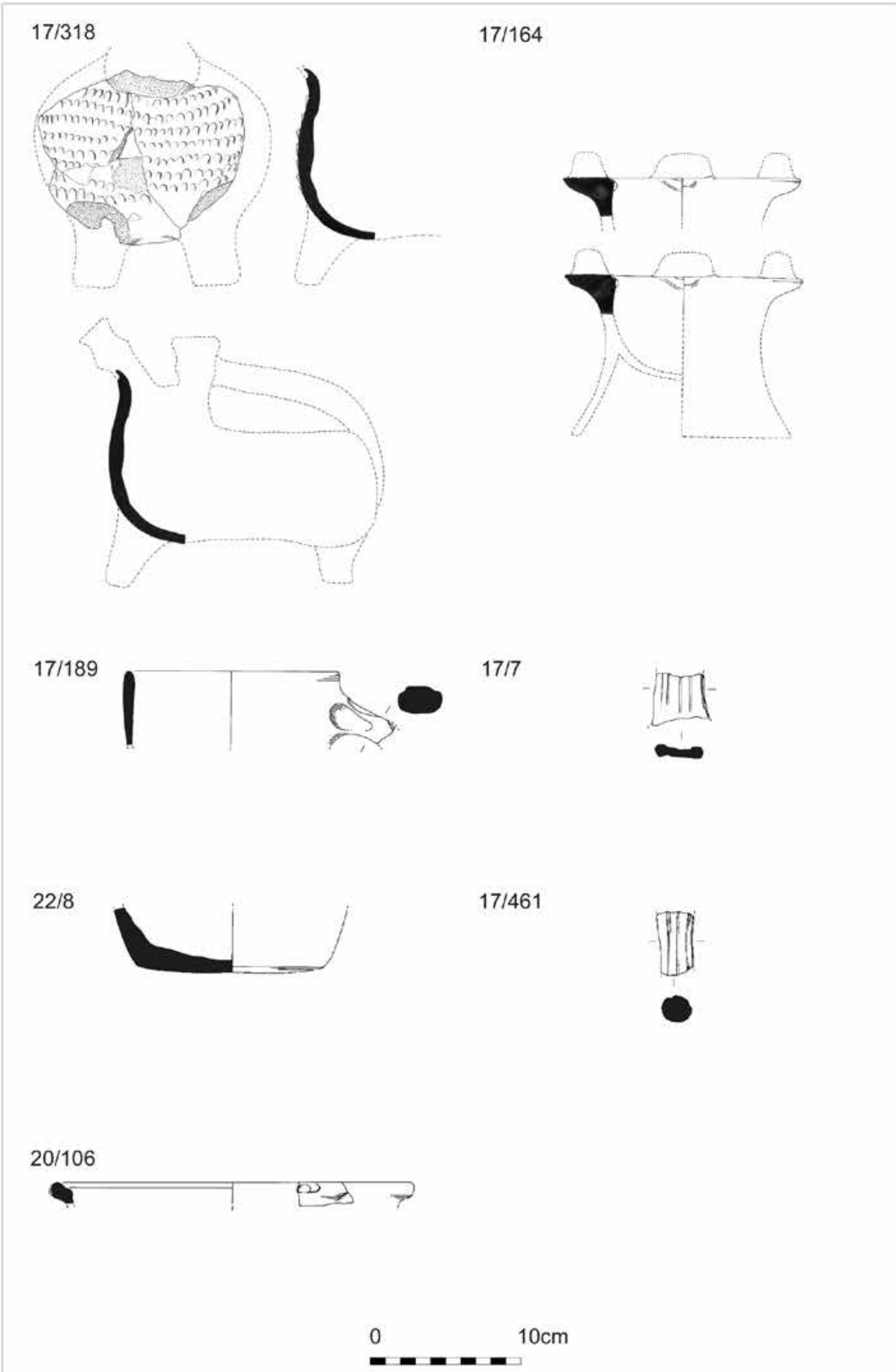


Illustration 7.7
Pottery from the church (see Digest 6.18)

late fifteenth century coins. The later Burial 24 contained fifteenth/sixteenth-century coins. These artefacts were mainly residual, but Burial 43 wore boots and leghose dating to the early fifteenth century (for descriptions of artefacts see Digest 6.1).

Seven burials were radiocarbon dated and the results fall into two groups: Burials 110, 112 and 113 are the earliest stratigraphically and date between the late thirteenth and early fifteenth century (1290–1410, 1280–1420 and 1290–1430 respectively). The remaining four burials (101, 90, 98 and 97) date between the early fifteenth to early seventeenth century (1440–1630, 1460–1660, 1420–1620, 1440–1660). Although this is not a large group of dates, the first six of the burials cited constitute a single stratigraphic sequence ranging from the earliest to the latest burials, so the lack of overlap in the mid-fifteenth century may be significant (see Digest 3.2, Table 2, marine corrected dates, and stratigraphy for Sector 4, p 55). The location of the graves (Illus 7.14) suggests that burial began in the orderly rows still visible at the west end, and experienced a later surge, mainly at the east end of the nave and focused on Burial 30/36. In the late sixteenth and into the seventeenth century, burial in the nave came to an end with the onset of the Reformation (here *c* 1580), but was to continue with the interment of infants around the steps to the crypt.

Church 4 is therefore judged to have experienced three main phases in its history. After its construction, and possible fire in the thirteenth century, the nave and crypt were intensively used, presumably for liturgical purposes, and the floor level rose by 0.4m. Sometime in the fourteenth century, burial returned to the nave and a grave capped by a floriate cross-slab was placed orthogonally against the east wall. In a third phase, in the fifteenth century, preceded possibly by a second fire, the crypt was equipped with a barrel vault, plastered, and provided with lights at the above-ground east end. The aumbry may also belong to this refurbishment (cf Chapter 5.4, p 173), as well as a new plain stone frame for the door, with a mason's mark on the jamb. At the same time burial intensified especially at the east end of the nave around the entrance to the crypt where a complex ritual at Burial 30/36 appeared to provide a focus (Illus 7.15; and see below). Given the date of the previous assemblage (thirteenth to fifteenth century) and the radiocarbon dates of the burials, a date in the fifteenth century seems probable for the beginning of this latter phase. In the overall chronological concordance, the first two of these burial phases occurred in Period 4B (thirteenth to fourteenth century) and the third in Period 4C (fifteenth to sixteenth century). It is possible that there was a hiatus between them, say 1350–1450, so reflecting events that were taking place in Sector 2 (see below, p 287).

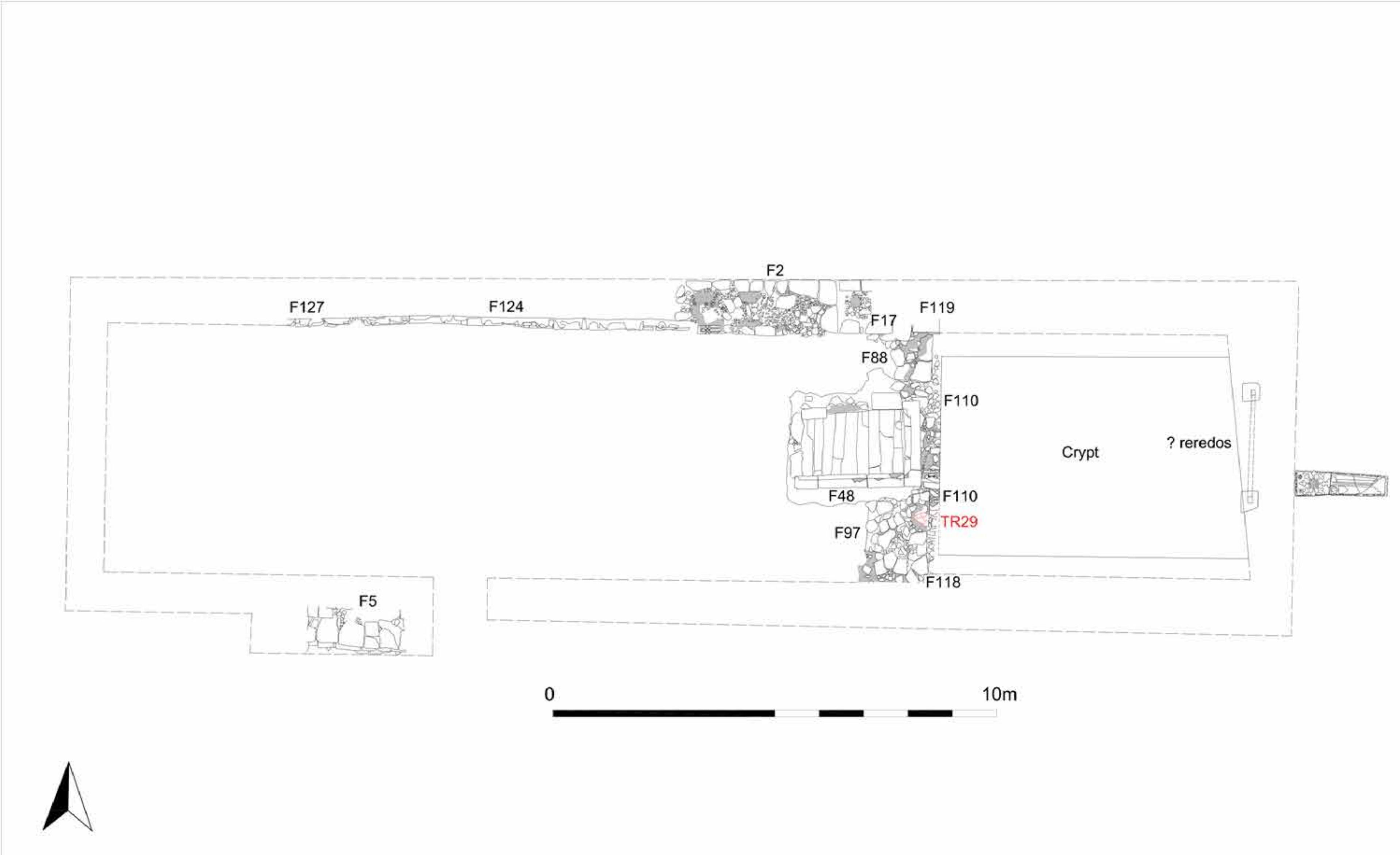


Illustration 7.8
Church 4: plan

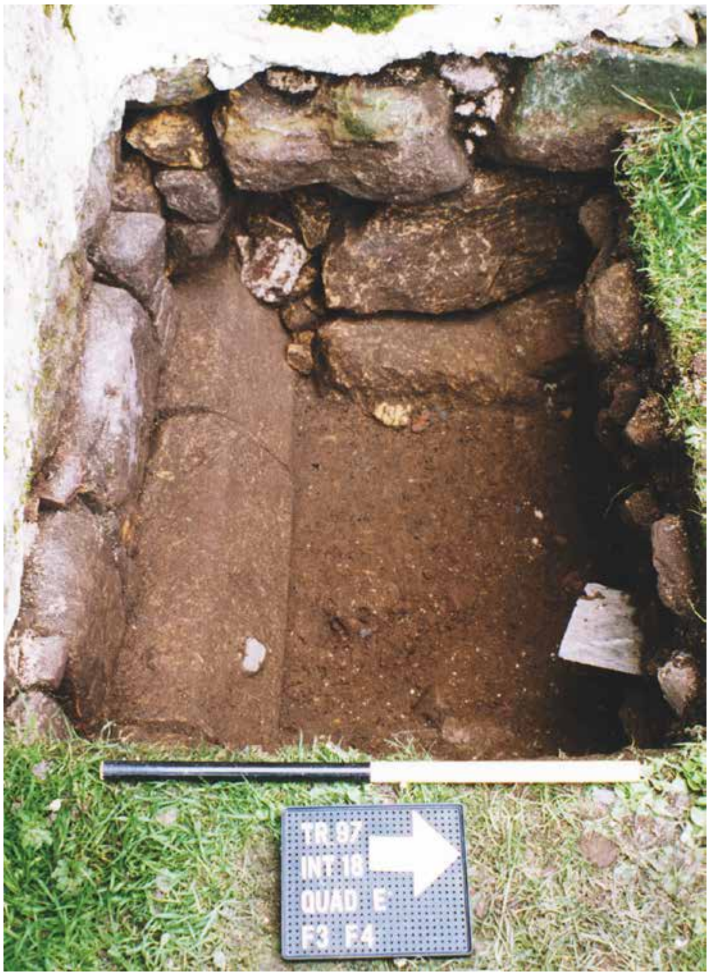


Illustration 7.9
Church 4: Chamfered plinth

The documentary record of a major fire in 1485 offers a tempting context for the refurbishment of Church 4 at the threshold of Period 4C. This incident is discussed below (p 319), but, as also emphasised there, the medieval church of St Colman stood for at least 300 years during which accident, unrest, violence and decay would have periodically caused fires and prompted repair. The principle evidence we have for the scorching of the walls of the crypt can relate it to two different moments – during construction in the thirteenth century and more than a century later in the early fifteenth. The latter incident may have happened in 1485, but we have no corroborating evidence that it did so.

Medieval people: the burials (fourteenth to sixteenth century) (OLA 6.3.3 at 3.4.5; for data on medieval burials see Table 2 and Digest 4.1, under Period 4 and 5)

Eighty-eight skeletons of men, women and children were excavated in the church (see above and Table 7.2: Illus 7.14). Chronological analysis (above) suggested that burials in the nave belonged to an early (thirteenth/fourteenth century) and a later (fifteenth/sixteenth century) group, with a possible interval between them. However, the burial sequence is a continuum and the following study relates to a population broadly contained from the late thirteenth to the sixteenth century.

Burial rites

With a few exceptions the burials were oriented W–E. Burials were sometimes coffined (twenty-five), sometimes shrouded (ten) and more rarely both (three). Individuals interred in coffins were identified as fifteen out of thirty-nine male (or probable male) burials, four out of twenty-four females (or probable females), four out of eighteen children and two out of three infants (Burials 58, 89). Of the coffined males, eight of the fifteen were aged forty-six years plus. These figures suggest an economically stratified community, privileging males. Analysis of coffin wood samples identified species in six instances with oak, pine and ash among the assemblage (Allen in Digest 6.19).

Burial 30/36 was the site of an exceptional, if eccentric commemoration. It consisted of an oak coffin containing two bodies, Burial 30 (C1209) and 36 (C1214), and four additional skulls (C1217), the grave being sited in a prominent position opposite the crypt steps (Illus 7.15–17). At the foot of the coffin was an infant of a few weeks old, also buried in a coffin (Burial 58). The skull and mandible of Burial 36 and the mandible of Burial 30 suggest both men were aged forty-six to fifty-nine years and their recorded stature shows Burial 36 to be the tallest in the medieval population at 180cm and Burial 30 not far behind at 176cm. Among the four additional skulls, buried without their mandibles, were two young men and a woman. The sequence of burial appears to have begun with the interment of a first male (Burial 36, a westerner; C1214) on his back in an oak coffin accompanied by four crania all

Illustration 7.10
Church 4: west wall of crypt with steps, interior

Illustration 7.11
Church 4, crypt: (a) north-east corner with aumbry; (b) south wall of vault with section of thirteenth/fourteenth-century window mullion

positioned to face east and arranged either side of his own skull, which carried blade wounds. Perhaps a generation later, the grave was reopened, the skull of Burial 36 was displaced, leaving the mandible in situ, and a second body (Burial 30, a local; C1209) was laid on his back over the first, his head taking the place of his predecessor. The displaced cranium assigned to the original occupant was laid on top of Burial 30 before the grave was again closed. Such skulduggery suggests something of a head cult, as well as an ongoing rivalry that continued beyond the grave (see below, p 321).

The location of this and neighbouring coffined graves were subsequently respected. Their grave *cuts* were affected by later overlying burial, but not their bodily remains or coffins. The reopening of Burial 36 to receive Burial 30 suggests that some graves were marked, perhaps by slabs, as indicated by the late fourteenth- to fifteenth-century grave slab reused within the floor of Church 5 (above). Burial 43 (with boots), an adjacent coffined burial of a mature male, aged forty-six years plus, of large stature (172cm), is notable in its juxtaposition and alignment with Burial 30/36 and its good bone survival suggesting its position was also marked. Burial 109, another male aged forty-six years or more, also of relatively high stature, represents another coffined burial on the same alignment. Nearby, another two coffined children were added to this group. A further unmolested, carefully shrouded, burial of a young man (175cm), Burial 35, lay between Burial 30/36 and Burial 43 and, although uncoffined, appears to belong in this group of burials at the east end of the nave. Another member of this group (Burial 93) was recorded as having a diet exceptionally rich in meat (Digest 4.3, p D31). The people, rites and spatial associations of this group suggest the eventful experiences of a prominent family.

Burial 43 had worn low boots and woollen leg hose (Illus 7.18); these provide a rare example of a clothed and shod burial from medieval Christian Scotland. The skeleton was identified as that of a male, aged forty-six years or older. A report on the textile identified the textile as leg hose in an undyed, heavy felted wool tabby of early fifteenth-century date. The hose were well worn

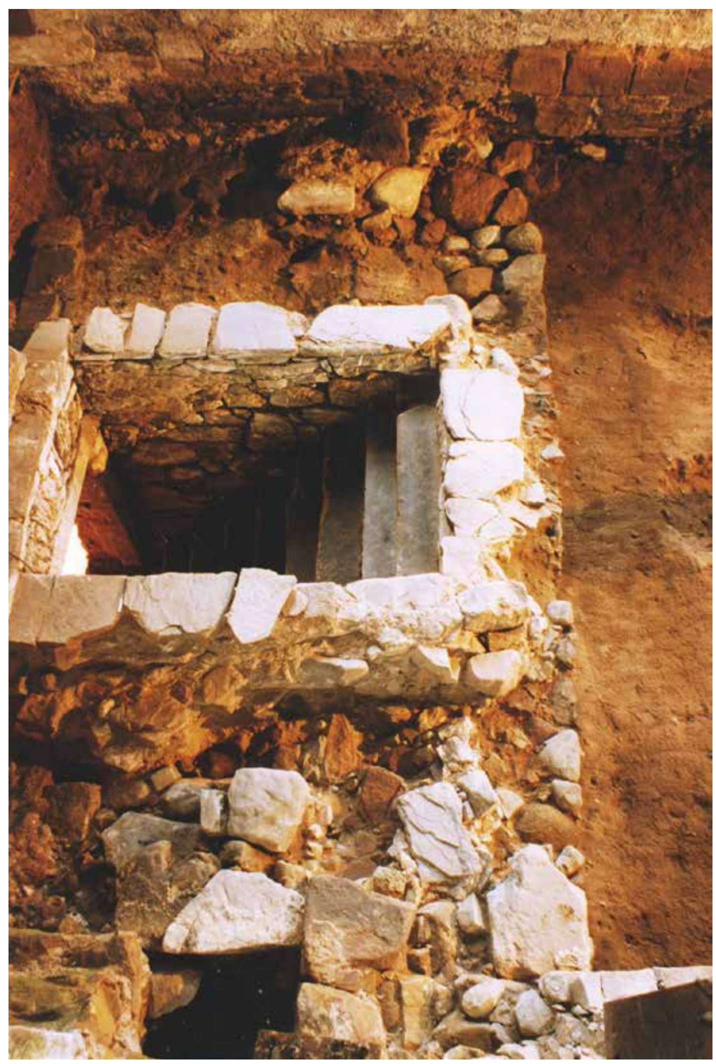


Illustration 7.12
Entrance to crypt cutting east wall of Church 2

Table 7.2
Burials of Period 4 (medieval)
All W–E, simple, extended, supine inhumations unless otherwise noted. Burial 117 is included in the Period 4 analyses

Burial	Type	Occupant	Stratification	Max. Height AOD (m)	Analyses	Date
	PERIOD 3/4					
117	Oriented NW–SE	Male 17–25 y Ht 1.63/5' 4"	Cutting Period 2 burials 114, 116, 128; cut by Period 4 burials 141, 148	*c* 16.9	Blade wounds to cranium, L. and R. femora. Origin local	AD 1150–1270
	PERIOD 4					
1		Prob. male Ht 1.69/5' 6"	late interment sealed by F6 flagstone floor of Church 5, overlay Burial 2, close to east end	17.5		
2		Child 1.5 y	overlain by Burial 1, close to east end	17.2		
3		Child 10–12 y	overlain by child and infant Burial 7 and infant Burial 6, close to east end	17.6	Rickets?	
5		Female 46–59 Ht 1.46/4' 9"			Healed fracture of a middle rib	
7		Child 3 y	incorporated remains of later infant burial, overlay Burial 3	17.6		
8	coffined	probable male, 17–25 y	truncated to knees by Burial 18, close to east end	17.5		
9	coffined	adult, probable male	overlay coffined child Burial 55, overlain by coffined Burial 93, close to east end	17.3		
10		child 6.6–10.5 y	overlain by coffined Burial 8, cut polished plaster slab F47	17.7		
11		child, 2.6–6.5 y		17.6		
14		child, 2.6–6.5 y	post-dated Burial 32 which contained late fifteenth-century coin	17.5		
16		child 6.6–10.5 y		17.5	Origin in west Britain	
18		male, 46+ y	post-dated coffined Burial 8	17.5		
19/31		male, 46+ y	grave fill contained thirteenth- to fifteenth-century pottery	17.5		
20		probable female, 46+ y	overlay coffined, clothed Burial 43 and overlain by Burial 5, close to east end	17.2		
21	coffined	child, 2.5–6.5	overlay coffined child Burial 119, overlain by Burial 28	17.3		
24		juvenile, 14.6–17 y	grave fill contained three coins of late 15th- to early sixteenth-century date	17.5		
25	coffined	male, 46+ y	overlay clothed, coffined Burial 43, overlain by Burial 35, close to east end	17.5		
26		infant, 0–0.5 y	overlay shrouded Burial 49, overlain by coffined Burial 9	17.2	scurvy	
27		child, 10.6–14.5 y	contained thirteenth- to fifteenth-century pottery, overlay Burial 42, overlain by coffined Burial 30/36 and coffined child Burial 21, close to east end	17.3		

Burial	Type	Occupant	Stratification	Max. Height AOD (m)	Analyses	Date
28		female, 46 y+	overlay coffined child Burial 21, late interment sealed by F6 flagstone floor of Church 5	17.5		
30	In oak coffin of Burial 36	male, 46 y+	(C1209) Interred over Burial 36 replacing position of head between four skulls, burial joined by coffined infant Burial 58 at feet, close to east end centred in nave	17.0	Origin local	
32		male, 46 y+	contained late fifteenth-century coin, overlain by child Burial 14	17.7		
34		male, 46 y+	overlain by child Burial 59, overlay crypt vault F110, fragment of thirteenth- to sixteenth-century glass hanging lamp contained in grave fill	17.3		
35		male, 17–25 y	overlay Burial 25 and 178, overlain by child Burial 3	17.1	Origin in west Britain	
36	In oak coffin, with four accompanying skulls (C1217)	male, 46 y+	(C1214) Skull removed on interment of Burial 30 over; contained thirteenth- to fifteenth-century pottery, deep late grave, burial joined by coffined infant Burial 58 at feet, close to east end centred in nave	17.1	Blade wounds to the head Origin in west Britain	
37		probable male, 26–45 y	pre-dated Burial 32	17.6		
41		male, 17–25 y	early burial in nave, overlain by Burial 27 which contained thirteenth- to fifteenth-century pottery	16.9	Origin in west Britain	
43	coffined (oak with ash lid) clothed with leg hose and shod with low leather boots	male, 46 y+	close to east end, overlain by Burial 20 and 25. Boots dated early fifteenth century,	16.8		
49	possibly shrouded	probable female, 46 y+	early burial in nave overlain by coffined infant Burial 26	17.0		
55		adult, sex undetermined, 17–25 y	cut the cut for the crypt steps F48	17.6		
56	coffined	male, 46 y+	late burial over child Burial 60 sealed by F6 flagstone floor of Church 5	17.8		
58	coffined	infant, 0.6–2.5 y	interred at feet of Burial 30/36	17.0		
62	shrouded	female, 46 y+	late burial in the nave sealed by F6 flagstone floor of Church 5, overlay Burial 64	17.8	Non-united fracture at the base of the fifth metatarsal (tuberosity) Origin in east Britain (non-local)	
63		child, 2.6–6.5 y	late burial in nave	17.8	Rickets	
64		male, 46 y+	overlay shrouded Burial 69 and overlain by shrouded Burial 62		Incomplete fracture on distal end of L fibula, with evidence of healing	

Burial	Type	Occupant	Stratification	Max. Height AOD (m)	Analyses	Date
65	coffined	child, 6.6–10.5 y		17.6	possible blade wound	
66		male, 26–45 y	overlay shrouded Burial 78 and overlain by infant Burial 73	17.6		
67/68		female, 26–45 y, including pre-term foetus in womb, Burial 68	disappeared beyond western limit of intervention	17.5		
69	shrouded	female, 46+ y	overlay shrouded Burial 78, overlain by Burial 64	17.6		
71		child, 2.5–6.5 y	overlay Burial 80, sealed by F6 flagstone floor of Church 5	17.5		
72		adult, sex undetermined	post-dated coffined Burial 112	17.5		
74		male, 46+ y	sealed by F6 flagstone floor of Church 5	17.6	Fracture of the styloid process, L third metacarpal	
75		adult, probable male	cut by Burial 77	17.6		
76		adult female skull only				
77		male, 26–45 y	cut Burial 75, cut by Church 5 bell casting pit F4	17.7		
78	shrouded	female, 26–45 y	overlain by shrouded Burial 69 and Burial 66	17.8		
79/114		probable female, 17–25 y	overlay Burial 105, cut by F63, flue/vent for Church 8	17.9		
80		male, 46+ y	early burial in nave, overlain by infant Burial 70 and child Burial 71	–		
81/87		child, 6.6–10.5 y		17.5		
82		female, 46+ y	later interment in nave, overlay coffined child Burial 86			
83		probable female, 26–45 y	cut by clothed, coffined Burial 43	17.3		
84		male 46+ y	late interment in nave sealed by F6 flagstone floor of Church 5, overlay coffined child Burial 86	17.5		
85		probable male, 17–25 y	late interment in nave sealed by F6 flagstone floor of Church 5, overlay Burial 120/132 and Burial 104	17.2		
86	coffined	child, 6.6–10.5 y	post-dated coffined Burial 108 and overlain by Burial 82 and 91	17.4	Origin in west Britain	
88	coffined and shrouded	female, 26–45 y	post-dated coffined Burial 161 and sealed by F6 flagstone floor of Church 5	17.4		
89	possibly coffined	infant, 0.6–2.5 y	overlain by Burial 84, post-dated Burial 91	17.4		

Burial	Type	Occupant	Stratification	Max. Height AOD (m)	Analyses	Date
90	shrouded	male, 46+ y	post-dated radiocarbon dated coffined Burial 113, post-dated by coffined Burial 98	17.4	Disabled	AD 1460–1660
91	shrouded	female, 26–45 y	post-dated coffined child Burial 86, post-dated by coffined child Burial 89	17.4		
92	coffined	female, 26–45 y	early burial in nave, overlain by Burial 178	17.4		
93	pine coffin	male, 26–45	late burial in nave, grave fill contained thirteenth- to fifteenth-century pottery	17.2	High meat diet	
94	coffined	adult, probable male		17.8		
95		female, 46+ y		17.5	severe osteoporosis	
96		adult, probable male	post-dated Burial 106	17.5		
97	shrouded	probable female, 46+ y		17.4	Scheuermanns-Schmorls disease	AD 1440–1640
98	coffined	male, 26–45 y	post-dated radiocarbon dated Burial 90	17.4		AD 1420–1620
99		female, 46+ y		17.5		
100		female, 26–45 y		17.4		
101	coffined and shrouded	female, 46+ y	grave fill contained thirteenth- to fifteenth-century pottery	17.4		AD 1440–1630
102		female, 26–45 y		17.3		
103		male, 26–45 y	post-dated by coffined Burial 93	17.4		
104		adult, probable male	post-dated by Burial 85	17.5		
105		female, 46+ y	post-dated by Burial 79/114	17.5	Well-healed incomplete fracture on distal end of R fibula Anomalous diet	
106		female, 46+ y	post-dated by Burial 96	17.7		
107		male, 17–25 y		17.8		
108	coffined	male, 26–45 y	post-dated Burial 50, post-dated by coffined child Burial 86	17.1		
109	coffined	male, 46+ y	post-dated by coffined child Burial 119	17.0		
110	shrouded	child, 10.6–14.5 y	post-dated by coffined Burial 113	17.1	scurvy? Origin in west Britain	AD 1290–1410
112	coffined	male, 46+ y	early burial in nave, post-dated by coffined, shrouded Burial 101 and Burial 72	17.2		AD 1280–1420
113	coffined and shrouded	male, 46+ y	very deep grave, post-dated by radiocarbon dated Burial 90	16.6	rickets? Blade wound to skull	AD 1290–1430

Burial	Type	Occupant	Stratification	Max. Height AOD (m)	Analyses	Date
115	coffined	adult, probable female	post-dated by Burial 24 which contained late fifteenth- to early sixteenth-century coins	16.8		
119	coffined	child, 10.6–14.5 y	post-dated coffined Burial 109, post-dated by coffined Burial 93	17.2	Origin west Britain	
120/132		male, 46+ y	post-dated by Burial 85, later truncated by flue/vent F63 for Church 8	17.5		
134		probable male, 17–25 y	cut by Church 5 bell-casting pit F4	17.6		
150		adult male	early burial in nave, post-dated by coffined Burial 108	17.0		
161	coffined	male, 26–45 y	post-dated child Burial 175, post-dated by coffined Burial 88	17.2		
175		child, 6.6–10.5 y	early burial in nave, post-dated by coffined Burial 161	17.5		
178		adult, sex undetermined	post-dated by Burial 35 and101, post-dated coffined Burial 92	17.5		
190		child, 2.6–4.5	cut by Church 5 bell-casting pit F4	17.9		

indicating they had been used in life prior to burial in the grave (Digest 6.17). The footwear was identified as a pair of low boots also of an early fifteenth-century style (Digest 6.16). The man was interred within an oak coffin, lidded with ash (Digest 6.19).

Infant burials (OLA 6.3.3 at 3.4.6)

A total of twenty-one articulated infant burials (0–2.5 years) were recorded within the nave and a further twenty-four were represented in the 'charnel' layer beneath the flagstone floor of Church 5. A further fifteen infants were identified in the assemblage of disarticulated bone amounting to a noteworthy total of sixty infant burials within the church. Of the articulated infant burials, four clearly belonged to Period 4, being stratified with Period 4 adult burials (Burials 2, 26, 58 and 89), while the remaining seventeen were identified as the latest, or probably the latest, interments in the sequence. The infants represented in the 'charnel' also suggest late interment. The group of late articulated infant burials have been assigned as Period 4/5 to acknowledge that, as a group, some may have been interred during the later part of Period 4 and some could belong to Period 5. Burial 29 interred in the north aisle certainly belongs to Period 5 (p 324).

The distribution of this group of late infant interments suggests that burial near the crypt was favoured (Illus 7.19). Burials 4, 12, 13 and F31 (double burial) formed a row, while Burials 33, 6 and the remains of an infant recorded at the feet of Burial 7 suggest further ordering. Two of these burials were shrouded, but coffins are absent. Orientation of burial varies notably, as compared to adult burials, with the two infants in F31 buried W–E and E–W. Burial 57 was also oriented E–W, Burials 15 and 29 were oriented S–N and N–S respectively, the latter apparently tucked between two walls. Burial 59 was that of a young child placed beneath and above flagstones, a noteworthy divergent burial rite and is grouped here accordingly. Children may have been favoured with sanctified locations long after these were no longer available or perhaps potent for most adults. The children's cemetery at medieval Inchmarnock continued into the seventeenth and eighteenth century (Lowe 2008, 93).

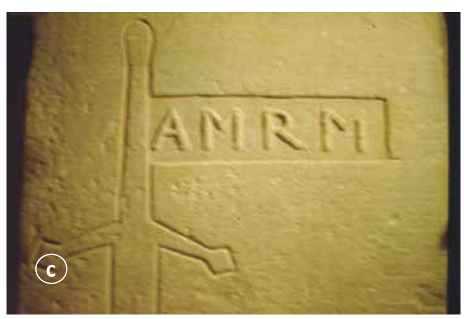
Analysis of Human Remains (Digest 4.1–4.5; for Sarah King's full report, see OLA 7.2.1.1; the osteological detail in the Catalogue D4.1 has been revised and enlarged by Shirley Curtis-Summers)

The medieval group of eighty-eight Period 2 burials breaks down into sixty-six adults (thirty-nine males or probable males, twenty-four females or probable females and three undetermined adults), eighteen children, three infants and one juvenile (Table 7.2). There was also a group of late infant burials that could be ascribed to Period 4 or 5 (see above). The stature of the medieval individuals from Tarbat was slightly less than their Scottish contemporaries. Overall, however, the average medieval female height of 5' 1" (154.94cm) and the average male height of 5' 6" (167.64cm) were not greatly different than the average modern Scot (females: 5' 4" (162.56cm); males: 5' 10" (177.80cm) (Knight 1984).

Health

The majority of individuals at Tarbat lived to relatively older ages in comparison to other medieval Scottish assemblages, with

Illustration 7.13
(a), (b) medieval grave covers abutting exterior east wall of Church 4; (c) medieval grave cover from the west end (detail)



the exception of Glasgow Cathedral (twelfth- to fifteenth-century phase; Digest 4.2). At that site, most individuals died as middle or old adults. There was also an almost identical ratio of females to males at Tarbat and Glasgow Cathedral. There was a high frequency of dental disease, particularly in medieval females, which may be indicative of a difference in diet (and oral hygiene) between the sexes. It is possible that women may have been eating more high-carbohydrate foods (or more sugary foods) than the males. It has been suggested that the consumption of animal protein may be associated with better dental health (Digest 4.2).

There was a high prevalence of dental enamel hypoplasia at Tarbat, suggesting that environmental stress during childhood may have been experienced more often (or more severely) by the Tarbat individuals, particularly by the females. In contrast to other Scottish assemblages (with the exception of Glasgow Cathedral), the Tarbat individuals did not have very many infectious lesions on their bones (Period 2 = 8.1% and Period 4 = 9.3%). In all assemblages, including Tarbat, the majority of the lesions were on the lower limbs.

Metabolic disease was low at Tarbat, with very few individuals showing signs of cribra orbitalia (9% in Period 2 and 3.8% in the medieval period). Unlike other Scottish assemblages, there were several cases of rickets observed in the Tarbat articulated and disarticulated remains. These children may have been swaddled or kept indoors (out of the sun) and/or ate foods which lacked vitamin D.

Tarbat also differed from other Scottish assemblages by having five possible cases of neoplastic disease (two from articulated burials, one from the disarticulated material and two from the 'charnel' deposit). One case was a possible metastatic carcinoma, perhaps secondary to prostate cancer. Another was a possible primary tumour to the face (basal cell carcinoma?) with secondary changes (metastasis) to the scapula, pelvis, ribs and a lumbar vertebra. The changes on the disarticulated bone remains undiagnosed, although osteoclastoma may be a possibility.

Medieval trauma

There was one case of mother and pre-term foetus dying together (Burial 67/68). Two medieval individuals had suffered blade attacks. The first case was the young adult male buried in Church 2 (Burial 117, above) who had three sharp-edged cut marks on the skeleton. One was present on the left parietal (near the occipital), and extended 53mm in length. It was slightly angled, so that it sheared the outer table of the skull, and only partially extended into the internal table. The second cut was on the proximal end of the posterior surface of the left femur, and was 33mm in length. Another was found on the proximal end of the right femur (posterior lateral surface). This cut was approximately 4mm deep, but only the cortex was affected. There was no evidence of healing suggesting that the individual died at the time the cuts were made. The

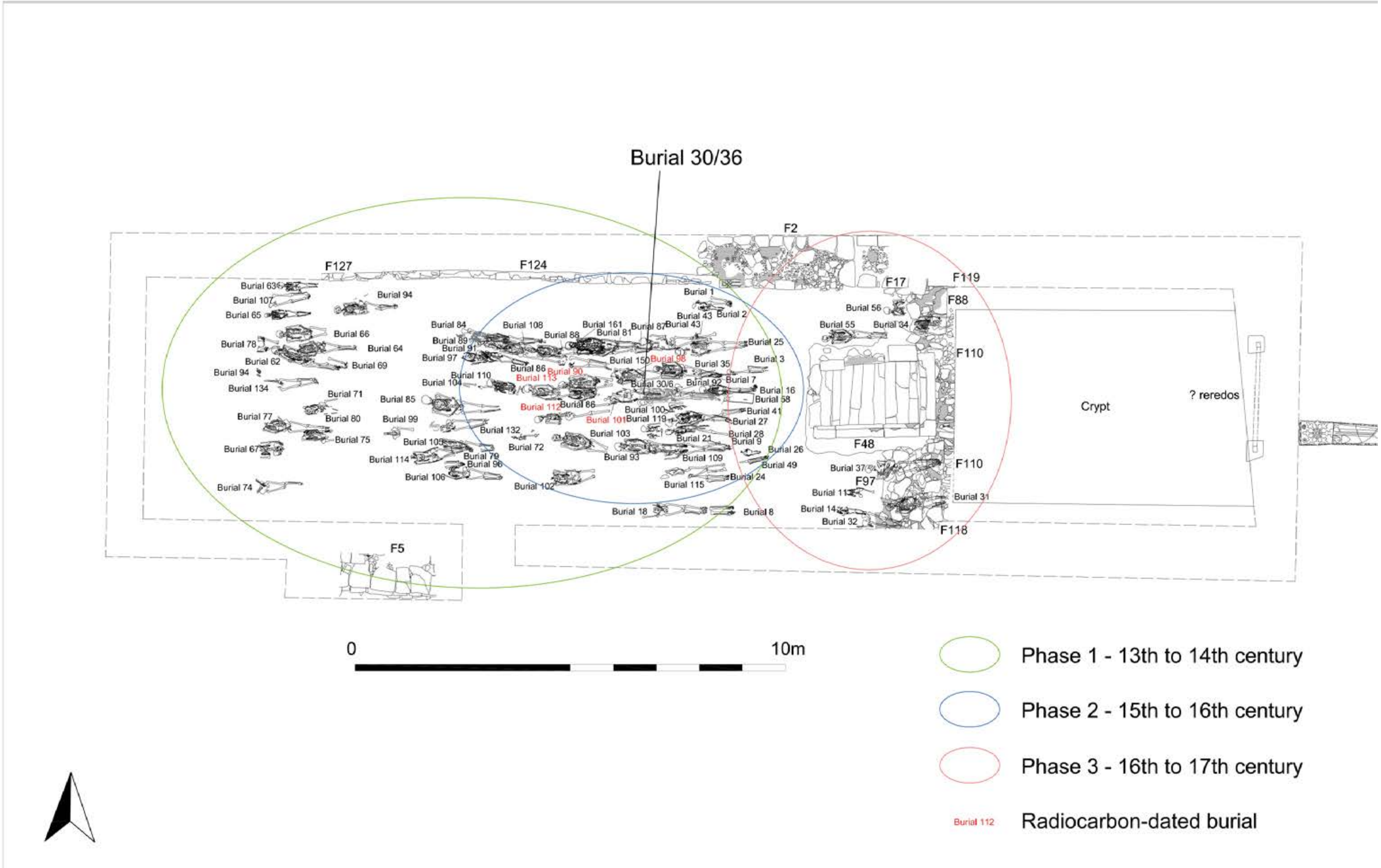


Illustration 7.14
Burials in Church 4

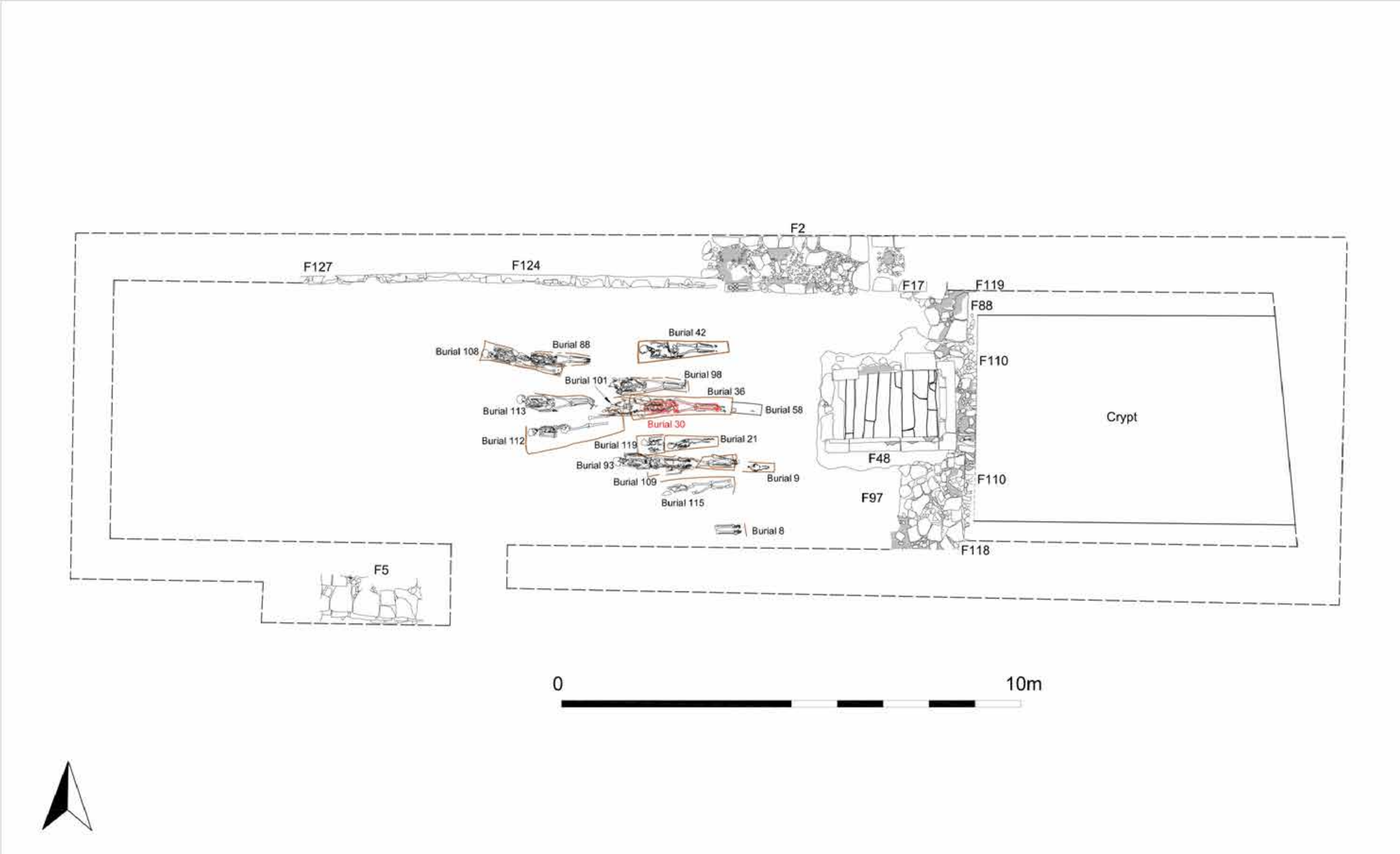


Illustration 7.15
Church 4: burial 30/36 and other high status burials at the opening to the crypt

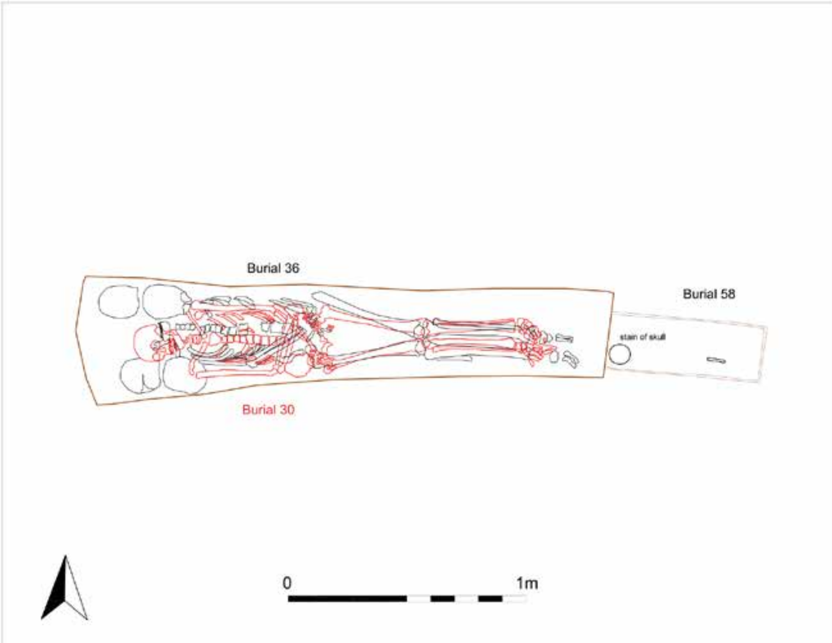


Illustration 7.16
Burial 30/36 group

placement of the cuts, and the type of cuts, suggested a violent attack from behind, with a sharp weapon such as a sword.

An old adult male (Burial 113) had a healed wound to the right parietal bone (near the occipital), possibly as a result of a sharp blade. The wound was oval – approximately 45mm by 35mm – with definite edges associated with a flat surface, suggesting that the bone was sheared. Within the oval, the bone surface was very slightly irregular, but did not affect the inner table of the skull. The interpretation of a healed blade injury may be supported by the number and type of other fractures present on the skeleton. Together, these injuries suggest that this individual had experienced violent conflict earlier in his life. Three adult men and two adult women had suffered fractures, either to the hand, foot, leg or rib (Table 7.2).

Disablement

Trauma to the vertebrae can result from compression fractures caused by a vertical force induced by a hyperflexion injury, or secondary to osteoporosis (Digest 4.2). One example of the latter may be observed on Burial 95, an old adult female from the medieval period. The bones of this individual were light and it is likely that one of her thoracic vertebral bodies collapsed as a result of osteoporosis. An old adult male (Burial 90) demonstrated fusion of the bodies (square), apophyseal joints and laminae between T4 and T5 (all vertebrae were present). In addition, T4 was slightly collapsed on the right side resulting in scoliosis. Ossification of ligaments was also present on a number of lumbar vertebrae, but only L4 and L5 were fused. In this case, the fusion was large and bulbous in appearance. It was also noted that this individual had an area of ossification on the base of the skull (lateral to the left occipital condyle), resulting in limited mobility to raise the head, and causing the head to be permanently faced slightly to the left side. No sacroiliac fusion was present.

Provenance from oxygen and strontium isotope analysis (Digest 4.4)

Of the eleven specimens examined, only two grew up in the area: Burial 117, who died of blade wounds and was buried in Church 2, and Burial 30, who displaced the westerner Burial 36. Burial 62, one of latest burials, had been raised elsewhere in eastern Britain. The remaining eight were from west coast Scotland. The group comprised three men (Burials 35, 36 and 41), one woman (Burial 88) and four children (16, 86, 110, 119). Burial 110 and probably Burials 35 and 41 were among the earlier burials in

Illustration 7.17
Burial 30/36 excavated

Table 7.3
Age group composition, based on dental development, eruption and tooth wear, in the charnel

Age Range	0–1	2–5	6–10	11–15	16–20	21–30	31–40	41–50	50+	Years
Number in sample	12	37	13	4	0	7	14	6	10	Total 103
% of total sample	11.7	35.9	12.6	3.9	0	6.8	13.6	5.8	9.7	

Church 4, while Burial 88 would be among the later. Immigration from the west coast was thus a continual theme of Period 4. (For results of C/N isotope and starch analysis, see *Diet*, below.)

Charnel deposit (for the specialist report, see Don Brothwell in OLA 7.2.1.3)

A disturbed deposit of 13,485 disarticulated bones was recovered by sieving from beneath the flagstone floor of the nave of the post-Reformation Church 5. It represents a chronologically mixed group, but relates mainly to the later medieval period, and thus to the fifteenth and sixteenth century. The atlas vertebrae show that at least seventy-four individuals were present. Of paired bones, the left calcaneum establishes 105 people, and as these specimens were all adult, and we know from the right femur that there are at least sixty-six young children, it implies a minimum of 171 bodies in the sample. *Sexing* was achieved on fifty-one adult individuals, and this was on cranial evidence. Of this sample, twenty-four were considered to be female, and twenty-seven male (52.9%). The age range is shown in Table 7.3.

There was considerable *child mortality* in the under-six year olds. Moreover, in the adults there is a significant number of individuals surviving beyond fifty years, a result also noted in the other Tarbat samples (where the percentage is even higher). This suggests that the community suffered from the usual range of destructive childhood illnesses, but survival into adulthood was linked to a healthy diet and immune response. From tibiae and femora, the mean *male stature* estimates were 168.5cm and 168.3cm, which are comparable with the ordinary Scotsman of the 1950s (Clements & Pickett 1952; and see above).

Basic craniometric measurements were taken as defined in Brothwell (1981) and these were used in a multivariate analysis, employing the Penrose (1954) 'size' and 'shape' statistic. Eighteen measurements were retaken on a sample of early (Pictish) Tarbat skulls, to compare with the charnel sample. It was also possible to assemble data on Scottish Bronze Age short-cist burials, Iron Age people from North Yorkshire, a West Scottish medieval series, a small medieval group from Carlisle and an eastern Scottish long-cist (medieval) series (OLA 7.2.1.3). The most divergent population from the charnel sample is the Yorkshire Iron Age community. Similarly, the Scottish Bronze Age short-cist group were well separated. Of the more contemporary groups, the Glasgow and Carlisle series were more similar to the Tarbat charnel group, with the Scottish long-cist medieval and Tarbat Pictish groups being the most biologically similar. It is possible to tentatively conclude from this that the charnel group was not significantly different from the earlier Pictish people, and that both displayed biological affinities with the Scottish eastern long-cist communities (but compare the results from O/Sr isotope analysis, above).

Among *non-metric cranial traits*, the occurrence of epipteric bones is perhaps noticeably higher in the charnel sample. Similarly, lambdoid ossicles are far more frequent in the charnel

Illustration 7.18
Burial 43, leather boots and hose

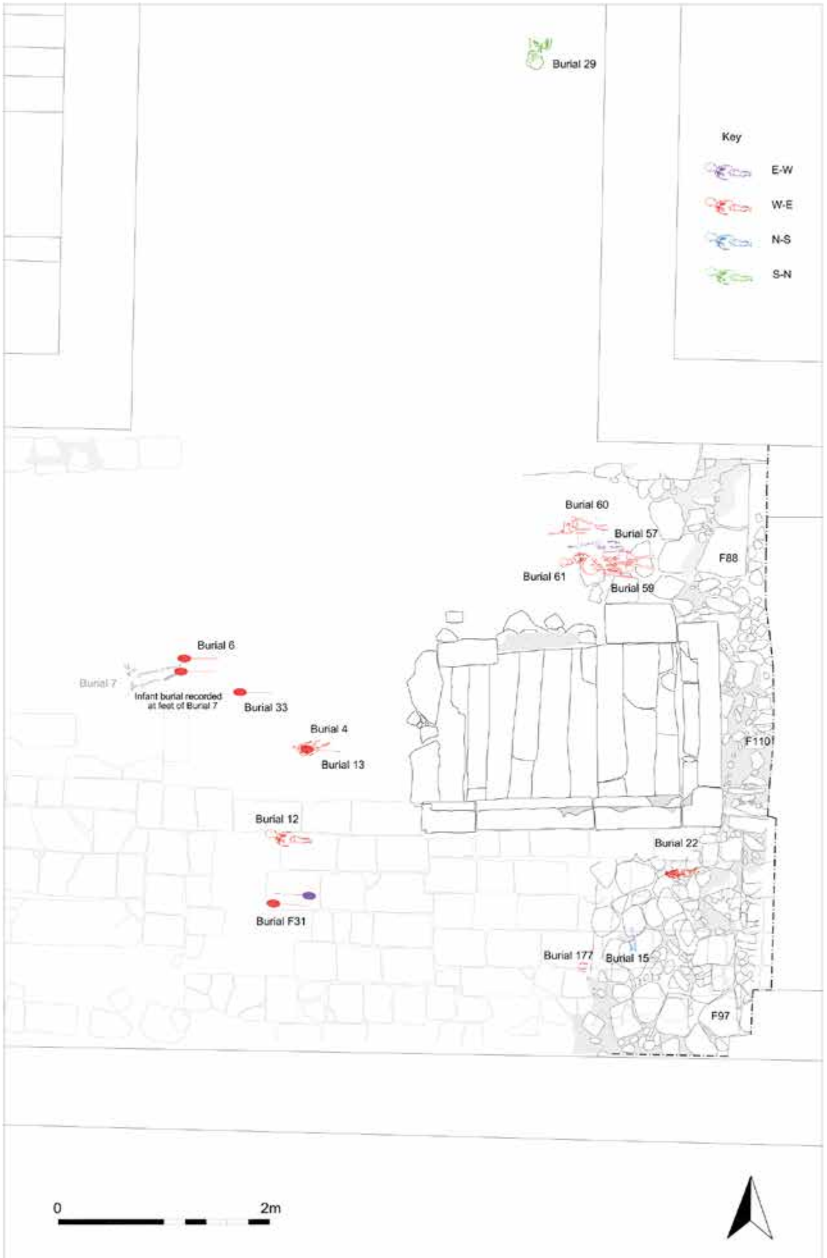


Illustration 7.19
Plan of infant burials in Periods 4 and 5

individuals. Evidence for pathology was slight. There was no clear evidence of tuberculosis, leprosy or syphilis. In the adults, the prevalence of rickets was no more than 1.1%. There was no clear evidence of scurvy. Moderate and restricted osteoporotic pitting occurred on the external surface of three skulls, but the changes were insufficient to indicate vitamin C deficiency. Between 30% and 40% of adults were showing some degree of arthritic change at the time of death. Other joint changes were not well represented. Surprisingly little oral pathology was notable in this charnel sample. Ante-mortem injuries to bones in the charnel sample are relatively uncommon, and suggest that the community was not engaged in much conflict or many accidents. There is one healed broken nose. There were two examples of serious tumours, a probable meningioma (Skull TI) and bone destruction in life interpreted as the result of metastatic (secondary) tumours, developing from a primary cancer elsewhere. This type of pathology is uncommon in cemetery samples, but the Tarbat material has produced more cases than usual.

Medieval diet (thirteenth to sixteenth century)

Evidence for the subsistence base of the medieval community comes from the ploughing, animal bones, starch and carbon and nitrogen isotope ratios. There were no plant remains. The animal bone assemblage was small but there were major fish and shellfish deposits in Sector 2 in this period. A number of artefacts relating to food production are considered below.

Cultivation in Sector 1 (OLA 6.1/3.5.1)

Clearing and levelling in Sector 1 is thought to have followed a lengthy hiatus and represents the first wholesale reorganisation of land use in this area since the digging of the second monastic enclosure ditch in the eighth century (p 178). Several posts were removed from S1, but no clear incidences of posts having rotted in situ (see Table 2 in Chapter 5.9). The well, S8, appears to have been finally disused and levelled in Period 4. Manual dumping of stone was accompanied by clearance of vegetation and the mechanical backfilling of the second enclosure ditch, S16 (p 186).

Ridge-and-furrow cultivation subsequently appeared throughout the sector (OLA 6.1/3.5.2). It was initially recorded from the air (see Illus 2.1) and then in detail on the ground (Illus 7.20). The furrows are oriented broadly NNW–SSE and spaced *c* 6m from centre to centre of furrows. In pre-excavation observations, the features appeared to cease at the Period 2 enclosure ditch system, although it became clear that, though discontinuous over the dip of the ditches, furrows reappear either side. Dateable material from the furrows consisted primarily of medieval pottery dominated by Scottish Redware dating to the thirteenth to fifteenth century (Digest 6.18). The pottery had most likely arrived with manure. In addition to the ceramics, three medieval coins were recovered from Sector 1: a silver penny of King Henry II/III (1205–7), a silver penny of Edward I/II (1280–1) and a Scottish round silver halfpenny of John Baliol (1292–6) (Holmes in Digest 6.14). Coins minted before the thirteenth century are generally scarce, but there are ceramic traditions of the eleventh to twelfth century, such as Gritty wares, that are not represented in the assemblage. Overall, the material contained within and associated with the furrows suggests a thirteenth-century date for the onset of the ridge-and-furrow cultivation.

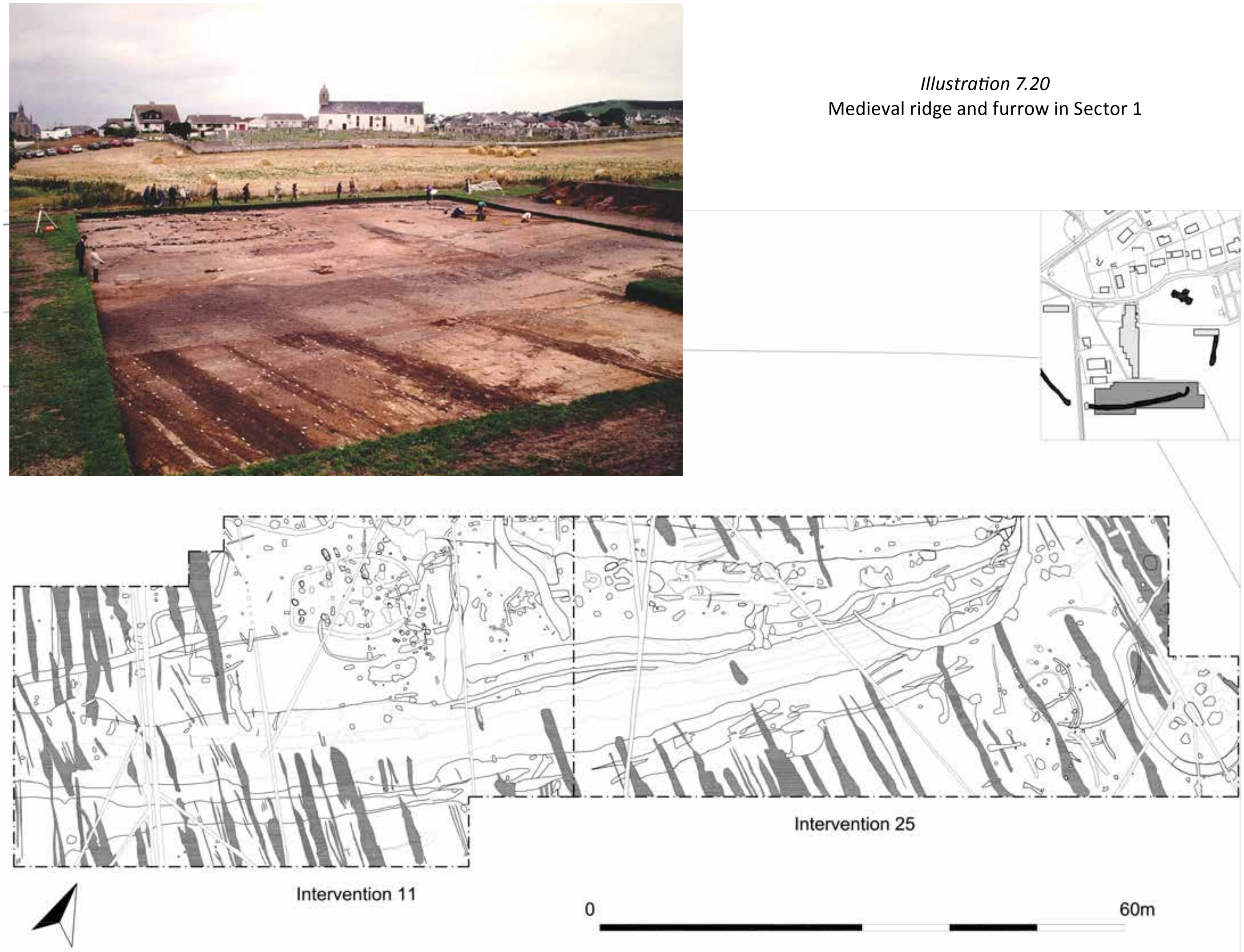


Illustration 7.20
Medieval ridge and furrow in Sector 1

Determination of diet

While it was clear that the medieval community was engaged in serious cereal production from the thirteenth century, direct information on what was eaten came from analysis of the skeletons buried in the church of Period 4). *Stable isotope ratios* of carbon and nitrogen (Curtis-Summers in Digest 4.3) showed medieval human δ^{13}C values ranged between –20.4‰ and –17.1‰ ($\Delta = 3.3$‰), with a mean of –18.8‰ ± 0.9‰ (1σ). Medieval human δ^{15}N values ranged from 12.7‰ to 16.6‰ ($\Delta = 3.9$‰), with a mean of 14.8‰ ± 1.0‰ (1σ). The δ^{13}C and δ^{15}N values were therefore higher in the medieval individuals than those of the monastic phase (Period 2). The faunal baseline shift reflects a significant trophic level increase in δ^{15}N and a shift towards higher δ^{13}C ratios. This implies that the human population was eating both terrestrial protein and marine fish.

Mean δ^{13}C and δ^{15}N isotope values for the medieval male and female bone collagen revealed little significant statistical difference, suggesting both men and women from this group consumed similar foods of C3 plants and terrestrial and marine protein. However, atypical isotope results were found in one adult female (Burial 105) from Period 4 who had the lowest δ^{13}C (–20.4‰) and δ^{15}N (12.7‰) values of this group. The isotope results from this individual fell within the Period 2 group and differed from the other medieval individuals in both δ^{13}C ($\Delta = 1.3$‰) and δ^{15}N ($\Delta = 2.0$‰), suggesting a more terrestrial-based diet (Digest 4.3).

No significant difference in diet was apparent for males in different age groups. But a twenty-six- to forty-five-year-old male (Burial 93) had the highest δ^{13}C and δ^{15}N isotope values out of the whole group and a whole trophic level difference compared to, for example, the two forty-five-plus males (Burial 64 and Burial 113) that have the lowest δ^{15}N isotope values out of the males from this group. This may reflect a division in the types of animal protein that were being consumed. Analysis of *starch* showed that four individuals in Period 4 (Burials 16, 88, 91 and100) had been eating oats or wheat and some tubers (Walters in Digest 4.5).

Illustration 7.21
Overview of Sector 2 in Period 4B, showing flattened shell middens (pale patches)

Illustration 7.22
Overview of gulleys of S17 cutting through earlier Period 3 road (S13/F18)

Evidence from the faunal assemblage

Food remains from animals, fish and shellfish were retrieved mainly from Sector 2. Within the medieval assemblage, domesticates show an increase of sheep/goat at the expense of cattle and pig, in comparison with the earlier periods (Chapter 3, p 69). Though reduced in numbers, a preponderance of adult cattle were being killed, commensurate with dairy farming (OLA 7.3.1 at 4.2).

Compared with Period 2, which had an assemblage twice its size, the medieval period showed the largest number of *horse* bones (174, 9.88% NISP; cf three, 0.10% in Period 2) and of dogs (198, 11.24%; as opposed to sixty-two, 2.05%). Chicken and geese, red deer and roe deer were present in comparable numbers to Period 2. *Wild creatures* included cat, fox, wolf, hare, redshank and curlew. There was an increase in porpoise and whale and a decrease in the culling of seals (Digest 7.1).

Illustration 7.23
Part of a shell midden with a buried dog on the east side of Int 24

There were large middens of *shellfish* in the central area of Sector 2 (Holmes in Digest 7.3; OLA 6.2 at 3.5.3; 7.3.2.1; Illus 7.21). As with the earlier period, winkles dominated the medieval assemblage by weight, and given their small size compared to the other common shellfish, this suggests the intensive exploitation of this species. Mussels and limpets were recorded in significant numbers from the middens, along with a small number of crab claws and oyster shells. These species could have been easily gathered from the shore. Although it is possible that shellfish were exported from the site, it is most likely that the accumulations of shells derive from animals eaten by the inhabitants of the settlement, forming an important part of the diet.

The middens also contained evidence for the first serious exploitation of *marine fish* (Holmes in Digest 7.2). The majority

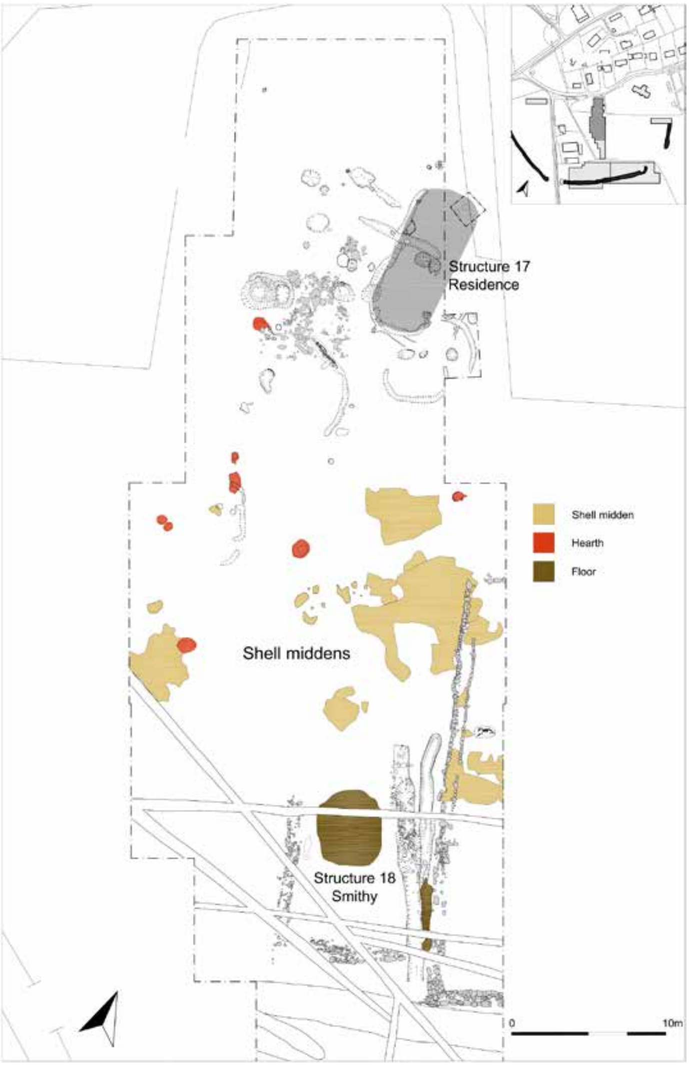


Illustration 7.24
Master plan of Sector 2 in Period 4

of the assemblage derives from large numbers of cod and haddock, but includes various demersal species living on or near the ocean floor, ie flatfish (plaice, halibut and possibly dab), conger eel, halibut, haddock and saithe all of which could be caught from close to the shoreline. Other species are benthopelagic and can be caught at all depths such as herring, cod, and pollack. All these fish occupy littoral zones, and can be found within the range of the continental shelf, so could be caught from the shore or from a small boat keeping close to the coast. Herring, cod, conger eel, halibut, haddock and saithe may be caught further out to sea. Butchery marks on cod and haddock were consistent with the filleting, curing and (by implication) export of fish. The increase in the acquisition of gadid family species (ie cod, saithe, pollack and haddock) reflects the intensification of the fish trade in both Scotland and Europe in the Middle Ages (Barrett et al 1999, 356, 378, Fig 378; Barrett et al 2008; Holmes in Digest 7.2).

Based on archaeological, faunal, starch and isotopic evidence, the medieval community had access to cereals (including wheat and oats), beans, beef, mutton, pork, poultry, eggs, dairy produce, winkles and sea fish caught from the shore and out in the deep. They were also making use of dolphins and whales, presumably for oil. The artefacts and bones found in the middens suggest that the community was well provided with food and probably generating a surplus (see below).

The village (thirteenth to fourteenth century) (OLA 6.2/3.5.1)

The resumption of settlement activity in Sector 2 after an interval of *c* 200 years was identified by features and deposits cutting the post-occupation grey ‘blanket’ of sand that formed over the trading station of Period 3. In the northern part of the site, features assigned to Period 4 were identified where they cut into the pebbled road or encroached over soils covering the

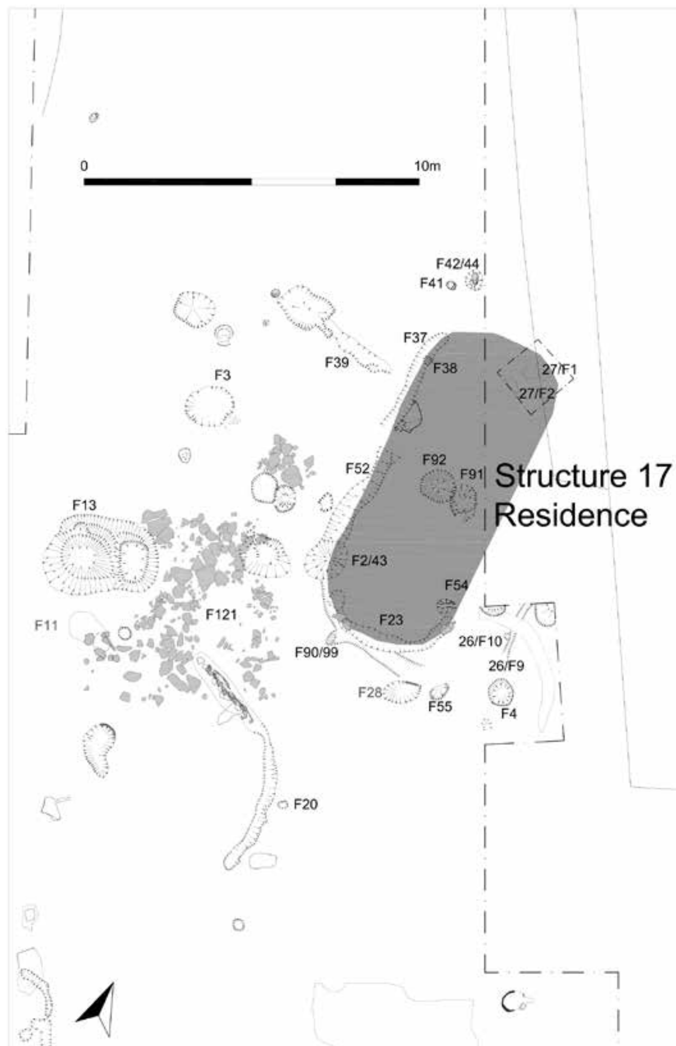


Illustration 7.25
Elements of medieval dwelling S17

road surface. An area of occupation was marked by a series of curvilinear gulleys (S17), truncated to a depth of 0.20m or less, suggesting that floor levels had been ploughed out. Further west were stone slab surfaces (F121), a possible oven (F3) and a well (F13) likely to belong to an associated occupation (Illus 7.22). Contemporary with these structures were the shell middens (above), which were focused in the centre of Sector 2, over the former monastic pool (Illus 7.23). These parts of the site were developing from the thirteenth to fourteenth century, here Period 4B. The plan of medieval features encountered in Sector 2 will be found in Illus 7.24.

Structure 17

The concentration of features occupying well-drained areas next to the present Tarbatness Road and above the valley in the northern part of Sector 2 belonged to a domestic or residential

Illustration 7.26
Medieval oven, F3

area. Among the truncated gulleys was a rectilinear group that could define the stance of a building, oriented NE–SW and disappearing beyond the eastern limit of intervention. Gulleys thought to relate to the stance of this building were identified as F90/F99 with post-in-trench F23 and post-hole F55 (south); F52/F37 with post-holes F38, F41, F42 and F44 (west); and F9 with post-hole F10 (east), which together define an elongated narrow stance measuring *c* 12.0m × *c* 6.0m. Features located internally included three small post-holes F54 and F1 and F2. Together they made up *S17* (Illus 7.25). Two intercutting rubbish pits contained a deposit

Illustration 7.27
Medieval well, F13

of pure winkle shell, a whale rib, a fragment of rotary quernstone and two whetstones. These lie within the possible building stance and could constitute storage pits given over to rubbish disposal in their last use.

To the west of S17 was a hearth or oven (F3) and a possible well (F13) with adjacent hard standing (F121). The hearth was defined as a raised platform of brightly coloured ash surrounded by a halo of charcoal within a shallow scoop measuring 1.20m diameter and associated with a cluster of stake-holes (Illus 7.26). The hard standing (F121) had reused a fragment of rotary quernstone (14/1329). The large pit (F13) had been cut through this pavement (Illus 7.27). It is identified as a possible well, although there was no conclusive evidence for its purpose other than that it penetrated as far as the water table during the seasons of excavation. It consisted of a substantial sub-oval cut deep into the sand subsoil measuring 3.5 × 2.0m and in excess of 1.5m deep with a broadly shelving form. The feature had filled with multiple soily deposits markedly lacking in cultural material apart from occasional shell fragments and animal bone. Notably, the feature contained no slag, suggesting it had been backfilled before the

Illustration 7.28
Finds from medieval village in Period 4B: (a) rotary quern (24/4592) and (b) iron netting tool (24/611)

phase of metalworking activity commenced in Period 4C (see below). Dispersed rubbish pits were also identified, containing shell, fish and animal bone, pottery and a half-complete upper stone of a rotary quern. The large middens to the south are likely to have been generated by this thirteenth- to fourteenth-century community.

Artefacts in action

The cumulative artefactual evidence provides a picture of comfortable self-sufficiency (see Digest 6.1 and Illus D6.1.21–27 for details of Period 4 artefacts). Evidence for the growing of crops, the processing of grain and the preparation of meal for bannocks and porridge comes from the possible oven F3 and the assemblage of mica schist rotary querns (14/1696, 1938, 1947/1999/2000/2001, 24/985, 1753–5, 4592) (Illus 7.28a). The assemblage of waste from exploitation of marine resources is joined by a small group of fishing equipment including the complete netting tool (24/611; Illus 7.28b), iron fish hooks (24/1882, 2665) and two lead fishing weights (24/4650, 29/40). It seems that these resources were exploited and enjoyed by the inhabitants of the village and were plentiful enough to generate a surplus of fish which was preserved and sold. The rise in sheep numbers also indicated an exploitation of secondary products endorsed by the assemblage of spinning and weaving tools. Five sherds of Scottish Redware (25/749, 24/1366, 1992, 2276 and 2940) and the head of a bovid femur (24/2139) were fashioned into spindle whorls for spinning wool joined by a red deer antler picker-cum-beater (24/4578), while garment finishing was indicated by an iron needle (24/2129) (Illus 7.29). Personal items also indicate that quality items were not beyond the reach of the inhabitants, including wire-wrap-headed pins for clothing and hairstyling including silver examples (15/2, 4, 112), decorative buckles (14/485, 487, 25/750), strap ends (11/4552) and belt fittings (11/2994, 14/1279 and 1499). The medieval middens also yielded sixty-four sherds of ceramic (almost exclusively Redware), slag, a fragmentary rotary quernstone and a whetstone indicating that the middens also incorporated a component of domestic waste.

Period 4 also yielded the largest number of horse bones, and an assemblage of three complete or near-complete horseshoes dateable to the thirteenth to fifteenth century (24/2514, 2871 Clark Type 4 and 24/3019 Clark Type 3) and over forty horseshoe nails suggest that horses were relied on for transport and traction

Illustration 7.29
Textile working: spindle whorls (24/1992, 2276, 2940)

and that farriers were active nearby. Basic horse equipment is joined by finds of regalia which indicate the presence of a mounted elite: a tinned snaffle-bit cheek piece (24/2781), a section of leather spur strap decorated with fleur-de-lys mounts (14/486), a harness pendant (14/1760) and harness strap connector (14/1285). Further high-status artefacts can also be related to the later part of Period 4 including a very fine one-piece miniature bone comb (Ashby in Digest 6.4, 2.1; 24/1805).

The township and its industries, fifteenth to sixteenth century (OLA 6.2/3.5.4)

In the southern part of Sector 2, an area of intensive ironworking arose in the fifteenth to sixteenth century (Period 4C), focused on a smithy *S18*. There was overlap in activity between the three

Illustration 7.30
Overview of ironworking in Sector 2, Period 4C (north)

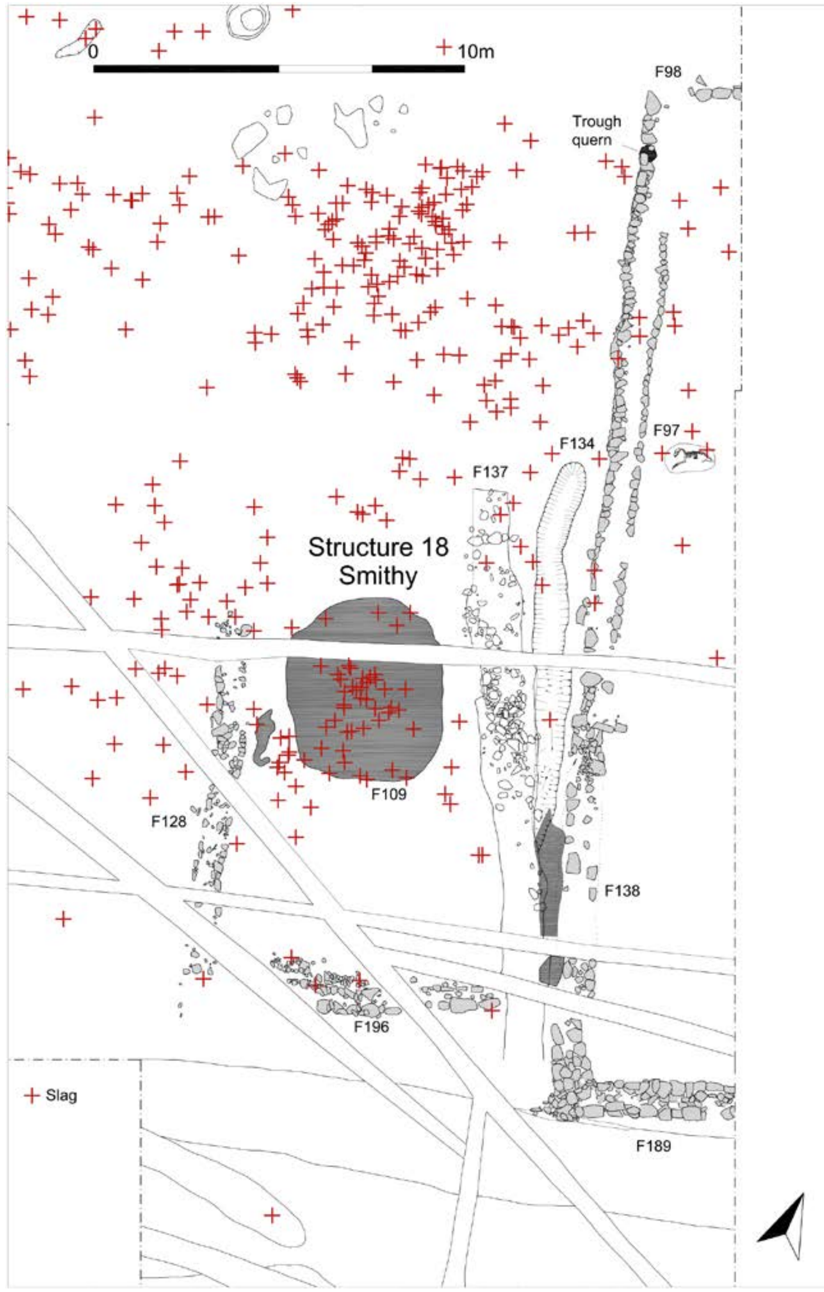


Illustration 7.31
Components of smithy S18: walls F128, F196, F97 showing slag distribution (right); smithy floor F109 (above)

zones, which may be seen together on Illus 7.24. In its largest extent, contemporary with the fifteenth-century enhancement of Church 4, the settlement was affluent, productive and deserving of the term 'township'.

The spreading of the middens of mixed shell in the area of the former pool was perhaps in an attempt to reclaim a zone that was periodically wet and unusable. It was here that a rectilinear stone-built enclosure was erected, host to an ironworking building or smithy (Scots *smiddy*) (Illus 7.30, 31; *S18*). However, evidence for ironworking was also widely distributed over the northern part of Sector 2 and into the neighbouring fields. In the north of the sector, there was a possible iron-smelting hearth (F11) comprising a stone-lined pit (F11/F58) and flue (F57) with a fragment of vitrified furnace lining. Another small pit (F28) was filled with ironworking slag including smithing hearth bottoms, tap slag and vitrified furnace lining. Ashy fills and waste from metalworking found their way into pits and hollows left by the prior domestic occupation. Among this material were ironworking slags and copper-alloy scrap, a copper-alloy vessel patch, a fragment of leather spur strip with fleur-de-lys mounts, two conjoining fragments of small grindstone, two mounts, and a fragmentary buckle frame (see Digest 6.1; Illus D22–4). A group of gulleys, many of which post-dated those of S17, produced hammerscale, a roughly shaped stone disc and a fragment of small grindstone (14/1770 and 1819), two conjoining fragments of a large stone mortar or metalworking mould for wrought sheet-working (14/1480, 1577), and two rough stone discs (14/1621 and 1865).

From late Period 4 contexts across the north end of Sector 2 and 3 also came evidence for the cold repair of copper-alloy vessels. Six paperclip rivets (14/494, 1274, 1276, 1278, 1778, 24/505) and six vessel repair patches with rivets in situ (14/489, 495, 1565, 1578, 15/12 and 44) were found along with thirty-five fragments of copper-alloy sheet scrap and dross (Illus D6.1.27). When the assemblage is compared with those recovered during excavations on rural sites where they are commonly retrieved in single figures, the numbers appear significant (Ford 1995, 1014–15; Ford 1998, 707). The assemblage stands comparison with specialist areas associated with similar waste in medieval urban sites such as Perth (Ford 1987, 127–9; Bowler et al 1995, 961) and York (Ottaway & Rogers 2002, 2813–15). Assuming the vessel repair requirements of a village would not constitute full-time employment for a permanent repair workshop and, in the absence of contemporary structural activity beyond the erection of windbreaks, it seems probable that the work was undertaken by itinerant smiths or '*tinceards*'. The location of this activity, on dunes close to the medieval churchyard and permanent forge, would seem an appropriate location for itinerants to pitch camp and provide such services, probably on a seasonal basis. In any case, the material indicates at least quasi-specialist, rather than home-based, repair.

The smithy

A set of stone-walled enclosures was identified on the eastern side of Sector 2 south (Illus 7.30). The most eastern enclosure was formed primarily by a wall (F97), measuring in excess of 27.0m long and oriented N–S, post-dating the shell middens (Illus 7.31). A large fragment of Bronze Age trough quern had been reused within the make-up of the northern corner of the enclosure wall. The wall was flanked to the west by a series of two broad, shallow ditches, possibly drains (F134, 137). At its north end, a right-angled length of wall oriented W–E appeared to be associated and continued beyond the eastern limit of the excavation (F98). Towards the southern corner, a robber trench (F138) was defined; much of the stonework had been salvaged along a distance of 5.5m of wall F97; this feature may in fact represent a wholesale episode of robbing not detected elsewhere. At the southern terminus, F97 turned east at a right angle and continued beyond the eastern limit of the excavation as F189.

To the west of this first enclosure two further walls defined a second: F128 oriented N–S and F196 oriented W–E. Together they enclosed an area measuring *c* 10.0 × 9.0m set against F97. All the walls survived to no higher than a few courses of dry-stone, often much less. They appeared to have an earthen core and served an open-fronted, shed-like structure facing north, defined as *S18* (S18). S18 contained two large spreads of slag-rich material, one (F109) consisting of a black, sticky clay silt with patches of concreted ironworking slag and in situ burning, effectively a thin, expanded lens of slaggy, burnt deposits forming a sub-circular area measuring *c* 6.0m in diameter and which on excavation proved to be no thicker than 0.15m. Large pieces of slag were concentrated notably in the north-east corner and patches suggesting in situ burning. Many fragments of slag incorporated copper-alloy discolouration. Surrounding F109 was a distribution of slag, consisting often of whole smithing hearth bottoms. The core of the southern corner of wall F97 also consisted of smithing hearth bottoms. A further area of concreted floor surface (C1496) contained dense ironworking slag, probably crushed smithing hearth bottoms, and frequent fragments of vitrified furnace lining; spheroidal hammerscale possibly indicative of fire-welding was recovered from the deposit by flotation. The small enclosure was almost certainly host to a structure in which ironworking was undertaken. Many processes of iron-smithing are undertaken at waist height, so no ground-level features need be anticipated, and often in gloomy lighting conditions, so the building is likely to have been roofed, but open-fronted. F109 is likely to have formed on the floor of the building. Several stone objects were in use during adjacent ironworking, including two fragments of large rotary grindstones for sharpening large iron implements (24/2174 and 2175), a roughly shaped disc (24/2056) and two large roughly hewn blocks with sharpening marks (24/2718 and 2179). Medieval depictions show that three people would have been required to use the grindstones – two turning and one sharpening – suggesting a team of smiths were employed in the workshop (Ottaway & Rogers 2002, 2798).

The ironworking activities in Sector 2 were further defined by the assemblages of *slags* recovered (Digest 6.9). Evidence for *smelting* took the form of a possible smelting hearth (F11), recorded as a stone-lined shallow pit measuring *c* 0.6m in diameter. A total of 1.5kg of *tap slag* was recovered from the feature along with 0.20kg of *vitrified furnace lining*. Other evidence for smelting was recorded in the form of 1.25kg of tap slag and a slag cake with tap slag on its surface. Evidence for *secondary smithing* was dominated by the smithy, defined as an open-fronted stone-built structure measuring 9 × 10m in plan abutting a stone-walled enclosure (S18). The walls enclosed a large spread of concreted slag that included patches of in situ burning and some lenses of discolouration from copper alloy, perhaps from brazing. Slag recovered from this deposit (F109) and from nearby features included thirteen *smithing hearth bottoms* including two doubles, along with 6.6kg of *dense slag*. Spheroidal hammerscale was recorded from the associated slag spread (C1496). The wall core of adjacent wall (F97) was filled with complete *smithing hearth bottoms* while thirty-two others were recovered from a nearby spread of rubbly hard-core.

Examples of excavated smithies are few, but include fourteenth- and fifteenth-century examples from Goltho and Burton Dassett. The dimensions of the Tarbat smithy are broadly comparable with the structures identified at these two sites (Goltho, 8 × 4m; Burton Dassett, 14 × 15m) (McDonnell 2000, 165). The Period 4 *hearth bottoms* are exceptionally large and compare well with a similar assemblage recovered from Eilean Donan Castle (Digest 6.9). These latter were associated with a late medieval episode of smithing of large iron items; a hearth filled with slags was radiocarbon dated to AD 1450–1640 (95%) (Starley 2010). Items smithed at Tarbat are also likely to have been sizeable and may be conjectured to have included the manufacture of arms. More than 150 Highland bloomeries of the late medieval period have been located, thought to have been extracting iron from bog ore and supplying ironworkers in both town and country (Photos-Jones et al 1998; Photos-Jones & Atkinson 1998, 891, 902). Late medieval ironworking detected at Highland settlement sites is thought to have been stimulated by inter-clan warfare and conflict (Atkinson 2003; and see below).

Discussion – a context for Medieval Tarbat

Each of our sectors at Portmahomack reports a different sequence and different aspects of life, reminding us that the Middle Ages is not a singularity. For convenience and for concordance we have divided up its five centuries into three periods: in Period 4A (the twelfth century) a church is built on the hill (Church 2/3), with a single burial, a casualty of blade wounds, buried inside it (Burial 117). The new ideology does not disapprove of the reuse of Pictish masterpieces in the foundations. In Sector 1 and 2, there is neither continuity nor discontinuity: nothing moves, we know nothing of subsistence or industry.

Period 4B, the thirteenth and fourteenth century, starts with a new prosperity and devotion. The grand Church 4 with its crypt, nave, chancel and belfry is constructed and equipped for serious ritual. Burial begins again with incomers from the west of Scotland, including children; western immigrants continue to be strongly represented throughout Period 4. High status is indicated by an inscribed and a floriate grave cover. A residential area, with building, well and oven, springs up in Sector 2 by the road next to the church. Sand is quarried. Shellfish are gathered and deep-sea fish are caught. In Sector 1, the remains of the overgrown eleventh-century farm are levelled into an extensive ploughed field, growing cereals.

In Period 4C, the fifteenth to sixteenth century, Church 4 is refurbished after a fire, given a new floor and the crypt is improved with a vault and a new door frame. A high-status focus for burials inside the nave is provided by the skeletal drama played out at the tomb between the supporters of Burial 36 (a westerner) and Burial 30 (a local). A minor surge of burial follows, including many from western Scotland, some arriving as children. The burial of children and infants continue to dominate the crypt entrance up to the Reformation and after. Down in Sector 2, a widespread iron industry rises, with smelting and smithing on a large scale focused on a stone enclosure in the south. Evidence for tinkering forms a small but significant element of the metalworking evidence and a possible rare glimpse of a professional itinerant minority. The industry and its assemblage indicate residents or clients belonging to an equestrian warrior class. The relative grandeur of the church, the burials employing decorated stone slabs, the ritual of Burial 30/36, the hints of a mounted elite, the evidence for fish processing and the possible making of iron weapons all point to a settlement of increasing status between the village of the thirteenth century and the township of the fifteenth to sixteenth. What context can we find for these events?

Twelfth century

Macbeth, one of the active principals of the last chapter, was killed by the Cumbrian Prince Malcolm, son of Duncan, that same *Malcolm Canmore* who established a dynasty that would rule Scotland until the death of Alexander III in 1286. Among the eight children of Canmore's second marriage to the English princess Margaret was David, who with his mother was to redesign Christianity in Scotland. From David's accession as David I in 1124, and especially after his conquest of Moray in 1147, we can expect the arrival of a new order in Portmahomack (Oram 2004, 96). The pre-existing Christian churches encountered by the reformers exhibited a fine diversity of married priests in secular, monastic and culdee communities: 'There were countless shrines, chapels, hermitages, possibly even small churches, bearing ancient dedications to an enormous variety of

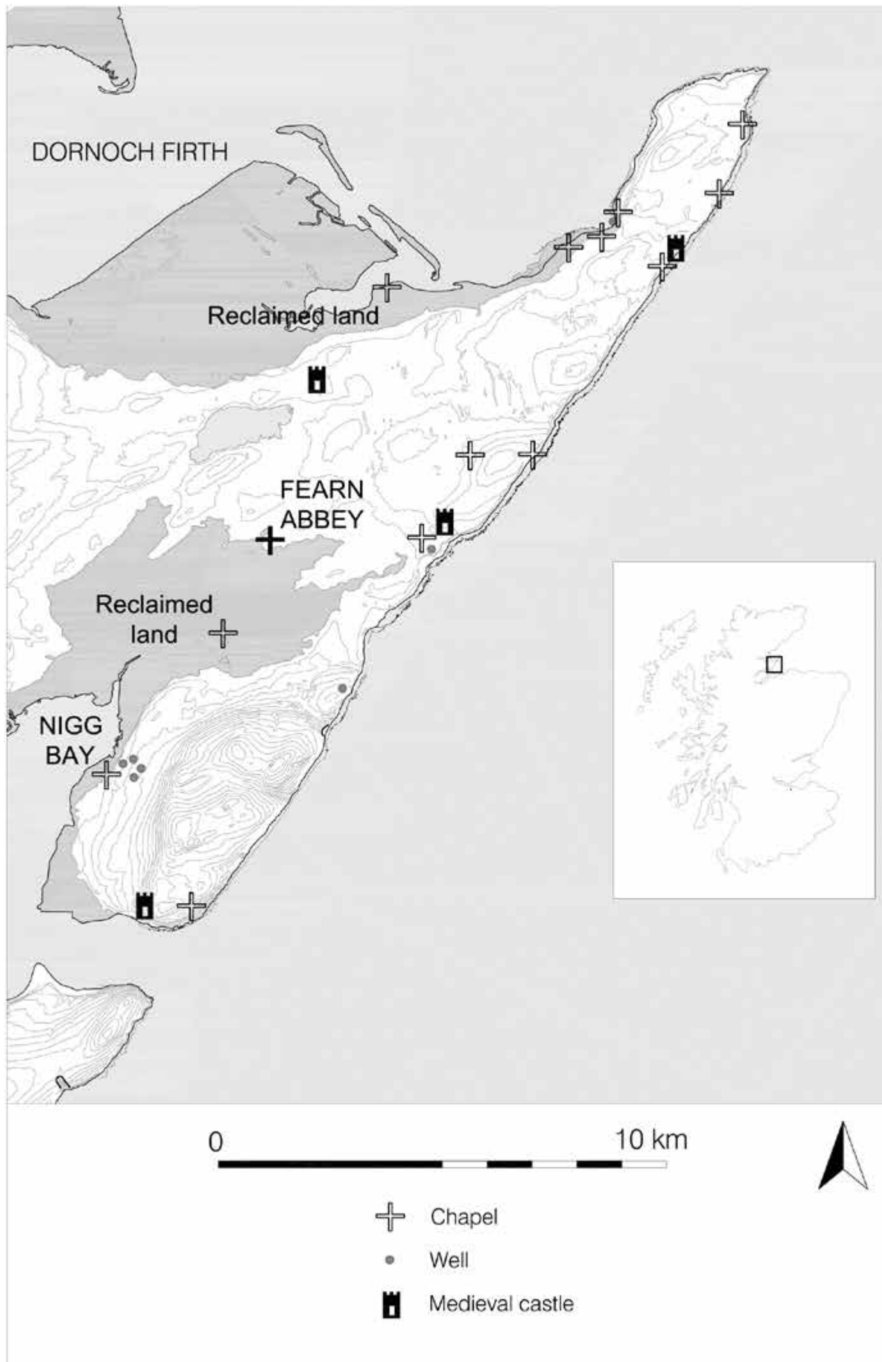


Illustration 7.32
The Tarbat peninsula in the Middle Ages showing chapels and holy wells, castles, Fearn Abbey, its millstream and reclaimed land

saints, the overwhelming majority of whom were of Celtic origin ... Only a small proportion of these sacred sites were selected for permanent parish kirks and we hardly ever know why one site was preferred to another' (Barrow 1981, 73).

In this case we can guess, namely that the site of the Pictish monastery had not been forgotten. A well-read enthusiast may have founded a chapel on the ruins of Portmahomack, acting as Aldwin of Winchcombe did at late eleventh-century Jarrow (Cramp 2005, 35). Such pious retrophilia might have been widespread. The Tarbat peninsula had sixteen chapels in the Middle Ages and in excess of twenty-five holy wells (Digest 8; Illus 7.32). Is this survival or revival? And if revival, when? And why then? Until better information comes from the chapel sites themselves, the twelfth century, and the new religious energy of Margaret and David seems the least inappropriate context for the building of Church 2. As discussed in Chapter 5.4, stone church building in Scotland is not impossible before the twelfth century: it is implied by the monolithic stone arch from Forteviot (Cameron 1994) and by architectural sculpture at Portmahomack itself (p 149). But examination of standing or even excavated buildings has failed to offer much certain church fabric before the late eleventh century (Fernie 1986; Cameron 1994; Alcock 2003, 285). John Dunbar proposed two major periods of church building in the Highlands, the first from *c* 1175 to 1250 and the second from 1375 to 1410 (Dunbar 1981, 39, 49). Early churches of the first period have an oblong nave and a small square-ended chancel, entered by means of a narrow chancel arch as in two examples on the Isle of Bute, constructed between 1170 and 1200. There was Romanesque carving around the doorways. St Mary's Chapel, Lybster, is also a small two-chambered building with a square-ended chancel and nave with west doorway, but in Ross, Sutherland and Caithness, comments Dunbar, early architectural remains 'make a decidedly poor showing' (Dunbar 1981, 39, 49).

In the course of the twelfth and thirteenth century the liturgical free-for-all was visited by a rigorous transformation: 'A high degree of uniformity was imposed generally on the whole of western Christendom ... As a result the peculiarities of many regional churches of the west, that of Scotland among them, were ironed out' (Barrow 1981, 62). So when did the cleansing fire reach Easter Ross? There was a diocese of Ross in the twelfth century but 'there is no record of an early bishop's church and the see was not fixed permanently at Elgin until the thirteenth century'. Moreover 'it is hard to be sure how far parish churches in any recognizable sense existed in Scotland before *c* 1120' (Barrow 1981, 68, 73; Cant 1986).

David died in 1153, and if he is not to be credited with the conditions for refounding a church at Portmahomack, we can infer an interest of the Scottish church and king at least from 1179, when William I ('The Lion') built a castle at the south end of the Tarbat peninsula at Dunskeath (Grant 2005, 107); there is an *Annat* place-name close by (Watson 1904, 52–3), which should refer to an early chapel with the relics of its founder. Church 2/3 gives little sense of standing in a thriving settlement. It was eventually equipped with a chancel, cruets and an altar rail. Modest and orthodox, but different from what is to come, it is assigned to the later twelfth century until we know better.

Thirteenth to fourteenth century

Alexander Grant feels that our region was not properly incorporated into the Scottish kingdom – and thus the broader Christian Europe – until the appointment in 1215 of the first Earl of Ross, Farquhar MacTaggart; 'the frontier between Ross and Moray was still, in many respects, the effective frontier for the kings of Alba' (Grant 2005, 110; cf Barrow 1981, 51). 'Macintaggart' (*Mac an t-Sagairt*, son of the priest) was said to have been lord of the secularised monastery of Applecross (Munro 1984, 127). He defeated the invading Irish Norse on behalf of Alexander II, crushed the Galloway Rebellion of 1235, was father-in-law to Olaf of Man, and a player on the international stage. According to the Chronicle of the Earls of Ross (*Chronicle* 1850, 1–3) he won the earldom in a wrestling match with a Norman Dougall Duncanson. In the 1220s he founded Fearn Abbey in Kincardine parish, and some fifteen years later moved it to Fearn on Tarbat in pursuit of 'tranquillity, peace and quietness' (Munro 1984, 128), bringing with it a lingering association with Whithorn, the Galloway monastery that maintained the right to present the Abbot of Fearn into the fourteenth century (Adam 1991, 29; *Chronicle* 1850, 5). The lands of New Fearn were cut out of the parish of Tarbat, which was therefore already in existence (Fraser & Munro 1988, 10). In 1255 there was a church at Portmahomack, served by a canon of Fearn Abbey and in 1274 a canon of Fearn was assigned vicarage revenues. The canons of New Fearn were still drawing revenues from the vicarage of the church of St Colman in 1529, when Pope Clement VII confirmed them. *Nova Farina* (New Fearn) sounds like a place valued for its cereal production (Watson 1904, 40). Fearn Abbey had a mill and is reported to be an example of a community that developed its agricultural production with the assistance of imported soils (Barber 1981, 359, Fig 45).

The first half of the thirteenth century would seem to be an appropriate time for reinvestment in the old settlement of Portmahomack, attracting settled fishers and putting the surrounding land under the plough. The new larger, grander church building with its crypt and west belfry (Church 4) seems to fit the mood and needs of the thirteenth century, when the performance of ceremony was a full-time and regulated business. The parish statutes of that time demanded that a church be divided into two, the nave built and maintained by the parishioners and the chancel paid for by the rector, and the fourth Lateran Council of 1216 decreed that parish churches should have a resident priest. The Benedictine church on Iona, built in 1200 with an aisleless choir and a single string course, was enlarged around 1220 to include an undercroft, which recalls the design of our Church 4 (Dunbar 1981, 41; Ritchie 1997, 104).

The early fourteenth century saw the rise of Tain, where in 1321 Earl William Ross endowed a collegiate community to serve the cult of St Duthac, which was to draw royal pilgrims and exercise power as an 'immunity' until the eighteenth century (Oram et al 2009, 25, 55). However, the Earls of Ross continued to take a strong interest in the Tarbat peninsula. Hugh succeeded William in 1323 and died in battle 1333 at Halidon Hill. He appears to have been based at the Rarichies, giving this estate (between Balintore and Nigg) to his younger son Hugh (Munro 1984, 128). The small fort still known at Easter Rarichie is assumed to be of Late Iron Age date (p 102), but it is not impossible that it had a real or assumed connection for the Rosses. Hugh Jr of Rarichie was long seen as the chief Ross ancestor. He launched the Munro family as allies, granting land to the father of Robert Munro for faithful service. Robert himself was killed in 1369 in defence of the earldom (Munro 1984, 130–1).

Fifteenth to sixteenth century

In the fourteenth century, the earldom of Ross apparently had no lands on the west coast (Munro 1984, 128) but in the early fifteenth century that changed. Alexander Leslie, Earl of Ross had a sister married to Donald, Lord of the Isles, who in 1411 made a bid for the earldom. King James I, returning from prison in England, resolved the dispute in favour of Alexander in 1436 and for the next forty years Ross and the Western Isles were held as a joint possession. Alexander and his son John were much in Easter Ross but conditions were clearly propitious for incoming families from the west, as reported by the stable isotopes (p 60). In 1476, John was discovered to have been guilty of disloyalty and the earldom was forfeit to the crown (Munro 1984, 129–30).

Numerous feuds and land claims contested by the clans began to be written down in sixteenth-century manuscripts and subsequently collected in later grand surveys. One of these incidents described in Eyre-Todd's *Highland Clans of Scotland* is of interest since it describes a raid on the church at Portmahomack: 'Again and again the Rosses had suffered molestation … and when at last, driven to desperation and thoroughly infuriated, they gathered their forces and marched against the Mackay Chief, they were in the mood to teach a severe lesson. The Mackays, with Angus of Strathnaver at their head, finding themselves fiercely attacked, sought shelter in the church of Tarbat. There several were slain, and, the church being set on fire, Angus Mackay and many of his clansmen were burned to ashes. To avenge this 'cruel slaughter', Ian Riach MacKay gathered his men, and, helped by a force of the Sutherlanders, his neighbours on the south, invaded the territory of the Rosses and proceeded to lay it waste with the utmost fury' (Eyre-Todd 1923, 471). This culminated in the battle of 'Aldy Charrish' or 'Aldecharwis' where the Rosses were heavily defeated by the Mackays, losing at least eleven of their leading men. *The Calendar of Fearn* names them and gives the date of the battle as 7 June 1487. It has been located in Strathoykel or near Loch Shin (Monica Clough, pers comm; Adam 1991, 91–3).

This rather specific event offers an equation with the patches of burning seen in St Colman's Church before it underwent its fifteenth-century renewal. But it does not have to be unique. In 1427 Thomas Mackay of Creich confronted Alexander of Freswick in St Duthac's chapel, Tain, murdered him and some of his household and then burnt the place down. Such feuds and their violent outcomes also provide an oblique context for the

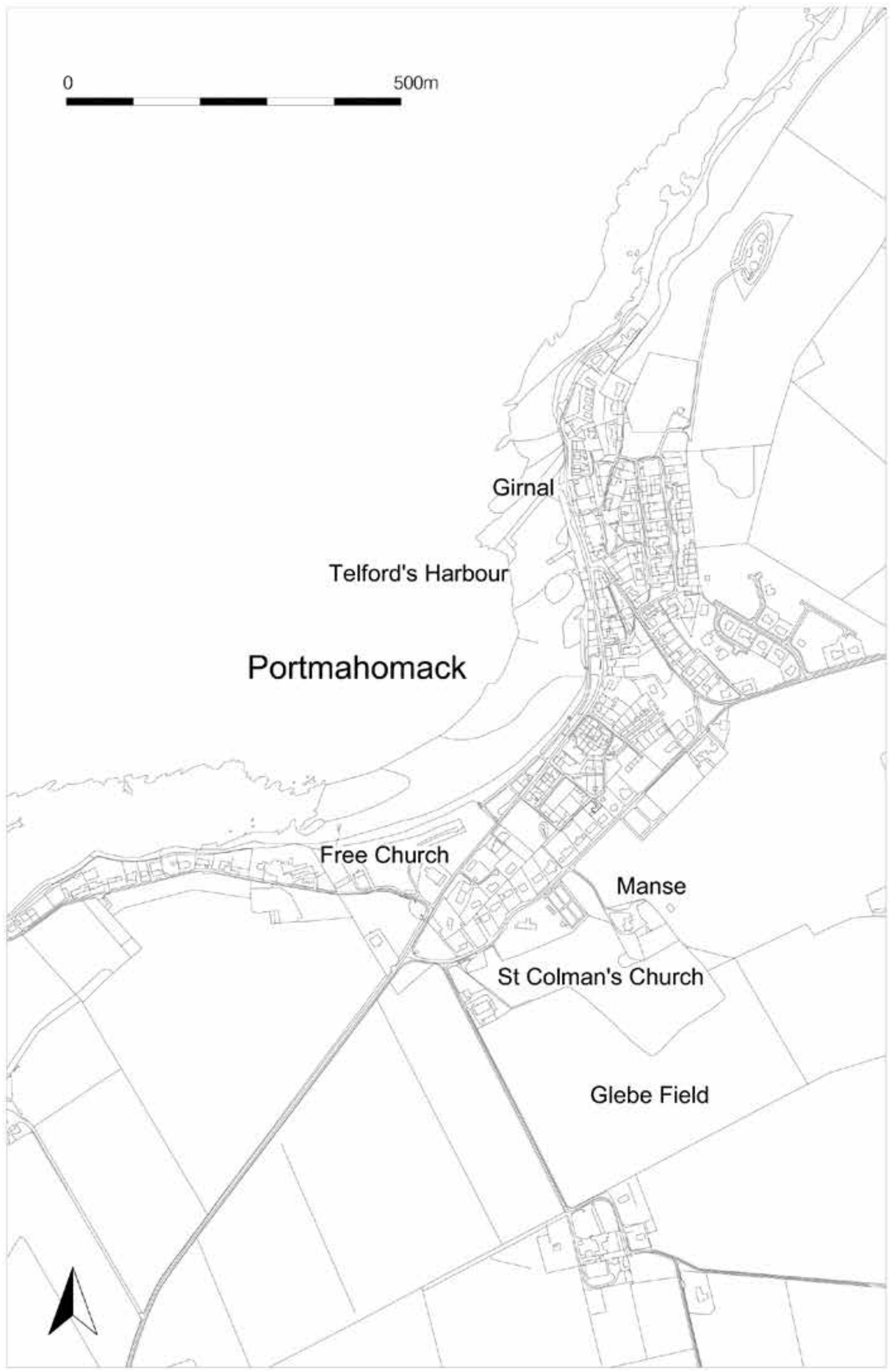


Illustration 7.33
Map of post-medieval/modern Portmahomack, showing the site of Telford's Harbour

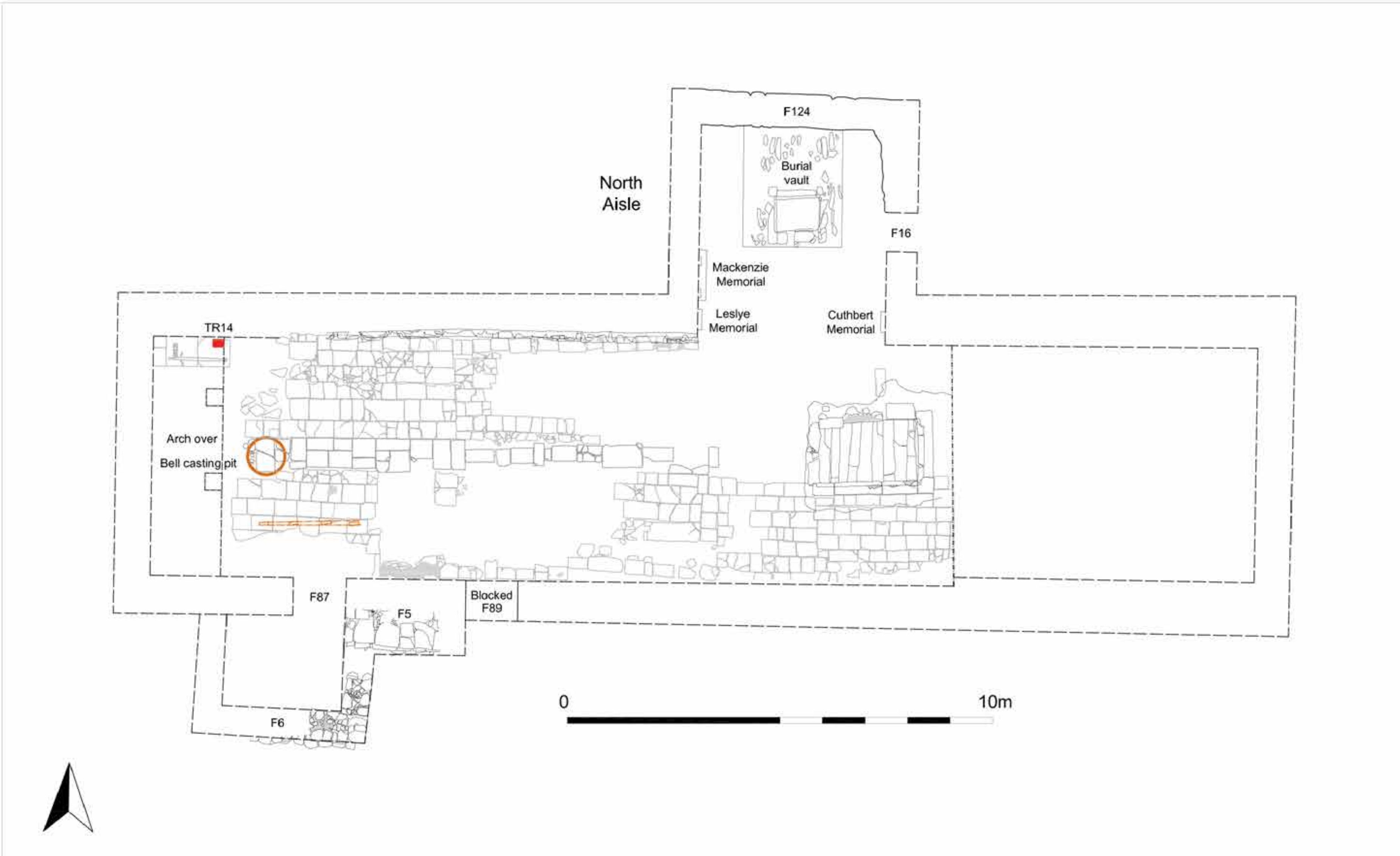


Illustration 7.34
Church 5, the Reformation church (seventeenth century)

remarkable burial complex that was placed opposite the entrance the crypt. The skeleton of an adult male (Burial 36), who was born in the west, died from blade wounds to the face and was buried with four skulls placed beside his, was superseded, physically and probably in reputation, when his coffin was reopened for the burial of another adult male (Burial 30), a local. The burial of a young child apparently lay in close association (p 324). This episode seems to evoke the life and death of clan leaders and their enemies, family, companions and heirs. The ritual recalls a still vigorous practice ultimately inherited from the Iron Age, where dominance was signalled in severed heads. It is reprised on Sueno's stone and mentioned in the *Annals of Ulster* – where Aed son of Niall took 'twelve score heads' after a victory over the Norse in 865. For the Middle Ages, the *Chronicle of Melrose* records one of Farquhar MacTaggart's early exploits, presenting heads to King Alexander after putting down a MacWilliam uprising in 1215 (Sellar 1993, 106–7). In the early fourteenth century, Randolph, Earl of Moray captured Eilean Donan on behalf of the king and exposed the heads of fifty 'misdoers' on the walls (Munro 1984, 131).

This incessant clash of weapons must have kept the Portmahomack metal-smiths busy. Presumably the settlement was still in Ross hands and would remain so until the Reformation. In spite of the western pressures, there were deep loyalties to perceived east-coast ancestors. By the mid-sixteenth century, Portmahomack had its own relic, that of St Colman, 'whose merits were attracting increasing numbers of people'. The *Aberdeen Martyrology* (Edinburgh University Library MS 50) that offers this anecdote gives the saint's day as 15 February, which aligns it approximately with Colman of Lindisfarne, whose feast day was 18 February (Carver 2008a, 15, n 21 for sources). The likelihood is that the relic was housed in the

Illustration 7.35
(a) Leslye memorial; (b) the flagstone floor of Church 5; (c) William Mackenzie's grave and memorial

crypt, where pilgrims could negotiate the steep steps to visit it and the new openings at the east end would light their way. However, this particular visitor attraction was soon to be closed down.

The new arrangements in the crypt and the numerous late medieval chapels and holy wells recorded on the peninsula imply an intense investment in Catholic piety on the eve of the Reformation. Between 1560, when the veneration of relics was officially prohibited, and 1588, when it got its burghal charter from King James VI, Tain exchanged spiritual for economic advancement. On Tarbat too the loosening of the old allegiances was no doubt assisted by post-Reformation asset stripping and increasing prosperity (Oram et al 2009, 36–9).

Post-Medieval Tarbat: St Colman's Church from the seventeenth to the twenty-first century (Period 5)

At the Reformation, which reached Tarbat in the late sixteenth century, the industrial settlement abandoned its situation outside the church: the old ironworks were ploughed for the minister's Glebe and all became farmland. The residential and business end of Portmahomack was transferred to the north end of the beach ('the Port') where a girnal survives from the seventeenth century and Thomas Telford improved the harbour in the eighteenth (Illus 7.33). From now on, the history of the investigated site is focused on the church, which supplies an ongoing vignette of society and religion in a theatre of ever-shifting scenes until the twenty-first century. The church was recorded in detail prior to its conversion to a visitor centre in 1997 (OLA 6.3.1 at 3.5; OLA 6.3.2). The graveyard was surveyed and all its memorials catalogued (see below). The documentary story of the church was compiled and presented in skilful detail by Alexander Fraser and Finlay Munro (1988).

Church 5 (OLA 6.3.1 at 3.5.1)

Church 5, the Reformation church, was a modification of Church 4; the axis of worship changed from a congregation facing east to one facing south. An annexe was added on the north side, called in local usage 'the north aisle' (Illus 7.34). The entrance into Church 4 was blocked and a *new doorway* cut into the south wall, manifest as a surviving threshold. External features associated with this new entrance suggest it was provided with a *porch* and a series of four niches cut into the flagstone floor suggest an internal screened *lobby entrance*. The *entrance to the crypt* was decommissioned as a reliquary and eventually earned

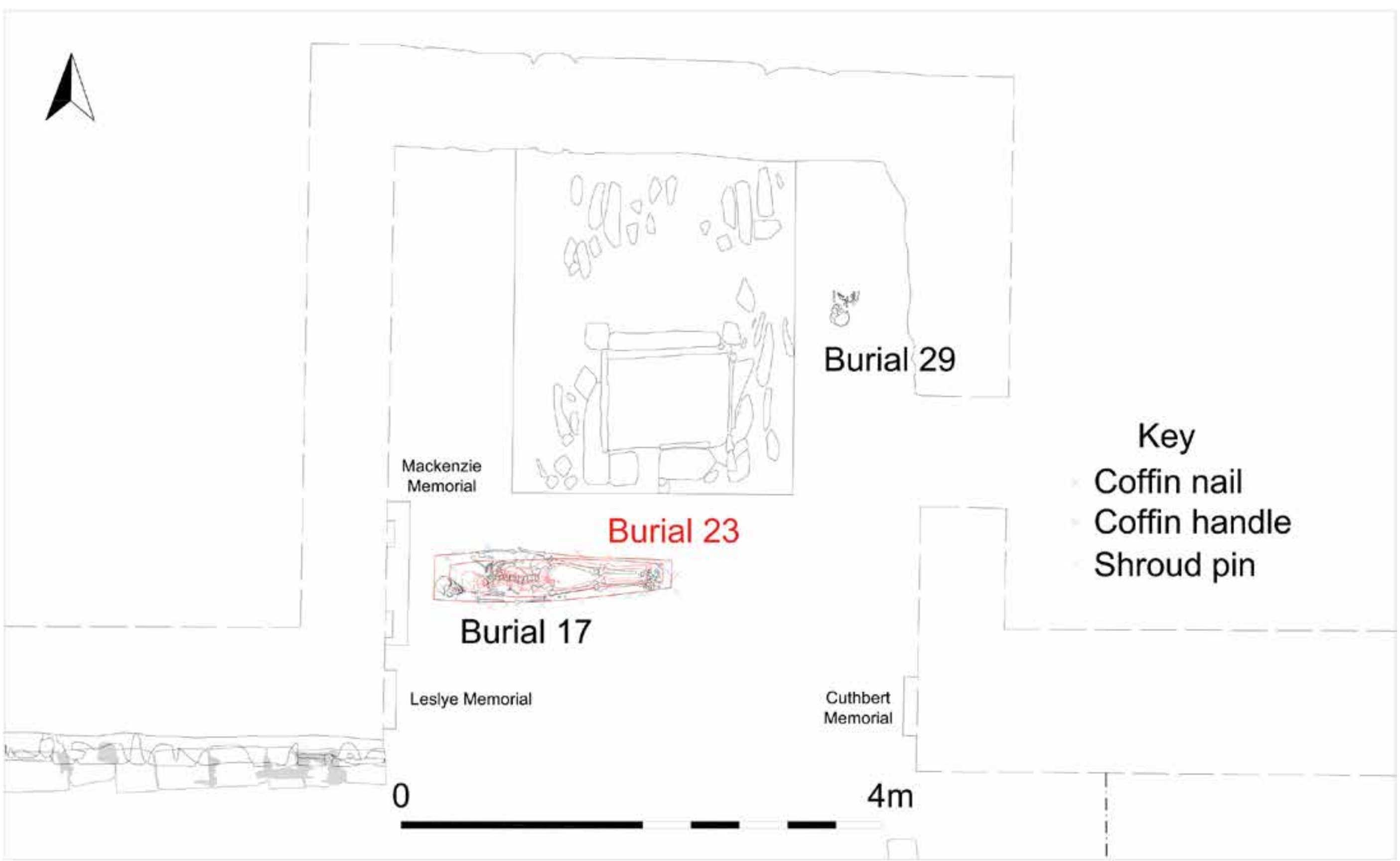


Illustration 7.36
Burials in the north aisle

Illustration 7.37
Churchyard map, showing sites of memorials and boundaries by date

a new role as a fuel store with a padlocked trap door (see below). A *belfry tower* was constructed with the aid of a relieving arch strengthened by two stone drum columns and by the reuse of ship's timbers in the fabric. Immediately adjacent to and centred on the drum columns a bell-casting pit was excavated. It was a steep-sided and sub-circular pit measuring 1.2m in diameter and 1.3m deep, and two fragments of clay bell mould were recovered from the backfill (20/265). The construction of the *north aisle* involved the addition of a small annexe measuring 4.5 × *c* 4.0m to the north side of the church close to the former nave/chancel junction. A 4.5m length of the Church 2/4 north wall was demolished to foundation level and three new walls built, the northernmost misaligned to the orientation of the medieval church. There was a doorway in the east wall of the north aisle. A square *burial vault* with entrance hatch was constructed in the centre of the aisle.

In the nave, a *flagstone floor* was laid on a thin bed of preparatory sand (Illus 7.35b). A piece of lead window came, derived from a figural scene (17/13) and nine fragments of plain, late medieval glass, along with a piece bearing fifteenth-century Gothic lettering were recovered from the sand (Wilmott in Digest 6.15). This assemblage suggests that late medieval glazing schemes, which may have included personal dedications or memorials, were stripped out. In addition, 108 fragments of plain window glass of sixteenth- to seventeenth-century date were recovered during clearance of the crypt, implying that reglazing in simple, large, rectangular leaded quarries was undertaken for Church 5. The reuse of the late fourteenth- to fifteenth-century grave cover in the north-west corner of Church 5 is the notable exception to an apparent dispensation with internal ornament in the nave and the initials 'AMRM' are likely to have been added to the reused slab at this time, perhaps commemorating members of the Munro family.

Burials associated with Church 5 (OLA 6.3 at 3.5.2)

The flagstone floor signalled the end of burial in the nave with the possible exception of a special group of infants, which are thought to spill over from the sixteenth into the seventeenth century (above). Two successive adult inhumations were excavated within the north aisle beneath the Mackenzie monument (Illus 7.35c). Burial 17 was that of a mature man in an elaborate coffin, and assumed to be William Mackenzie, while the successive Burial 23 in a matching coffin containing a mature woman is assumed to be his widow. Infant Burial 29 was located within the north aisle close to the laird's vault suggesting the possibility of familial association, perhaps an illegitimate child not treated to formal burial (Illus 7.36). William Mackenzie, as we learn from his teeth, arrived from a childhood home in the west between the age of seven and twenty-six years old (Digest 4.4). He died in 1642 at about forty-five years old.

The majority of Period 5 burials would have been interred outside the church. Memorials dating from the seventeenth century have been recorded within the extant churchyard and boundary features encountered during the excavation of the service trench (F1) may originate in this period with the Period 5 cemetery marked with a bank and ditch (Illus 7.37).

Dating

A post-Union twopence of James VI of 1623 (17/11) was recovered from beneath the flagstone floor, and precisely the same date (1623) is shown on two stone plaques dedicated to the Leslye/Cuthbert family inserted into the walls of the north aisle, providing further *termini post quos* (Illus 7.35a). It is possible that these memorials were concomitant with the building of the aisle and represent endowments by the Leslye/Cuthbert family towards its construction. The headstone of the Mackenzie monument dated 1642 is also let into the west wall of the aisle.

Discussion

The new interior space was created as a result of the Reformation, and reflected its thinking (Howard 1995, 193; Dunbar 1996). *The First Book of Discipline* (1560) summed up the new liturgical requirements as: a bell to bring the people together, a pulpit to preach the word, a basin for baptism and a table for communion. The intercession of saints was no longer sought, so that there was no more need of access to a relic in the crypt. A wooden pulpit was sited against the south wall; this and the position of the north aisle opposite shows how the axis of worship had changed. The purpose of the north aisle was to house the laird's family and provide him with a family burial place. In 1581 the General Assembly of the Church of Scotland forbade burial within churches, a stricture repeated four times before 1643. Thus burial was to be no longer in the nave but 'lying in the most free air'. However, burial vaults were erected by important families, and these could be within the church, as at St Colman's, under the north aisle.

At the Reformation, Tarbat Church was first assigned as a *mensa* to the Bishop of Ross. The lands of Fearn Abbey were being apportioned by the crown in the mid-sixteenth century and the old buildings of the abbey were acquired by Nicholas and then Thomas Ross who converted the Dorter into a hall and kitchen (*Chronicle*, 19–20). By 1563 'the chapter ceased to exist in any recognisable sense' (Adam 1991, 30). In 1626–1628, Fearn parish, including the Abbey, was separated from the parish of Tarbat (to which it had originally belonged). By 1634 Sir John Mackenzie was chief heritor and had the right to the north aisle (Fraser & Munro 1988, 31, 47). The Laird was increasingly significant in the control of religious thinking, as well as in the economic and social control of the local inhabitants. At St Colman's he entered via a private door in the east wall of the north aisle. The bones of his relatives lay in a special burial vault beneath his feet. The construction of the north aisle had presumably been achieved before 1623, the date on two cartouches inserted in its walls. In 1690 an act in favour of Presbyterians was passed by William and Mary, and Tarbat may have then ceased to be Episcopal in name. It became one of fourteen churches in the possession of George, Lord Tarbat, First Earl of Cromartie, Sir John Mackenzie's heir. Ballone Castle, built in the late sixteenth century presumably by the Dunbars who held the property from 1507, was acquired by the MacKenzies in 1623 (Canmore). The Christian religion now became an overt instrument of the aristocracy, and the relationship between the local landowners and the minister was to become ever stronger over the next 300 years.

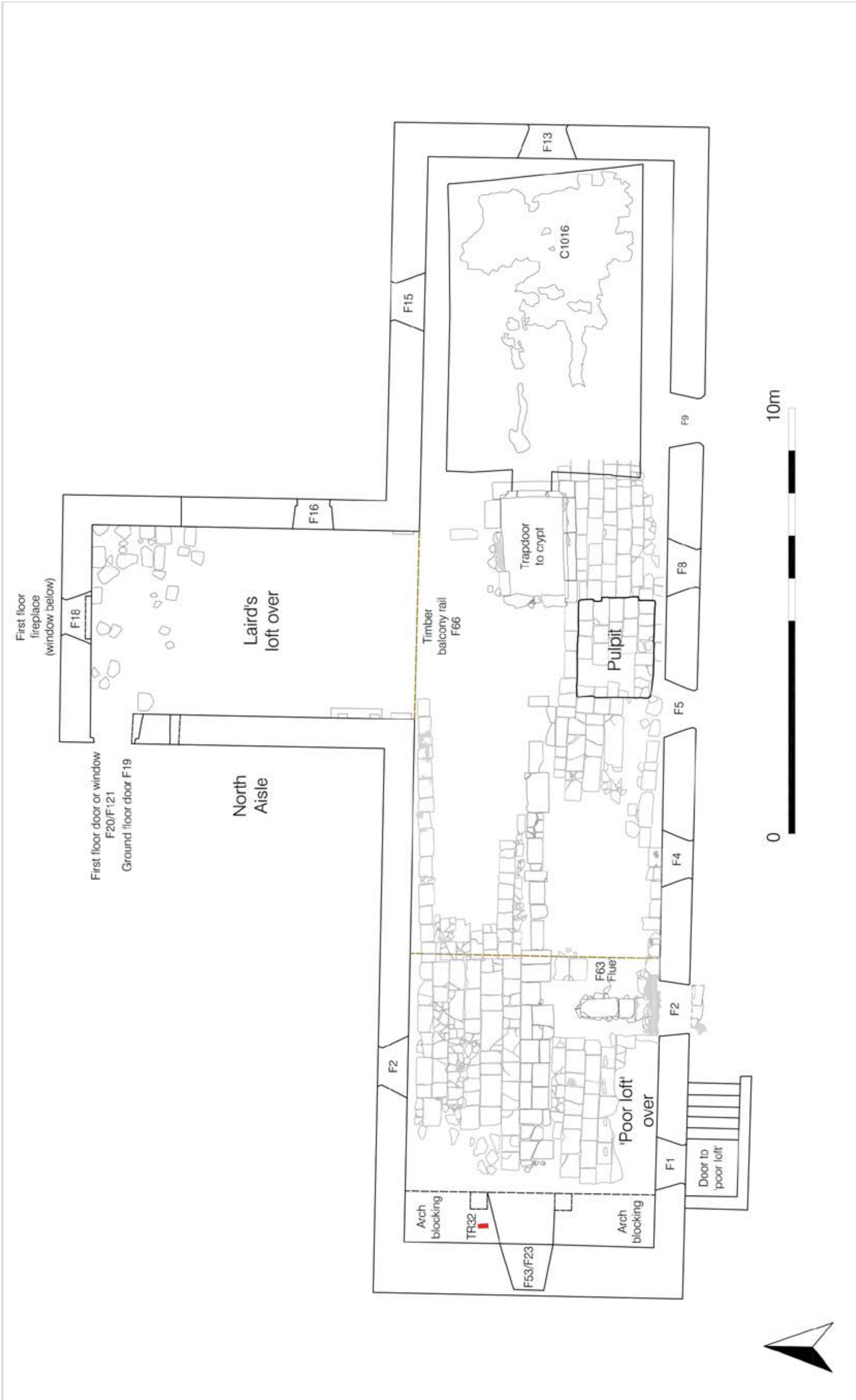


Illustration 7.38
Church 6: eighteenth century

Church 6 (eighteenth century) (OLA 6.3.1 at 3.6.1)

Church 6 was a refurbishment of Church 5, using the same footprint, with the exception of the northward extension of the north aisle (Illus 7.38). The *west gable end* of Church 4 had been retained within Church 5 where it also supported its belfry arch; this structural arrangement was retained wholesale for Church 6. A total of *three doorways* now served the *south side* of the ground floor of Church 6 and were seen to be integral to the fabric of the wall F2 (square head), F5 (later converted to a window) and F9 (arched head) with F2 persisting in use to the present day. The door for Church 5 was dismantled to threshold level and the remnants of the threshold blocked. Punctuating the space between the doors of Church 6 were *two windows* assigned F4 and F8. Access to a *first-floor west gallery* was facilitated by an external stair leading to a door (F1; with a square head). A stone 'flue' consisting of bonded sandstone sides and a slab cover was constructed beneath the threshold for south door (F2) beneath the flagstone floor. The feature ran from the south side of the threshold and continued into the body of the church measuring a total 3.0m in length.

The *north wall* required far less intervention and may have survived largely intact, although externally the two ground-floor windows appeared integral with the surrounding fabric. Observations at the east end made during replacement of external harling suggest that some of the east gable was retained. The *north aisle* of Church 5 was substantially remodelled for Church 6 with evidence for the partial reuse of the west and east walls and a new north wall sited further north. The remodelled aisle consisted of a northwards extension to the annexe measuring *c* 6.6 × 4.4m and the creation of an upper storey; the fabric of these walls was bonded with red clay. The east door for the Church 5 north aisle was converted to a window (F16) while a new integral window lit the annexe from the north (F18). A *small flue* for a stove to heat the ground floor was identified and assigned F3; the ceramic drains used for the flue were consistent with a mid-eighteenth-century date onwards. A new *ground-floor entrance* was provided close to the north end of the west wall, noted as integral to the fabric of the new west wall (F19). It is not clear how the first floor loft was accessed for Church 6, as no evidence for an internal or external stone or timber stair was identified, although a blocked door at first-floor level (F121), converted to a window probably for Church 7, is the most likely candidate for an entry point. The first floor was provided with a fireplace. A *timber balcony* was inserted at the front of the loft into the nave.

A *west gallery* was inserted over the relieving arch and columns of the belfry and was accessed via an external stone stair, becoming timber in construction internally and cutting across the belfry arch and its blocking. Externally, this stair overlay the remains of the porch of Church 5. Internally, evidence for a flat gallery was identified in the fabric and evidence for a barrel-vaulted ceiling was also preserved as a scar. A timber balcony was provided at the front of the gallery looking into the nave. Access into the belfry was via a stair from the west gallery.

The extant distinctive *birdcage belfry* is attributed to Church 6. The existing belfry arch of Church 5 was strengthened to bear the new load by the insertion of rubble blocking beneath and to either side of the Church 5 stone pillars. This was also plastered over. The rubble blocking also partially obscured the reused late fourteenth- to fifteenth-century grave marker set into the flagstone floor initiated in Church 5.

Analysis of the debris found in the crypt showed that it was used for the storage of peat fuel. It is postulated that the fuel was imported to serve the fireplace and stove within the church, namely those in the laird's loft and lower north aisle. In the *churchyard* several memorials dating to 1750–1800 cluster against the western churchyard boundary of Church 6 (see Illus 7.37).

Discussion

It is recorded that a series of inspections and estimates led to the erection of Church 6, which began in the 1720s and took some forty years to realise (Fraser & Munro 1988, 45). The iconic Tarbat belfry, made in beautifully shaped and fitted ashlar is thought to be the work of Alexander Stronach, the dynastic name taken by at least three generations of master masons living in Tarbat, and active between 1634 and 1790. The present church bell is inscribed: 'The Church of Tarbat. John Milne fecit 1764' but a later inscription reads 'Recast 1908'. Provision was made for a greatly increased congregation: a flat gallery constructed at the west end would have held another fifty people; this area would become known later as the 'poor loft', and this may have been its original intention. At the east end a more modest gallery, supported by two joists, may have been intended as an organ loft. There were now no fewer than five doors in the south wall. Starting from the east, the first was accessed by a staircase and led to the supposed organ loft. The next was arched and may have been that for the minister, who could access a pulpit on the south wall, now the focal point of the service. The next two led to the nave and the last provided access to the west gallery. The congregation thus found its way through three doors suggesting that places were allocated and society was thoroughly ranked. The Laird's family continued to use their private east entrance into the ground floor north aisle.

Church 7 (late eighteenth to early nineteenth century)

Church 7 was a series of adaptations to the interior and access arrangements (Illus 7.39). These involved an increase to a total of seven access points, the creation of more galleries and the raising of the church wall head and gables by *c* 1m including the north aisle, and the remodelling of the church roof. Changes to the *north aisle* included raising the wall head, gable and roof. An *external stair* was built against the west wall that led to a newly inserted door, providing direct access into an upper floor – the 'laird's loft'. The previous access into the loft was converted to a window (F121). The ground floor was divided into two spaces by the insertion of a *timber partition*. This space, opening directly into the nave, would likely have housed parishioners, perhaps still gaining entry via the east door (F16) or directly from the nave, while the space behind the partition, accessed via the west door (F19), may have been reserved as private space for the laird.

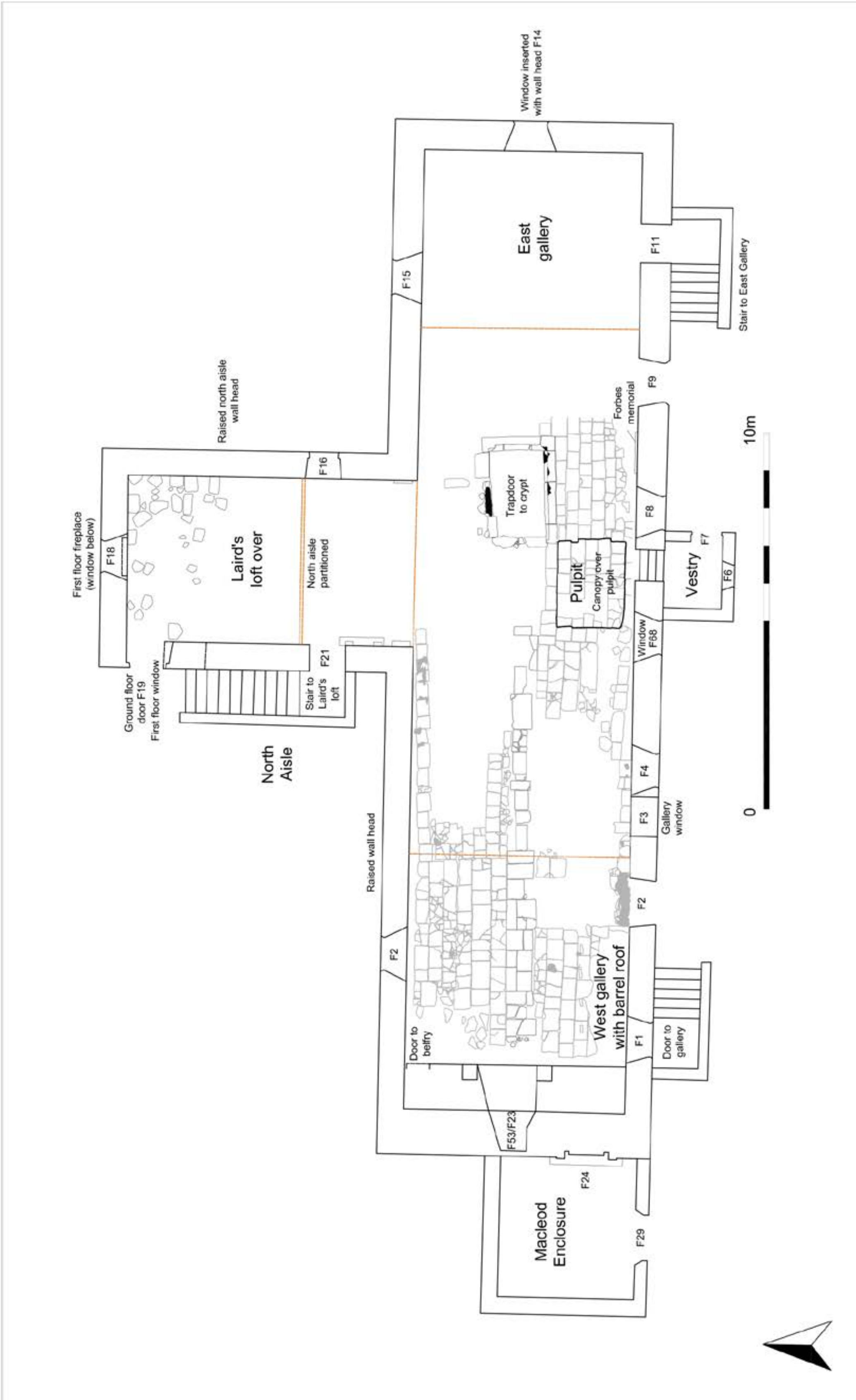


Illustration 7.39
Church 7: late eighteenth to early nineteenth century

Remodelling of the *west gallery* included the creation of a sloping floor providing improved views into the nave and the minister for the heritors and their families who now occupied the former poor loft. A small light was provided for the new loft, facilitated by and probably concomitant with the raising of the wall head. The new church roof provided more headroom and the barrel-vaulted ceiling was removed. Access to the belfry was retained and gained from this gallery. An *east gallery* appears to have been inserted, with an external stair providing access to a door opening, notably straight sided (not chamfered like the doors of Church 6). This door (F11) provided entry to the gallery, which was set at the same height as the laird's loft and the west heritors' gallery. The elevated position and separate entrance suggests the east gallery, like its counterparts, was reserved for parishioners of some standing. The gallery was lit by a new large window (F14) inserted into the east gable, again facilitated by the raised wall head.

Along with more segregated means of entry into the church, a *south vestry* was built sequentially after the raising of the wall head, but very probably as a coherent part of the development. The vestry consisted of a small annexe measuring 1.7 × 1.4m internally and was accessed via a door in its east wall. The interior space was lit by a single window in the south wall and contained a small vestment cupboard in the north-west corner. Access into the pulpit was via a door with timber lintel. A small flight of steps led into the pulpit, which was fitted with a canopy and was the focal point for all galleries and the body of the nave. Evidence for the location of the pulpit in the floor suggests that it persisted in use from Church 5 until the end of Church 7. The three windows of the south wall were heightened, as facilitated by the new wall head.

This period also saw an increase in *memorials in the churchyard*, some of which were markedly elaborate and ostentatious while others are notably humble. The construction of the *Macleod enclosure* outside the west end of the church belongs to part of the growth of investment in elaborate memorials. The enclosure measured *c* 4.5m × *c* 4.0m and it was accessed via a flat-headed entrance set originally with a gate. The enclosure was constructed for the burial of members of the Macleod family of Geanies. Some time after 1807 a memorial to two sons of Donald Macleod of Geanies, who died in 1805 and 1807 respectively, was erected within the enclosure. Exactly when this memorial was erected cannot be determined confidently since a subsequent memorial to Donald Macleod who died in 1834 was not erected until forty years after his death. This later memorial to Macleod, initiated by his last-born child Catherine in 1874, implies that the remains of Macleod, his wife Margaret Crawford and their second son lie in the enclosure; their eleven other children were not permitted that honour. Donald and Margaret were married for nineteen years, during which time Margaret gave birth to twelve children before her death in 1781. A record of the churchyard memorials is curated at the Tarbat Discovery Centre.

Discussion

This period saw a steep rise in the population of Portmahomack and consequently in the number of parishioners. This resulted in crowding inside the church, prompting attempts at alleviating pressure on space while enhancing class distinctions. Ground-floor space within the laird's aisle was given over to parishioners, the 'poor loft' of Church 6 was adapted as a more high-status space for use by the heritors and their families and an eastern gallery was created; the laird's loft and the east and west galleries were high-status areas incorporating separate entrances and elevated viewpoints.

A visitation of 1780 had resulted in the unanimous agreement of the heritors 'to have the aisle belonging to Sir John Gordon and to which he has exclusive right, fitted up in such a manner as to answer the purpose of accommodating the parishioners in attending divine service, the said John Gordon having given his consent to this under condition that the thing is to be done at the joint expense of the heritors, which was also agreed to' (Fraser & Munro 1988, 46–7). It was also agreed that the west gallery, at that time dedicated to the poor of the parish, should be reallocated to the use of the heritors for the price of the seats. This agreement meant that the Laird and the heritors could rise from the ground together. Each part of the community – laird, heritors, minister, upper class, professionals and poor – was now truly consigned to his own estate. Assuming a modicum of space around the pulpit, the whole church now had a capacity for some 1,000 souls.

We get a flavour of a late eighteenth- and early nineteenth-century Ross-shire cleric (and his sermons) in the person of William Forbes, who was Minster of Tarbat from 1797 to 1838. His brother-in-law described him as 'a profound and scriptural divine … at one time in a flow of high spirits, laughing until his eyes ran over at his own anecdotes – at another sunk in the deepest gloom, which his countenance, naturally dark and sallow, was particularly well suited to express'. William Forbes' exacting standards led him to falsely accuse a parishioner of making his maid Jean Purves pregnant, leading the aptly named Archibald Dudgeon to challenge him to a duel. (In fact the guilty party was Archibald's brother.) William Forbes is remembered in a remarkable eulogy in stone which still hangs on the south wall of the nave, next to the pulpit he occupied for forty years (transcribed in Carver 2008a, 167).

Church 8, after 1843 (OLA 6.3 at 3.7.1)

Church 8 (Illus 7.40) was the form of the building following the Disruption of 1843, when the minister and most of the congregation abandoned it in favour of the Free Church. The principal changes adopted by the relict parishioners were the return of worship to a W–E axis facing a raised timber platform, and the contraction of space required for a much reduced congregation. The western gallery and both floors of the north aisle were blocked off, while the eastern gallery was dismantled to allow the construction of a new vestry. A timber floor was inserted over most of the flagstone floor, some of the flags stacked to form joist supports. Access into Church 8 was reduced to a single south door reusing that of Church 6 (F2). The easternmost south door of Church 6 (F9) was blocked, incorporating the remains of a seventeenth-century grave cover slab to a Mackenzie 'and his spouse' and a post-medieval slab incised with a capital 'A' and further lettering, both of which remain in situ.

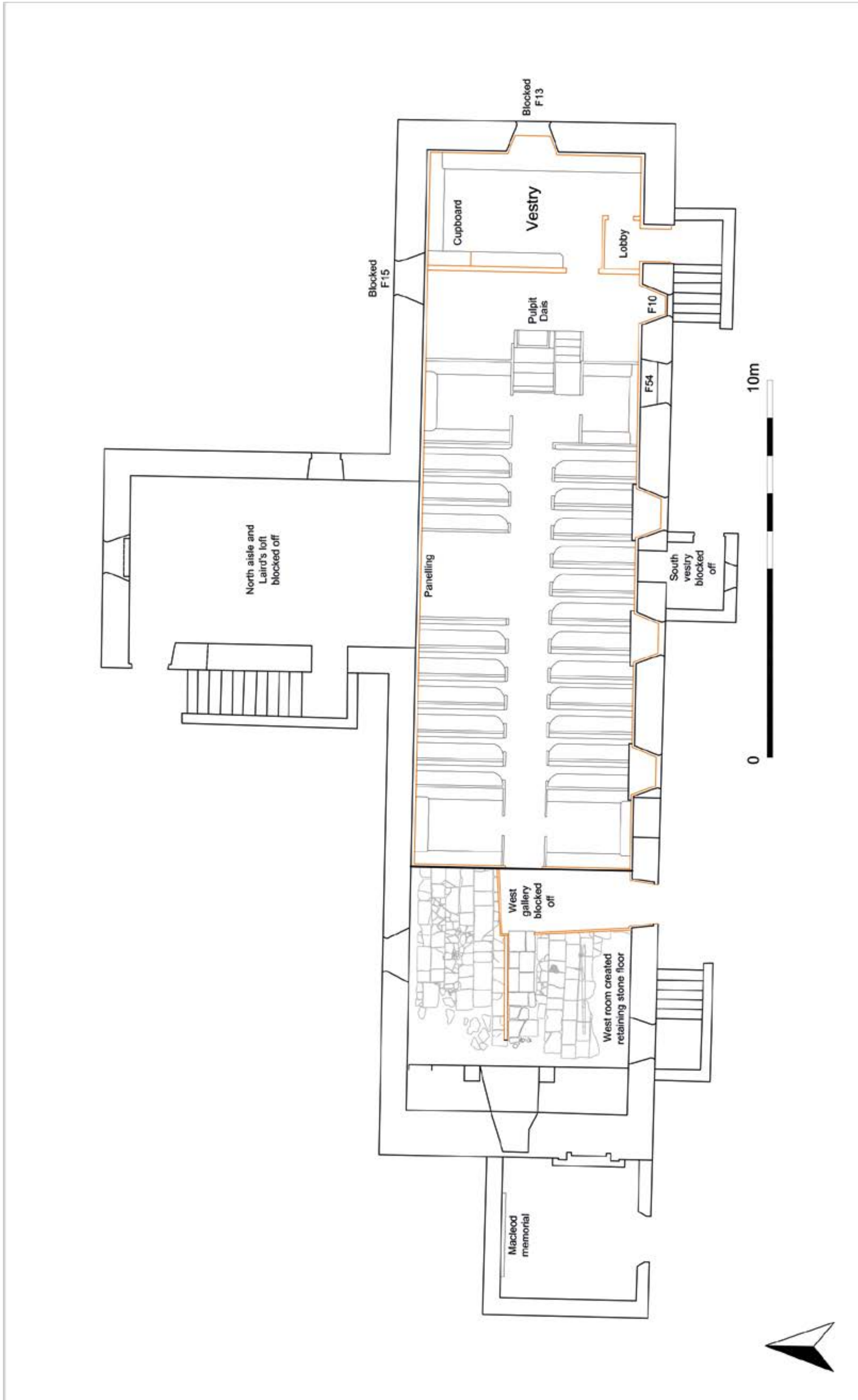


Illustration 7.40
Church 8: the church of the post-Disruption era, after 1843

The *raised east end* incorporated a timber gallery with a *precentor's box* and *vestry* behind. This arrangement rendered the previous pulpit and south vestry obsolete; the pulpit canopy was removed and the door from the south vestry blocked off. The creation of the new vestry required the blocking of east and north windows F13 and F15, while window F10 was inserted adjacent to the south door F11 to light the new pulpit which also retained the use of the former east gallery window F14. The vestry was partitioned from the nave by timber-panelled stud walls. As part of the general contraction of space within Church 8, a *west room* was formed to the left of the entrance by timber stud walls. Within this space the flagstone floor continued in use up until the conversion of the church in 1997. The room was lit with the pre-existing windows of Church 6 and 7 (F22 and F23).

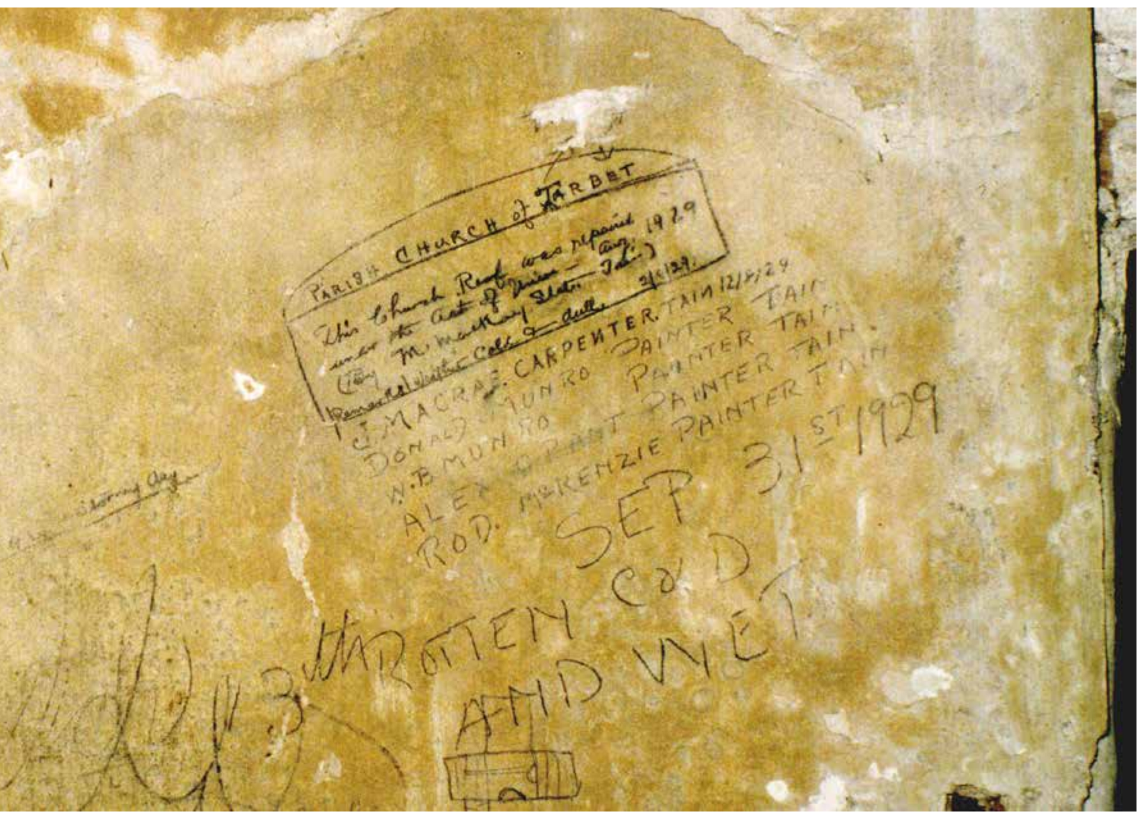


Illustration 7.41
Graffiti made in 1929

The latest layers cleared from the crypt (Int 13) were derived from an extended period of disuse and neglect, now that the fuel store was redundant. The bone component within the fuel peat layers was not consistent with the importation of fen peat and it was evident that the crypt had been colonised by a variety of animals. A minimum of eighteen hares were identified, along with a leveret, rabbits, dog, cat and kitten, many species of bird as well as amphibian and fish bone. At least some of the remains might be attributable to importation by carnivorous animals such as owls and otters – which may have been responsible for the presence of amphibians and fish. The assemblage suggests that the space had become wholly abandoned by this stage and that the windows were unglazed, allowing ingress to animals. Further features were identified as likely burrows.

Other material recovered seemed to imply some use for the disposal of soil perhaps from grave digging. A fragmentary nineteenth-century memorial stone was identified, along with disarticulated human bone, fragments of leather shoes and ironwork, perhaps coffin fittings. Most notably, six fragments of early medieval sculpture were recovered including three conjoining fragments of slab with incised interlace (TR17). A further small remnant of spiral decoration (TR18) and two fragmentary grave-marker cross-slabs were identified, one with a hollow-armed cross on both sides (1389), the other preserving a pecked cross arm with a double-looped terminal (1384) (Chapter 5.3). An assemblage of fifteen coins from the late medieval period onwards was also recovered (Digest 6.14). A further nine copper-alloy shroud pins were identified along with a late medieval thimble, lace chapes and other dress accessories along with a possible bone stylus.

Discussion

The change of layout and use between Church 8 and its predecessor (Church 7) was the result of a surge in the old struggle between laird and landowners on the one hand and the rest of the congregation on the other. Land reform and improvement was to the benefit of the landowners, but not necessarily to that of their employees, many of whom were being dispossessed by the Highland Clearances. Ministers played a crucial role in this, since their advice and strictures could be pivotal. In the early nineteenth century, the labourers were increasingly supported by ministers of a new Evangelical persuasion, and matters came to a head in 1843, when ministers and congregation broke with the bonds of the heritors and marched out to form the Free Church of Scotland. At Portmahomack, the new Free Church building was erected between St Colman's and the beach (where its successor, dating to 1893, now stands) and most of the congregation joined it. St Colman's congregation, which had numbered over 1,000 before 1843, had dwindled to eighty-five ten years later.

The old Church was adapted to its new circumstances, reaching back into the past to emphasise its authentic ancestry (Church 8). The direction of worship returned to the traditional W–E axis. High box pews were placed at either end of the nave with smaller unenclosed seating in between. A lower ceiling was inserted, and the openings to the north aisle, upper and lower, were boarded up with timber panelling which also continued round all the nave walls. The nave walls and vestry were painted in lemon yellow (upper half) and terracotta red (lower half) separated by a horizontal black stripe.

Tarbat Old Church had now become the preserve of 'high church' parishioners. In 1866, the General Assembly permitted the return of music and Tarbat subsequently acquired an organ. The eastern platform was shared by the organ and the lectern that held the Bible. In front of it was a box from which the precentor would read out extracts of the sacred texts while the congregation awaited the minister's sermon. The sermon, which might continue for an hour or more, was delivered from the platform above. Perhaps with these lengthy perorations in mind, nineteenth-century heritors were obliged to provide seating spaces for their parishioners to the measure of 18 × 29 inches per posterior.

However, financial support was not lacking. In 1801 the manse had been totally rebuilt, and the Glebe enlarged from four acres to six acres and two roods. In 1851 a grass Glebe was provided for the minister and in 1874 the land held by Minister Campbell amounted to twelve acres. Geanies made over a small part of their land that adjoined the north-east part of the Glebe. In 1856 an inspection recommended extensive repairs to the church, manse and outbuildings. Church walls, the harling, the roof, stone stairs, windows and doors all needed repair. Notwithstanding the existence of the popular Free Church, the Tarbat churchyard continued to be the main place for the burial of everyone, and the Churchyard was enlarged in 1868 and again in 1893 (Illus 7.37).

The Tarbat churchyard is the resting place of a number of Ross-shire families. The Rosses themselves who held sway in the pre-Reformation centuries are found all over the burial ground. The Mackenzies who rose to fame after the Reformation have a number of clusters of fine monuments, which probably locate their *lairs*. We can also track the resting places of Munros, Mackays, MacLeods, Skinners and many others who lived and died in Easter Ross and knew the Port and its ever-varying fortunes.

In the twentieth century, the upkeep of St Colman's Church was a continuing challenge. In 1928 the church, manse and Glebe were transferred from the heritors to the Church of Scotland Trustees. Graffiti records a repair job in 1929 (Illus 7.41), but only seventeen years later, in 1946, the Church was declared redundant and in 1980 the now derelict building was purchased by Tarbat Historic Trust for £1. This was the point of departure for its restoration and rebirth as a gateway to Scottish history (Illus 7.42).

Illustration 7.42
St Colman's Church restored in 1999

Chapter 8

Connections

Introduction

In this book Portmahomack appears as a beacon of change, in the sense that each of its four major settlements, together with the long coda of its consecutive churches, mark pivotal moments in which politics and the economy set off in a new direction. Previous accounts of this story have tended to give the monastic phase the primacy, and for us today it probably remains the most prominent episode in the story. In reality the monastic moment may have been fleeting. What came before, and what happened after, do more than give a chronological context for one outstanding achievement. The materiality of the Portmahomack sequence suggests that the political mood changed frequently and resulted in peaks of investment followed by reaction or relapse. The family estate, with settlement and cemetery, had a brief existence in the mid-sixth to late seventh century before it was superseded, perhaps through endowment, by the massive development of the monastery. This establishment lasted a little more than a century (the eighth), before it was not so much destroyed as redirected by a Viking raid. The manufacturing and trading agenda of the new settlement lasted less than a century (the ninth). Its farmers persevered longer, but by the eleventh there were few material signs of activity at Portmahomack, apart from the occasional interment and the burial of some silver rings. With the dedication of a parish church in the twelfth century, a new era began, but it inaugurated no long-term stability. A fishing village flourished in the thirteenth century, and a colony of ironworkers served a large community in the fifteenth (Illus 8.1). The Reformation changed all that again, reordering the church and redeploying its population to the present port.

Our investigation clearly did not chronicle every eventuality in the locality or the region, so do these 'peaks' mislead us into claiming generalities? The reported changes argue principally from material culture, so offer reports no less vivid, but no less partial, than documentary history. But their value may still find some application beyond the thousand-year history of an iconic fishing village. Broader relevance may be tested by examining how far the people of Portmahomack were in contact with others; whether their remoteness was more apparent than real, their experience isolated. The aim is both to assess the historical utility of our narrative and to see if it can be in some measure explained. This chapter, drawing on the conclusions presented in Chapters 4–7, reflects briefly on the connections of each of our communities with their locality, and with their wider world.

Mobility

We start with positive expectations. In the period with which we are mainly concerned, the sixth to sixteenth century, the people of Tarbat are of mixed descent, their responses to events widely informed. Archaeologically, cultural references and stable isotopes encourage us to accept a persistent mobility of peoples, and of ideas. In the twenty-nine samples taken from burials at Portmahomack, incomers outnumber the locally born by five to one. Most of the arrivals before the ninth century are from south and east Britain. People from the west coast appear occasionally in the early medieval population, but it is from the fifteenth century that they come in numbers. Culturally, sixth- to eighth-century Tarbat is part of the insular world. The seventh-century horse mount has its nearest parallel at Sutton Hoo in south-east England. The monastic arts make reference to works of art found in Ireland, Northumbria, Mercia and west-coast Scotland, but there is a substrate of taste in the sculpture reaching into Strathclyde and south-west Britain. In the ninth century, the Norse left a violent calling card, but two men already in the cemetery were Scandinavians and commemorated in the manner of orthodox monks. In the ninth century an Anglo-Saxon horn mount finds its way to Burghead (Graham-Campbell 1973). In the eleventh century, there are coins from England and France in circulation on Tarbat Ness. The first pottery to arrive in the Middle Ages comes from Yorkshire. Traffic moves as readily up and down the east coast by ship, as it does between east and west using the Great Glen and its portages (McCullough 2000; Phillips 2006). From the time of the eighth-century monastery, if not before, Picts, Britons, Scots, Irish, English and Norse, and no doubt others besides, are potentially active in the Moray Firth.

Prehistoric to Pictish transitions

There are Bronze Age sites on the Tarbat peninsula, but the Middle Iron Age there awaits definition. There are few Roman finds (Digest 8), so we have difficulty aligning with that transition to Pictishness being chronicled by Fraser Hunter at Birnie (2007, 51). There, two hoards of Roman coins were deposited in the late second/early third century AD in an Iron Age settlement of turf-

Illustration 8.1
The sequence at Portmahomack, Periods 1–4

built roundhouses, one destroyed by fire. This is seen to have begun a shift from locally based power (as at Birnie) to fortified centres in the fifth/sixth century (Hunter 2007, 32, 54). This move to the ramparts has been endorsed by new research, exposing a varied typology of fortified hilltop and coastal sites in this period over wider Aberdeenshire (Cook 2011).

The chronological framework adopted here ends the Middle Iron Age about 400, and the Late Iron Age about 650 (Maldonado 2011, 98, 123, 127), this latter period also being named 'early Pictish' on the grounds that it is coincident with the appearance of the incised symbol stones. Thanks to the revelations at the high-status ritual centre excavated at Rhynie, Aberdeenshire, which originally contained nine of these symbol stones, we can be reasonably certain that this iconographic system was established in a non-Christian society in the fifth to seventh century, even if Christianity subsequently adopted some of its imagery (Gondek & Noble 2010; Noble et al 2013; Carver 1999a). These stones may have been erected in response to incoming Christians: 'the stones lack Christian iconography and may have been erected as a pagan reaction against the influence of these new beliefs, whether due to the successes of the sub-Roman or the Columban church' (Foster 1996, 79, moderated by idem 2004, 75–6; revived by Clarke 2007 and Fraser & Halliday 2011, 327, 330). However, the Rhynie site suggests that Picts needed no prompting from Christianity to create their own cult sites and symbolic language, their investment in monuments promoting their own cosmology rather than emulating that of the neighbours. In this, their spiritual trajectory is more akin to that of Scandinavia (cf Hedeager 2011).

Early Pictish Portmahomack was not enclosed or fortified and has to date produced no Class I symbol stones. Along the crest that is now marked by Tarbatness Road there were burials from the fifth century and before, culminating in the sixth to seventh century in a cemetery of long-cist graves, some aggregating in clusters, a number of them covered by earth mounds. Some of these barrows remained visible and continued to exert a gravitational pull even on monastic head-box burials through the eighth and into the ninth century. In this sense, there was a *longue durée* in the sanctity of the place. Complementary examples may be seen in maps of the peninsula, where later Christian sites join earlier burial grounds at Nigg, Shandwick and Balintore/Hilton, although, since all are landing places, geography will also have played its part (Illus 8.2).

Behind the cemetery, in the marshy valley, was a circular building providing shelter for smiths, working with iron and collecting water. On the hilltop beside the graves a wood-lined gulley containing grain suggests an economy in which rye, wheat and barley were staples. Plough pebbles residual in the settlement and an acre of scratch-plough marks to the south are possibly related to this cereal production. There were hints of high status and exotic contact in the exiguous finds: disc-headed iron dress pins paralleled in southern England, and the harness mount which finds its closest match on the ornamental disc of the bridle from Mound 17 at Sutton Hoo. The isotopes also report a well-travelled bunch: one local, one westerner and one from 'east Britain' but not local, which is a catch-all for somewhere on the east coast further south (p 60).

In AD 565 Columba undertook his expedition up the Great Glen, of which the Tarbat peninsula is a geological extension. The dates of our cist graves embrace this iconic year. It would be historically satisfying to grant the Period 1 settlers the status of early Christian pioneers, led or inspired by a mission from Iona; it would be logical for such a mission to head for a traditional holy place. But there was little overtly Christian or monastic about the Period 1 people, with their mixed sexes, self-serving ornament and lack of crosses. Admittedly, the ascetic reputation of the early monks does not promise much visibility and it is even possible that our informal cluster of multi-taskers is what a formative Columban community looked like. However, at the present state of knowledge it would be prudent not to force a Columban straitjacket on the Period 1 settlers at Portmahomack (*pace* Carver 2004). They were persons of both sexes owning items of equestrian rank successfully practising mixed farming with access to metals and a strong Iron Age burial tradition. The change which was to occur in the late seventh century is sufficiently dramatic to credit it to incomers, but there is no special indication of their presence in the cemeteries. It is argued that the transition is what might be expected where a landowning family donates land to endow a monastery (Chapter 4).

From family estate to monastery

A light dusting of windblown sand, possibly due to turf stripping, separates the first settlement at Portmahomack from what followed it in the late seventh or early eighth century (Period 2; Illus 8.1). The new development had a revolutionary character from its inception. An infrastructure was created, involving major earthworks: the stream in the valley was dammed, creating a pond; a paved road led down the hill from the crest and over a bridge to the previously ploughed arable land beyond. The new property was demarcated with a first, and soon afterwards a second, deeper, enclosure ditch that embraced the valley, the crest and the beach onto the Dornoch Firth. Infrastructure and buildings were contrived from local materials: stone slabs and turf. The road was paved in sandstone flags with beach cobbles forming the kerb, and V-shaped roadside ditches. The boundary walls were built with stone and turf layers and founded on bones where they crossed a wet patch. The dam was a dump of clay, branches and stones; the culvert was made of smooth stone slabs fitted like a long box with tight joints; the bridge was compounded of megalithic clapper stones over the culvert and (probably) oak beams on edge-on stones over the outwash (Chapter 5.5).

Beside the road were yards, where hides and skins were processed for the manufacture of vellum (Chapter 5.6). At the southern edge of the enclosure was an area dedicated to working glass and precious metals, destined for objects paralleled in ecclesiastical contexts, such as the chalice, paten or reliquary (Chapter 5.7). It was served by the extraordinary building S1 with its 'sporran-shaped' plan, probably roofed with timber uprights on pads and wrapped around with a turf jacket. Its complex symmetrical layout, – a semicircle joined to a trapezium – featured an intriguing metrology, but also made references to the architecture of the Iron Age roundhouse and its porch (Chapter 5.9). The references here are to the new learning and invention

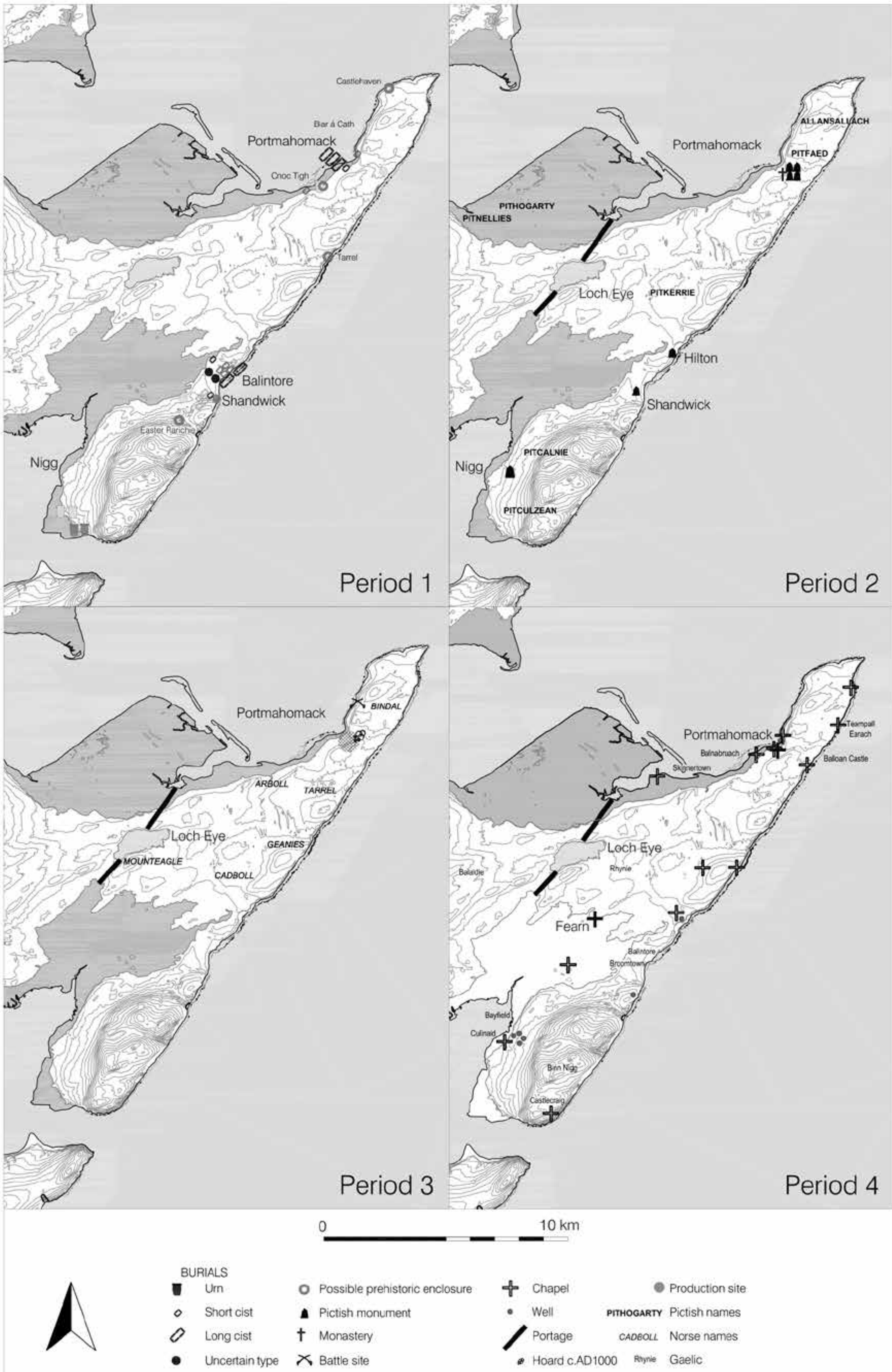


Illustration 8.2
The sequence on the Tarbat peninsula, Periods 1–4

of the insular world of Britain and Ireland, with a background counterpoint inherited from the Iron Age.

On the hill there may (or may not) have been a church (Chapter 5.4) but there was certainly a cemetery. The new burials were added to earlier cist graves in the same place, but the burial ground was now constrained in its boundaries. The characteristic new rite consisted of small stone slabs placed by the head or body or encasing the head, and the graves were oriented W–E and place side by side in N–S rows (head-box burials; Chapter 5.2). There were stone grave markers, many simple and geometrical, featuring little more than the cross. But there were more lavish memorials too. A recumbent monolith with images of a boar and lion was probably the lid of a sarcophagus. Monuments were created on an increasingly massive scale, with three great cross-slabs erected in the later eighth century and a cross-shaft at the end of the eighth or beginning of the ninth. These ceremonial crosses were placed at the edges of the inner precinct, where the existence of a church is strongly signalled by fragments of architectural sculpture (Chapters 5.3). The accomplishment and grandeur of these monuments is matched only by those erected at Hilton, Shandwick and Nigg at the same time (Illus 8.2). Together they proclaim the initiation of a major high-investment project that embraced the whole peninsula and was international in outlook (Chapter 5.10). The allegiance of the monuments was multiple: a huge cross on one side, a name writ large in Pictish symbols on the other, argued here to signify a holy person, celebrated in an anecdotal hagiographical image. The ornament refers to exemplars from Ireland, Northumbria, Mercia and also Strathclyde and Cumbria. References to Rome operated here at a more muted level, perhaps in the form of the road.

This enterprise was operated by a specialised group, if we are to assess it from those buried on the hill. With minor exceptions, they were all adult males, some elderly. Of the seven tested, three were locally born, two from elsewhere on eastern Britain and two were of Scandinavian origin, the latter not buried with head-boxes but placed together and integrated into a row. There was no one from the west in the sample. This endorses the impression of an international project, with Pictish ownership. The model of an indigenous response to an exotic initiative is also exemplified by the ingenious ways in which the occupants met the demands of new ritual. Lacking lime for preparing vellum, they synthesised it from seashells and seaweed. Lacking high-grade fuels they recycled animal bone as 'bone coal'. They probably obtained oil for lamps or chrism from seals, dolphins and whales. No amphorae reached Tarbat, so another form of container (skin?) or another form of wine (barley?) must have supplied the Eucharist.

The economy was built on cattle, with pigs and goats also providing some meat (Chapter 5.8). Barley was cultivated, but most of the expected fruits, berries, nuts and vegetables eluded detection. Some fish and shellfish were eaten, but the diet of all the tested individuals was based on terrestrial protein and with little seafood. The cattle were slaughtered late, having provided milk, butter, cheese and pulling the plough and carts. Calves were slaughtered to provide vellum. The economic assessment was that the establishment was more than self-sufficient. Spiritual benefits could be purchased by endowment, and once the community had the run of the peninsula, there was grazing and arable enough to support labourers, smiths, sculptors and artisans on a food-for-output basis. All this was done for the greater glory of God, but the institution would need to acquire resources from outside the region, principally precious metals, and assuming these were not donated, a food surplus would need to be converted into commodities to pay for them. It is argued (Chapter 5.8) that the most likely form of currency was the tanned cattle hide, a form of wealth that could be created locally, stored and transported, and provided an essential material for dressing, fighting, riding, sailing and drinking.

The interpretation of eighth-century Portmahomack as a monastery, and of Tarbat as its territory, is based on its single-sex cemetery, the output of its workshops, its economy, and its huge collection of carved stone monuments with Christian and in one case (Nigg) specifically monastic references to St Paul and St Anthony. The emphasis on ritual in burial, stone carving, architecture, and the manufacture of books and ecclesiastical vessels suggests this was a monastery which in its heyday formed part of the wider insular network and shared its values and promoted its agenda. How did these ideas get to Easter Ross?

Monastic origins

The rationale of founding a monastery at that particular time and place can be sought in the activities of missionaries, or in terms of previous ritual practice, or as part of a wider trajectory, which (it will be argued) is not only ideological but political and economic. Portmahomack is not mentioned in any early record and its founders are unknown. Its church was medieval and is dedicated to St Colman. Among the numerous bearers of this name was the Bishop of Lindisfarne who was on the losing side at the Synod of Whitby in 664, and thereafter travelled with his companions via Iona to set up monasteries in his native Ireland (HE IV.4). He is not known to have been active in Pictland, but may have been celebrated there at the turn of the century; or his dedication at Portmahomack may have been retrospective. Many named champions of monastic and 'apostolicist' (pro-Roman) Christianity were active about the time that the Tarbat monastery was founded, including Adomnán at Iona (Fraser 2009, 220). Some Irish intervention in Easter Ross is still probable; but given the later date (more than a century after Columba) for the material beginning of the monastery, the lack of imported pottery, and the presence of an eighth-century sceat, the odds have shortened on a Northumbrian initiative. Nechtan's embassy of 710 to Ceolfrid (HE V.21) will have opened or enlarged the dialogue with Northumbria. Perhaps an agent was the shadowy Curadán-Boniface (Macdonald A 1992); but a more attractive candidate for the local mover and shaker is the Hendersons' suggestion of the energetic Egbert. An Englishman sworn to permanent exile, he was a tireless advocate of unified monastic practice and a transporter of books and relics, on both sides of the Channel and the Irish Sea (Henderson & Henderson 2004, 216, 223). Egbert was a bridge builder, champion of *peregrinatio* and sponsor of continental missions (by Wictbert and Willibrord) (Levison 1946, 44, 53). In AD 714 he was inspired to abandon a trip to Germany and go instead to Iona where he was instrumental in uniting the community with the Roman project in AD 716. Here he died thirteen years later aged ninety (HE V.22). Bede notes that this inspiring teacher and diplomat at the hub of an international intellectual network also lived some of his voluntary exile among the Picts (HE III.27).

Not knowing who built or led the monastery at Portmahomack urges us to look for other clues. The basic necessities required from a donor are a parcel of land and a herd of cattle; this would keep the community alive, and from this a surplus could eventually be generated. Subsequent hints as to where the monastic inspiration is coming from should lie in the layout, the art and the nature of the people in the cemetery. Nearly all the indications are equivocal.

Layout

The choice of site and the settlement morphology could provide pointers on whether local roots and old loyalties are being reconciled. Wearmouth and Jarrow seemed to have been founded on unexploited land (Cramp 2005, 23), but in the more northern and western areas there is more of an expectation that monasteries will refer in some way to what had gone before (Edwards & Lane 1992, 10). At its most basic, Celtic monastic sites follow prehistoric exemplars, while Anglo-Saxon monasteries follow Roman ones (Loveluck 2007, 201; Carver 2008c, 20–2). The exemplars in Scotland are not easy to pin down, but there are numerous examples in Ireland of the 'religious re-education' of prehistoric monuments (Swift 2000, 17–20; 29–31) and a case has been occasionally advanced for a spiritual alignment between monasteries and their Iron Age collegiate predecessors in Scotland too (Burn 1969; Carver 2009a).

Another way of defining the roots of monastic layout is to draw them not from earlier religious sites or contemporary cosmology, but from contemporary princely settlement. This is not easy as there are so few to cite, and in Scotland it seems likely that many will be constrained by fortification as at Dunadd (Lane & Campbell 2000) or the upland sites defined in Aberdeenshire (above; Cook 2011). In England the problem lies in distinguishing between aristocratic and monastic settlement; seemingly all are essentially 'minsters' (Blair 1996; Blair 2005, 266 et seq). In this light Tim Pestell has warned that with an excess of minsters 'we face the dangerous possibility of seeing an emerging Anglo-Saxon landscape governed at all its key, nodal, points by the Church, rather than the aristocracy and secular rulers who lived and died in the pursuit of power, and who were the church's sponsors' (Pestell 2004, 59). Alternatively, as more monastic correlates are claimed by princely sites (like styli) we can start to believe that there is no distinction between them (Carr et al 1988). This may be a product of difficult archaeology, as suggested by those sites where the two modes have been defined in different stratigraphic phases as at Flixborough (Loveluck 2001, 2007). That is not to say that one phase should always feed directly from the other. The monastic layout may emulate an axial princely layout, as at Yeavering (Blair 2005, 199–200), which may be owed in turn to a prehistoric exemplar (Hamerow 2012, 106). But neither need wholly wrest the primacy from more intellectual imperatives, such as the emulation of a quadrilateral Roman 'villa' at Jarrow (Cramp 2005, Fig 24.3) or the prehistoric symbolism of the triple oval enclosure at Nendrum (McErlearn & Crothers 2007, 393). The 'archaeology of difference' allows for many ideas to compete, but often one idea will be seen, from the material emphasis, to emerge and dominate, if only briefly.

If there can said to be a Scottish model, it is neither oval nor quadrilateral, but the shape of a flattened C, with its terminals in water, either of the sea (Iona), a river (Hoddom) or a firth (Portmahomack). At Portmahomack the church on the hill had an early (if undated) oval churchyard, and the proposed siting of the crosses mark it out (Chapter 5.3). Those approaching from the valley and the metal workshop entered a craft area dedicated to hides and vellum, via a bridge and passing through boundary walls. The road continued upwards towards the site of church and cemetery. These are hints that the interior was partitioned with the kind of concentric arrangement seen at Clonmacnoise. But at present it has to be said that we have very few monastic layouts, and remarkably few convincing enclosures. More grievous still we have very few princely settlements to compare them with. In this state of knowledge it would be incautious to generalise, other than noting that permanent settlements require water, drainage, good soil and a landing place. Perhaps monastic communities shared a talent for discovering and adapting suitable sites, each in its own way.

In the heyday of the monastic achievement, the peninsula itself can be said to have adopted a layout, its territory marked by grand cross-slabs at the landing places (see above). Each of these have, or once had, a view over a different piece of sea, and conversely would have acted as a seamark for travellers coming from the Cromarty Firth (Nigg), from Moray (Shandwick), from the northern Moray Firth (Hilton) and from the Dornoch Firth (Portmahomack). Since each of these was sited at an ancestral burial ground and since each is argued to represent a particular saintly dedication, it can be surmised that they acted as devotional stations around which the community and its visitors may process. In this they have drawn inspiration from the kind of sacred landscape mapped at Inishmurray (O'Sullivan & Ó Carragáin 2008).

Attributes

Assembling the elements of the monastic package in new territory will have presented more challenges than merely creating a working farm. In our case, there are ritual necessities that are novel, and would have to be imported, like writing and Christian iconography, while others rely on imported material, like precious metals; others must be imported as a concept, but can be built according to local preference, like watermills and churches, others can be learnt but resourced and executed locally, like vellum-making. Other ritual investments are rooted in the local past, but adapted to the needs of Christianity, like the standing stones, a feature of the landscape since the Bronze Age. Sculptural experts could be recruited from their previous profession making Class I stones and rapidly trained (no doubt with imported masters as well as imported motifs). They emerged within a century as top-of-the-range artists with an innovative repertoire. This second phase of Pictish carving, with cross-slabs squared and carved in relief (Class II), gathered the spiritual power that formerly ornamented the landscape and nucleated it at one special place in the region (Gondek 2006). Cist graves are Iron Age in origin, but it would appear that head-box graves are imported or evolved locally. Numerology is arguably rooted in local wisdom, as are the itineraries of pilgrims (Ó Carragáin, T 2003a). The cult of relics, the form of the tonsure and the calculation of the date of Easter have all been suggested as having their fiercely defended particularities in the previous Iron Age (Venclova 2002; Carver 2009a) (Illus 8.3).

There are some indications that the new skills did not endure, at least not here. If books were made in the eighth century, there is a lack of literacy by the ninth, such that it is difficult to point to a manuscript of Scottish provenance before the tenth century *Book of Deer* (Gameson 2011a, 5–6). On the other hand, so much has been lost (Henderson & Henderson 2004, 215 et seq).

Contacts

The isotope measurements made on the remains of those buried in the cemetery suggest a mobile population before, during and following the monastic experiment. Pictish and other Britons, and even two persons of Scandinavian extraction were members of the community, but, read from our samples, the monastery is actually the one period in the whole of our story in which locals dominate. For a member of an international movement, Portmahomack is also an importer of very little. In half a hectare of sieved excavation there were no sherds of Mediterranean, North African and Aquitainian pottery such as was reaching Wales, Ireland, Dunadd and even Inverness (Campbell 2007; Doyle 2009; Kelly, A 2010). However, the artists and artisans of Period 2 at Portmahomack are full participants in the northern sacred insular output. Only one grave marker (TR22) is considered as an actual import (although its provenance is untraced). All the plainer grave markers are well paralleled at Iona and other sites on the west coast. Some of grander cross-slabs, such as Hilton and TR1 seem to make close references to forms that occur in Northumbria and Mercia as well as south-east Pictland. In the later part of the eighth century and into the ninth, close affiliation with the south-west, as in Strathclyde and Galloway, is suggested by the elements of the later Cross D (Chapter 5.3, p 168). It is hard to pinpoint an origin here, such as might be associated with a particular missionary or kingdom. It seems rather that Portmahomack had its own researcher, its own Benedict Biscop, scouring Britain and Ireland for ideas, but putting a local stamp on the home institution, exemplified by the carved Pictish symbols. A longer journey, over the Alps, to Rome or Bobbio, might have inspired that unique human corbel, currently the best evidence that Pictish Portmahomack had a church (p 150).

A single tiny silver 'porcupine' sceat represents an import issued around AD 715–35 and likely to have originated in the Rhine delta. Together with the 'Woden/Monster' from Dunbar it provides 'important evidence for contact between eastern Scotland and the Continent fifty years or more before the traditional date for the beginning of the Viking Age' (Blackburn in Digest 6.2). The monastery at Portmahomack is essentially a phenomenon of the 'long eighth century', ranging from about 680 to 810 and noted over much of Europe as an era of increasing affluence and interaction (Hansen & Wickham 2000). But more than a tiny coin connects the rise of Tarbat with contemporary movements on the continent.

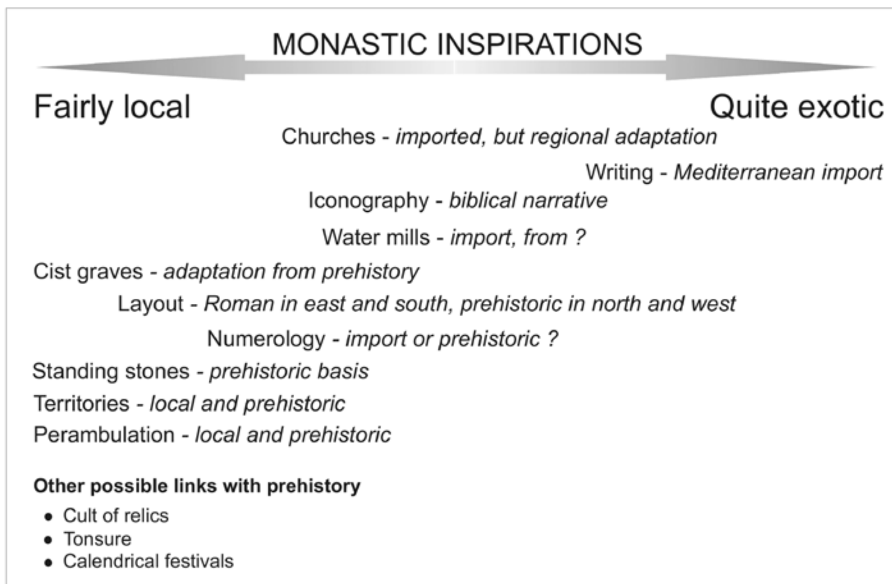


Illustration 8.3
Monastic inspiration: local and exotic

The politics of monasticism in Europe

The monastic idea grew as an integral option within Christianity in the fourth to sixth century, flourishing on the continent of Europe by the sixth to eighth. However it was not the only spiritually driven enterprise at that time. In Scandinavia, cult sites contemporary and analogous with monasteries have been revealed in recent years in increasing numbers and complexity. These relatively well-studied places are of particular interest in that they show not only the lure of such specialist intellectual centres but also their economic contribution and how it changed. Dagfinn Skre defines a first group of local centres – all cult sites (comprising Gudme, Sorte Muld, Tissø, Uppåkra and Helgö) operating before 700, where those seeking spiritual benefits also facilitated the transfer of goods through votive offerings or endowment leading to the generation of capital and the promotion of seasonal markets (Skre 2012, 52–3; Jørgensen 2003; Arrhenius & O'Meadhra 2011). In a second, eighth-century stage, 'nodal centres' arise in liminal locations, examples being Aarhus and Ribe 1. Here raw materials are brought in from abroad, for example glass, and the products, for example beads, are traded over long distance. These sites are no longer constrained by their spirituality, but embrace a new commercial 'mentality' (Skre 2012, 55). Their analogues in south England are *wics* or emporia (Pestell & Ulmschneider 2003; Jørgensen 2003; Skre 2008; 2012). After 800, in a third phase, there emerge real towns, the four permanent producer and trader sites of Hedeby, Birka, Ribe and Kaupang (Skre 2012, 57).

In an earlier model, Doherty (1985) cited the monastery as a prime mover in urban development, a good idea that became rather entangled in the debate over the sense in which the early Irish monastery actually was 'a town' (Clarke & Simms 1985), as opposed to the phases in which it manifested urban trends. Doherty himself emphasised that the process was evolutionary, citing the pull of prehistoric cult centres and the demonstration owed to Paul Wheatley that the origins of cities in *all* the regions of primary urban generation could be traced back to a ceremonial complex as opposed to a citadel or market place (Doherty 1985, 46). By the seventh/eighth century, the monastery had achieved a monopoly of endowments and donations, and by 800 its centrality is well established (ibid, 54). By 900 public buildings and open spaces had been added around the sacred precinct, and 'the cult centre itself was at the centre of a complex redistributive system' (ibid, 60, 66).

Recent studies of the monastic outcome in France offer a different trajectory although still related in that it involves monasteries acting as creators of wealth and agents of political change. Stéphane Lebecq shows that, from their foundation in the fifth/sixth century, the monasteries of central and southern Europe were located on the busy routes, in the shadow of the city walls. Even Fulda, said to have been founded in a *horrendum desertum,* was actually placed in a fiscal estate with a monumental Merovingian villa at its centre. By the seventh century, aristocrats were endowing monasteries with vast estates together with the men who worked them (2000, 127–30; see also Dell'Acqua 2001). The monasteries felt the need to acquire additional property by the sea, including salt flats for grazing and making salt, and coasts for fishing and hunting marine mammals 'much sought after for their meat, for their bones and especially for their blubber' (Lebecq 2000, 131). Monasteries could easily become economic centres and after they became beneficiaries of tolls and tithes in the eighth century, they also became centres for redistribution and the resale of surplus (ibid, 138). Monasteries are recorded as having their own merchants who plied the routes with their pack animals, carts and boats, bringing back furs, fabrics, ambers and illuminated gospel books (ibid, 146–8).

Joachim Henning's archaeological inquiry asked when and how far monasteries were actually engaged in manufacture, as opposed to attracting gifts and exchanging benefits. He catalogued every example of craft in central Europe and found that while there was only one example of a monastic production site in the seventh century (at St Denis), this shot up to eighteen in the eighth and declined again to six in the ninth. Examples of eighth-century production sites included Fulda (glass-working, bronze casting, combs), Corvey (glass, bronze) and Lorsch (glass, combs). He concluded that during the eighth century, monasteries were on a par with the wics/emporia to the north and did the same kind of things, under a different ideological governance (Henning 2007, 18).

This is not to deny initiatives to the aristocrat (Wickham 2005, 760–7, 818; Hodges 2012) or the enterprising merchant (Theuws 2012, 34; McCormick, M 2001; 2007, 44; 2012), who surely had a finger in every promising pie. It is only to say that monasteries were players in the economy and politics of eighth-century Europe; and in some places, particularly the Gallic and Celtic west, were the dominant economic force. Even in our age it would not be inconceivable to have the political agenda set by religious conviction rather than by wealth creation or a king. As argued above, the cult sites of the north and east seem to morph readily into trader-led establishments, manifestations of an ideological revolution that helps to give the early Viking wars an economic context (Carver 2016).

The return of commercial imperatives

The European turn towards commerce, even within monasteries, provides a context for our site in Period 3. Admittedly the 'turn' was here somewhat enforced, since the Portmahomack monastery offers convincing evidence for destruction by Vikings in the late eighth/early ninth century. A major fire consumed the northern workshops and carved stone monuments were broken up and tipped onto the smouldering ruins (Chapter 5.11). One or two of the inmates died of sword wounds. After only a short interval, the settlement revived, with some continuity but also with a change of character (Period 3; Illus 8.1). Burial, including head-box burial, continued on the hill and made use of existing grave-rows for another century; and those buried are still only men. A new workshop of metal-smiths sprang up over the ruins of the vellum workers. They used the same technology as their predecessors had in the southern workshops (moulds, crucibles and bone coal). The metal workers chucked their debris into the pool, which still held water. They repaired the road, presumably to maintain access to the southern fields, where the conversion of the former metalworkers' hall to a kiln barn showed the new priorities in Sector 1. Another heated building associated with grain was constructed further east. These farmers were now less concerned with cattle, and were growing grain. The change from pasture to arable, from cattle to grain, from the manufacture of symbolic to consumable goods and from spiritual benefits to commerce seems to epitomise the transition from Period 2 to Period 3.

The transformation of the vellum workshops into a manufactory included the production of weights, two of which are related to the Scandinavian network. It may have been the virtual absence of coins that urged the adoption of weighed bullion (Wastling in Evans & Loveluck 2009, 422) or the rationale of exchange itself might have changed to one more suited to constant bargaining (Hinton 1996, 60, 100). The change from cattle to arable farming suggests the commoditisation and distribution or sale of a grain surplus to support dependencies or allies (McCormick F 2008). Similar transitions would appear to have taken place at Wearmouth/Jarrow. The workshops of Building D at Jarrow remained in use and their occupants continued to handle coins there into the ninth century (Cramp 2005, 219–29). They were now making or using strap ends (CA35) and hooked tags (AG1-2; CA36) (Cramp 2006, 230, 234). Professor Cramp comments; 'the latest phases of the workshops alongside the river confirmed that the functions of these areas changed through time and that monasteries were not static entities, but reflected changing economic strategies' (2005, 360). She sees a lower level of commitment to the monastic project after 800, symptom of a society destabilised by the Viking raids.

Perhaps the Period 3 establishment at Tarbat could also be seen as the continued existence of the monastery in another guise. Could its occupants have been the same people in new robes, a genus of 'adaptable monks' who, like the Vicar of Bray, recognised what was necessary for survival, and signed up to it? At Clonmacnoise, the early settlement of the seventh to eighth century was reorganised and expanded between the ninth and eleventh century, with the industrial working of antler, bone stone, lignite, bronze, glass, silver and possibly gold (King 2009, 333). While the seventh/eighth-century phase had an emphasis on mature cattle (McCormick & Murray 2007, 213), the ninth-century expansion was reflected in an increased exploitation of red deer. The exploitation of antler and output of metal products resembles that of Dublin and has accordingly been declared 'urban' (King 2009, 338; Soderberg 2004a; 2004b). The examples from Ireland and Northumbria support the idea that monasteries such as Iona, Clonmacnoise and Jarrow, while not 'urban' in any useful sense, were engaged in the generation of surplus through the management of cattle and later with some symbolic dividend – red deer, the 'wild cattle' (Soderberg 2004a).

But this is not quite what happened at Portmahomack. Numbers of red deer decreased. The smiths made themselves at home, but their order book was meeting different demands – pins, belt plates and weights. The scale is not urban and only just industrial. Unlike at Clonmacnoise no more sculpture was made. The smiths worked on a carpet of smashed-up sculpture laid as hard-core, adapting some of the carved fragments to line a drain. This does not seem consistent with a devotional community of the kind that contained staunch believers, prepared to die to protect a reliquary. If local people turned to manufacture and commerce this was a survival strategy made necessary by the age.

The adaptability of some members of the community and the dispersal of others is consistent with a period of war. The

Illustration 8.4
Insular places mentioned in the text

background, obscure as it is, suggests that Scots and Norse fought for the control of the Firthlands through the ninth to eleventh century, and the Picts lost to both. We can guess that lands formerly within the monastic estate were redistributed to new owners, ostensibly given Norse names (Arboll, Bindall, Cadboll, Geanies, Shandwick; Illus 8.2). However the main post-Pictish legacy in this part of the east coast was not Norse but Gaelic. The Moray Firth as a whole became a Scottish province, repelling the Earls of Orkney and extinguishing Pictish culture. Tarbat itself is among the places named in Gaelic, one of the few indications that the portage remained, or became, of importance in the ninth century.

The reborn settlement at Portmahomack occupied a strategic location in the long struggle for mastery of north-east Scotland, but it was not itself active for long. Metalworking beside the pool is unlikely to have endured beyond the ninth century, and the same is argued for most of the burials (not many now) that were interred in the church. In *c* AD 1000, a hoard of silver buried on the hill contained English and Frankish coins and Scandinavian ring money. This speaks of the new opportunities offered by a North Sea maritime market place, or perhaps of the end of them. In 1035 a sea battle was fought at Torfness showing that, as in contemporary England, the competition to control Britain and decide its political direction was far from over.

In the absence of a documentary notice, whether the monastery at Portmahomack was actually destroyed by Vikings is likely to remain beyond proof. Ó Floinn (1998, 98) warns, 'the evidence from Clonmacnoise and elsewhere cautions against generalising about the effects of, say, Viking raids on artistic activity at monastic sites. Each must be examined separately to establish the local conditions within its region at a given time.' This sensible advice actually catches the mood of current archaeological research, which is essentially to let every site tell its own story rather than search for ways to conform to a generalised picture. Nevertheless it can be accepted for north-east Britain that Viking raids on monasteries were a feature of the late eighth and early ninth century, after which much ecclesiastical land appears to have passed into the hands of the laity (Pestell 2004, 74). That is not to say that the laity were necessarily different people. A natural survivor will throw off one robe and put on another, driven by the ideas of the day.

Some modern readers will find it possible to see the Viking raids as liberating, a prelude to a new commercial principle that released energy and opportunity from the lower levels of society, and not necessarily only in those of the Viking persuasion. Had Easter Ross become fully Norse, like Orkney and Shetland, these opportunities might have broadened. The trajectories described above suggest that even in the most rigid and ascetic institutions there were trends towards intercepting the stream of wealth. The transition from a monastic to a commercial centre was not therefore only a matter of external force. Monasteries and wics differ most in whom they primarily serve: God, the market or the king. Taking sides is therefore about which ideology is espoused, and the alliances are more political than ethnic. For some, the new dispensation is resisted unto death. For others one kind of service supplants another.

It is not straightforward to assign an ideological stance to the incoming Scots. Some no doubt signed up to the enterprise culture and became merchant adventurers, while others transferred with their monastic treasures to Ireland. In the Moray Firth we hear only of kings and battles, on which there is a persuasive opinion that the Pictish powers were eliminated through violent Scottish conquest (Wormald 1996; Chapter 1, p 11). To date, archaeology has succeeded in contributing little to this question, which consequently remains an attractive research objective. As sketched in Chapter 6, the Moray Firth in the ninth to eleventh century was a theatre of war, as hard fought and as consequential as its contemporary battleground in Wessex. The forts, ships and weapons, industries and artistry of

Illustration 8.5
Europe with locations of selected places mentioned in this book. For citations in text please see index. 1. Portmahomack; 2. St Ninian's Isle, Shetland; 3. Birsay, Orkney; 4. Clonmacnoise, Ireland; 5. Sutton Hoo; 6. Helgö; 7. Birka; 8. Tissø; 9. Kaupang; 10. Hedeby; 11. Domburg (Rhine estuary); 12. Ribe; 13. Fulda; 14. St Denis; 15. Castelseprio; 16. Bobbio; 17. Malles; 18. Rome; 19. Ravenna; 20. Byzantium

the battle-scarred leaders created Scotland in the Moray Firth, no less than Alfred created England in Wessex. They await and deserve discovery.

Medieval prescriptions: sanctity and iron

A century or more elapsed after the fever of the Scots/Norse wars and before detectable investment returned to Tarbat. According to the narrative constructed here, there were at least three Middle Ages (Chapter 7). The twelfth century (our Period 4A) saw a first change in political, economic and ideological direction (Illus 8.1). The monastery was now a 300-year-old memory, marked by a filled-in ditch on the arable south field, an unrepaired road, a dysfunctional dam and a dried-up pond. Up on the hill was a run-down cemetery and chunks of carved masonry which were to be recycled in the foundations of the first medieval church (Church 2). These ruins, plus the Portmahomack place-name, with perhaps a record in some lost monastic archive, were probably sufficient to lead to the selection of the old monastic site as a place to build a new church. It seems unlikely that such a usable beach and harbour would be neglected by fishers and farmers, but we had no sighting of any other twelfth-century activity. The chapel was no doubt intended to serve a parish of Tarbat, established in keeping with the mission of David I and his mother to bring Scotland under the mantle of European orthodox Catholic Christianity.

The thirteenth century, however, saw a boom (Period 4B). Villagers arrived on the crest, with dwelling, oven and well, who were fishing on a large scale: taking deep-sea fish, inshore fish and shellfish, their remains stacked in large middens. Cultivation with broad ridge and furrow began in the south field, finally infilling the monastery ditch. The church itself was rebuilt to make the larger Church 4, with a belfry at the west end and a crypt at the east. As its east wall, the crypt may have reused the west wall of a hypothetical Pictish ruin. Inside the crypt was an aumbry, perhaps the keep-safe of church plate or those relics of St Colman of Lindisfarne later claimed to have found their home there (p 321).

Another palpable change of direction was observed in the fifteenth century (4C). The area to the west of the church (and all around it) was given over to large-scale ironworking. The church itself was renovated after a fire and a barrel vault now roofed the crypt. The nave became crowded with burials. Among these were a mighty group of coffined males, one coffin famously filled with two bodies and six heads. This population was predominately from the west coast of Scotland (eight out of eleven), a stable isotope result thought to reflect the new interests held in that region by the Earls of Ross. The buried population was a 'normal' one, consisting of men, women and children and a large contingent of infants who continued to find a resting place near the crypt entrance up to the Reformation and beyond. The later Middle Ages seem to have rung with the bells of the priests as well as the hammers of armourers. The new sanctity is evident on the peninsula dominated from the thirteenth century by the Abbey of Fearn and the very large number of chapels built at every point, including at the old Pictish ritual centres of Cadboll (St Mary's), Nigg and perhaps Shandwick (Illus 8.2). This is thought to have reflected a defiant piety in the face of the advancing Reformation (p 288).

Reformation and after

After the Reformation, our field of view narrows to the church, but this is an evolving artefact of considerable fascination, a changing installation showing how the people of Portmahomack saw themselves on earth and in the afterlife. Judging by the reworking of space and its embellishment, this was no static vision and was directly influenced by the degree of social control imposed on the congregation by minister and laird. The care and expense taken to celebrate every twist and turn of the current ideology, from the twelfth century to the nineteenth, is impressive (Chapter 7, p 289). Perhaps reflecting the ideology of our own day, the church has now become a visitor centre and a museum, a monument to the people who had lived beside the firth for fifteen centuries.

Envoi

The Portmahomack experience was one of remarkable variety, and while we cannot simply extrapolate it to all of the north-east, let alone all of north Britain, it offers an indicative biography. Like other great lives, it excels both in its individual character, its connections and what it made of them. The major peaks of what was achieved at Portmahomack, the sixth-century 'cemetery-settlement', the eighth-century monastery, the ninth-century trading farm, the twelfth-century parish church, the thirteenth-century fishing village and the fifteenth-century township, represent changes in direction at unequal intervals. While some of these developments may be due to climatic lows or some other natural *force majeure,* switches in farming strategy between grain and cattle, in social relations between family and single-sex communities, in industry between the making of giant stone monuments and the making of belts and weapons, in motivation between faith in prayer and reliance on profit, all seem to spring from ideological conviction. By and large, the resources were stable. It is new ideas, especially those relating to the theoretical benefits of religion, that apparently drive our community one way and then another over the thousand years experienced here. This is the rationale behind the 'changing ideologies' of our title. In the process, this now remote and beautiful place on the north-eastern edge of the British island has shown itself to have been perennially inventive, adaptive, multicultural and ingenious, a touchstone of European thinking.

References

Note: This is the bibliography for the eight chapters of the text. The references for the specialist reports will be found with the reports in the Digest or the OLA.

Abbreviations

Bulletin: Bulletin of the Tarbat Discovery Programme 1–7 (1995–2002); see http://york.ac.uk/dept/arch/staff/sites/Tarbat

Canmore: Royal Commission on the Ancient and Historical Monuments of Scotland on line archive; see canmoremapping.rcahms.gov.uk/index and http://canmore.rcahms.gov.uk (accessed 2014).

DES: Discovery & Excavation in Scotland; see http://archaeologydataservice.ac.uk/archives/view/des/

ECMS: Allen, J & Anderson, J 1903 *The Early Christian Monuments of Scotland*, three parts (Edinburgh), reprinted two volumes 1993. Balgavies: Pinkfoot Press.

HE: *A History of the English Church and People* by the Venerable Bede. Translated and Introduced by Leo Sherley-Price (Penguin 1968).

LC: *Life of St Columba* by Adomnán of Iona. Translated and introduced by Richard Sharpe (Penguin 1995).

OLA: Online archive.

ONB: Ordnance Survey *Object Name Books* 1872, 1907.

OPS: *Origines Parochiales Scotiae* 1850–55 (Edinburgh) by Innes, C, Anderson, W, Robertson, J, Brichan, J & McNab, J *Origines Parochiales Scotiae: the Antiquities Ecclesiastical and Territorial of the Parishes of Scotland* (two volumes) v. 2:2 (Edinburgh, 1851–5), see 434 for Tarbat.

Orkneyinga Saga: Taylor, Alexander Burt & Sigurður Nordal (trans) 1938, *The Orkneyinga Saga*. Edinburgh and London: Oliver & Boyd.

FSA: Sinclair, J 1791–9 *First Statistical Account*, 13, see 19–20 for Tarbat.

NSA and SSA: *New [Second] Statistical Account (Edinburgh)* 1845, 14, 28–30 for Tarbat.

TSA: *Third Statistical Account* 1957; unnumbered pages.

PSAS: *Proceedings of the Society of Antiquaries of Scotland.*

NGR: National Grid reference.

NMR: National Monuments Record.

Maps

Gerhard Mercator 1595 Scotiae Regnum N Sheet.

Gerhard Mercator 1595 Scotiae Regnum S Sheet.

Timothy Pont 1560?–1614? Tarbet Ness, Easter Ross *c* 1583–96 Adv.MS 70.2.10 (Gordon 20).

W. Hole 1607 Scotiae Regnum. Marischal 8.

John Speed 1610.

John Adair 1650–1722 Bart 26; MS 1651Z 69/01.

Greenville Collins 1693.

Clément Lempriere 1731 *A Description of the Highlands of Scotland.*

Andrew Rutherford 1745 [EMS 5.90b] An exact plan of His Majesty's great roads through the Highlands of Scotland.

OS/Ordnance Survey 1880.

OS/Ordnance Survey 1907.

A

Adam, R J (ed) 1991 *The Calendar of Fearn: Text and Additions 1471–1667*. Edinburgh: Scottish Historical Society.

Adomnán of Iona *Life of St Columba,* ed and trans and with an introduction by R Sharpe. London.

Aitchison, N 1999 *Macbeth. Man and Myth*. Thrupp: Sutton Publishing.

Akerström-Hougen, G 1981 'Falconry as a motif in early Swedish art. Its historical and art historical significance', *in* Rudolf Zeitler (ed) *Les Pays du Nord et Byzance*, 263–93. Uppsala: Almqvist & Wiksell.

Alcock, L, 1993 'Image and icon in Pictish sculpture', *in* R M Spearman & J Higgitt (eds) *The Age of Migrating Ideas. Early Medieval Art in Northern Britain and Ireland*, 230–6. Sutton: Stroud.

Alcock, L & Alcock, E A 1987 'Reconnaissance excavations on the Early Historic fortifications and other royal sites in Scotland, 1974–84, Excavations at Dunollie Castle, Oban, Argyll, 1978', PSAS 117: 119–47.

Alcock, L 2003 *Kings and Warriors, Craftsmen and Priests in Northern Britain AD 550–850.* Edinburgh: Society of Antiquaries of Scotland.

Alexander, D 2005 'Redcastle, Lunan Bay, Angus: the excavation of an Iron Age timber-lined souterrain and a Pictish barrow cemetery', PSAS 135, 41–118.

Alexander, J J G 1978 *Insular Manuscripts 6th to the 11th Century*. London: Harvey Millar.

Allen, J R & Anderson, J 1903 *The Early Christian Monuments of Scotland* (three volumes). Edinburgh. (Reprinted 1993, two volumes). Balgavies: Pinkfoot Press.

Anderson, A O 1922 *Early Sources of Scottish History AD 500–1286* (Republished 1990. Stanford University Press).

Armbruster, B 2006 'Technological aspects of the Viking age gold treasure from Hiddensee, Germany', *Historical Metallurgy* Vol 40 Part 1, 27–41.

Armit, I, Campbell, E & Dunwell, A 2008 'Excavation of an Iron Age, Early Historic and medieval settlement and metalworking site at Eilean Olabhat, North Uist', PSAS 138, 27–104.

Armitage, P 1989 'The use of animal bones as building material in Post-Medieval Britain', *in* Serjeanston, D & Waldren, T (eds) *Diet and Crafts in Towns*, BAR Series 199, 147–60. Oxford: British Archaeological Reports.

Arrhenius, B & O'Meadhra, U (eds) 2011 *Excavations at Helgö XVIII Conclusions and New Aspects*. Stockholm: Kungl. Vitterhets Historie och Antikvitets Akademien.

Arthur, R & Murray, J 2014 'Painting the stones black: solving the mystery of painted quartz pebbles' (with a catalogue by Anna Ritchie), *Archaeology Reports Online* 12. Guard Archaeology Ltd, www.archaeologyreportsonline.com.

Arwidsson, G & Berg, G G 1983 *The Mastermyr Find: a Viking Age Toolchest from Gotland*. Stockholm.

Ashmore, P 1980 'Low cairns, Long Cists and Symbol stones', PSAS 110, 346–55.

Ashmore, P J 2003 'Orkney burials in the first millennium AD', *in* Downes & Ritchie (eds), 35–50.

Atkinson, J 2003 'Late Medieval Bloomery Sites: Settlement and Industry in the Scottish Highlands', *in* Govan (ed), 35–44. Edinburgh: Historic Scotland.

B

Backhouse, Janet 1981 *The Lindisfarne Gospels*. Oxford: Phaidon.

Bagshaw, S, Bryant, R, & Hare, M 2006 'The discovery of an Anglo-Saxon painted figure at St Mary's church, Deerhurst, Gloucestershire' *Antiq. J*, 86, 66–109.

Bailey, R 1996 *England's Earliest Sculptors*, 5. Toronto: Publications of the Dictionary of Old English.

Bailey, R 2005 *Anglo-Saxon Sculptures at Deerhurst*. Deerhurst Lecture 2002: Deerhurst.

Bailey, R 2010 *Cheshire and Lancashire*. British Academy: Corpus of Anglo-Saxon Stone Sculpture Volume IX.

Bailey, J 2000 'Saxon glass-working at Glastonbury Abbey', *in* Price (ed), 2000b, 161–88.

Baldwin, J R (ed) 1986 *Firthlands of Ross and Sutherland*. Edinburgh: Scottish Society for Northern Studies.

Barber, J W 1981 'Excavations on Iona 1979', PSAS 111, 282–380.

Barrett, J, Nicholson, R & Ceron-Carrasco, R 1999 'Archaeo-ichthyological evidence for longterm socioeconomic trends in northern Scotland: 3500 BC to AD 1500', *Journal of Archaeological Science* 26, 353–88.

Barrett, J, Beukens, R & Nicholson, R 2000 'Diet and ethnicity during the Viking colonization of northern Scotland: evidence from fish bones and stable carbon isotopes', *Antiquity* 75, 145–54.

Barrett, J, Locker, A & Roberts, C 2004 'Dark Age Economics revisited: the English fish bone evidence AD 600–1600', *Antiquity* 78, 618–36.

Barrett, J, Johnstone, C, Harland, J, Van Neer, W, Ervynck, A, Makowiecki, D, Heinrich, D, Hufthammer, A, Enghoff, I, Amundson, C, Christiansen, J, Jones, A, Locker, A, Hamilton-Dyer, S, Jonsson, L, Lougas, L, Roberts, C & Richards, M 2008 'Detecting the medieval cod trade: a new method and first results', *Journal of Archaeological Science* 35, 850–61.

Barrow, G W S 1981 *Kingship and Unity. Scotland 1000–1306*. Edinburgh: Edinburgh University Press.

Barrowman, R 2011 *The chapel and burial ground on St Ninian's Isle Shetland: Excavations past and present*. Society for Medieval Archaeology Monograph 32.

Batey, C E 1993 'The Viking and late Norse graves of Caithness and Sutherland', *in* Batey CE, Jesch J and Morris CD (eds) *The Viking Age in Caithness, Orkney and the North Atlantic*, 148–64. Edinburgh: Edinburgh University Press.

Batey, C, Jesch J & Morris C D (eds) 1993 *The Viking Age in Caithness, Orkney and the North Atlantic*. Edinburgh: Edinburgh University Press.

Bieler, L (ed) 1963 *The Irish Penitentials* (Vol 5). Dublin Institute for Advanced Studies.

Biggam, C 2006 'Whelks and purple dye in Anglo-Saxon England', *The Archaeomalacology Group Newsletter* 9, 1–2.

Blair, J 1996 'Palaces or minsters? Northampton and Cheddar reconsidered', *Anglo-Saxon England* 25, 97–121.

Blair, J 2005 *The Church in Anglo-Saxon Society*. Oxford: Oxford University Press.

Blair, J & Pyrah, C 1996 *Church Archaeology: Research Directions for the Future*. York: Council for British Archaeology Research Report BA RR 104.

Bourke, C (ed) 1995 *From the Isles of the North. Early medieval Art in Ireland and Britain*. Belfast: HMSO.

Bowler, D, Cox, A & Smith, C 1995 'Four excavations in Perth 1979–84', PSAS 125, 917–99.

Bradley, J 1993 'Moynagh Lough: an insular workshop of the second quarter of the 8th century', *in* Spearman & Higgitt (eds), 74–81.

Brothwell, D R 1981 *Digging up Bones*. London: British Museum (Natural History).

Broun, D & Clancy, T O (eds) 1999 *Spes Scotorum: Hope of the Scots. St Columba, Iona and Scotland*. Edinburgh: T&T Clark.

Broun, D 2005 'The Seven Kingdoms in *De Situ Albaniae*: A Record of Pictish political geography or imaginary map of ancient Alba?', *in* Cowan & McDonald (eds), 24–42.

Brown, T J 1972 'Northumbria and the Book of Kells', *Anglo-Saxon England* 1, 219–46.

Bruce-Mitford, R L S 2005 *A Corpus of Late Celtic Hanging Bowls*. Oxford: Oxford University Press.

Brunskill, R W 1982 *Traditional Farm Buildings of Britain* (Gollancz).

Bryant, R 2012 *The Western Midlands*. British Academy: Corpus of Anglo-Saxon Stone Sculpture Volume X.

Buckberry, J 2007 'On Sacred Ground: Social Identity and Churchyard Burial in Lincolnshire and Yorkshire, *c* AD 700–1100', *Anglo-Saxon Studies in Archaeology and History* 14, 117–29.

Burn, A R 1969 'Holy men on islands in pre-Christian Britain', *Glasgow Archaeological Journal* 1, 2–6.

C

Cameron, N 1994 'St Rule's Church, St Andrews, and early stone-built churches in Scotland', PSAS 124, 367–78.

Cameron, N 1996 'The church in Scotland in the later 11th and 12th centuries', *in* Blair & Pyrah (eds), 42–6.

Campbell, E 1999 *Saints and Sea-kings. The first kingdom of the Scots*. Canongate & Historic Scotland.

Campbell, E 2007 *Continental and Mediterranean Imports to Atlantic Britain and Ireland, AD 400–800*. York: CBA RR 157: Alden Press.

Campbell, E 2010 'The Archaeology of Writing in the time of Adomnán', *in* Wooding, J W (ed) *Adomnán of Iona, Theologian, Lawmaker, Peacemaker*, 139–44. Dublin: Four Courts Press.

Campbell, E & Lane, A 1993 'Celtic and Germanic Interaction in Dalriada: the 7th century Metalworking Site at Dunadd', *in* Spearman & Higgitt (eds), 52–63.

Campbell, J 2009 'Archipelagic thoughts: comparing early medieval polities in Britain and Ireland', *in* Baxter, S, Karkov, C, Nelson, J L & Pelteret, D (eds) *Early Medieval Studies in Memory of Patrick Wormald*, 47–61. Farnham: Ashgate.

Cant, R G 1986 'The Medieval church in the north: contrasting influences in the Dioceses of Ross and Caithness', *in* J R Baldwin (ed) *Firthlands of Ross and Sutherland,* 47–58. Edinburgh: Scottish Society for Northern Studies.

Carlin, N 2008 'Ironworking and production', *in* Carlin, N, Clarke, L & Walsh, F (eds) *The Archaeology of Life and Death in the Boyne Floodplain. The linear Landscape of the M4*, 87–112. Dublin: NRA.

Carr, R D, Tester, A & Murphy, P 1988 'The Middle Saxon settlement at Staunch Meadow, Brandon', *Antiquity* 62, 371–7.

Carver, M O H 1987 'S Maria foris portas at Castel Seprio: a famous church in a new context', *World Archaeology* 18.3, 312–29.

Carver, M O H, 1993 *Arguments in Stone, Archaeological Research and the European Town in the First Millennium*. Oxford: Oxbow.

Carver, M O H 1998a 'Conversion and politics on the eastern seaboard of Britain: some archaeological indicators', *in* Crawford (ed), 11–40.

Carver, M O H 1998b 'Hilton of Cadboll: an archaeological assessment and project design'. University of York.

Carver, M O H 1999a *Surviving in Symbols: A visit to the Pictish Nation*. Edinburgh: Canongate.

Carver, M O H 1999b 'Shielding identity: some comments on objects and images in Pictish carving', *in* Bennett, S (ed) *Pictish Art*, 7–9. Proceedings of a Conference held at Elgin: Elgin Museum.

Carver, M O H 2001 'Why that? Why there? Why then? The politics of early medieval monumentality', *in* Macgregor, A & Hamerow, H (eds) *Image and Power in Early Medieval British Archaeology. Essays in honour of Rosemary Cramp*, 1–22. Oxford: Oxbow.

Carver, M O H 2003a 'Northern Europeans negotiate their future', *in* M Carver (ed) *The Cross goes North. Processes of Conversion in Northern Europe AD 300–1300*, 3–14. York: York Medieval Press.

Carver, M O H 2004 'An Iona of the East: the early medieval monastery at Portmahomack, Easter Ross', *Medieval Archaeology* 48, 1–30.

Carver, M O H 2005a *Sutton Hoo. A seventh century princely burial ground and its context*. London: British Museum Press.

Carver, M O H 2005b 'Sculpture in action: contexts for stone carving on the Tarbat peninsula, Easter Ross', *in* Foster & Cross (eds), 13–36

Carver, M O H 2006 'A Columban monastery in Pictland', *Current Archaeology* 20, 20–9.

Carver, M O H 2008a *Portmahomack Monastery of the Picts*. Edinburgh: Edinburgh University Press.

Carver, M O H 2008b *Post-Pictish Problems: The Moray Firthlands in the 9th–11th centuries*. Rosemarkie: Groam House Lecture for 2007.

Carver, M O H 2008c *The Pictish Monastery at Portmahomack*. Jarrow: Jarrow Lecture for 2008.

Carver, M O H 2009a 'Early Scottish monasteries and prehistory: a preliminary dialogue', *The Scottish Historical Review* 88, 332–51.

Carver, M O H 2009b *Archaeological Investigation*. London & New York: Routledge.

Carver, M O H 2010a 'Agency, Intellect and the Archaeological Agenda', *in* Carver, M O H, Sandmark, A & Semple, S (eds) *Signals of Belief in Early England*, 1–20. Oxford: Oxbow Books.

Carver, M O H 2010b *The Birth of a Borough. An archaeological study of Anglo-Saxon Stafford*. Woodbridge: Boydell.

Carver, M O H 2011 *Making Archaeology Happen: Design versus Dogma*. Walnut Creek California: Left Coast Press.

Carver, M O H 2015 'Commerce and cult. Confronted ideologies in 6th–9th century Europe', *Medieval Archaeology* 59, 1–23.

Carver, M O H forthcoming 'Reflections on the Pictish House', *Neue Studien zur Sachsenforschung*.

Carver, M O H, Hills, C & Scheschkewitz, J 2009 *Wasperton. A Roman, British and Anglo-Saxon Community in Central England*. Woodbridge: Boydell Press.

Carver, M O H & Spall, C A 2004 'Excavating a *parchmenerie*: archaeological correlates of making parchment at the Pictish monastery at Portmahomack, Easter Ross', PSAS 134, 183–200.

Carver, M O H, Barrett, J, Downes, J & Hooper, J 2012 'Pictish-period byre-houses at Pitcarmick and their landscape: investigations 1993–5', PSAS 142, 145–200.

Challinor, C 2004 'Butter as an economic resource in the Northern Isles', *in* Housley, R A & Coles, G (eds) *Atlantic Connections and adaptations*, 163–74. Oxford: Oxbow.

Champion, T 1977 'Chalton', *Current Archaeology* 59, 364–9.

Cheape, H (ed) 1993 *Tools and Traditions. Studies in European Ethnology Presented to Alexander Fenton*. Edinburgh: National Museums of Scotland.

Chronicle 1850 *Ane brieve cronicle of the Earlis of Ross including notices of the Abbots of Fearn and of the family of Ross of Balnagown*. Edinburgh.

Clarke, D V 2007 'Reading the multiple lives of Pictish Symbol Stones', *Medieval Archaeology* 51, 19–40.

Clarke, D, Blackwell, A & Goldberg, M 2012 *Early Medieval Scotland. Individuals, communities and ideas*. Edinburgh: National Museums of Scotland.

Clarke, G 1979 *Pre-Roman and Roman Winchester. Part 2: The Roman Cemetery at Lankhills*. Winchester Studies 3.2: Oxford: Clarendon Press.

Clarke, H B & Simms, A (eds.) 1985 *The Comparative History of Urban Origins in Non-Roman Europe*, British Archaeological Reports International Series 255. Oxford: British Archaeological Reports.

Clarke, L & Carlin, N 2008 'Living with the dead at Johnstown: an enclosed burial, settlement and industrial site', *in* Carlin, N, Clarke, L & Walsh, F (eds) *The Archaeology of Life and Death in the Boyne Floodplain: The Linear Landscape of the M4*, 87–112. Dublin: NRA.

Clarke, M 2011 'Framing analytical research questions', *in* Neate, S, Howell, D, Ovenden, R & Pollard, A M (eds) *The Technological Study of Books and Manuscripts as Artefacts, Research Questions and Analytical Solutions*, 25–6. Oxford: Archaeopress.

Clements, E & Pickett, K 1952 Stature of Scotsmen aged 18–40 years in 1941, *British Journal of Social Medicine* 6, 246–52.

Close-Brooks, J 1984a 'Pictish and other burials', *in* Friell & Watson (eds), 87–114.

Close-Brooks, J 1984b ‘Some early querns’, PSAS 113, 282–9.

Close-Brooks, J 1986. ‘Excavations at Clatchard Craig, Fife’, PSAS 116, 117–84.

Colardelle, M 1996 ‘Typo-chronologie des sépultures du Bas-Empire à la fin du Moyen-Âge dans le Sud-Est de la Gaule’, *in* Galinié et Zadora-Rio (eds), 271–303.

Coleman, R & Photos-Jones, E 2008 ‘Early medieval settlement and ironworking in Dornoch, Sutherland: excavations at The Meadows Business Park’, *Scottish Archaeological Internet Report* 28.

Colgrave, B 1940 *Two Lives of Saint Cuthbert: A Life by an Anonymous Monk of Lindisfarne and Bede’s Prose Life*. Cambridge: Cambridge University Press.

Cook, M 2011 ‘New evidence for the activities of Pictish potentates: the hillforts of Strathdon’, PSAS 141, 201–29.

Cordiner, C 1780 *Antiquities and Scenery of the North of Scotland, in a series of letters to Thomas Pennant.* London and Edinburgh.

Covington, A D 2009 *Tanning Chemistry, The Science of Leather.* Cambridge: RSC Publishing.

Cowan, E J 1993 ‘The Historical Macbeth’, *in* Sellar (ed), 117–41.

Cowan, E J & McDonald, R A (eds) 2005 *Alba. Celtic Scotland in the Medieval Era*. Edinburgh: John Donald.

Cramp, R J 1977 ‘Schools of Mercian Sculpture’, *in* Dornier, A (ed) *Mercian Studies*, 191–233. Leicester: Leicester University Press.

Cramp, R J 1980 ‘The Viking Image’, *in* R Farrell (ed) *The Vikings*, 8–19. London: Phillimore.

Cramp, R J 1984a *General Introduction*. British Academy: Corpus of Anglo-Saxon Stone Sculpture in England Vol 1, ppvii–li, issued separately.

Cramp, R J 1984b *Durham and Northumberland*. British Academy: Corpus of Anglo-Saxon Stone Sculpture in England Vol 1.

Cramp, R J 2005 *Wearmouth and Jarrow Monastic Sites Vol 1.* Swindon: English Heritage.

Cramp, R J 2006a *Wearmouth and Jarrow Monastic Sites Vol 2*. Swindon: English Heritage.

Cramp, R J 2006b *South-West England*. British Academy: A Corpus of Anglo-Saxon Stone Sculpture Volume VII.

Cramp, R J 2014 *The Hirsel Excavations*. Society for Medieval Archaeology Monograph 36.

Crawford, B 1987 *Scandinavian Scotland*. Leicester: Leicester University Press.

Crawford, B (ed) 1996 *Scotland in Dark Age Britain*. St Andrews: University of St Andrews.

Crawford, B (ed) 1998 *Christianity and Conversion and Christianity in the North Sea World*. St Andrews: Committee for Dark Age Studies, University of St Andrews.

Cressey, M, Anderson, S, Clarke, A, Cowie, T, Hunter, F, Heald, A, Eremin, K et al 2011 *A Later Prehistoric Settlement and Metalworking Site at Seafield West, near Inverness, Highland*. Scottish Archaeological Internet Papers 47.

Crone, A 2000 *The History of a Scottish Lowland Crannog: Excavations at Buiston, Ayrshire 1989–90.* Edinburgh: Historic Scotland Monograph 4.

Crone, A & Campbell, E 2005 *A Crannog of the 1st Millennium AD Excavations by Jack Scott at Loch Glashan, Argyll, 1960*. Edinburgh: Society of Antiquaries Scotland Monograph Series.

Cunliffe, B W 2008 *Europe between the Oceans*. New Haven: Yale University Press.

Cunliffe, B W 2013 *Britain Begins*. Oxford: Oxford University Press.

Curle, C L 1982 *Pictish and Norse finds from the Brough of Birsay 1934–74*. Edinburgh: Society of Antiquaries Scotland Monograph 1.

Curle, J 1911 *A Roman Frontier Post and its People. The Fort of Newstead in the parish of Melrose*. Society of Antiquaries of Scotland; reproduced online The Trimontium Trust.

D

Daniels, R 2007 *Anglo-Saxon Hartlepool and the Foundations of English Christianity: An archaeology of the Anglo-Saxon Monastery.* Tees Archaeology Monograph 3.

Davidson, J M 1946 ‘A miscellany of antiquities in Easter Ross and Sutherland’, PSAS 80, 25–33.

Davies, A 2009 ‘The early medieval Church in North-west Wales’, *in* Edwards (ed), 41–60.

de Hamel, C 1992 *Scribes and Illuminators*. London: British Museum.

Dell’Acqua, F 2001 ‘Craft production in early western monasticism: rules, spaces, products’, *in* Dey, H & Fentress, E (eds) *Western Monasticism Ante Litteram: The Spaces of Monastic Observance in Late Antiquity and the Early Middle Ages*, 289–314. Turnhout: Brepols.

Dickinson, T, Fern, C & Hall, M A 2006 ‘An early Anglo-Saxon Bridle-fitting from South Leckaway, Forfar, Angus, Scotland’, *Medieval Archaeology* 50, 249–60.

Diderot, D & d’Alembert, J R 1751–77 *Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métiers*. Académie royale des Sciences de Paris, de celle de Prusse et de la Société royale de Londres.

Divers, D, Killock, D & Armitage, P 2002 ‘Post-medieval development at Tyres Gate, Bermondsey’, *London Archaeologist*, Winter 2002, 61–75.

Dobney, K, Jaques, D, Barrett, J & Johnstone, C 2007. *Farmers, Monks and Aristocrats, the Environmental Archaeology of Anglo-Saxon Flixborough*, Excavations at Flixborough Volume 3. Oxford: Oxbow.

Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E & Nicholson, R A 2010 *Excavations at Old Scatness, Shetland* Vol 1 *The Pictish Village and Viking Settlement.* Lerwick: Shetland Heritage Publications Lerwick.

Doherty, C 1985 ‘The monastic town in early medieval Ireland’, *in* Clarke, H B & Simms, A (eds) *The Comparative History of Urban Origins in Non-Roman Europe*, British Archaeological Reports International Series 255, 45–75. Oxford: British Archaeological Reports.

Downes, J & Ritchie, A (eds) 2003 *Sea Change: Orkney and Northern Europe in the Later Iron Age AD 300–800*. Balgavies: Pinkfoot Press.

Doyle, I W 2009 ‘Mediterranean and Frankish pottery imports in early medieval Ireland’, *Journal of Irish Archaeology* 18, 17–62.

Driscoll, S T 1988 ‘Power and authority in Early Historic Scotland: Pictish symbol stones and other documents’, *in* Gledhill, J, Bender, B & Larsen, M T (eds) *State and Society. The Emergence and Development of Social Hierarchy and Political Centralization*, 215–36. London: Unwin Hyman.

Driscoll, S T 1997 ‘A Pictish settlement in north-east Fife: the Scottish Field School of Archaeology excavations at Easter Kinnear’, TAFAJ 3, 74–118.

Driscoll, S T, Geddes, J & Hall, M A (eds) 2011 *Pictish Progress: New Studies on Northern Britain in the Early Middle Ages.* Leiden: Brill.

Dunbar, J 1981 ‘The Medieval architecture of the Scottish Highlands’, *in* Maclean of Dochgarroch, 28–70.

Dunbar, J 1996 'The emergence of the reformed church in Scotland *c* 1560–*c* 1700', *in* Blair & Pyrah (eds), 127–34.

E

Easton, D 1996 *The Rammed Earth House*. White River Junction (VT): Chelsea Green Publishing.

Edmonds, M 1992 'Their use is wholly unknown', *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors: Essays on the Neolithic of Britain and Ireland in Honour of Audrey Henshall*, 179–93. Edinburgh: Edinburgh University Press.

Edwards, N 1996 *The Archaeology of Early Medieval Ireland*. London: Batsford.

Edwards, N 1998 'The Irish Connection', *in* Foster (ed), 227–39.

Edwards, N & Lane, A 1992 'The archaeology of the early church in Wales', *in* Edwards, N & Lane, A (eds) *The Early Church in Wales and the West*, 1–11. Oxford: Oxbow.

Edwards, N (ed) 2009 *The Archaeology of the Early Medieval Celtic Churches*, Society for Medieval Archaeology Monograph 29, Society for Church Archaeology Monograph 1. Leeds: Maney Publishing.

Ekelund Jr, R B , Hebert, R F, Tollison, R D, Anderson, G M & Braidson, A 1996 *Sacred Trust: The Medieval Church as an Economic Firm*. Oxford: Oxford University Press.

Evans, A 2005 'Seventh-century assemblages', *in* Carver 2005a, 201–82.

Evans, D & Loveluck, C 2009 *Life and Economy at Early Medieval Flixborough,* c. *AD 600–1000*, Excavations at Flixborough Volume 2. Oxford: Oxbow.

Everson, P & Stocker, D 1999 *Lincolnshire*, British Academy: Corpus of Anglo-Saxon Stone Sculpture Volume V.

Evison, V 1987 *Dover: Buckland Anglo-Saxon Cemetery*. London: Historic Buildings and Monuments Commission.

Evison, V 2000 'The glass fragments from Glastonbury', *in* Price, J (ed) *Glass in Britain and Ireland AD 350–1100*, 189–200. London: The British Museum

Eyre-Todd, G 1923 *The Highland Clans of Scotland: Their History and Traditions* Vol II. London: Heath Granton.

F

Fanning, T 1981 'Excavation of an Early Christian cemetery and settlement at Reask, Co Kerry', *Proceedings of the Royal Irish Academy* RIA 81C, 67–172.

Fenton, A 1968 'Alternating Turf and Stone – An Obsolete Building Practice', *Folk Life* 6, 94–103.

Fenton, A 1999 [1976] *Scottish Country Life*. East Linton: Reissued 1999 by Tuckwell Press.

Fenton, A & Walker, B 1981 *The Rural Architecture of Scotland*. Edinburgh: John Donald.

Fernie, E 1986 'Early Church architecture in Scotland', PSAS 116, 393–411.

Ferrari, G 1957 *Early Roman Monasteries*. Vatican City: Pontifico Istituto dí archaeologia cristiana.

Fisher, I 2001 *Early Medieval Sculpture in the West Highlands and Islands*. Edinburgh: Society of Antiquaries of Scotland Monograph Series 1.

Flynn, C 2009 'Camlin: a cemetery-settlement in north Tipperary', *in* Stanley et al (eds), 133–41.

Ford, B 1987 'The copper-alloy objects', *in* Holdsworth (ed) *Excavations in the Medieval Burgh of Perth 1979–1981*, 121–9. Society of Antiquaries of Scotland Monograph Series 5.

Ford, B 1995 'Non-ferrous metal', *in* Russell-White, C J 'Medieval features and finds from Balfarg/Balbirnie, Fife', PSAS 125, 1014–15.

Ford, B 1998 'Metal objects', *in* Dixon, P 'A rural medieval settlement in Roxburghshire: excavations at Springwood Park, Kelso, 1985–6', PSAS 128, 706–9.

Forsyth, K 1995 'The inscriptions on the Dupplin Cross', *in* Bourke (ed), 237–44.

Forsyth, K 1997 'Some thoughts on Pictish symbols as a formal writing system', *in* Henry (ed), 85–98.

Foster, S 1996 *Picts, Gaels and Scots*. Edinburgh: Batsford/Historic Scotland.

Foster, S (ed) 1998 *The St Andrews sarcophagus. A Pictish Masterpiece and its international connections*. Dublin: Four Courts Press.

Foster, S 2004 *Picts Gaels and Scots* (second edition). Edinburgh: Batsford/Historic Scotland.

Foster, S & Cross, M (eds) 2005 *Able Minds and Practised Hands. Scotland's Early Medieval Sculpture in the 21st century*. Leeds: Society for Medieval Archaeology and Historic Scotland.

Foster, S forthcoming 'Physical evidence for the early church in Scotland', *in* Barnwell, P (ed) *Buildings for Worship in Britain: Celtic and Anglo-Saxon*. Donington: Shaun Tyas.

Fowler, P 2002 *Farming in the First Millennium AD*. Cambridge: Cambridge University Press.

Fraser, I A 1986 'Norse and Celtic Placenames around the Dornoch Firth', *in* Baldwin (ed), 23–32.

Fraser, I & Halliday, S 2011 'The Early Medieval Landscape of Donside, Aberdeenshire', *in* Driscoll et al (eds), 307–34.

Fraser, A & Munro, F 1988 *Tarbat: Easter Ross. A Historical Sketch*. Evanton: Ross and Cromarty Heritage Society.

Fraser, J E 2009 *From Caledonia to Pictland. Scotland to 795*. Edinburgh: Edinburgh University Press.

Freestone, I, Meeks, N & Middleton, A 1985 'Retention of Phosphates in Buried Ceramics: An Electron Microbeam Approach', *Archaeometry*, 27(2), 161–77.

Freestone, I, Hughes, M J, & Stapleton, C P 2008 'The composition and production of Anglo-Saxon glass', *in* Evison, V *Catalogue of Anglo-Saxon Glass in the British Museum*, 29–46. London: The British Museum.

Friell, J G P & Watson, W G (eds) 1984 *Pictish Studies*, British Archaeological International Series 125 Oxford: British Archaeological Reports.

G

Galinié, H & Zadora-Rio, E (eds) 1996 *Archéologie du cimetière chrétien*. Tours: La Simarre.

Gameson, R 1992 'The Cost of the Codex Amiatinus', *Notes and Queries*, 3–9.

Gameson, R (ed) 2011 *The Cambridge History of the Book in Britain: c 400–1100* Volume 1. Cambridge: Cambridge University Press.

Gameson, R 2011a 'From Vindolanda to Domesday; the book in Britain from the Romans to the Normans', *in* Gameson (ed), 1–10.

Gameson, R 2011b 'The material fabric of early British books', *in* Gameson (ed), 11–93.

Gameson, R 2011c 'The study of early British Books', *in* Gameson (ed), 709–21.

Gannon, A 2010 *The Iconography of Early Anglo-Saxon Coinage*. Oxford: Oxford University Press.

Gansum, T 2004 'Role of the bones – from iron to steel', *Norwegian Archaeological Review* 37.2, 41–57.

Gardiner, M 1997 'The exploitation of sea mammals in Medieval England: bones and their social context', *Archeological Journal* 154, 173–95.

Gelichi, S & Hodges, R (eds) 2012 *From One Sea to Another: Trading Places in the European and Mediterranean Early Middle Ages*. Turnhout: Brepols.

Gem, R D H 1984 'L'architecture pré-romane et romane en Angleterre: problèmes d'origine et de chronologie', *Bulletin Monumental* 142, 233–72.

Gondek, M 2006 'Investing in Sculpture: Power in Early Historic Scotland', *Medieval Archaeology* 50, 105–42.

Gondek, M & Noble, G 2010 'Together as One: the Landscape of the Symbol Stones at Rhynie', *in* Driscoll, S T, Geddes, J & Hall, M (eds) *Pictish Progress: New Studies on North Britain in the Early Middle Ages*, 281–306. Leiden: Brill.

Gordon, A & Macdonald, J nd [*c* 1988] *Down to the Sea: An Account of Life in the Fishing Villages of Hilton, Balintore and Shandwick*. Ross and Cromarty Heritage Society.

Govan, S (ed) 2003. *Medieval or Later Rural Settlement in Scotland: 10 Years On*. Edinburgh: Historic Scotland.

Graham-Campbell, J 1973 'The 9th-century Anglo-Saxon horn mount from Burghead, Morayshire, Scotland', *Medieval Archaeology* 17, 43–51.

Graham-Campbell, J 1981 'The bell and the mould', *in* Reece, R *Excavations in Iona 1964 to 1974*, 23–5. University of Leicester: Institute of Archaeology Occasional Paper No 5.

Graham-Campbell, J 1995 *The Viking-Age Gold and Silver of Scotland (AD 850–1100)*. Edinburgh: National Museums of Scotland.

Graham-Campbell, J & Batey, C 1998 *Vikings in Scotland. An Archaeological Survey*. Edinburgh: Edinburgh University Press.

Grant, A 2005 'The Province of Ross and the Kingdom of Alba', *in* Cowan & McDonald (eds), 88–126.

Green, B, Rogerson, A & White, S G 1987 *The Anglo-Saxon Cemetery at Morningthorpe, Norfolk*. East Anglian Archaeology 36.

Grieg, S 1940 'Viking Antiquities in Scotland', *in* Shetelig, H *Viking Antiquities in Great Britain and Ireland* Volume II. Oslo: H Aschehoug & Co.

Guardian 2011 Are our summers getting colder? (www.guardian.co.uk/news/datablog/2011/aug/31/weather)

Guttmann, E B A, Dockrill, S J & Simpson, IA 2004 'Arable agriculture in prehistory; new evidence from soils in the Northern Isles', PSAS 134, 53–64 .

H

Hadley, D 2002 'Burial practices in northern England in the later Anglo-Saxon period', *in* Lucy, S & Reynolds, A (eds) *Burial in Early Medieval England and Wales*, 209–28. London: Society for Medieval Archaeology Monograph 17.

Hall, A & Kenward, H 2003a 'Evidence for tanning from plant and insect remains', *in* Mould, Q, Carlisle, I & Cameron, E *Leather and Leather-working in Anglo-Scandinavian and Medieval York*, 3230–1.

Hall, A & Kenward, H 2003b 'Can we identify biological indicator groups for craft, industry and other activities?', *in* Murphy, P & Wiltshire, P E J (eds) *The Environmental Archaeology of Industry*, 114–30. Oxford: Oxbow.

Hall, A & Kenward, H 2011 'Plant and invertebrate indicators of leather production, from fresh skin to leather offcuts', *in* Thompson, R & Mould, Q (eds) *Leather Tanneries: The Archaeological Evidence*, 9–32. London: Archetype Books.

Hamerow, H 2012 *Rural Settlements and Society in Anglo-Saxon England*. Oxford: Oxford University Press.

Hamerow, H & MacGregor, A (eds) 2001 *Image and Power in the Archaeology of Early Medieval Britain. Essays in Honour of Rosemary Cramp*. Oxford: Oxbow.

Hamilton, J R C 1964 'Brochs and broch builders', *in* Wainwright, F T (ed) *The Northern Isles*, 53–90. Edinburgh and London: Nelson.

Hansen, I L & Wickham, C (eds) 2000 *The Long Eighth Century*. Leiden: Brill.

Harbison, P 1970 'How old is the Gallarus oratory?' *Medieval Archaeology* 14, 34–59.

Harden, J 1995 'A potential archaeological context for the early Christian sculptured stones from Tarbat, Easter Ross', *in* Bourke, C (ed) *From the Isles of the North: Early Medieval Art in Ireland and Britain*, 221–6. Belfast: HMSO.

Harding, D W 2009 *The Iron Age Round House: Later Prehistoric Building in Britain and Beyond*. Oxford: Oxford University Press.

Hare, M 2009 'The 9th-century west porch of St Mary's Church, Deerhurst, Gloucestershire: form and function', *Medieval Archaeology* 53, 35–93.

Hare, M & Hamlin, A 1986 'The study of early church architecture in Ireland: an Anglo-Saxon viewpoint with an appendix on documentary evidence for round towers', *in* Butler, L A S & Morris, R K (eds) *The Anglo-Saxon Church*, 130–45. York: Council for British Archaeology Research Report CBA RR 60.

Harris, S 2012 'Hide-working with dry scrape technique using stone and bone tools', *Archaeological Leather Group Newsletter* 36, 12–14.

Heald, A 2003 *Non-ferrous metal-working in Iron Age Scotland (c 700 BC to AD 800)*. University of Edinburgh: unpublished PhD Thesis.

Hedeager, L 2011 *Iron Age Myth and Materiality: An Archaeology of Scandinavia AD 400–1000*. London and New York: Routledge.

Hencken, H 1950 'Lagore Crannog: An Irish Royal Residence of the Seventh to Tenth Centuries', PRIA 53C, 1–247.

Henderson, G 2001 'The Barberini Gospels (Rome, Vatican, *Biblioteca Apostolica Barberini* Lat 570)', *in* Redknap et al (eds), 157–68.

Henderson, I H 1975 'Inverness, a Pictish capital', in Maclean of Dochgarroch, L *The Hub of the Highlands. The Book of Inverness and District*, 91–108. Edinburgh: Inverness Field Club and James Thin.

Henderson, I 1993 'The shape and decoration of the Cross on Pictish Cross-slabs carved in relief', *in* Spearman, M & Higgit, J (eds) *The Age of Migrating Ideas*, 209–18. Edinburgh: National Museums of Scotland and Alan Sutton Publishing.

Henderson, I 1994 'The Insular and Continental Context of the St Andrews Sarcophagus', *in* Crawford, B (ed) *Scotland in Dark Age Europe*, 71–102. St Andrews: University of St Andrews.

Henderson, I & Henderson, G 2004 *The Art of the Picts: Sculpture and Metalwork in Early Medieval Scotland*. London and New York: Thames & Hudson.

Henderson, J 1988 'The nature of the Early Christian glass industry in Ireland: some evidence from Dunmisk Fort, Co Tyrone', *Ulster Journal of Archaeology* 51, 115–26.

Henderson, J 2000a 'The production technology of Irish Early Christian glass with specific reference to beads and enamels', *in* Price, J (ed) *Glass in Britain and Ireland AD 350–1100*, 143–59. London: British Museum Press.

Henderson, J 2000b 'Archaeological and scientific aspects of the glass technology', *in* Lane, A & Campbell, E *Dunadd: An Early Dalriadic Capital*, 212–17. Oxford: Oxbow Books.

Henderson, J & Ivens, S 1992 'Dunmisk and glass-making in Early Christian Ireland', *Antiquity* 66, 52–64.

Henning, J (ed) 2007 *Post-Roman Towns, Trade and Settlement in Europe and Byzantium: Vol 1 The Heirs of the Roman West*, 233–70. Berlin and New York: De Gruyter.

Henning, J 2007 'Early European towns: the way of the economy in the Frankish area between dynamism and deceleration 500–1000 AD', *in* Henning (ed), 3–40.

Henry, D (ed) 1997 *The Worm, the Germ and the Thorn: Pictish and Related Studies Presented to Isabel Henderson*, 89–98. Balgavies: Pinkfoot Press.

Hickey, H 1985 *Images of Stone* (second edition). Enniskillen: Fermanagh District Council.

Higgitt, J 1982 'The Pictish Latin inscription at Tarbat in Ross-shire', PSAS 112, 300–21.

Hill, P 1997 *Whithorn and St Ninian. Excavation of a monastic town 1984–1991.* Stroud: Whithorn Trust, Sutton Publishing.

Hill, P H & Kucharski, K 1990 'Early medieval ploughing at Whithorn and the chronology of plough pebbles', *Trans. Dumfriesshire and Galloway Natural History and Antiquarian Society* 65, 73–83.

Hinton, D A 1996 'The gold, silver and other non-ferrous alloy objects from Hamwic', *Southampton Finds Volume II.* Stroud: Alan Sutton and Southampton City Council.

Hinton, D A 2001 *A Smith in Lindsey: The Anglo-Saxon Grave at Tattershall Thorpe, Lincolnshire*, The Society for Medieval Archaeology Monograph Series No 16. London: The Society for Medieval Archaeology.

Hodges, R 2012 *Dark Age Economics: A New Audit.* London: Bristol University Press.

Holbrook, N & Thomas, A 2005 'An early medieval monastic cemetery at Llandough, Glamorgan: excavations in 1994', *Medieval Archaeology* 49, 1–92.

Hope-Taylor, B 1977 *Yeavering: An Anglo-British Centre of Early Northumbria*. London: HMSO.

Howard, D 1995 *Scottish Architecture. Reformation to Restoration 1560–1660*. Edinburgh: Edinburgh University Press.

Hudson, B T 1996 *Prophecy of Berchan: Irish and Scottish High-Kings in the Early Middle Ages.* Westport and London: Greenwood.

Hughes, K 1970 *Early Christianity in Pictland*. Jarrow: Jarrow Lecture.

Hunter, F 2007 *Beyond the Edge of the Empire – Caledonians, Picts and Romans*. Rosemarkie: Groam House Lecture.

J

Jackman, N, Moore, C & Rynne, C 2013 *The Mill at Kilbegly. An archaeological investigation on the route of the M6 Ballinsloe to Athlone national road scheme*. Dublin: NRA Scheme Monograph 12.

Jackson, C 2005 'Making colourless glass in the Roman period', *Archaeometry* 47(4), 763–80.

Jackson, A 1993 'Further thoughts on Sueno's Stone', *in* Sellar (ed), 91–6.

James, H 1992 'Early medieval cemeteries in Wales', *in* Edwards, N & Lane, A (eds) *The early Church in Wales and the West*, 90–103. Oxford: Oxbow.

James, H 2005 'Pictish Cross-slabs: an examination of the original archaeological context', *in* Foster & Cross (eds), 95–112.

James, H & Yeoman, P 2008 *Excavations at St Ethernan's Monastery. Isle of May, Fife 1992–7.* Perth: Tayside and Fife Archaeological Committee Monograph 6.

James, H, Henderson, I, Foster, S M & Jones, S 2008 *A Fragmented Masterpiece: Recovering the Biography of the Hilton of Cadboll Pictish Cross-slab*. Edinburgh: Society of Antiquaries of Scotland.

James, S, Marshall, A & Millett, M 1984 'An early medieval building tradition', *Archaeol. J* 141, 182–215.

Jewell, R H I 1986 'The Anglo-Saxon friezes at Breedon-on-the-Hill, Leicestershire', *Archaeologia* 108, 95–116.

Ježek, M 2013 'Touchstones of archaeology', *J. Anthropological Archaeology* 32, 713–31.

Jolly, W 1880 'Notice of the excavation and contents of ancient graves at Dalmore, Alness, Ross-shire', PSAS 13, 252–64.

Jones, B, Keillar, I & Maude, K 1993 'The Moray aerial survey: discovering the prehistoric and protohistoric landscape', *in* Sellar (ed), 64–70.

Jørgensen, L 2003 'Manor and Market. Lake Tissø in the sixth to eleventh centuries', *in* Pestell, T & Ulmschneider, K (eds) *Markets in Early Medieval Europe. Trading and 'Productive' Sites, 650–850*, 175–207. Macclesfield: Windgather Press.

K

Kelly, A 2010 'The discovery of Phocaean Red Slip ware (PRSW) Form 3 and Bii ware (LR1 amphorae) on sites in Ireland: an analysis in a broader framework', PRIA 110C, 35–88.

Kelly, E P 2001 'The Hillquarter, Co. Westmeath mounts: an early medieval saddle from Ireland', *in* Redknap et al (eds), 261–74.

Kelly, F 2000 *Early Irish Farming. A study based mainly on the law-texts of the 7th and 8th centuries AD*. Dublin: Institute for Advanced Studies.

Kenny, N 2010 'Charcoal production in medieval Ireland', *in* Stanley, M et al (eds) *Creative Minds: Production, Manufacturing and Invention in Ancient Ireland*, 99–116. Dublin: Archaeology and the National Roads Authority Monograph No. 7.

King, H 2009 'The economy and industry of early medieval Clonmacnoise: a preliminary view', *in* Edwards (ed), 333–49.

Kinsella, J 2010 'A new Irish early medieval site type? Exploring the recent archaeological evidence for non-circular enclosed settlement and burial sites', *PRIA* 110C, 89–132.

Knight, I 1984 *The Heights and Weights of Adults in Britain*. London: HMSO.

Kruse, S E 1992 'Late Saxon balances and weights from England', *Medieval Archaeology* 36, 67–95.

L

Laing, L 2006 *The Archaeology of Celtic Britain and Ireland*. Cambridge: Cambridge University Press.

Laing, L & Longley, D 2006. *The Mote of Mark, A Dark Age Hillfort in South-West Scotland*. Oxford: Oxbow.

Lambert, J M 1960 *The Making of the Broads*. London: Royal Geographic Society.

Lane, A, & Campbell, E, 2000 *Excavations at Dunadd: An Early Dalriadic Capital*. Oxford: Oxbow Books.

Lang, J 1991 *York and Eastern Yorkshire: Corpus of Anglo-Saxon Stone Sculpture Vol III*. British Academy.

Lang, J 1993 'Survival and Revival in Insular Art: Northumbrian Sculpture of the 8th to 10th centuries', *in* Spearman & Higgitt (eds), 261–7.

Lang, J 1999 'The apostles in Anglo-Saxon sculpture', *Early Medieval Europe* 8.2, 271–82.

Lawlor, H C 1925 *The Monastery of Saint Mochaoi of Nendrum*. Belfast: Belfast Natural History and Philosophical Society.

Lebecq, S 2000 'The role of the monasteries in the systems of production and exchange of the Frankish world between the seventh and the beginning of the ninth centuries', *in* Hansen & Wickham (eds), 121–48.

Levison, W 1946 *England and the Continent in the Eighth Century*. London: Oxford University Press.

Longley, D 2009 'Early Medieval Burial in Wales', *in* Edwards (ed), 105–32.

Loveluck, C P 1998 'A high status Anglo-Saxon settlement at Flixborough, Lincolnshire', *Antiquity* 72, 146–61.

Loveluck, C P 2001 'Wealth, waste and conspicuous consumption. Flixborough and its importance for middle and late Saxon settlement studies', *in* Macgregor, A & Hamerow, H (eds) *Image and Power in Early Medieval British Archaeology. Essays in Honour of Rosemary Cramp*, 78–130. Oxford: Oxbow.

Loveluck, C P 2007 *Rural Settlement, Lifestyles and Social change in the Later First Millenium AD: Anglo-Saxon Flixborough in its Wider Context*. Excavations at Flixborough Vol 4. Oxford: Oxbow.

Lowe, C 1998 *St Boniface Church Orkney. Coastal Erosion and Archaeological Assessment*. Edinburgh: Historic Scotland and Sutton Publishing.

Lowe, C 2006 *Excavations at Hoddom, Dumfriesshire. An Early Ecclesiastical Site in South-West Scotland*. Edinburgh: Society of Antiquaries of Scotland.

Lowe, C 2008 *Inchmarnock. An Early Historic Island Monastery and its Archaeological Landscape*. Edinburgh: Society of Antiquaries of Scotland.

Lynn, C J & McDowell, J A 2011 *Deer Park Farms. The Excavation of a Raised Rath in the Glenarm Valley, Co Antrim*. Belfast: Northern Ireland Environment Agency.

M

Macdonald, A D S 1992 *Curadán, Boniface and the Early Church at Rosemarkie*. Rosemarkie: Groam House Lectures.

Macdonald, A D S & Laing, L R 1970 'Early ecclesiastical sites in Scotland: a field survey, Part II', PSAS 102, 129–45.

MacDonald, D A 1993 'Corn-drying kilns in Uist', *in* Cheape (ed), 185–96.

MacFarlane, W 1906–8 *Geographical Collections Relating to Scotland* (three volumes). Edited by Mitchell, G & Clark, J T. Edinburgh: Scottish History Society.

MacGibbon, D & Thomas, R 1896 *The Ecclesiastical Architecture of Scotland. From the Earliest Christian Times to the Seventeenth Century*. Edinburgh: David Douglas.

MacGregor, A 1985. *Bone, Antler, Ivory and Horn: The Technology of Skeletal Materials Since the Roman Period*. London: Croom Helm.

Maclean of Dochgarroch, L (ed) 1981 *The Middle Ages in the Highlands*. Inverness: Inverness Field Club.

Magrill, B 2009 'Corbels of Romanesque churches: The interface of diverse social patterns represented on marginal spaces', RACAR (*Canadian Art Review*) 34.2, 43–54.

Mainman, A J & Rogers, N S H 2000 'Craft, Industry and Everyday Life: Finds from Anglo-Scandinavian York', *The Archaeology of York* AY17/14. York: Council for British Archaeology.

Malcolm, G, Bowsher, D & Cowie, R 2003 *Middle Saxon London. Excavations at the Royal Opera House 1989–99*. London: Museum of London Archaeology Service Monograph 15.

Maldonado, R A D 2011 *Christianity and burial in late Iron Age Scotland, AD 400–650*. University of Glasgow: PhD thesis.

Manning, W H 1976. *Catalogue of Romano-British Ironwork in the Museum of Antiquities, Newcastle upon Tyne*. Newcastle upon Tyne: University of Newcastle upon Tyne.

Marsh, S (31 August 2011) 'Are our summers getting colder?' *The Guardian*. Retrieved from www.theguardian.com.

Marshall, D 1977 'Carved stone balls', PSAS 108, 40–72.

Marshall, D 1983 'Further notes on carved stone balls', PSAS 113, 628–30.

Marshall, A & Marshall, G 1991 'A survey and analysis of the buildings of Early and Middle Anglo-Saxon England', *Medieval Archaeology* 35, 29–43.

Marshall, A & Marshall, G 1993 'Differentiation, change and continuity in Anglo-Saxon buildings', *Archaeol. J* 150, 366–402.

McCormick, F 1997 'Iona: the archaeology of the early monastery', *in* Bourke, C (ed) *Studies in the Cult of Saint Columba*, 45–68. Dublin: Four Courts Press.

McCormick, F 2009 'Struell wells: Pagan past and Christian present', *JRSIA* 139, 45–62.

McCormick, F 2008 'The decline of the cow: agricultural and settlement change in early medieval Ireland', *Peritia* 20, 209–24.

McCormick, F & Murphy, E 1997 'The Animal bones', *in* Hill, P, 605–13.

McCormick, F & Murray, E 2007 *Excavations at Knowth 3. Knowth and the zooarchaeology of Early Christian Ireland*. Dublin: Royal Irish Academy.

McCormick, M 2001 *Origins of the European Economy*. Cambridge: Cambridge University Press.

McCormick, M 2007 'Where do trading towns come from? Early medieval Venice and the northern Emporia', *in* Henning, J (ed), *Post-Roman Towns, Trade and Settlement in Europe and Byzantium. Vol 1 The Heirs of the Roman West*, 40–68. Berlin and New York: De Gruyter.

McCormick, M 2012 'Comparing and connecting: Comacchio and the early medieval trading towns', *in* Gelichi & Hodges (eds), 477–502.

McCullagh, K & Wood, J 2010 *Loandhu to Portmahomack Water Main Renewal. Watching Brief*. Tain: Highland Archaeology Services.

McCullagh, R & Tipping, R (eds) 1998 *The Lairg Project 1988–96. The evolution of an archaeological landscape in Northern Scotland*. Edinburgh: STAR.

McCullough, D A 2000 *Investigating Portages in the Norse Maritime Landscape of Scotland and the Isles*. Glasgow: unpublished PhD thesis.

McDonnell, G 1998 'Irons in the fire – evidence of ironworking on broch sites', *in* Nicholson, R A & Dockerill, S J (eds) *Old Scatness Broch, Shetland: Retrospect and Prospect*, 150–62.

McDonnell, G J 2000 'The Ironworking Evidence', *in* Stamper, P A & Croft, R A (eds), *Wharram, a Study of Settlement on the Yorkshire Wolds*, vol 8, 155–66. York: University of York.

McErlean, T & Crothers, N 2007 *Harnessing the Tides. The Early Medieval Tide Mills at Nendrum Monastery, Strangford Lough*. Belfast: Northern Ireland Stationery Office.

Meehan, B 1994 *The Book of Kells. An Illustrated Introduction to the Manuscript in Trinity College Dublin*. London: Thames & Hudson.

Melander, T 2001 'More gems from the marketplace' *By, marsk og geest* 13, 33–36.

Meyer, K 2005 *Reading the stones: The Pictish Monuments on Tarbat Peninsula, Easter Ross*. University of York: unpublished PhD dissertation.

Meyer, K 2011 'Saints, scrolls and serpents: theorising a Pictish liturgy on the Tarbat peninsula', *in* Driscoll et al (eds), 169–200.

Miller Sr, H 1835 [repr 1994] *Scenes and Legends of the North of Scotland*. Edinburgh: B&W Publishing.

Miller Jr, H 1889 'Note on fragments of two sculptured stones of Celtic workmanship found in the churchyard of Tarbat, Easter Ross', PSAS 23 [11 ns], 435–44.

Miller Jr, H & the Rev Donald Macleod 1889 'Notice of the Discovery of a Hoard of silver penannular armlets and coins at Tarbat, Ross-shire', PSAS 23, 314–17.

Millett, M & James, S 1983 'Excavations at Cowdery's Down, Basingstoke, Hampshire', *Archaeol. J* 140, 151–279.

Mitchel, M D 2004 'Tracing Comanche history: Eighteenth-century rock art depictions of leather armoured horses from the Arkansas River basin, south-eastern Colorado, USA', *Antiquity* 78, 115–26.

Moore, D T & Oddy, W A 1985 'Touchstones: some aspects of their nomenclature, petrography and provenance', *Journal of Archaeological Science* 12, 59–80.

Morris, C D 1989 *Church and Monastery in the Far North: An Archaeological Evaluation*. Jarrow: Jarrow Lecture.

Morris, C D & Emery, N 1986 'The chapel and enclosure on the Brough of Deerness, Orkney: survey and excavations, 1975–1977', PSAS 116, 301–74.

Mould, Q, Carlisle, I & Cameron, E 2003 'Leather and Leatherworking in Anglo-Scandinavian York', *The Archaeology of York, The Small Finds* 17/16. York: Council for British Archaeology.

Mowat, I R M 1981 *Easter Ross 1750–1850: The Double Frontier*. Edinburgh: John Donald.

Mulville, J, Parker Pearson, M, Sharples, N, Smith, H & Chamberlain, A 2003 'Quarters, arcs and squares: human and animal remains in the Hebridean Late Iron Age', *in* Downes & Ritchie (eds), 20–34.

Munro, J 1984 'The Clan period' *in* Ormand, D (ed) *The Ross and Cromarty Book,* 127–45. Golspie: The Northern Times Ltd.

Murphy, D 2003 'Excavation of an early monastic enclosure at Clonmacnoise', *in* King (ed), 1–34.

Murphy, P & Wiltshire P E J (eds) 2003 *The Environmental Archaeology of Industry*, Symposia of the Association for Environmental Archaeology 20. Oxford: Oxbow.

Murray, E, McCormick, F & Plunkett, G 2004 'The food economies of Atlantic island monasteries: the documentary and archaeo-environmental evidence', *Environmental Archaeology* 9, 179–88.

Murray, H 1979 'Documentary evidence for domestic buildings in Ireland 400–1200 in the light of archaeology', *Medieval Archaeology* 23, 81–97.

N

Neate, S & Howell, D 2011 'Conservation issues and research questions: the role of analysis in book and manuscript conservation', *in* Neate, S, Howell, D, Ovenden, R & Pollard, A M (eds) *The Technological Study of Books and Manuscripts as Artefacts. Research Questions and Analytical Solutions*, British Archaeological International Series 2209, 9–16. Oxford: Archaeopress.

Noble, G, Gondek, M, Campbell, E & Cook, M 2013 'Between prehistory and history: the archaeological detection of social change among the Picts', *Antiquity* 87, 1136–50.

Noble, R R 1984 'Turf-walled houses of the Central Highlands. An experiment in reconstruction', *Folk Life. A Journal of Ethnological Studies* 22, 68–83.

Ó

O'Brien, E 2009 'Pagan or Christian? Burial in Ireland during the fifth to eighth centuries AD', *in* Edwards (ed), 135–54.

Ó Carragáin, E 1989 'The Meeting of Saint Paul and Saint Anthony: Visual and Literary Uses of a Eucharistic Motif', *in* Wallace, P & Niocaill, G (eds) *Keimeila*, 1–58. Galway: Galway University Press.

Ó Carragáin, T 2002 *Pre-Romanesque Churches in Ireland: Interpreting Archaeological Regionalisms*. University College, Cork: unpublished PhD dissertation.

Ó Carragáin, T 2003a 'A landscape converted: archaeology and early church organisation on Iveragh and Dingle, Ireland', *in* Carver (ed) *The Cross Goes North. Processes of Conversion in Northern Europe, AD 300–1300,* 127–52. York: Medieval Press.

Ó Carragáin, T 2003b 'The architectural setting of the Cult of Relics in Early Medieval Ireland', *JRSAI* 133, 130–76.

Ó Carragáin, T 2005 'Regional Variation in Irish Pre-Romanesque Architecture', *Antiquaries Journal*, 85, 23–56.

Ó Carragáin, T 2009 'Cemetery Settlements and Local Churches in Pre-Viking Ireland in light of comparisons with England and Wales', *in* Graham-Campbell, J & Ryan, M (eds), *Anglo-Saxon/Irish Relations before the Vikings*, 329–66. Oxford: Oxford University Press.

Ó Carragáin, T 2010a *Churches in Medieval Ireland*. New Haven and London: Yale University Press.

Ó Carragáin, T 2010b 'From family cemeteries to community cemeteries in Viking Age Ireland?' *in* Corlett, C & Potterton, M (eds) *Death and burial in early medieval Ireland in the light of recent archaeological excavations*, Research Papers in Irish archaeology 2, 217–26. Dublin: Wordwell.

O'Connor, T 2003 'The Osteological Evidence', *in* Mould, Q, Carlisle, I & Cameron, E *Leather and Leather-working in Anglo-Scandinavian and Medieval York*, *The Archaeology of York, The Small Finds* 3231–5. York: Council for British Archaeology.

O'Dwyer, P 1981 *Célí Dé. Spiritual Reform in Ireland, 750–900*. Dublin.

Ó Floinn, R 1998 'Clonmacnoise: art and patronage in the early medieval period', *in* King, H (ed), *Clonmacnoise Studies*, vol I, 87–100. Dublin: Dúchas.

O'Maidin, U 1996 *The Celtic Monk*. Kalamazoo: Cistercian Publications.

O'Riordan, S P 1942 'The excavation of a large earthen ring-fort at Garranes, Co Cork', *Proceedings of the Royal Irish Academy* 47C, 77–150.

O'Sullivan, A & Boland, D 2000 *The Clonmacnoise Bridge: An Early Medieval River Crossing in County Offaly*, Archaeology Ireland Heritage Guide No 11. Bray: Wordwell.

O'Sullivan, A & Nicholl, T 2010 'Early Medieval settlement enclosures in Ireland', *PRIA* 111C, 59–90.

O'Sullivan, A, McCormick, F, Kerr, T & Harney, L 2010 *Early Medieval Ireland: Archaeological Excavations 1930–2009*. Dublin: Royal Irish Academy.

O'Sullivan, A, McCormick, F, Kerr, T & Harney, L 2014 *Early Medieval Ireland, AD 400–1100: The Evidence from Archaeological Excavations*. Dublin: Royal Irish Academy.

O'Sullivan, D & Young, R 1991 'The early medieval settlement at Green Shiel, Northumberland', *Archaeologia Aeliana* 5S 19, 55–70.

O'Sullivan, D 2001 'Space, silence and shortages on Lindisfarne, the archaeology of asceticism', *in* Hamerow, H & MacGregor, A (eds) *Image and Power in the Archaeology of Early Medieval Britain*, 33–52. Oxford: Oxbow.

O'Sullivan, J 1994 'Excavation of an early church and a women's cemetery at St Ronan's medieval parish church, Iona', PSAS 124, 327–65, fiche A5–D11.

O'Sullivan, J 1999 'Iona: archaeological investigations 1875–1996', *in* Braun, D & Clancy, T (eds) *Spes Scottorum: Hope of Scots. Saint Columba, Iona and Scotland*, 215–43. Edinburgh: T&T Clark.

O'Sullivan, J & Ó Carragáin, T 2008 *Inishmurray. Monks and pilgrims in an Atlantic landscape* Vol 1. Cork: Collins Press.

O'Sullivan, J & Stanley, M (eds) 2006 *Settlement, Industry and Ritual: Proceedings of a public seminar on archaeological discoveries on national road schemes, September 2005*. Bray: Wordwell.

O

Olsen, B, Urbanczyk, P & Amundsen, C (eds) 2011 *Hybrid Spaces. Medieval Finnmark and the Archaeology of Multi-Room Houses*. Oslo: Institute of Comparative Research in Human Culture and Novus Press.

Omand, D (ed) 1984 *The Ross and Cromarty Book*. Golspie: The Northern Times Ltd.

Oram, R 2004 *David I. The King Who Made Scotland*. Stroud: Tempus Publishing.

Oram, R D, Martin, P F, McKean, C A, Neighbour, T & Cathcart, A 2009 *Historic Tain. Archaeology and Development*. York and Edinburgh: Historic Scotland and Council for British Archaeology.

Ottaway, P J 2009 'Leatherworking tools', *in* Evans, D & Loveluck, C 2009 *Life and Economy at Early Medieval Flixborough, c AD 600–1000*, 278–80. Oxford: Oxbow.

Ottaway, P & Rogers, N 2002 'Craft, Industry and Everyday Life: Finds from Medieval York', *The Archaeology of York*, *The Small Finds*, AY 17/15. York: Council for British Archaeology.

Owen, O 1999 'The lead bullion weights', *in* Owen, O & Dalland, M *Scar. A Viking Boat Burial on Sanday, Orkney*, 118–26. East Linton: Tuckwell.

P

Peers, C & Radford, C A R 1943 'The Saxon monastery at Whitby', *Archaeologia* 89, 27–88.

Penrose, L 1954 'Distance, size and shape', *Annals of Eugenics* 18, 337–93.

Perry, D 2000 *Castle Bar Dunbar. Two Thousand Years on a Fortified Headland*. Edinburgh: Society of Antiquaries of Scotland.

Perry, M 2006 *A spatial analysis of trends in the UK climate since 1914 using gridded data sets*. National Information Centre Climate Memorandum No 21. Exeter: The Met Office.

Pestell, T 2004 *Landscapes of Monastic Foundation. The Establishment of Religous House in East Anglia c650–1200*. Woodbridge: Boydell.

Pestell, T 2009 'The styli', *in* Evans, D H & Loveluck, C (eds) *Life and Economy at Early Medieval Flixborough* c *AD 600–1000. The Artefact Evidence*, Excavations at Flixborough Volume 2, 123–37. Oxford: Oxbow.

Pestell, T & Ulmschneider, K (eds) 2003 *Markets in Medieval Europe, Trading and Productive Sites, 650–850*. Macclesfield: Windgather Press.

Petley, C 1831 'A short account of some carved stones in Ross-shire, accompanied by a series of outline engravings', *Archaeologia Scotica* 4, 345–52.

Phillips, C 2006 'Portages in early medieval Scotland. The Great Glen route and the Forth-Clyde isthmus', *in* Westerdahl, C (ed) *The Significance of Portages*, British Archaeological Reports International Series 1499, 191–8. Oxford: Archaeopress.

Photos-Jones, E, Atkinson, J A, Hall, A J & Banks, I 1998 'The bloomery mounds of the Scottish Highlands, Part 1: the archaeological background', *Historic Metallurgy* 32(1), 15–32.

Photos-Jones, E & Atkinson, J A 1998 'Iron-working in medieval Perth: a case of town and country', PSAS 128, 887–904.

Pitts, M 2012 'Bronze finds put prehistoric leather-workers on the map', *British Archaeology* 3, 7.

Plunkett , S J 1998 'The Mercian perspective', *in* Foster (ed), 202–26.

Pocock, M & Wheeler, H 1971 'Excavations at Escomb Church', *JBAA* 3S 34, 11–29.

Porter, D 1997 'Small Finds', *in* Buteux, S (ed) *Settlements at Skaill, Deerness, Orkney: Excavations by Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981*, British Archaeological Reports International Series 260, 96–132. Oxford: Archaeopress.

Pritchard, A 2009 'The origins of ecclesiastical stone architecture in Wales', *in* Edwards (ed), 245–64.

Proudfoot, E V W 1996 'Excavations at the long cist cemetery on the Hallow Hill, St Andrews, Fife', PSAS 126, 387–454.

Prummel, W 1987 'Atlas for the identification of foetal skeletal elements of cattle, horse, sheep and pig. Part 2', *Archaeozoologia* 1(2), 11–42.

R

Rahme, L 2011 'Tanning with tradition tools and techniques, Inuit, American Indian and Sami people', *in* Thompson & Mould (eds), 39–48. London: Archetype.

Rahtz, P A, Watts, L, Taylor, H M & Butler, L 1997 *St Mary's Church Deerhurst, Gloucestershire: Fieldwork, Excavations and Structural Analysis, 1971–1984*. London: Society of Antiquities Research Report 55.

Rahtz, P A, Hirst, S & Wright, S M 2000 *Cannington Cemetery*, Britannia Monograph 17. London: Society for the Promotion of Roman Studies.

Ralston, I 1997 'Pictish Homes', *in* Henry, D (ed) *The Worm, the Germ and the Thorn: Pictish and Related Studies Presented to Isabel Henderson,* 19–34. Balgavies: Pinkfoot Press.

Ralston, I 2004 *The Hill-forts of Pictland since 'The problem of the Picts'*. Rosemarkie: Groam House Lecture.

RCAHMS 1979 *The Archaeological Monuments of Scotland. Volume 8: Easter Ross*. Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland.

RCAHMS 1982 *Argyll: An Inventory of the Monuments. Volume 4: Iona*. Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland.

Redknap, M 2008 'Early Medieval Metalwork and Christianity: A Welsh Perspective', *in* Edwards (ed), 351–74. Leeds: Maney Publishing.

Redknap, M, Edwards, N, Youngs, S, Lane, A & Knight, J (eds) 2001 *Pattern and Purpose in Insular Art. Proceedings of the Fourth International Conference on Insular Art held at the National Museum and Gallery, Cardiff 3–6 September 1998*. Oxford: Oxbow.

Reed, D 1995 'The excavation of a cemetery and putative chapel site at Newhall Point, Balblair, Ross and Cromarty, 1985', PSAS 125, 779–91.

Reed, R 1972 *Ancient Skins, Parchments and Leathers*. Leeds: Seminar Press.

Rees, A R 2002 'A first millennium cemetery, rectangular Bronze Age structure and late prehistoric settlement at Thornybank, Midlothian', PSAS 132, 313–55.

Richardson, H & Scarry, J 1990 *An Introduction to Irish High Crosses*. Cork: Mercier.

Rideout, J S 1995 'Carn Dubh, Moulin, Perthshire: survey and excavation of an archaeological landscape 1987–90', PSAS 125, 139–95.

Ritchie, A 1997 *Iona*. Edinburgh: Historic Scotland.

Ritchie, J 1915 'Description of a simple Inscribed Cross observed in the Churchyard of Tarbat and now destroyed', PSAS 49, 304–6.

Robertson, A S 1983, Roman coins found in Scotland, 1971–82, PSAS 113, 405–48.

Rodwell, W 2011 *St Peter's, Barton-upon-Humber, Lincolnshire. A parish church and its community*, vol 1. Oxford: Oxbow.

Romankiewicz, T 2011 *The Complex Roundhouses of the Scottish Iron Age: An architectural Analysis of Complex Atlantic Roundhouses (Brochs and Galleried Duns), with Reference to Wheelhouses and Timber Roundhouses* (two volumes), BAR series 550. Oxford: Archaeopress.

Ross, S 1992 *Dress Pins from Anglo-Saxon England: Their production and typo-chronological development*. University of Oxford: unpublished DPhil dissertation.

Ryan, M 1988 'Fine metal-working and early Irish monasteries: the archaeological evidence', *in* Bradley, J (ed) *Settlement and Society in Medieval Ireland*, 33–48. Kilkenny: Boethius.

Ryan, M 1993 *Metal craftsmanship in Early Ireland*. Dublin: Country House.

Ryan, M & O'Floinn, R 1983 *The Derrynaflan Hoard 1: A Preliminary Account*. Dublin: National Museum of Ireland.

S

Salaman, R A 1986 *Dictionary of Leather-Working Tools,* c *1700–1950 and the Tools of Allied Trades*. Minnesota: The Astragal Press.

Samson, R 1992 'The reinterpretation of the Pictish Symbols', *Journal of the British Archaeological Association* 145, 29–65.

Seaver, M 2006 'Through the mill – excavation of an early medieval settlement at Raystown, County Meath', *in* O'Sullivan & Stanley (eds), 73–87. Bray: Wordwell.

Sellar, D 1993 'Sueno's Stone and its interpreters', *in* Sellar (ed), 97–116.

Sellar, W D H (ed) 1993 *Moray: Province and People*. Edinburgh: School of Scottish Studies.

Seymour, J 1984 *The Forgotten Arts: A Practical Guide to Traditional Skills*. Melbourne: Angus & Robertson.

Sharpe, R (ed and trans) 1995 *Adomnán of Iona: Life of St Columba*. Harmondsworth: Penguin Books.

Sharples, N 1999 *The Iron Age and Norse Settlement at Bornish, South Uist: an interim report on the 1999 excavations.* Cardiff: University of Cardiff Studies in Archaeology, Report No 16.

Sharples, N 2005 *A Norse Farmstead in the Outer Hebrides. Excavations at Mound 3, Bornais, South Uist*. Oxford: Oxbow Books.

Sharples, N 2012 *A Late Iron Age Farmstead in the Outer Hebrides, Excavations at Mound I, Bornais, South Uist*. Oxford: Oxbow Books.

Sheffer, D J 2013 'Cattle hide industry', *in* Tucker, S C (ed) *The Encyclopedia of the American-Mexican War*, 130. Santa Barbara (CA): ABC-CLIO.

Sigurðadóttir, S 2008 *Building with Turf.* Skagafjörður Heritage Museum.

Simpson, I A, Dockrill, S J & Lancaster, S J 1998 'Making arable soils: anthropogenic soil formation in a multi-period landscape', *in* Nicholson, R A & Dockrill, S J (eds) *Old Scatness Broch, Shetland: Retrospect and Prospect,* 111–26. Bradford: Univerity of Bradford.

Simpson, I A, Vésteinsson, O, Adderley, P & McGovern, T H 2003 'Fuel resource utilization in landscape settlement', *Journal of Archaeological Science* 30, 1401–20.

Skre, D 2008 'Post-substantivist Towns and Trade AD 600–1000', *in* Skre, D (ed) *The Means of Exchange,* Kaupang Excavation Projekt Publication Series 2, 327–41. Aarhus: Aarhus University Press.

Skre, D 2012 'Markets, towns and currencies in Scandinavia *c* AD 200–1000', *in* Gelichi & Hodges (eds), 47–63. Turnhout: Brepols.

Small, A (ed) 1987 *The Picts: A New Look at Old Problems*. Dundee: Graham Hunter Foundation.

Small, A, Thomas, C & Wilson, D M 1973 *St Ninian's Isle and its Treasure*. Oxford: Oxford University Press.

Smith, I M 1996 'The origins and development of Christianity in North Britain and Southern Pictland', *in* Blair & Pyrah (eds), 19–36. York: Council for British Archaeology.

Smyth, A 1984 *Warlords and Holy Men*. Edinburgh: Edinburgh University Press.

Soderberg, J 2004a 'Wild cattle: Red deer in the religious texts, iconography and archaeology of early Medieval Ireland', *J. Historical Archaeology* 8, 167–83.

Soderberg, J 2004b 'Distinguishing the local from the regional: Irish perspectives on urbanization in Early Medieval Europe', *in* Mathieu, J R & Scott, R E (eds) *Exploring the Role of Analytical Scale in Archaeological Interpretation*, BAR Int Series 1261, 67–82. Oxford: Archaeopress.

Spall, C A 2006 'All that glitters: the case for goldworking at the early medieval monastery at Portmahomack', *Historical Metallurgy* 40(1), 42–8.

Spall, C A 2011 'Have we got a parchmenerie? Identifying parchment making at a dry-preserved site: the evidence from Portmahomack, Tarbatness, Ross-shire', *in* Thompson & Mould (eds), 93–102. London: Archetype.

Spall, C A & Toop, N J 2005 'Excavations at Blue Bridge Lane and Fishergate House 2000 to 2001', Archaeological Planning Consultancy. Retrieved from www.archaeologicalplanning consultancy.co.uk.

Spearman, R M 1988a 'Early Scottish Towns: their origins and economy', *in* Driscoll, S T & Nieke, M R (eds) *Power & Politics in Early Medieval Britain and Ireland*, 79–95. Edinburgh: Edinburgh University Press.

Spearman, R M 1988b *Industrialization and urbanization in medieval Scotland: the material evidence.* University of Glasgow: unpublished PhD dissertation.

Spearman, R M & Higgitt, J (eds) 1993 *The Age of Migrating Ideas: Early Medieval Art in Northern Britain and Ireland*. Edinburgh: National Museums of Scotland and Alan Sutton Publishing.

Stanley, M, Danaher, E & Eogan, J (eds) 2009 *Dining and Dwelling: proceedings of a public seminar on archaeological discoveries on national road schemes August 2008*, National Roads Authority Monograph 6. Dublin: National Roads Authority.

Stanley, M, Danaher, E & Eogan, J (eds) 2010 *Creative Minds: Archaeology and the National Roads Authority*, National Roads Authority Monograph 6. Dublin: National Roads Authority.

Starley, D 2010 'Assessment of metal-working debris from Eilean Donan Castle, Ross-shire'. FAS-Heritage York: unpublished technical report.

Stuart, J 1856 *The Sculptured Stones of Scotland* Vol 1. Aberdeen: The Spalding Club.

Swift, C 2000 *Ogam stones and the Earliest Irish Christians.* Maynooth Monographs 2. Maynooth: Dept of Old and Middle Irish, St Patrick's College.

Swift, C 2003 'Sculptors and their customers: a study of Clonmacnoise grave slabs', *in* King (ed), 105–23. Clonmacnoise Studies vol 2. Dublin: Dúchas.

T

Taylor, H M & Taylor, J 1965 *Anglo-Saxon Architecture*. Cambridge University Press.

Taylor, H M 1978 *Anglo-Saxon Architecture*, Vol III. Cambridge University Press.

Theuws, F 2102 'River-based trade centres in early medieval north-western Europe. Some reactionary thoughts', *in* Gelichi & Hodges (eds), 25–46. Turnhout: Brepols.

Thomas, A C 1971 *The Early Christian Archaeology of North Britain*. Edinburgh: Edinburgh University Press.

Thomas, A C 1973 'Sculptured stones and crosses from St Ninian's Isle and Papil', *in* Small et al, 8–44. Oxford: Oxford University Press.

Thomas, A C 1990 ''Gallici Nautae de Galliarum Provinciis' – a Sixth/Seventh Century Trade with Gaul, reconsidered', *Medieval Archaeology* 34, 1–26.

Thompson, D V 1956 *The Materials and Techniques of Medieval Painting.* New York: Dover Publications.

Thompson, R 1998 'Leather Working Processes', *in* Cameron, E (ed) *Leather and Fur: Aspects of Early Medieval Trade and Technology.* London: Archetype.

Thompson, R & Mould, Q (eds) 2011 *Leather Tanneries: The Archaeological Evidence.* London: Archetype.

Thompson, V 2004 *Dying and Death in Later Anglo-Saxon England*. Woodbridge: Boydell.

Tite, M, Pradell, T & Shortland, A 2008 'Discovery, production and use of tin-based opacifiers in glasses, enamels and glazes from the Late Iron Age onwards: a reassessment', *Archaeometry*, 50(1), 67–84.

Treue, W, Goldman, K, Kellerman, R, Klem, F, Schneider, K, Stromer, W V, Wißner, A & Zirnbauer, H (eds) 1965 *Das Hausbuch der Mendelschen Zwölfbrüderstiftung zu Nürnberg, Deutsche Handwerkerbilder des 15. und 16. Jahrhunderts*. Munich: Bruckmann.

Tulp, C 2003 'Tjitsma, Wijnaldum: an Early Medieval production site in the Netherlands', *in* Pestell & Ulmschneider (eds), 221–33. Macclesfield: Windgather Press.

V

van Driel-Murray, C 2011 'Are we missing something? The elusive tanneries of the Roman period', *in* Thompson & Mould (eds), 69–84. London: Archetype.

Venclova, N 2002 'The Venerable Bede, druidic tonsure and archaeology', *Antiquity* 76, 458–71.

W

Walker, B 1977 *Clay buildings in North East Scotland*. Dundee and Edinburgh: Scottish Vernacular Buildings Working Group.

Walker, B 2006 *Scottish Turf Construction*, TAN 30. Edinburgh: Historic Scotland.

Walker, B & McGregor, C 1996 *Earth Structures and Construction in Scotland*. Edinburgh: Historic Scotland.

Walker, B, McGregor, C & Stark, G 1996 *Thatch and Thatching Techniques: A Guide to Conserving Scottish Thatching Traditions*. Edinburgh: Historic Scotland.

Wallace, A & Anguilano, L 2010 'Iron smelting and smithing: new evidence emerging on Irish road schemes', *in* Stanley et al (eds), 69–84. Dublin: National Roads Authority.

Wallace, P F 1987 'The economy and commerce of Viking Age Dublin', *in* Jankuhn, H H (ed) *Der Handel der Karolinger- und Wikingerzeit*, 200–45. Göttingen: Vandenhoeck & Ruprecht.

Walsh, C 2009 'An early medieval roadway at Chancery Lane', in Dufy, S (ed) *Medieval Dublin* IX, 9–37. Dublin: Four Courts Press.

Walton Rogers, P 1997 'Textile Production at 16–22 Coppergate', *The Archaeology of York* 17/11. York: Council for British Archaeology.

Waterer, J W 1956 'Leather', *in* Singer, C & Holmyards, E J (eds) *A History of Technology*, Volume 2, 147–90. Oxford: Clarendon Press.

Watson, W J 1904 [1996] *Place names of Ross and Cromarty.* Repr Evanton: Highland Heritage Books.

Webster, L 2012 *Anglo-Saxon Art*. London: British Museum Press.

Wedderburn, L M M & Grime D M 1984 'The cairn cemetery at Garbeg, Drumnadrochit', *in* Friell & Watson (eds), 151–68. Oxford: British Archaeological Reports.

Wenham, S J 1987 *Anatomical and microscopic interpetations of ancient weapon injuries*. BSc thesis, University of Leicester.

Westphalen, P 1993 *Die Eisenfunde aus Haithabu: Form, Funktion und Vergleich ausgewähtlen Fundgruppen*. University of Kiel: unpublished PhD thesis.

White Marshall, J & Rourke, G 2000 *High Island: An Irish monastery in the Atlantic*. Dublin: Town House.

White Marshall, J & Walsh, C 2005 *Illaunloughan Island: An Early Medieval Monastery in County Kerry*. Bray: Wordwell.

Whitfield, N 1999 'Design and units of measure in The Hunterston brooch', *in* Hawkes, J & Mills, S (eds), *Northumbria's Golden Age*, 296–314. Stroud: Sutton.

Wickham, C 2005 *Framing the Early Middle Ages: Europe and the Mediterranean, 400–800*. Oxford: Oxford University Press.

Willsher, B 1985 *How to Record Scottish Graveyards: A Companion to Understanding Scottish Graveyards*. Edinburgh: Council for British Archaeology Scotland.

Wingate, M 1985 *Small-scale Lime Burning: A Practical Introduction*. London: Intermediate Technology Publications.

Winlow, S 2011 'A review of Pictish burial practices in Tayside and Fife', *in* Driscoll et al (eds), 335–69. Leiden: Brill.

Woolf, A 2006 'Dún Nechtain, Fortriu and the geography of the Picts', *The Scottish Historical Review* 85.2, 182–201.

Woolf, A 2007 *From Pictland to Alba 789–1070*. Edinburgh: Edinburgh University Press.

Wormald, P 1996 'The emergence of the Regnum Scottorum: A Carolingian hegemony?', *in* Crawford (ed), 131–60. St Andrews: University of St Andrews.

Wright, T (ed) 2011 [1848] *Early Travels in Palestine Comprising the Narratives of Arculf, Willibald, Bernard, Saewulf, Sigurd, Benjamin of Tudela, Sir John Maundeville de la Broquière and Maundrell*. London.

Y

Yeoman, P 2009 'Investigations on the May Island, and other early medieval churches and monasteries in Scotland', *in* Edwards (ed), 227–44. Leeds: Maney Publishing.

Youngs, S (ed) 1989 *'The Work of Angels': Masterpieces of Celtic Metalwork, 6th–9th Centuries AD*. London: British Museum.

Digest of Evidence

Contents of the Digest of Evidence

The online archive is held by the Archaeological Data Service and will be found using the following link: http://dx.doi.org/10.5284/1031216.

Digest 1 ARCHAEOLOGICAL INTERVENTIONS AT PORTMAHOMACK

Int No.	Location	Activity	Recorder	Date
1	ZONE E	Trial excavation across enclosure ditch	Harden	6/1991
2	ZONES D, E	Magnetometer survey	Garner-Lahire	3/1994
3	ZONES D, E	Resistivity	Garner-Lahire	3/1994
4	ZONES B–F	Contour survey	Copp	3/1994
5	ZONE A	Contour survey	Copp	3/1994
6	ZONE B	Churchyard map	Copp	3/1994
7	ZONE E	Trial excavation in South Field	Roe	9/1994
8	ZONE D	Trial excavation in Glebe Field	Garner-Lahire	9/1994
9	ZONES B–E	Radar survey	Sympkins	9/1994
10	ZONE E	Trial excavation in West Field	Garner-Lahire	9/1994
11	ZONE E, SECTOR 1	Horizon 2 mapping in South Field	Garner-Lahire/Spall	1995–2002
12	ZONE E	Cropmark mapping	Garner-Lahire	8/1995
13	ZONE A	Crypt clearance	Harden	1992–5
14	ZONE D, SECTOR 2	Horizon 2 mapping in the Glebe Field	Roe/Garner-Lahire/Spall	1996–2007
15	ZONE J, SECTOR 3	Horizon 2 mapping and excavation	Garner-Lahire	1996
16	ZONE B	Excavation of service trench (N)	Garner-Lahire	1996
17	ZONE A	Excavation in the church, east end	Roe	1996
18	ZONE B	Test pits around church exterior	Geddes	1996–7
19	ZONE A, SECTOR 4	Excavation in the crypt	Roe	1997
20	ZONE A, SECTOR 4	Excavation in the church, west end	Roe	1997
21	ZONE B	Watching brief on the churchyard wall	Robins	1997
22	ZONE B	Excavation of service trench tretrench (S)	Roe	1997
23	ZONE A, SECTOR 4	Recording of church building	Jones	1997
24	ZONE D, SECTOR 2	Excavation in the Glebe Field (S)	Garner-Lahire/Spall	1997–2007
25	ZONE E, SECTOR 1	Excavation in the South Field	Hummler	1997–8
26	ZONE D, SECTOR 2	Pit dug for the oil storage tank in the Glebe Field	Garner-Lahire	1998
27	ZONE D	Pit dug for the foundation of a bronze statue	Garner-Lahire	1999
28	ZONE B	Recording of memorials in the churchyard	Carver	1998–2002
29	ZONE D & E, SECTOR 1 & 2	Metal detector survey of spoil heaps and ploughsoil	Garner-Lahire	1999–2002
30	ZONE E	Watching brief on construction at Highfield plot	Garner-Lahire	2005

Digest 2 INDEX OF PERIODS, STRUCTURES AND CHURCHES

PERIODS

Period 0	to AD 550
Period 1	mid-sixth to late seventh century
Period 2	late seventh to early ninth century
Period 3	early ninth to twelfth century
Period 4	twelfth to sixteenth century
Period 5	seventeenth to twentieth century

STRUCTURES

S1	Bag-shaped building identified as metalsmith's Hall (Period 2) and Kiln Barn (Period 3) in Sector 1
S2	Rectangular enclosure south of S1 in Sector 1 (uncertain identity)
S3	Bag-shaped building north of S1 in Sector 1 (Periods 2–3)
S4	Stone-lined tank for vellum making in Sector 2 (Period 2)
S5	Bag-shaped building in Sector 1, east end (Period 3)
S6	Rectilinear enclosure in Sector 1, west end (uncertain identity)
S7	Water management features in Sector 2 (Period 2)
S8	Well adjacent to S1 in Sector 1 (Periods 2–3)
S9	Workshop and yard dedicated to vellum making in Sector 2 (Period 2)
S10	Ring ditch in Sector 2, F559, possible barrow (Period 1)
S11	Ring ditch in Sector 2, F547, workshop (Period 1)
S12	Ring ditch in Sector 1, F31 (Period 0)
S13	Road in Sector 2, F469, F18 (Periods 2–3)
S14	Ring ditch in Sector 3, possible barrow (Period 1)
S15	First Enclosure ditch in Sector 1 (Period 2)
S16	Second Enclosure ditch in Sector 2 (Period 2–4)
S17	Residence in Sector 2, north (Period 4)
S18	Smithy in Sector 2, south (Period 4)

CHURCHES

Church 1	Hypothetical Pictish stone church implied by the east wall of the crypt (Period 2)
Church 2	Unicameral chapel of the twelfth century (Period 4)
Church 3	Twelfth-century chapel extended with an eastern chancel (Period 4)
Church 4	Thirteenth–sixteenth-century church with belfry and crypt (Period 4)
Church 5	Seventeenth-century building reordered in response to the Reformation (Period 5)
Church 6	Reconstructed building of the mid-eighteenth century (Period 5)
Church 7	Modified building of the late eighteenthth/early nineteenth century (Period 5)
Church 8	Form of the building from the Disruption of 1843 until redundancy in 1946 (Period 5)

Digest 3 RADIOCARBON DATES

3.1 Radiocarbon dating and Bayesian modelling

DEREK HAMILTON (Scottish Universities Environmental Research Centre)

Between 1992 and 2011, seventy-two radiocarbon measurements were produced from seventy-one samples representing seventy individual archaeological contexts from the Tarbat Discovery Programme. In total, the pool of samples comprised thirty-six on human bone, eight on charcoal, eight on charred grain, seven on wood, five on animal bone, four on humic acids from bulk organic sediment, three on waterlogged seeds and one on cremated animal bone.

Of the seventy-one samples, six samples (three human bone and three bulk organic sediment) were submitted to the Scottish Universities Research and Reactor Centre, East Kilbride, and measured by liquid scintillation counting. The human bone was pretreated with a modified Longin (1971) method while the sediment was pretreated as described in Stenhouse and Baxter (1983), with the humic acid fraction reserved for dating. The samples were further processed and measured as described by Noakes et al (1965). These results are identified by their GU- number.

Forty-eight samples were submitted to the Scottish Universities Environmental Research Centre, East Kilbride, for Accelerator Mass Spectrometry dating (AMS). The twenty-five samples of human bone and five animal bone samples were pretreated using a modified Longin (1971) method. The twenty-one samples of charcoal and plant macrofossils were pretreated as described in Stenhouse and Baxter (1983). The sample of cremated animal bone was pretreated using the methods of Lanting et al (2001). All the samples were combusted as described in Vandeputte et al (1996), graphitised as described in Slota et al (1987), and measured by AMS as described in Xu et al (2004). These samples are identified by their SUERC- number.

The remaining samples were submitted to the Oxford Radiocarbon Accelerator Unit for AMS dating. The one sample of human bone was pretreated following the original 'ultrafiltration' method detailed in Bronk Ramsey et al (2000), while the remaining twelve samples were pretreated using the improved 'ultrafiltration' method described in Bronk Ramsey et al (2004a). The five samples of charcoal and wood were pretreated following methods described in Hedges et al (1989). The samples were further processed and measured as described in Bronk Ramsey et al (2004b). These are identified by their OxA- number.

Both laboratories maintain rigorous internal quality assurance procedures and participation in international intercomparisons (Scott 2003) indicate no laboratory offsets; thus validating the measurement precision quoted for the radiocarbon ages.

The radiocarbon results are given in Table D3.2, and are quoted in accordance with the international standard known as the Trondheim convention (Stuiver & Kra 1986). They are conventional radiocarbon ages (Stuiver & Polach 1977).

The calibrations of the results, relating the radiocarbon measurements directly to calendar dates, are also given in Table D3.2. All have been calculated using the internationally agreed calibration curve of Reimer et al (2009) and the computer program OxCal v4.1 (Bronk Ramsey 1995; 1998; 2001; 2009). The calibrated date ranges cited in the text are those for 95% confidence. They are quoted in the form recommended by Mook (1986), with the end points rounded outwards to ten years if the error term is greater than or equal to twenty-five radiocarbon years or to five years if it is less. The ranges quoted in italics are posterior density estimates derived from mathematical modelling. The ranges in roman type in Table D3.2 have been calculated according to the maximum intercept method (Stuiver & Reimer 1986). All other ranges are derived from the probability method (Stuiver & Reimer 1993).

Methodological approach

A Bayesian approach has been adopted for the interpretation of the chronology (Buck et al 1996). Although the simple calibrated dates are accurate estimates of the dates of the samples, this is usually not what archaeologists really wish to know. It is the dates of the archaeological events represented by those samples that are of interest. In the case of the Tarbat Discovery Programme, it is the chronology of the church and graveyard and that of the sequence of settlements beyond them that are under consideration. The dates of the overall chronological activity in each Sector can be estimated, not only using the absolute dating information from the radiocarbon measurements on the samples, but also by using the stratigraphic relationships between samples.

Fortunately, methodology is now available which allows the combination of these different types of information explicitly, to produce realistic estimates of the dates of archaeological interest. It should be emphasised that the *posterior density estimates* produced by this modelling are not absolute. They are interpretative *estimates*, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives.

The technique used is a form of Markov Chain Monte Carlo sampling, and has been applied using the program OxCal v4.2. Details of the algorithms employed by this program are available from the on-line manual or in Bronk Ramsey (1995; 1998; 2001; 2009). The algorithm used in the model described below can be derived directly from the model structure shown in Illus D3.1.2–5.

Stable isotopes and marine correction

The C:N ratios for these samples suggest that bone preservation was sufficiently good to have confidence in the accuracy of the radiocarbon determinations (Table D3.2; Masters 1987; Tuross et al 1988).

The $\delta^{13}C$ and $\delta^{15}N$ values from the majority of the earlier burials from this site (Illus D3.1) suggest a very small marine component in the diet, which is not likely to affect the radiocarbon dating significantly (Chisholm et al 1982; Schoeninger et al 1983). The same cannot be said for the later burials, nearly all of which have a moderate to significant marine signature.

When humans and non-human animals consume marine resources, the radiocarbon age of their bones will be older than expected. The reason for this is that while the production and distribution of radiocarbon in the atmosphere is virtually instantaneous, so that terrestrial plants and animals that feed on those plants will have their ratio of radiocarbon in equilibrium, when ^{14}C enters the oceans it does not become distributed instantaneously and 'hangs around' for a while at some depth. The result is that the marine carbon cycle is not in sync with the terrestrial, and marine ages are too old when calibrated with the terrestrial radiocarbon calibration curve.

It is possible to 'correct' radiocarbon ages for material whose protein has come from

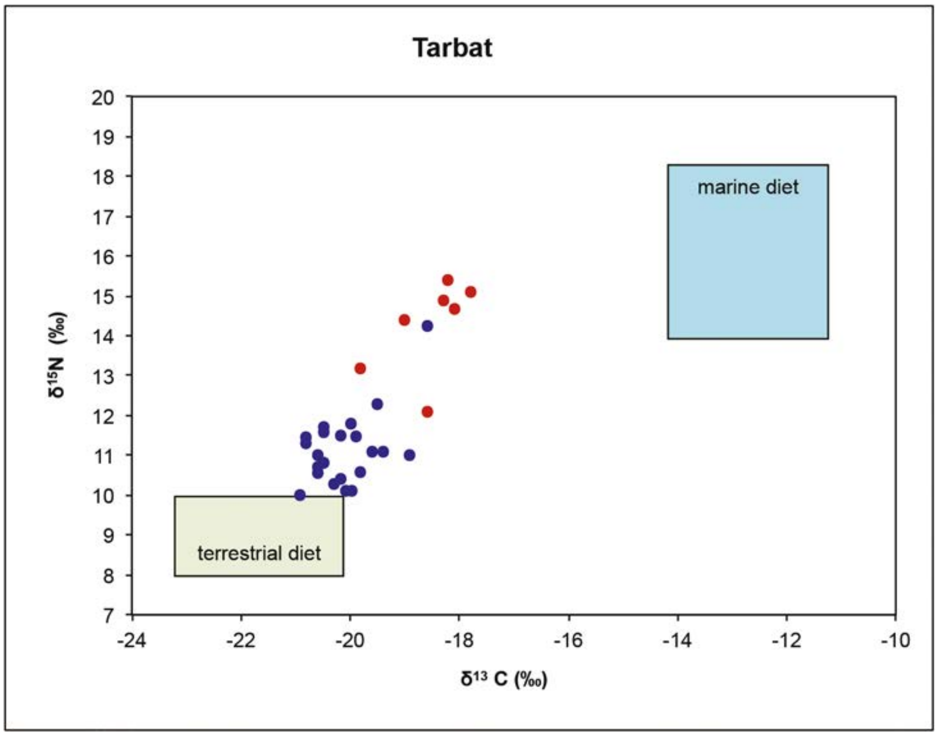


Illustration D3.1.1

Plot of the stable isotope results for those human bone samples where there is both a δ^{13}C and δ^{15}N measurement available. The points plotted in blue are from earlier burials, while those in red are from the later burials. The boxes for the expected values of fully terrestrial versus fully marine values are based on the data of Mays (1998, fig 9)

both terrestrial and marine sources (Bayliss et al 2004). It should be stressed that this marine correction is, in essence, a modelled radiocarbon calibration that uses a mixture of the internationally agreed calibration curves IntCal09 and Marine09 of Reimer et al (2009). It is a modelled calibration because there is more than one way to determine the percentage of diet that derived from terrestrial/marine resources. As such, the results will vary slightly, depending on the method used.

The method employed here was to calculate the percentage of the diet that was terrestrial by using −12.5‰ and −20.0‰ as the end members for the δ^{13}C, where −20.0‰ was the equivalent of 100% terrestrial and −12.5‰ was equal to 100% marine. The local marine reservoir correction (ΔR) of −29 ± 51 was used (Russell 2011). Radiocarbon results with a marine component that was determined to be 1% or greater were corrected using OxCal and 'mixing' the two calibration curves at the calculated percentage. The corrected radiocarbon dates are given in Table D3.2, and these same corrected dates were used throughout the modelling of the results from Tarbat.

The Tarbat discovery samples

Except for samples submitted from a palaeo-environmental sequence (discussed below), all the samples were single-entities and from short-lived species (Ashmore 1999). The overall model employed combines the observed stratigraphy in the three excavated and dated sectors (Sectors 1, 2 and 4) with the samples discussed within their place in the overall site periodisation. While the samples are discussed below by period and then by sector, the model maintains independence between the dating of the individual sectors and uses the multiple estimations for period transitions across the sectors as a point for later discussion. Furthermore, the model only stipulates that the Periods are sequential, and that they are not necessarily temporally contiguous, which is attested to in some cases by the archaeology (eg wind-blown sand deposits at the transition from Period 1 and 2 in Sectors 2 and 4, and the burning event that marked the end of Period 2).

Period 1

Seven features were dated from Sector 2 and placed into Period 1. There was no stratigraphy between these features. There is a result (SUERC-14989) from a bulk sample (C2310/4874) of waterlogged weed seeds from the marsh. SUERC-13277 is a result from a waterlogged willow stake in a pool (F436/C2224). SUERC-33420 is from a charred hazelnut shell recovered from a hearth (F535/C3406). SUERC-33421 is from a fragment of hazel woven to form the lining of a well (F527/C3570). SUERC-13263 is on a carbonised barley grain from the fill of a pre-church ditch (F129/C1345). There are two results (SUERC-13256 and -33416) on two burials (Burial 186/F515/C2987 and Burial 187/F516/C3346) that were excavated outside the church, but which form part of the cist burial cemetery that was excavated within the church. Finally, SUERC-14994 is on a fragment of waterlogged birch from a context (C2296/4873) that represents the end of the Period 1 peat deposits that were superseded by the pool in Period 2.

Six features, forming two sequences, in Sector 4 provided eight results. The first sequence of burials begins with Burial 170, a simple inhumation, with one result (SUERC-33413) on a rib, which is followed by another simple inhumation (Burial 169) from which there is a result (SUERC-33412) on a rib.

The second sequence begins with two results (SUERC-13255 and OxA-13483) from cist Burial 162. These two results are statistically consistent (T' = 0.4; n = 1; T'(5%) = 3.8 (Ward & Wilson 1978) and have been combined prior to calibration to form mean 162 (1546 ± 21 BP). Burial 162 is stratigraphically coeval with Burial 172, from which there are two results (SUERC-37079 and OxA-9699) that are not statistically consistent at 2-sigma (T' = 5.3; n = 1; T'(5%) = 3.8: Ward & Wilson 1978), though they are at less than 3-sigma (T'(1%) = 6.6). Given the two samples are from the same body, it is more likely that the measurements from the two labs are only slightly more variable than would usually be expected. The results have been combined prior to calibration to form mean 172 (1441 ± 23 BP). Burial 172 is followed stratigraphically by cist Burial 146, which produced a single result (SUERC-37078) on a metatarsal. Burial 146 is of similar stratigraphic age to Burial 163 (they are not actually in contact), which produced a result (OxA-13484) on a leg bone from the probable shrouded inhumation.

Period 2

In Sector 1, there is one result (OxA-10159) from a wooden stake recovered in situ in the outer enclosure ditch. Three samples of bulked organic sediment taken from the early fill of the outer enclosure ditch in 1991 (Int 1) gave dates in the later Iron Age (GU-3265, -3266, and -3267). There is a result (SUERC-2621) on a fragment of cremated cattle bone recovered

Illustration D3.1.2
Simplified structure of the model for all three dated sectors at Tarbat

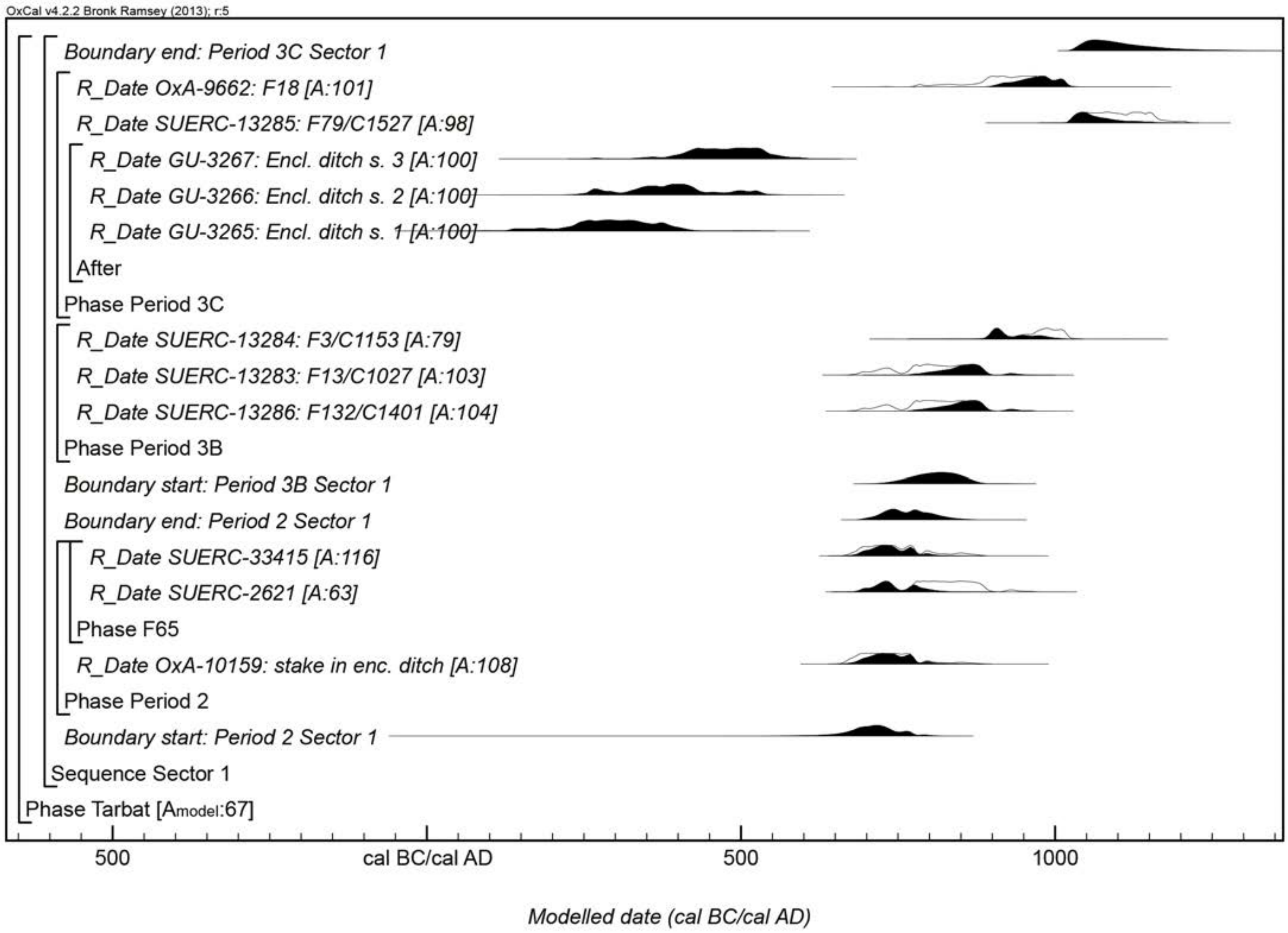


Illustration D3.1.3

Chronological model for the radiocarbon dates from Sector 1 at Tarbat. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements, two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model use. The other distributions correspond to aspects of the model. For example, *'start: Period 2 Sector 1'* is the estimated date that activity began at that site, based on the radiocarbon dating results. The large square 'brackets' along with the OxCal keywords define the overall model exactly

from the hearth (F65/C1141) in the Smith's Hall (S1), with a replicate measurement (SUERC-33415) made on a charred hazelnut shell from the same context. The two results are statistically consistent (T' = 1.2; v = 1; T'(5%) = 3.8: Ward & Wilson 1978) and could be the same actual age.

There are twelve radiocarbon-dated contexts from Period 2 in Sector 2. A single date (SUERC-13581) is available from charred barley recovered the hearth (F495/C2786) in S9. Four dates are available from features in the S9 yard. SUERC-13272 is a result from a charred barley grain recovered from a hearth in the yard (F445/C2468). SUERC-13266 is from a cattle metatarsal recovered as part of a 'bone raft' beneath S9 yard wall (F480/C3122). SUERC-13267 is from one of an alignment of worked cattle metapodials in the S9 yard (F393/C1957), and this result is the earlier in a sequence with SUERC-13271, a result on a cattle metatarsal that was one in a cache of metapodials in the workshop yard (C2000). SUERC-13265 is on a cattle metatarsal from a horizon of butchered bone on the eastern roadside surface (C2335), and SUERC-13276 of a sample from a waterlogged willow stake that was recovered in situ in the nearby stream (F404/C2295).

The Period 2 sequence in Sector 2 ended with a widespread fire, providing a strong stratigraphic horizon in this sector. A burnt hazel stake from the terrace wall (F490/C2697) produced SUERC-13273, and OxA-9664 came from a sample of burnt structural timber from primary burning horizon [C1030]. These final two results were potentially in use for an extended period of time prior to the destruction level that they form a part of, and so the results are included here as providing a *terminus post quem* for that destruction. A Frisian sceat, originating in the Rhineland in AD 715–35 was redeposited in a pit of Period 3 (F185) and also provides a *tpq* for the fire. There is one result that relates directly to the date of the fire (SUERC-13274 and -13275) on burnt hazel wattles from the terrace wall that formed part of a primary burning horizon (F483/C2584 and C2704, respectively), while a bulk sample of waterlogged elder seeds in the latest pool deposit (C2310) produced SUERC-14995, which also marked the end of Period 2 in Sector 2.

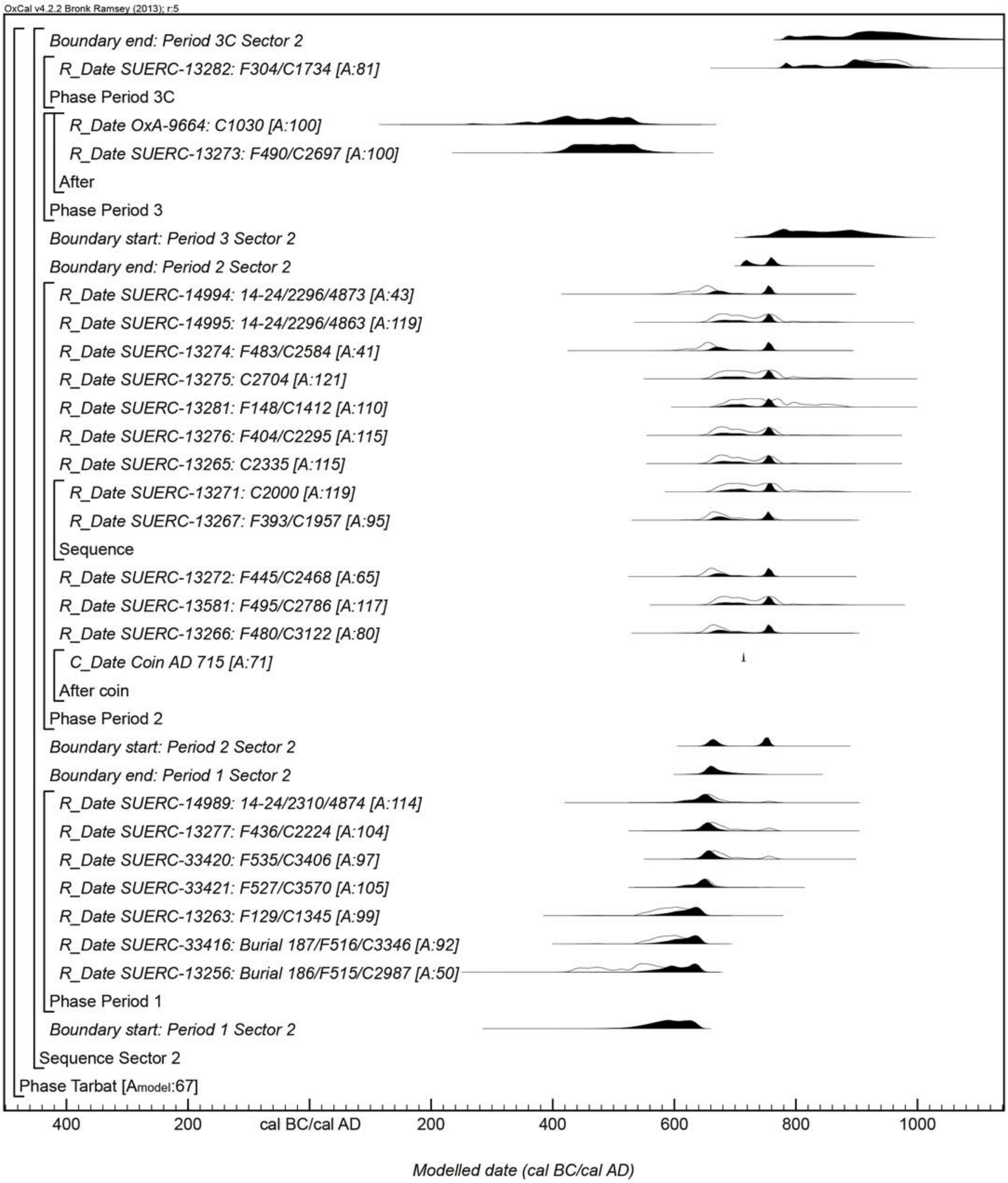


Illustration D3.1.4
Chronological model for Sector 2 at Tarbat. The model structure is as described in Illus D3.1.3

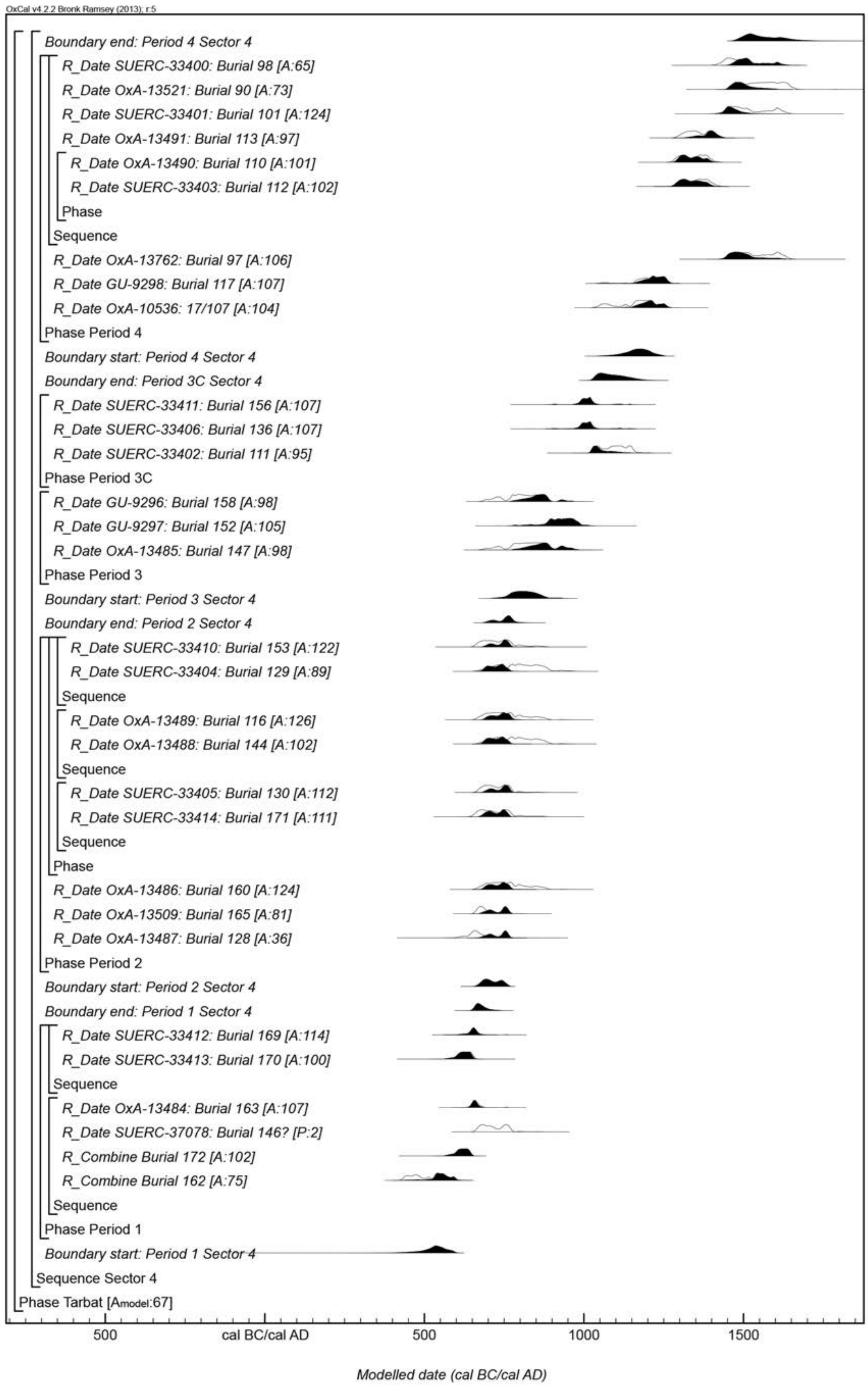


Illustration D3.1.5
Chronological model for Sector 4 at Tarbat. The model structure is as described in Illus D3.1.3

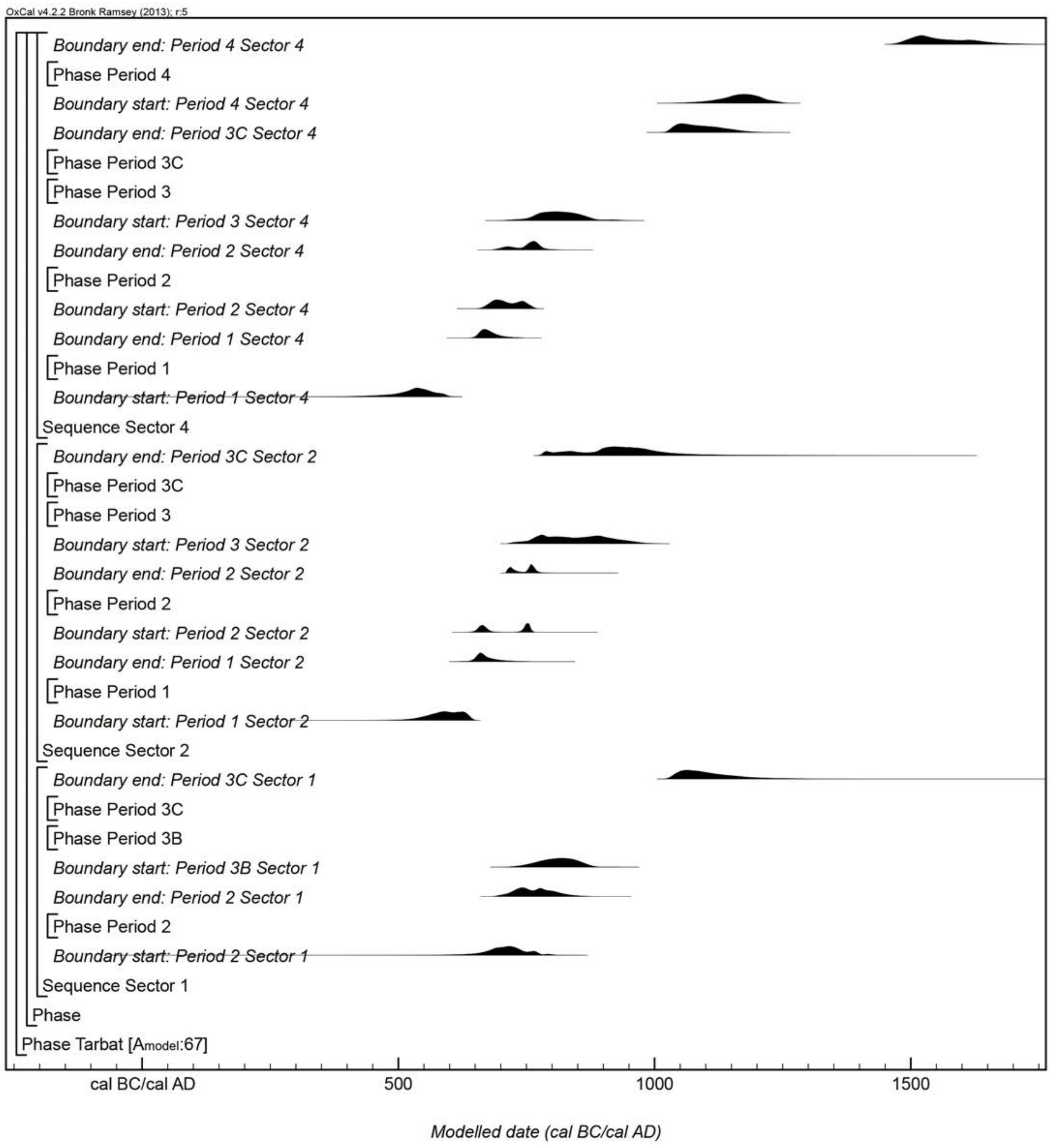


Illustration D3.1.6
Summary of the transitions of all three sectors dated and modelled from Tarbat

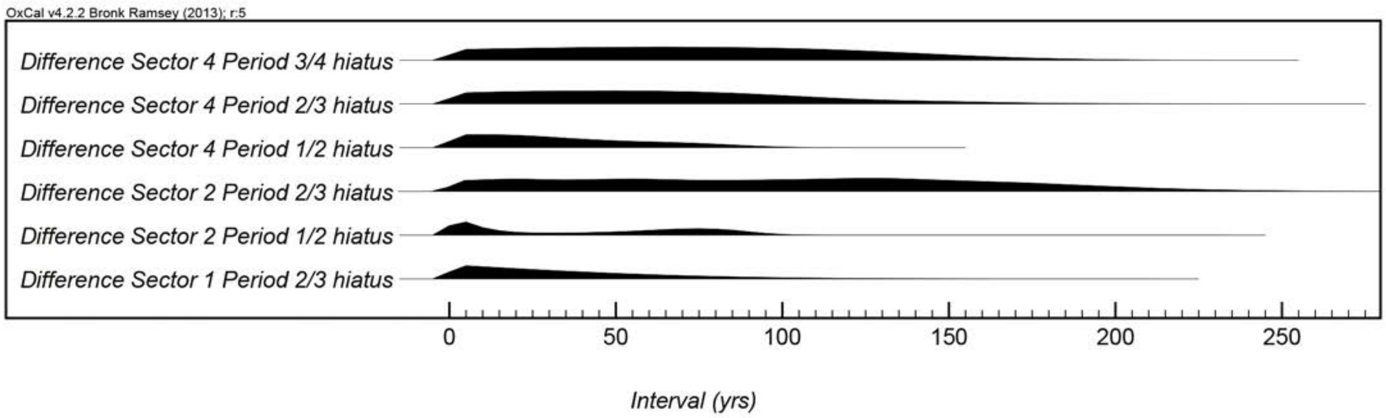


Illustration D3.1.7
Ranges for hiatuses, and potential hiatuses, noted in the archaeology from Tarbat, calculated from the probability estimates shown in the models for Sectors 1, 2 and 4

There are nine burials that belong to Period 2 in Sector 4. The head-support Burial 128 has a result (OxA-13487) on a humerus. Burial 165 provided a result (OxA-13509) from the tibia of this probable simple inhumation. The probable shrouded inhumation (Burial 160) provided a result (OxA-13486) on a leg bone. In addition to the previous three burials, there are three sequences of burials. There is a result (OxA-13488) on a humerus from a simple inhumation, Burial 144, which is followed by head-support Burial 116, from which there is a result (OxA-13489) on a humerus. The second sequence begins with a result (SUERC-33414) from the rib of a simple inhumation (Burial 171), that is followed by Burial 130, from which there is a result (SUERC-33405) on a rib from a probable shrouded inhumation. The third sequence of burials begins with a result (SUERC-33404) on a rib bone from a shrouded inhumation (Burial 129), which is followed by a result (SUERC-33410) on a rib from shrouded inhumation Burial 153.

Period 3

In Sector 1 and 2, Period 3A represents the revival of activity and Period 3B a period of abandon.

Period 3A

In Sector 1 there are two results on single charred barley grains from oval S5 features: SUERC-13283 is from the central pit (F13/C1027), and SUERC-13284 is from the ditch of the same structure (F3/C1153). These two dates relate to grain from the same structure and so should be contemporary, which would suggest the structure likely dates to the ninth or tenth century.

In Sector 2, SUERC-13281 is on a fragment of hazel charcoal from a metal-working hearth (F148/C1412) and represents the first stratigraphic event following the fire in Sector 2.

Period 3B

In Sector 1, SUERC-13285 is on a single charred barley grain recovered from the flue

Table D3.2.2
Calibrated dates for radiocarbon results on samples of human bone that have been identified with a marine component

Lab ID [Burial ID]	Radiocarbon age (BP)	Modelled % marine	Marine-corrected calibrated date (95% confidence)
OxA-13521 [Burial 90]	439 ± 30	29.0	cal AD 1460–1660
OxA-13762 [Burial 97]	475 ± 27	25.3	cal AD 1440–1640
SUERC-33400 [Burial 98]	520 ± 30	24.0	cal AD 1420–1620
OxA-13490 [Burial 110]	644 ± 27	2.7	cal AD 1290–1410
SUERC-33401 [Burial 101]	450 ± 30	13.3	cal AD 1440–1630
SUERC-33403 [Burial 112]	710 ± 30	22.7	cal AD 1280–1420
OxA-13491 [Burial 113]	659 ± 27	18.7	cal AD 1290–1430
OxA-13489 [Burial 116]	1268 ± 28	3.0	cal AD 680–880
OxA-13487 [Burial 128]	1364 ± 28	1.0	cal AD 640–770
OxA-13488 [Burial 144]	1304 ± 28	19.0	cal AD 680–890
OxA-13485 [Burial 147]	1213 ± 31	5.0	cal AD 720–960
OxA-13486 [Burial 160]	1283 ± 27	8.0	cal AD 680–880
SUERC-33414 [Burial 171]	1325 ± 30	6.7	cal AD 660–850

of the converted S1 (F79/C1527) and should represent its last use. OxA-9662 is on a piece of unidentified charcoal that is part of the ultimate fill of the tributary ditch. SUERC-13286 is from a fragment of waterlogged willow that was in a deposit related to the early disuse of the enclosure ditch (F132/C1401). These events should be broadly contemporary.

In Sector 2, a pit that contained an articulated cow burial (F304/C1734) produced a result (SUERC-13282) from a metatarsal. This represents the final disuse of the road (S13).

There are three results from Period 3 burials in Sector 4. There is one result (OxA-13485) on the humerus from a possible wicker-lined burial (147). A second result (GU-9297) is available from the humerus of head-support Burial 152, while the right humerus of shrouded inhumation Burial 158 provides the third result (GU-9296). From head-support inhumation Burial 111, there is a result (SUERC-33402) on a rib. There are results from two bodies in a possible double burial. From the first body (Burial 156) there is a result (SUERC-33411) on a rib, and from the second (Burial 136) there is a result (SUERC-33406) on a rib.

Period 4

The earliest dated events in Sector 4 (assigned to Period 4A) were a bell-casting pit (F107/C1220), which gave a result (OxA-10536) on a fragment of unidentified charcoal, and a single Burial 117, which gave a result (GU-9298) on a humerus. These are contemporary with the early church (Church 2/3).

There were three burials broadly contemporary with the early years of Church 4 (Period 4B): Burial 110, from which there is a result (OxA-13490) on a juvenile tibia, Burial 112, from which there is a result (SUERC-33403) on a rib. There is a result (OxA-13941) from the tibia of a coffined, shrouded Burial 113.

Four other burials belong to a later period, associated with the refurbishment of Church 4 following a fire (Period 4C). The first is a coffined, shrouded Burial 101 dated by a result (SUERC-33401) from a rib. Coffined Burial 90 produced result OxA-13521 on a humerus, while the shrouded Burial 98 produced a result (SUERC-33400) on a rib. These three burials were stratigraphically sequential to those of Period 4B. Another shrouded inhumation (Burial 97) had a humerus dated (OxA-13762).

Bayesian modelling results

The model that follows the relationships given in the section above (Illus D3.1.2) has good agreement between the archaeology and the radiocarbon dates ($A_{model} = 67$). The results for the start and end date of the major periods are given in Table D3.2.3 and Illus D3.1.3–6.

The chronological model for Sector 1 (Illus D3.1.3) begins with Period 2 and ends with a general Period 3. The model estimates that the potential hiatus between the two periods in this sector was *0–115 years* (*95% probability*; Illus 7; *Sector 1 Period 2/3 hiatus*), but maybe only up to *60 years* (*68% probability*).

The chronological model for Sector 2 (Illus D3.1.4) has a greater time-depth, beginning with Period 1 and continuing until Period 3B. Here the hiatus between Periods 1 and 2, as evidenced by the wind-blown sand deposit, was *0–95 years* (*95% probability*; Illus D3.1.7; *Sector 2 Period 1/2 hiatus*), and probably either *0–20 years* (*49% probability*) or *60–85 years* (*19% probability*). There was a break in activity between Periods 2 and 3, evidenced in Sector 2 by the site-wide fire that included the breaking up of sculpture. The Periods 2 and 3 are easily distinguishable and there is the possibility that there was another hiatus in activity at this time

Table D3.2.3
Probability ranges for the start and end dates of the different Periods, by Sector, derived from the modelling shown in Illus D3.3–5

	Sector 1 (Illus D3.3)	Sector 2 (Illus D3.4)	Sector 4 (Illus D3.5)
start: Period 1		cal AD 525–650 (95%) cal AD 570–635 (68%)	cal AD 420–600 (95%) cal AD 500–80 (68%)
end: Period 1		cal AD 635–730 (95%) cal AD 645–85 (68%)	cal AD 645–725 (95%) cal AD 655–90 (68%)
start: Period 2	cal AD 610–780 (95%) cal AD 670–745 (67%) or cal AD 760–770 (1%)	cal AD 645–85 (50%) or cal AD 735–65 (45%) cal AD 655–75 (35%) or cal AD 745–60 (33%)	cal AD 670–760 (95%) cal AD 675–715 (46%) or cal AD 730–50 (22%)
end: Period 2	cal AD 700–840 (95%) cal AD 725–800 (68%)	cal AD 710–80 (95%) cal AD 710–25 (27%) or cal AD 750–70 (41%)	cal AD 690–790 (95%) cal AD 705–25 (11%) or cal AD 745–80 (58%)
start: Period 3		cal AD 735–965 (95%) cal AD 765–840 (38%) or cal AD 850–910 (30%)	cal AD 720–895 (95%) cal AD 770–855 (68%)
end: Period 3			
start: Period 3A	cal AD 740–880 (95%) cal AD 775–855 (68%)		
end: Period 3B	cal AD 1025–1250 (95%) cal AD 1035–1135 (68%)	cal AD 775–1130 (95%) cal AD 785–95 (2%) or cal AD 815–850 (7%) or cal AD 885–1015 (59%)	cal AD 1025–1175 (95%) cal AD 1035–1120 (68%)
start: Period 4			cal AD 1085–1245 (95%) cal AD 1135–1215 (68%)
end: Period 4			cal AD 1470–1690 (95%) cal AD 1490–1590 (61%) or cal AD 1605–25 (7%)

that lasted *0–210 years* (*95% probability*; Illus D3.7; *Sector 2 Period 2/3 hiatus*), and probably *5–150 years* (*68% probability*).

Sector 4 (Illus D3.1.5) has the greatest time-depth, and runs from Period 1 through Period 4. Here the hiatus between Periods 1 and 2 lasted *0–85 years* (*95% probability*; Illus D3.1.7; *Sector 4 Period 1/2 hiatus*), and probably for up to *55 years* (*68% probability*). The hiatus between Periods 2 and 3 lasted for *0–150 years* (*95% probability*; Illus D3.1.7; *Sector 4 Period 2/3 hiatus*), and probably for *1–90 years* (*68% probability*). The break between Periods 3 and 4 lasted for *0–160 years* (*95% probability*; Illus D3.1.7; *Sector 4 Period 3/4 hiatus*), and probably for *5–110 years* (*68% probability*).

It should be noted that, based on the radiocarbon data alone, there is no clear evidence for a hiatus between any of the periods. The calculation of the difference between the end probability for one period and the start of the next always begins in the negative, which indicates the possibility for no hiatus. Given the archaeological evidence for hiatuses between periods in some sectors, it is worthwhile summarising the data based on that evidence. The hiatus between Periods 1 and 2 was dated in Sectors 2 and 4, and suggested a break in activity of perhaps *one century* (*95% probability*), but perhaps only *a half-century* (*68% probability*). The estimated period for the break in activity following the widespread burning (Period 2 to 3) is more varied across the site and ranges from one to two centuries, but the consensus at *68% probability* is *between one-half and three-quarters of a century*. Any break in activity between Periods 3 and 4 would have probably lasted for *up to a century* (*68% probability*), though it might have lasted closer to a *century and a half* (*95% probability*).

References

Ashmore, P J 1999 'Radiocarbon dating: avoiding errors by avoiding mixed samples', *Antiquity*, 73(279): 124–30.

Bayliss, A, Shepherd Popescu, E, Beavan-Athfield, N, Bronk Ramsey, C, Cook, G T & Locker, A 2004 'The potential significance of dietary offsets for the interpretation of radiocarbon dates: an archaeologically significant example from medieval Norwich', *Journal of Archaeological Science* 31: 563–75.

Bronk Ramsey, C 1995 'Radiocarbon calibration and analysis of stratigraphy: the OxCal program', *Radiocarbon* 37: 425–30.

Bronk Ramsey, C 1998 'Probability and dating', *Radiocarbon* 40(1): 461–74.

Bronk Ramsey, C 2001 'Development of the radiocarbon calibration program', *Radiocarbon* 43: 355–63.

Bronk Ramsey, C 2009 'Bayesian analysis of radio-carbon dates', *Radiocarbon* 51(1): 337–60.

Bronk Ramsey, C, Pettitt, P B, Hedges, R E M, Hodgins, G W L & Owen, D C 2000 'Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 30', *Archaeometry* 42(2): 459–79.

Bronk Ramsey, C, Higham, T, Bowles, A, & Hedges, R 2004a 'Improvements to the pretreatment of bone at Oxford', *Radiocarbon* 46(1): 155–63.

Bronk Ramsey, C, Higham, T F G & Leach, P 2004b 'Towards high-precision AMS: progress and limitations', *Radiocarbon* 46(1): 17–24.

Buck, C E, Cavanagh, W G & Litton, C D 1996 *Bayesian approach to interpreting archaeological data*. Chichester: John Wiley & Sons, Ltd.

Chisholm, B S, Nelson, D E & Schwarcz, H P 1982 'Stable carbon isotope ratios as a measure of marine versus terrestrial protein in ancient diets', *Science* 216: 1131–2.

Hedges, R E M, Law, I A, Bronk Ramsey, C & Housley, R A 1989 'The Oxford Accelerator Mass Spectrometry facility: technical developments in routine dating', *Archaeometry* 31: 99–113.

Lanting, J N, Aerts-Bijma, A T & van der Plicht, J 2001 'Dating of cremated bone', *Radiocarbon* 43(2A): 249–54.

Longin, R 1971 'New method of collagen extraction for radiocarbon dating', *Nature* 230: 241–2.

Mant, A K 1987 'Knowledge acquired from post-War exhumations', *in* Boddington, A, Garland, AN & Janaway R C (eds) *Death, decay, and reconstruction*, 65–80. Manchester: Manchester University Press.

Masters, P M 1987 'Preferential preservation of non-collagenous protein during bone diagenesis: implications for chronometric and stable isotope measurements', *Geochimica et Cosmochimica Acta* 51: 3209–14.

Mays, S 1998 *The Archaeology of Human Bones*. London: Routledge.

Mook, W G 1986 'Business meeting: Recommendations/Resolutions adopted by the Twelfth International Radiocarbon Conference', *Radiocarbon* 28: 799.

Noakes, J E, Kim, S M & Stipp, J J 1965 'Chemical and counting advances in Liquid Scintillation Age dating', *in* Olsson, E A & Chatter, R M (eds) *Proceedings of the Sixth International Conference on Radiocarbon and Tritium Dating*, 68–92. Pullman: Washington State University Press.

Reimer, P J, Baillie, M G L, Bard, E, Bayliss, A, Beck, J W, Blackwell, P G, Bronk Ramsey, C, Buck, C E, Burr, G S, Edwards, R L, Friedrich, M, Grootes, P M, Guilderson, T P, Hajdas, I, Heaton, T J, Hogg, A G, Hughen, K A, Kaiser, K F, Kromer, B, McCormac, F G, Manning, S W, Reimer, R W, Richards, D A, Southon, J R, Talamo, S, Turney, C S M, van der Plicht, J & Weyhenmeyer, C E 2009 'INTCAL09 and MARINE09 radiocarbon age calibration curves, 0–50,000 years cal BP', *Radiocarbon* 51(4): 1111–50.

Russell, N 2011 *Marine radiocarbon reservoir effects (MRE) in archaeology: temporal and spatial changes through the Holocene within the UK coastal environment*. Unpublished PhD thesis, University of Glasgow.

Schoeninger, M J, Deniro, M J & Tauber, H 1983 'Stable nitrogen isotope ratios of bone collagen reflect marine and terrestrial components of prehistoric diets', *Science* 216: 1381–3.

Scott, E M 2003 'The Third International Radiocarbon Intercomparison (TIRI) and the Fourth International Radiocarbon Intercomparison (FIRI) 1990–2002: results, analysis, and conclusions', *Radiocarbon*, 45(2): 135–408.

Slota Jr, P J, Jull, A J T, Linick, T W & Toolin, L J 1987 'Preparation of small samples for ^{14}C accelerator targets by catalytic reduction of CO', *Radiocarbon* 29(2): 303–6.

Stenhouse, M J & Baxter, M S 1983 '^{14}C reproducibility: evidence from routine dating of archaeological samples', *PACT* 8: 147–61.

Stuiver, M & Polach, H A 1977 'Reporting of ^{14}C data', *Radiocarbon* 19(3): 355–63.

Stuiver, M & Kra, R S 1986 'Editorial comment', *Radiocarbon* 28(2B): ii.

Stuiver, M & Reimer, P J 1986 'A computer program from radiocarbon age calibration', *Radiocarbon* 28: 1022–30.

Stuiver, M & Reimer, P J 1993 'Extended ^{14}C data base and revised CALIB 3.0 ^{14}C calibration program', *Radiocarbon* 35(1): 215–30.

Tuross, N, Fogel, M L & Hare, P E 1988 'Variability in the preservation of the isotopic composition of collagen from fossil bone', *Geochimica et Cosmochimica Acta*, 52: 929–35.

Vandeputte, K, Moens, L & Dams, R 1996 'Improved sealed-tube combustion of organic samples to CO_2 for stable isotope analysis, radiocarbon dating and percent carbon determinations', *Analytical Letters* 29(15): 2761–73.

Ward, G K & Wilson, S R 1978 'Procedures for comparing and combining radiocarbon age determinations: a critique', *Archaeometry*, 20: 19–32.

Xu, S, Anderson, R, Bryant, C, Cook, G T, Dougans, A, Freeman, S, Naysmith, P, Schnabel, C & Scott, E M 2004 'Capabilities of the new SUERC 5MV AMS facility for ^{14}C dating', *Radiocarbon*, 46(1): 59–64.

D3.2
Table of Radiocarbon determinations

Lab ID	Context	Material type	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Radio-carbon Age (BP)	Calibrated date (95% confidence)
OxA-13521	Burial 90: shrouded inhumation	human bone: male; right humerus	−17.8	15.1	3.3	439 ± 30	cal AD 1420–1480*
OxA-13762	Burial 97: shrouded inhumation	human bone: ?female; right humerus	−18.1	14.7	3.3	475 ± 27	cal AD 1410–1450*
SUERC-33400	Burial 98: coffined inhumation	human bone: male; rib	−17.9	15.4	3.2	520 ± 30	cal AD 1320–1450*
SUERC-33401	Burial 101: coffined, shrouded inhumation	human bone: female; rib	−18.9	14.4	3.2	450 ± 30	cal AD 1410–1470*
OxA-13490	Burial 110: simple inhumation	human bone: juvenile; right tibia	−19.8	13.2	3.3	644 ± 27	cal AD 1280–1400*
SUERC-33402	Burial 111: head-support inhumation	human bone: male; rib	−20.2	11.5	3.3	945 ± 30	cal AD 1020–1170
SUERC-33403	Burial 112: coffined inhumation	human bone: male; rib	−17.9	14.9	3.3	710 ± 30	cal AD 1260–1380*
OxA-13491	Burial 113: coffined, shrouded inhumation	human bone: male; right tibia	−18.6	12.1	3.2	659 ± 27	cal AD 1270–1400*
OxA-13489	Burial 116: head-support burial	human bone: male; left humerus	−19.8	10.6	3.3	1268 ± 28	cal AD 660–810*
GU-9298	Burial 117: simple inhumation	human bone: male; right humerus	−20.5	–	–	830 ± 35	cal AD 1150–1270
OxA-13487	Burial 128: head-support burial	human bone: ?male; right humerus	−19.9	11.5	3.5	1364 ± 28	cal AD 640–690*
SUERC-33404	Burial 129: shrouded inhumation	human bone: male; rib	−20.5	10.8	3.3	1255 ± 30	cal AD 670–880
SUERC-33405	Burial 130: probable shrouded inhumation	human bone: male; rib	−20.5	11.6	3.3	1280 ± 30	cal AD 660–780
SUERC-33406	Burial 136: possible double burial with Burial 156	human bone: male; rib	−20.8	11.5	3.3	1020 ± 30	cal AD 970–1040
OxA-13488	Burial 144: simple inhumation	human bone: male; right humerus	−18.6	14.2	3.4	1304 ± 28	cal AD 650–780*
SUERC-37078	Burial 146: possible cist burial	human bone: female; left 4th metatarsal	−20.8	10.6	3.3	1295 ± 30	cal AD 660–780
OxA-13485	Burial 147: possible wicker-lined burial	human bone: male; right humerus	−19.4	11.1	3.2	1213 ± 31	cal AD 690–900*
GU-9297	Burial 152: head-support burial	human bone: male; right humerus	−20.1	–	–	1120 ± 35	cal AD 780–1000
SUERC-33410	Burial 153: shrouded inhumation	human bone: male; rib	−20.0	11.8	3.3	1315 ± 30	cal AD 650–780
SUERC-33411	Burial 156: possible double burial with Burial 136; head-support burial	human bone: male; rib	−20.8	11.3	3.3	1020 ± 30	cal AD 970–1040
GU-9296	Burial 158: shrouded burial	human bone: male; right humerus	−20.2	–	–	1215 ± 35	cal AD 680–900
OxA-13486	Burial 160: probable shrouded inhumation	human bone: male; left femur or tibia	−19.6	11.1	3.3	1283 ± 27	cal AD 660–780*
SUERC-13255	Burial 162: cist burial	human bone: male; right tibia	−20.9	–	–	1565 ± 35	
OxA-13483	Burial 162: cist burial	human bone: male; left tibia	−21.0	10.4	3.3	1536 ± 26	
mean 162	T' = 0.4; v = 1; T'(5%) = 3.8					1546 ± 21	cal AD 430–575
OxA-13484	Burial 163: probable shrouded inhumation	human bone: male; left femur or tibia?	−20.6	11.0	3.3	1359 ± 26	cal AD 640–690
OxA-13509	Burial 165: probable simple inhumation	human bone: undetermined; right tibia	−20.6	10.6	3.2	1309 ± 26	cal AD 650–780
SUERC-33412	Burial 169: simple inhumation	human bone: male; rib	−20.2	10.4	3.2	1375 ± 30	cal AD 610–680
SUERC-33413	Burial 170: simple inhumation	human bone: male; rib	−20.5	11.7	3.3	1420 ± 30	cal AD 580–660
SUERC-33414	Burial 171: simple inhumation	human bone: male; rib	−19.1	12.3	3.3	1325 ± 30	cal AD 650–770*
OxA-9699	Burial 172: cist burial	human bone: female; right femur	−20.0	–	–	1498 ± 34	
SUERC-37079	Burial 172: cist burial	human bone: female; left second metatarsal	−20.7	10.7	3.3	1441 ± 23	
mean 172	T' = 5.3; v = 1; T'(5%) = 3.8					1441 ± 23	cal AD 570–650
SUERC-13256	Burial 186: cist burial in group of three burials	human bone: ?male; left rib	−20.3	10.3	3.4	1525 ± 35	cal AD 420–610
SUERC-33416	Burial 187: cist burial in group of three burials	human bone: male; rib	−20.6	10.7	3.4	1470 ± 30	cal AD 540–650
Balnabruach Burials							
SUERC-13257	Burial A at Balnabruach [Bal A]	human bone: ?male; right ulna	−18.9	11.0	3.3	2290 ± 35	410–230 cal BC
SUERC-13261	Burial B at Balnabruach [Bal B]	human bone: female; left humerus	−20.0	10.1	3.4	1705 ± 30	cal AD 240–420

Lab ID	Context	Material type	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Radio-carbon Age (BP)	Calibrated date (95% confidence)
SUERC-13262	Burial C at Balnabruach [Bal C]	human bone: male; left ulna	−20.1	10.1	3.6	1655 ± 35	cal AD 260–530
OxA-10536	Bell casting pit [17/F107/C1220]	charcoal: unidentified	−27.8	–	–	865 ± 39	cal AD 1040–1260
SUERC-13263	Ditch under church [20/F129/C1345]	carbonised grain: *Hordeum* sp	−23.6	–	–	1465 ± 35	cal AD 540–660
SUERC-33422	Pit with deliberate charcoal deposit [14-24/F573/C3536]	charcoal: birch	−26.3	–	–	1765 ± 30	cal AD 170–380
OxA-9664	Burnt structural timber from primary burning horizon [26/C1030]	charcoal: unidentified	−23.6	–	–	1615 ± 45	cal AD 330–550
SUERC-13271	Cache of metapodials in workshop yard [14-24/C2000]	animal bone: cattle; right metatarsal	−22.7	5.5	3.2	1280 ± 35	cal AD 660–810
SUERC-13265	Butchered bone horizon on eastern roadside surface [14-24/C2335]	animal bone: cattle; left metatarsal (distal)	−21.1	5.4	3.3	1305 ± 35	cal AD 650–780
SUERC-13275	Burnt wattle from structure destroyed in primary burning horizon [14-24/C2704]	charcoal: hazel	−27.2	–	–	1285 ± 40	cal AD 650–810
SUERC-13282	Cow burial [14-24/F304/C1734]	animal bone: cattle; left metatarsal	−22.8	4.4	3.4	1115 ± 35	cal AD 830–1020
SUERC-13276	Stake in situ in stream [14-24/F404/C2295]	waterlogged wood: willow	−28.3	–	–	1305 ± 35	cal AD 650–780
SUERC-13277	Stake in pool [14-24/F436/C2224]	waterlogged wood: willow	−27.3	–	–	1345 ± 35	cal AD 640–770
SUERC-13272	Hearth in S9 yard [14-24/F445/C2468]	carbonised grain: *Hordeum* sp	−23.5	–	–	1350 ± 35	cal AD 640–770
SUERC-13266	Bone raft beneath S9 yard wall [14-24/F480/C3122]	animal bone: cattle; right metatarsal (proximal)	−22.0	5.1	3.3	1340 ± 35	cal AD 640–770
SUERC-13274	Burnt wattle from terrace wall destroyed in primary burning horizon [14-24/F483/C2584]	charcoal: hazel	−26.9	–	–	1370 ± 35	cal AD 610–690
SUERC-13273	Burnt stake from terrace wall [14-24/F490/C2697]	charcoal: hazel	−26.4	–	–	1575 ± 35	cal AD 400–570
SUERC-13581	Hearth in S9 [14-24/F495/C2786]	carbonised grain: *Hordeum* sp	−24.3	–	–	1295 ± 35	cal AD 650–780
SUERC-33421	Well [14-24/F527/C3570]	waterlogged wood: willow; woven well lining	−27.5	–	–	1385 ± 30	cal AD 610–680
SUERC-33420	Hearth [14-24/F535/C3406]	charred hazel nutshell	−24.7	–	–	1335 ± 30	cal AD 640–770
SUERC-13281	Metal-working hearth [14-24/F148/C1412]	charcoal: hazel	−27.7	–	–	1255 ± 35	cal AD 660–880
SUERC-13267	Alignment of worked cattle metapodials in S9 yard [14-24/F393/C1957]	animal bone: cattle; right metatarsal (distal)	−21.6	5.0	3.3	1335 ± 35	cal AD 640–770
SUERC-13283	Central pit of oval S5 [25/F13/C1027]	carbonised grain: *Hordeum* sp	−22.9	–	–	1215 ± 35	cal AD 680–900
SUERC-13284	Ditch of S5 [25/F3/C1153]	carbonised grain: *Hordeum* sp	−22.0	–	–	1065 ± 35	cal AD 890–1030
SUERC-13285	Flue of S1 [11/F79/C1527]	carbonised grain: *Hordeum* sp	−24.3	–	–	925 ± 30	cal AD 1020–1210
SUERC-13286	Deposit relating to the clogging or earliest disuse of the enclosure ditch [25/F132/C1401]	waterlogged wood: willow	−26.0	–	–	1210 ± 35	cal AD 680–940
SUERC-13264	14-24/C2310	bulk sediment: humic acid	−30.0	–	–	2445 ± 35	770–400 cal BC
SUERC-14989	Latest deposit in marsh, between (14-24/2310/4910) and (2296/4863) [14-24/2310/4874]	bulk waterlogged weed seeds	−27.4	–	–	1370 ± 40	cal AD 600–760
SUERC-14990	Earliest deposit in marsh, beneath (14-24/2310/4874) [14-24/2310/4910]	bulk waterlogged seeds	−26.5	–	–	2365 ± 40	720–380 cal BC
SUERC-14994	Earliest deposit in pool, between (14-24/2310/4874) and (2296/4863) [14-24/2296/4873]	waterlogged birch twig	−27.4	–	–	1375 ± 40	cal AD 590–760
SUERC-14995	Latest deposit in pool, above (14-24/2296/4873) [14-24/2296/4863]	bulk waterlogged elder seeds	−26.9	–	–	1300 ± 40	cal AD 650–840
GU-3265	Peat from enclosure ditch S16, Int 1 (Harden 1995)	bulk organic material	−28.8	–	–	1740 ± 50	cal AD 140–410
GU-3266	Peat from enclosure ditch S16, Int 1 (Harden 1995)	bulk organic material	−28.8	–	–	1660 ± 50	cal AD 250–530
GU-3267	Peat from enclosure ditch S16, Int 1 (Harden 1995)	bulk organic material	−29.6	–	–	1590 ± 50	cal AD 350–580
OxA-9663	Wooden stake in situ in outer enclosure ditch	waterlogged wood: unidentified	−24.9	–	–	1410 ± 45	cal AD 550–680

Lab ID	Context	Material type	δ13C (‰)	δ15N (‰)	C:N	Radio-carbon Age (BP)	Calibrated date (95% confidence)
OxA-10159	Supersedes OxA-9663	waterlogged wood: unidentified	–24.0	–	–	1270 ± 33	cal AD 670–890
OxA-9662	Ultimate backfilling of tributary ditch (F18)	charcoal: unidentified	–27.3	–	–	1110 ± 45	cal AD 790–1020
SUERC-2621	Hearth in the Smith's Hall (S1) [Sample #1 F65 C1141]	cremated cow bone	–24.7	–	–	1205 ± 35	cal AD 700–940
SUERC-33415	Hearth in the Smith's Hall (S1) [Sample #2 F65 C1141]	charred hazelnut shell	–25.3	–	–	1255 ± 30	cal AD 670–870

* The calibrated result given here in Table D3.1 is based on the assumption that the individual had a 100% terrestrial diet. The stable isotopes for these samples, however, suggest a marine component to the diet. These results have been adjusted for the marine component and recalibrated in Table D3.2 using a mixture of the terrestrial and marine radiocarbon calibration curves

Digest 4.1 INVENTORY OF BURIAL DATA

Sarah King and Shirley Curtis-Summers (University of Liverpool)

Table D4.1

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C^{14} date (AD)
1	17	20	1079	4	Good	25–50	Probable male	Adult		168.72	5.6	Periostitis, OA, Trauma (?)		
2	17	56	1163	4	Good	>75	unsexed	1.1–2.5	1.5 yrs			Calculus, Cribra Orbitalia, Rickets (?)		
3	17	24	1084	4	Fair	25–50	unsexed	10.6–14.5	10–12 yrs					
4	17	39	1122	5	Good	50–75	unsexed	0–1	1–2 mths				Shrouded	
5	17	25	1085	4	Fair	50–75	Female	46–59		146.46	4.9			
6	17	22	1081	5	Good	50–75	unsexed	0–1	6–9 mths			Rickets. Scurvy (?)		
7	17	21	1077	4	Good	25–50	unsexed	2.6–6.5	3 yrs					
8	17	34	1117	4	Good	<25	Probable male	18–25		174.63	5.9	Osgood-Schlatter's	Coffined	
9	17	45	1139	4	Very good	25–50	Probable male	46–59		172.36	5.8		Coffined	
10	17	40	1124	4	Good	<25	unsexed	6.6–10.5	7.7 yrs					
11	17	36	1098	4	Fair	25–50	unsexed	2.6–6.5	6 yrs					
12	17	35	1119	5	Fair	>75	unsexed	0–1	2 mths			Scurvy		
13	17	39	1138	5	Fair	>75	unsexed	0–1	3–12 mths			Scurvy		
14	17	27	1101	4	Fair	50–75	unsexed	1.1–2.5	2.5 yrs					
15	17	41	1128	5	Fair	<25	unsexed	1.1–2.5	1.5 yrs					
16	17	28	1103	4	Fair	>75	unsexed	6.6–10.5	10.5 yrs				Shrouded	
17	17	7	1127	5	Poor	>75	Male	36–45		167.68	5.6		Coffined	
18	17	33	1114	4	Good	50–75	Male	36–45		170.80	5.7		Shrouded	
19	17	54	1158	4	Matched up with Burial 31									
20	17	49	1145	4	Fair	<25	Probable female	46–59		149.69	4.10			
21	20	75	1196	4	Fair	>75	unsexed	2.6–6.5	6 yrs			Cribra Orbitalia	Coffined	
22	17	50	1148	5	Poor	25–50	unsexed	0-0.5	0–6 mths			Infection (Ribs)		
23	17	7	1108	5	Good	>75	Female	46–59		165.09	5.5		Coffined and shrouded	
24	17	43	1133	4	Good	25–50	Probable male	14.6–17						
25	17	26	1099	4	Fair	>75	Male	46–59		162.74	5.4	SJD, DJD, Caries, Calculus, Sacralisation	Shrouded	
26	17	55	1162	4	Poor	50–75	unsexed	0–1	1–2 mths			Scurvy	Coffined	
27	17	38	1120	4	Good	>75	unsexed	10.6–14.5	9.6 yrs				Shrouded	
28	17	44	1135	4	Fair	25–50	Female	46–59		159.98	5.3	Entheseal changes		
29	17	77	1213	5	Fair	25–50	unsexed	1.1–2.5	2.5 yrs					

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C[14] date (AD)
30	17	76	1209	4	Good	>75	Male	36–45		176.13	5.9	Craniosynostosis, OA (ACC joints; R. StC joint, S. Iliac joints). Entheses R. CC lig. Non union of C1 foramina	Coffined; six skulls with Burial 36	
31	17	42	1130	4	Fair	>75	Male	36–45		159.94	5.3	OA? (R. ACC joint); C1-S5 caudal shift		
32	17	30	1106	4	Poor	25–50	Male	60+		169.84	5.7			
33	17	79	1224	5	Fair	>75	unsexed	0–1	3–4 mths			Scurvy		
34	17	51	1152	4	Poor	50–75	Male	46–59		167.56	5.6	Vert and R.Shoulder OA		
35	17	82	1225	4	Good	>75	Male	18–25		175.48	5.9		Shrouded	
36	17	76	1214	4	Fair	>75	Male	46–59		180.29	5.11	OA, DJD, SJD, Dental, Cranial Blade wounds	Coffined; six skulls with Burial 30	
37	17	32	1102	4	Fair	>75	Male	26–35		157.54	5.2	DEH, Calculus, Caries		
38	17	99	1272	2	Fair	>75	Male	46–59		170.28	5.7	Neoplasm, SJD, Dental, periostitis	Prob. shrouded	
39	17	96	1265	2	Fair	<25	Probable male	Adult		168.08	5.6	Fracture: R. Proximal Fibula		
40	17	120	1304	2	Fair	>75	Male	46–59		174.44	5.9			
41	17	84	1233	4	Poor	50–75	Male	18–25				OA (?), Dental disease, Bifid neural arch, Nasal concha bullosa, Kyphosis(?)	Shrouded	
42	17	108	1288	2	Fair	25–50	Male	46–59		177.55	5.10	L. Rib Fracture, OA, SJD, DJD, Spina bifida occulta, Dental	Head Support	
43	17	83	1228	4	FAIR	50–75	Male	46–59		172.62	5.8	SJD, Dental disease	Coffined, clothed, shod	
44	17	94	1261	2	Fair	<40	Male	46–59					Head support	
45	17	107	1285	2	Fair	<50	Male	46–59		170.86	5.7		Head support	
46	17	91	1254	1	Good	<40	Male	Adult		172.10	5.8		Long Cist	
47	17	98	1271	2	Good	25–50	Male	26–35		173.63	5.8	Dental, Entheses		
48	17	89	1250	2	Fair	25–50	Probable male	36–45		166.32	5.5	Entheses: L4, Calcanei		
49	17	90	1252	4	Poor	<25	Probable female	Adult		166.22	5.5		Shrouded?	
50	17	101	1274	2	Fair	<25	Probable male	Adult		163.98	5.5			
51	17	102	1276	2	Fair	50–75	Male	36–45		163.91	5.5	Fracture (R. 5th MT), OA, DJD		
52	17	109	1292	2	Good	25–50	Male	46–59		166.38	5.6	Periostitis (R. Fibula)	Shrouded	
53	17	106	1282	2	Poor	50–75	Male	46–59				SN, Calculus, caries, abscess, mand tori	Head support	
54	17	103	1278	2	Poor	50–75	Male	18–25		173.01	5.8	Pulmonary infection (TB?) Calculus, DEH		
55	17	8	1048	4	Fair	>75	Probable female	16–25		166.22	5.5	Caries, Calculus	Shrouded	
56	17	8	1015	4	Fair	50–75	Male	46–59		168.51	5.6		Coffin	
57	17	8	1031	5	Good	25–50	unsexed	0–1	7 mths					
58	17	79	1220	4	Poor	<25	unsexed	0–1	6 mths				Coffin	
59	17	8	1025	5	Good	>75	unsexed	2.6–6.5	3.5 yrs			Calculus	Flagstones	

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C^{14} date (AD)
60	17	14	1045	5	Good	25–50	unsexed	1.1–2.5	1.5 yrs					
61	17	8	1042	5	Fair	25–50	unsexed	0–1	11 mths			Metabolic (?)		
62	20	5	1016	4	Good	50–75	Female	46–59		160.64	5.3		Shrouded	
63	20	2	1011	4	Fair	>75	unsexed	2.6–6.5	3.6 yrs			Rickets (femora)	Shrouded	
64	20	8	1020	4	Good	>75	Male	46–59		164.17	5.5	OA,DJD, DISH, L.Fib Fracture	Shrouded	
65	20	16	1036	4	Fair	>75	unsexed	6.6–10.5	7–8 yrs			Blade wound(?), Cribra Orbitalia	Coffin	
66	20	9	1021	4	Good	50–75	Male	26–35		156.13	5.1	SJD/SN, Sinusitis, Rib Periostitis, OA (?) (L. Femur)		
67	20	7	1019	4	Good	50–75	Female	26–35		158.09	5.2	SJD (SN)		
68	20	7	1019 x 2	4	Good	50–75	unsexed	Perinate	7–8 f.mths			Cribra Orbitalia		
69	20	10	1022	4	Good	50–75	Female	46–59		156.89	5.2	DJD, OA, Entheses	Shrouded	
70	20	15	1035	5	Fair	50–75	unsexed	1.1–2.5	1.2 yrs				Shrouded	
71	20	18	1038	4	Fair	50–75	unsexed	2.6–6.5	5 yrs					
72	20	46	1099	4	Poor	<25	Unknown	18–25						
73	20	11	1027	5	Fair	50–75	unsexed	0–1	6 mths			Scurvy	Shrouded	
74	20	25	1063	4	Good	25–50	Male	46–59		165.08	5.5	L. 3rd MC Fracture, SJD(?)		
75	20	13	1030	4	Poor	25–50	Probable male	Adult		160.18	5.3	OA: L. & R. knee, R. 1st MC–P and 3rd prox IP joint	Shrouded	
(Not used)														
77	20	6	1017	4	Good	50–75	Male	36–45		170.02	5.7	SJD, DJD (R.shoulder)	Shrouded	
78	20	19	1041	4	Good	25–50	Female	26–35		152.41	5.0		Shrouded	
79	20	51	1122	4	Matched up with Burial 114									
80	20	18	1039	4	Poor	25–50	Male	36–45				OA, SN, L. Rib fractures		
81	20	43	1100	4	Fair	>75	unsexed	10.6–14.5	12 yrs			Periostitis (L. Fibula)		
82	20	38	1101	4	Poor	25–50	Female	36–45				SJD? (marginal OP on Lumbar frag)		
83	20	42	1093	4	Fair	50–75	Female	36–45		158.33	5.2	SN (?): Lower Thoracic Vertebra		
84	20	39	1102	4	Fair	25–50	Male	46–59		175.35	5.9	Sacralisation, Entheses, SJD/DJD, L.Patella (avulsion?)		
85	20	36	1110	4	Fair	>75	Probable male	18–25		171.19	5.7	Calculus, Tooth agenesis, L5 sacralisation		
86	20	60	1144	4	Fair	>75	unsexed	6.6–10.5	8–9 yrs			Cribra Orbitalia, Parietal Porosity (Scurvy?)	Coffin	
87	20	52	1125	4	Matched up with Burial 81									
88	20	50	1117	4	Fair	>75	Female	36–45		148.97	4.11	OA/OP, SN, Dental	Coffin and shroud	
89	20	59	1142	4	Good	>75	unsexed	1.1–2.5	2.2 yrs			Congenital fusion of T3–4	Coffin?	
90	20	45	1106	4	Good	>75	Male	60+		172.79	5.8	OA, SN, DJD, Paracondylar process, Dental	Shrouded	1460–1660
91	20	62	1147	4	Good	>75	Female	26–35		148.69	4.10		Shrouded	
92	20	66	1159	4	Fair	<25	Female	26–35		148.94	4.10		Coffin	
93	20	28	1115	4	Good	>75	Male	36–45?		166.51	5.5	OA, SJD, Neoplasm/Infection	Coffin	

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C^{14} date (AD)
94	20	94	1048	4	Good	<40	Probable male	Adult					Coffin	
95	20	70	1169	4	Fair	>75	Female	46–59		149.69	4.11			
96	20	57	1135	4	Good	<25	Probable male	Adult		173.12	5.8	Entheses: Achilles Heel		
97	20	48	1107	4	Fair	25–50	Probable female	46–59				Scheuermanns–Schmorls disease; thoracolumbar border shifting	Shroud	1440–1640
98	20	49	1113	4	Fair	>75	Male	26–35		175.35	5.9		Coffin	1420–1620
99	20	76	1183	4	Good	<25	Female	60+		150.18	4.11			
100	20	64	1155	4	Good	<25	Female	36–45		156.75	5.2			
101	20	47	1105	4	Fair	<40	Female	46–59		158.97	5.3		Coffined and shrouded	1440–1630
102	20	31	1123	4	Good	50–75	Female	36–45		155.86	5.1			
103	20	32	1119	4	Good	>75	Male	26–35		165.65	5.5	Dental disease, Bifid rib, Congenital Abnormalities (R. humerus and Lunate)		
104	20	37	1120	4	Good	<25	Male	Adult		173.92	5.8	Non-specific infection: L. Tibia		
105	20	56	1131	4	Poor	25–50	Female	46–59		154.06	5.1	OA, SJD/DJD, Fracture (R. Fibula), Infection (L. Femur)	Anomalous diet	
106	20	54	1138	4	Good	50–75	Female	60+		157.58	5.2			
107	20	1	1010	4	Good	<40	Probable male	14–17		166.06	5.5			
108	20	75	1180	4	Good	>75	Male	36–45		172.49	5.8	OA, SJD, Dental disease, Entheses, Infection (Tibiae, Fibulae), Treponemal (?)	Coffin	
109	20	77	1189	4	Fair	>75	Male	46–59		165.73	5.5	Oro–A Fistulas, caries, L. & R. 3rd MC fracture, Entheses	Coffin	
110	20	79	1193	4	Fair	50–75	unsexed	10.6–14.5	11yrs			Dental, CO, Infection, Scurvy (?) Treponemal (?)	Shrouded	1280–1400
111	20	86	1209	3	Poor	50–75	Male	26–35		168.03	5.6		Head support	
112	20	69	1174	4	Good	>75	Male	46–59		174.30	5.9		Coffin	1280–1420
113	20	84	1206	4	Good	>75	Male	36–45		165.60	5.5	OA, SJD, Dental, Fracture, Rickets (?R. Fibula) Blade wound (trepanation?), Os acromiale, O. dissecans (?)	Coffin and shroud	1290–1430
114	20	82	1200	4	Fair	>75	Female	18–25		156.47	5.2	OA, NS Infection, Entheses, Trauma (Patella)		
115	20	83	1202	4	Poor	25–50	Female	Adult		160.11	5.3	OA (?) SJD (?) DJD (Hips, knees)		
116	20	96	1228	2	Poor	25–50	Male	46–59				OA: verts, L. shoulder	Head support	680–880
117	20	93	1222	4	Fair	50–75	Male	18–25		163.27	5.4	R. 3rd MC Styloid fracture, Blade wounds (L. cranium, L. & R. Femora), SN.		1150–1270
118	20	102	1242	2	Fair	25–50	Male	Adult				Fracture: R. 5th MT Tuberosity		
119	20	81	1198	4	Fair	25–50	unsexed	10.6–14.5	12 yrs			Granuloma, Calculus, Entheses	Coffin	
120	20	58	1140	4	Good	50–75	Male	36–45		160.79	5.3	Schmorls Nodes. No photos taken		
121	20	110	1259	2	Fair	>75	Male	26–35		167.16	5.6	Compression (L1), Spondylolysis (L5), SN, Os Acromiale, DJD		

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C[14] date (AD)
122	20	112	1263	2	Fair	>75	Male	46–59		174.05	5.9	OA, SJD, Dental, Fractures (T7, R. Fib, L. Rad)	Head and torso cover, prob. shrouded	
123	20	100	1273	2	Poor	25–50	Male	60+		175.17	5.9	Fracture (R. 5th Prox phalanx), OA (Hip, L4–5)		
124	20	109	1256	2	Fair	25–50	Male	18–25		177.02	5.10	Scurvy (?) C1 to Occitpital fusion, SN		
125	20	113	1265	2	Poor	>75	Male	60+		173.01	5.8	Fracture (L. Tib/Fib), OA (L. Hip, C.verts)	Head support (?), shrouded (?)	
126	20	97	1229	2	Fair	50–75	Male	46–59		169.93	5.7	SJD, OA, SN, DJD, Dental Abscesses, Calculus	Head support	
127	20	128	1300	2	Poor	50–75	Probable male	36–45		162.09	5.4			
128	20	103	1244	2	Poor	<40	Probable male	46–59					Head support	640–770
129	20	118	1277	2	Fair	>75	Probable male	18–25		165.81	5.5		Shrouded	670–880
130	20	133	1309	2	Fair	>75	Probable male	46–59		170.41	5.7		Head support	660–780
131	20	135	1312	1	Fair	<25	Female	46–59						
132	20	80	1195	Matched up with Burial 120										
133	20	122	1288	2	Fair	25–50	Male	60+		168.84	5.6	DJD, SJD, OA (Verts, Hips, Tarsals)	Prob. Shrouded	
134	20	14	1034	4	Fair	25–50	Male	18–25		171.86	5.8	Periostitis, Fracture (?) (L. 1st MC)		
135	20	120	1280	2	Fair	25–50	Probable male	46–59				SJD, SN, Possible Scheuermanns (T11)		
136	20	121	1286	3	Fair	50–75	Male	36–45		173.93	5.8		With Burial 156	970–1040
137	20	119	1278	2	Poor	25–50	Probable male	36–45		174.24	5.9		Head support	
(Not used)														
139	20	106	1251	2	Fair	25–50	Male	46–59		164.08	5.5	Scurvy, Vert OA, SN	Head support	
140	20	123	1289	2	Fair	>75	Male	18–25		166.13	5.5	SN, R.Os acromiale, CC Entheses	Prob. shrouded	
141	20	101	1240	2	Fair	>75	Male	36–45		168.75	5.6	SN, Spondylolysis, Sacralisation, R. Fibula, Fracture	Shrouded	
142	20	111	1260	2	Fair	25–50	Male	46–59		173.62	5.8	OA, Fracture (R. 5th MT), O.Dissecans?		
143	20	90	1214	2	Fair	>75	Male	60+		167.55	5.6	SN, OA, Infection	Shrouded	
144	20	98	1232	2	Fair	50–75	Male	46–59		161.00	5.4	OA(Verts), SN, DJD, Dental diseases	Anomalous diet	680–890
145	20	139	1329	3	Fair	25–50	Male	Adult				Vert OA, L.Clavicle Fracture, Caries		
146	20	137	1318	1	Fair	25–50	Female	26–35		160.13	5.3		Long Cist	660–780
147	20	125	1294	3	Fair	50–75	Male	26–35		171.60	5.7		Wood/wicker bier	720–960
148	20	99	1235	2	Fair	25–50	Male	60+		177.79	5.10	OA (R. Wrist, R. Hip, L. Knee and verts), Periostitis (L. Femur), DJD/SN	Prob. shrouded	
149	20	117	1275	1	Poor	50–75	Male	60+				Fractured R. ribs, Poss Neoplasm (R. Orbit), OA, DJD, SN, Dental, Maxillary Sinusitis	Long Cist	

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C^{14} date (AD)
150	20	94	1224	4	Good	25–50	Male	Adult		172.23	5.8	DJD, Periosteal changes, Entheseal changes		
151	20	140	1322	2	Fair	50–75	Male	46–59		171.60	5.8	OA, SJD, DJD, L. Mid Rib Fracture	Head support, shrouded	
152	20	132	1307	3	Fair	50–75	Male	26–35		173.93	5.8	Blade wounds × 3, Dental, Max Sinusitis (?)	Head support	780–1000
153	20	114	1268	2	Fair	50–75	Male	36–45		170.55	5.7	SN/Scheuermanns, Vert fractures, Dental	Shrouded	650–780
154	20	141	1331	2	Fair	50–75	Male	46–59		172.61	5.8	SJD, DJD, OA, Infection (R. Tibia), Dental	Head support, shrouded	
155	20	146	1338	2	Poor	50–75	Female	46–59		164.81	5.5	SJD, Osteoporosis (?)	Shrouded	
156	20	121	1284	3	Poor	50–75	Male	36–45		170.50	5.7		Head support; with Burial 136	970–1040
157	20	104	1247	2	Fair	50–75	Male	46–59		173.32	5.8		Head support	
158	20	138	1328	3	Fair	50–75	Male	46–59		172.71	5.8	Blade wound (L. Parietal), Fractured L. Ribs, OA: L. & R. ACC; Verts, SN, Dental disease	Shrouded	680–900
159	20	115	1270	2	Fair	50–75	unsexed	10.6–14.5	10 yrs					
160	20	148	1346	2	Poor	25–50	Probable male	Adult		165.95		OA: R (and L?) Hip, L3	Prob. shrouded	680–880
161	20	74	1177	4	Good	>75	Male	36–45		169.76	5.7	OA, DJD, SJD, SN	Poss. coffin	
162	20	159	1373	1	Poor	25–50	Male	Adult		167.56	5.6		Long Cist	430–575
163	20	160	1374	1	Poor	25–50	Male	36–45		174.12	5.9		Prob. shrouded	640–690
164	20	151	1353	2	Fair	>75	Male	46–59		165.65	5.5	Lytic (Neoplasm?), Entheses, sacralisation Fractured ribs, OA/SJD/DJD, Dental		
165	20	158	1371	2	Poor	<25	Unknown	Adult						650–780
166	20	161	1381	1	Poor	<25	Probable female	Adult		153.73	5.1			
167	20	156	1366	2	Poor	<40	Male	Adult		167.32	5.6			
168	20	153	1357	2	Poor	25–50	Probable male	36–45						
169	20	155	1362	1	Fair	50–75	Male	26–35		176.36	5.9			610–680
170	20	157	1368	1	Poor	>75	Male	26–35		176.65	5.10	Calculus, Fracture (L. clavicle), SN, Neoplasm?		580–660
171	20	154	1360	2	Good	>75	Male	36–45		175.17	5.9			660–850
172	20	152	1364	1	Poor	50–75	Female	46–59		160.37	5.3	OA: L5–Sacral R. facet, L. knee, poss granuloma	Long Cist	570–650
173	20	116	1271	2	Good	25–50	Male	46–59				SJD, Granuloma/Abscess, Scheuermann's, SN, Max Sinusitis, Ankylosing Spondylitis (?)	Head support	
174	20	144	1334	2	Poor	25–50	Female (?)	Adult				Neural arch entheses	Shrouded	
175	20	40	1090	4	Good	50–75	unsexed	6.6–10.5	6.6 yrs			Calculus		

Burial	Interv	Feature	Context	Period	Condition	Completeness (%)	Sex	Age range[1] (yrs)	Sub-adult[2] Age (assessed)	Stature (cm)	Stature (ft/in)	Pathology[3]	Burial type	C^{14} date (AD)
176	17	95	1267	2	Fair	>75	Male	46–59		161.57	5.4	OA, SJD, Dental, Fracture, Infection (sinusitis), Cribra Orbitalia, Spondylolysis (L5)	Head support, probably shrouded	
177	17	37	1086	5	Good	25–50	unsexed	0–1	39.37 f.wks					
178	20	65	1157	4										
179	20	136	1314	1										
180	20	164	1342	1									Long Cist	
181	20	27	1074	1									Long Cist	
182	20	142	1343	1									Long Cist	
183	20	149	1348	1									Long Cist	
184	20	162	1378	1										
185	20	163	1379	1									Long Cist	
186	14	515	2987	1	Fair	>75	Male	26–35		169.89	5.7	Spondylolisis (L5), L. Os acromiale, Entheses.	Long Cist	420–610
187	14	516	3346	1	Fair	50–75	Probable male	36–45		180.02	5.10	Spina bifida occulta, L. & R. 5th MT fracture, Periostitis (R. Ulna)	Long Cist	540–650
188	14	517	3367	1	Very Poor	<25	Probable male	Adult				SJD(?): C2	Long Cist	
189	16	1	1012	2	Poor	25–50	Male	26–35				Calculus & DEH		
190	20	3	1006	4	Good	<25	Unsexed	2.6–6.5	3 yrs			Infection (lower limbs)		
191	17	37	1083	4	Good	<25	Unknown	36–45						

1 Sub-adult age categories used: perinate (under 38 weeks gestation); birth to 1 year (infant), 1.1–2.5 years, 2.6–6.5 years, 6.6–10.5 years, 10.6–14.5, 14.6–17.0 (following Magilton et al 2008: 174). In the last category, individuals were estimated to be older than 17 when the root of the third molar was complete (Rc = 17.5) but the apex remained open (Moorrees et al 1963).

2 Sub-adult age based on assessments.

3 Abbreviations used in the pathology column:

ACC Acromioclavicular; CC Costoclavicular; DDD degenerative disc disease; DEH Dental enamal hypoplasia; DISH Diffuse idiopathic skeletal hyperostosis; DJD degenerative joint disease; Max. maxillary; MT metatarsal; OA osteoarthritis; S.Iliac sacroiliac; SJD spinal joint disease; SN Schmorls' nodes; StC Sternoclavicular; TB tuberculosis; Vert. vertebral.

REFERENCES

Magilton, J R, Lee, F & Boylston, A (eds) *'Lepers Outside the Gate': Excavations at the Cemetery of the Hospital of St James and St Mary Magdalene, Chichester, 1986–87 and 1993*. York: Council for British Archaeology Research Report 158.

Moorrees, C F A, Fanning, E A & Hunt, E E 1963 'Age variation of formation for ten permanent teeth', *J. Dental Research* 42.6: 1490–1502.

Digest 4.2 SUMMARY REPORT ON THE TARBAT POPULATIONS

SARAH KING (summary from full archive report, OLA 7.2.1)

The Tarbat skeletons were analysed early in the course of the project and the burials were at that point assigned to two phases: an eighth to eleventh century phase (Phase 1 and 2) (n = 67) and a twelfth to sixteenth century medieval period (Phase 3 and 4) (n = 99). Later there was some refinement of the phasing, thanks to the completion of an intensive programme of stratigraphic analysis and radiocarbon dating. King's Phase 1 is equivalent to Period 1, but is now better defined; her Phase 2 embraces the burials of Period 2 and 3, but, as shown in Chapter 5.2, Period 3 is simply the tail end of the Period 2 cemetery and is continuous with it. Phase 3 and 4 are grouped as Period 4. All the burials are tabulated in the updated inventory in D4.1. Although there has been some migration of graves between periods, they have not affected the conclusions drawn by Sarah King. To help the reader follow the argument, the groups will be labelled as Monastic (Periods 2 and 3) and medieval (Period 4). It is an important aspect of burial at Portmahomack that there is a marked hiatus between these two episodes of burial, one that is reflected by the rather different character of the populations being commemorated.

Similarities and differences

In the *Monastic Period* (Period 2/3) the individuals interred were mostly males who lived until middle or old age, whereas the *medieval period* (Period 4) was represented by individuals of all ages. In this later period, there was a more equal representation of females to males, with a ratio of 1:1.6, whereas in Period 2/3, the ratio of females to males was 1:9.2.

There were no differences in cranial morphological features through time at Tarbat (when examined as averages). Overall, the males and females had medium-shaped crania, low skull height, narrow faces and nasal apertures, medium-sized eye orbits and broad palates. However, when examined as proportions, an equal number of individuals from Period 2/3 had narrow heads or medium-shaped heads. In the medieval period, most individuals had medium-shaped heads, although a third also had broad heads. Most of the individuals from other Scottish medieval assemblages had medium or broad-shaped heads. Overall, the physical features of the Tarbat individuals were not unlike to those observed on individuals from other Scottish sites.

The demographic pattern in Tarbat Period 2/3 was most similar to the Isle of May, also thought to represent a monastic community. In contrast, the medieval period at Tarbat was more representative of a family community – consisting of children, women and men. The age and sex profile of the medieval phase was most similar to that observed at Glasgow Cathedral. As the burials were recovered within the parish church at Tarbat and Glasgow Cathedral, they might be expected to be of a higher status than those buried outside of the church. As both of these sites have relatively higher percentages of older individuals in their medieval phases, it is conceivable that Scottish people of relatively high status sometimes lived to older ages, or that old adults were often given more prestigious burials.

The Portmahomack individuals had a similar lower limb shape to the individuals buried at Isle of May (fifth to twelfth century phase) – that is, the majority of individuals had anterior-posterior flattening of the femoral shaft, and broad tibiae. The lower limb shape of the monastic individuals was also similar to those from the medieval period at Tarbat. Medieval Scottish assemblages generally demonstrate a pattern on anterior-posterior flattening of the femora, whereas tibiae were either broad or moderately flattened – depending on the site.

The body build and head shape of the Tarbat individuals (from the monastic and medieval periods) was similar to their Scottish contemporaries. There was paleopathological evidence to suggest that the monastic individuals differed from those of the medieval period in terms of diet and, perhaps, activity patterns. Moreover, there is evidence to suggest that although the medieval individuals suffered from childhood illnesses, they may have been healthier in older ages than other contemporary Scottish population groups, with the exception of Glasgow Cathedral.

The early medieval cemetery is presented and discussed in Chapter 5.2, p 106 and the medieval cemetery in Chapter 7, p 296.

Early medieval population

The majority of the occupants of the Portmahomack monastery lived longer than their colleagues at the contemporary establishments at the Isle of May and Hallow Hill. However, as at Tarbat, very few females were buried at the Isle of May during the monastic phase. The stature of the females and males (5' 3" and 5' 7" respectively) was comparable to the Isle of May and Hallow Hill.

Physique

Fifty-two per cent of the monastic population were affected by spinal joint disease, particularly, T10, L1 and L2. These observations, along with three cases of spondylosis (a condition which may occur as a result of bending and lifting in an upright posture) and three cases of compression fractures of the vertebrae (possibly as a result of a vertical force injury) suggested that the Period 2/3 individuals may have participated in activities resulting in lower back stress more frequently than the medieval individuals. There is also evidence to suggest that this stress began at younger ages in Period 2/3 than in the medieval period.

Teeth

Calculus, abscesses, ante-mortem tooth loss and dental wear were more frequently observed in the monastic than in the medieval period. Overall, the prevalence of caries in Period 2/3 and in the medieval period was similar to other contemporary Scottish sites. In the medieval phase at Tarbat, however, there was more ante-mortem tooth loss and dental enamel hypoplasia than in the Glasgow Cathedral dentitions.

These findings suggested that there were differences in diet and oral hygiene between the two phases, between the females and males from the medieval period, and between the Tarbat and Glasgow Cathedral individuals. In Period 2/3, the diet may have been more coarse than during the medieval period at Tarbat. Indeed, a small particle of stone was embedded in the pulp cavity of one of the well worn teeth from Period 2/3. The heavy wear may have also resulted in exposure of the pulp cavities, causing dental abscesses. The presence of heavy calculus may be associated with diet type and/or the lack of oral hygiene to remove plaque build-up.

Trauma

Thirty-two per cent of the monastic population had suffered fractures. In addition, similar types of fractures were consistently observed on the Period 2/3 skeletons, including three fractures of the left clavicle and three of the right proximal fibula. It is possible that these individuals experienced similar accidents. There was also evidence of interpersonal conflict at Tarbat – sharp-edged weapon wounds were present on three skeletons from Period 2/3, and one from the medieval period (as well as four cases in the disarticulated remains). Weapon wounds have been observed in other Scottish sites spanning all time periods. Overall, a higher percentage of fractures were observed in earlier Scottish assemblages compared to the medieval assemblages.

Blade injuries

Two individuals from the end of the monastic cemetery (Period 3) had suffered violent attack. A middle adult male (Burial 152) had three sharp cut marks to the skull. One was approximately 72mm in length and extended across both parietals with radiating fractures extending from both ends (one curved into the right side of the frontal bone and the other curved along the left parietal). The cut was angled such that one side was sharp and the other was broken post-mortem, but it did not extend into the endocranial surface (although there was a fracture line along the wound). The second wound bisected the lamboid suture on the left side. It was 41mm in length, was slightly angled and did not penetrate the inner table. The last fracture was on the right side of the occipital, however, much of the area was broken post-mortem and the extent of the wound was difficult to assess. A radiating fracture extended from this cut towards the cranial base. There was no evidence of healing thus suggesting this individual did not survive after the wounds were inflicted. As two of the cuts were on the back of the head, it is likely that the assailant attacked from behind. Given that one of the fractures was on the crown of the head, the individual may have been below the assailant at one point (eg kneeling). As injuries with larger weapons are more likely to produce terminal fractures (Wenham, 1987), it is possible that a weapon such as a large sword may have been used to produce these fractures.

An old adult male (Burial 158) had two well-healed fractures on the left parietal. They were smooth parallel depressions extending

Table D4.2.1
Period 1–3 Trauma

Burial	Period	Age	Sex	Bone	Side	Description
170	1	middle adult	M	clavicle	L	Well-healed fracture near the conoid tubercle – slightly displaced, so that the lateral end is slightly inferior to the rest of the shaft
39	2	adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
42	2	adult	M	rib		Healed fracture with new bone formation which has developed into a facet for articulation with a middle rib
51	2	middle adult	M	5th metatarsal		Non-united fracture at the base (tuberosity)
122	2	old adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
123	2	old adult	M	5th proximal phalanx	R	Well-healed, complete, straight fracture across the shaft
125	2	old adult	M	tibia fibula	L	Both are well-healed, complete, oblique fractures on the distal ends, but the tibia also has gaps and cloacae present along the fracture line. The ends of the fracture overlap by approximately 35mm and, as a result, the L tibia is shorter than the right. In addition, the proximal end of the fibula shaft is angled slightly medially and the fracture ends overlap by approximately 22mm. This individual also has OA of the left hip (secondary?), and probably walked with a limp
141	2	middle adult	M	fibula	R	Proximal end – well healed (with callus formation), complete, oblique fracture
142	2	old adult	?M	5th metacarpal 5th metatarsal	R	Fusion at an angle with the proximal phalanx – trauma? Non-united fracture at the base (tuberosity)
151	2	old adult	M	rib		Healed fracture of a middle rib
164	2	middle adult	M	rib		Rib fracture as well as a trauma or infection to the pelvis (see below)
176	2	middle adult	M	clavicle ribs	L	Non-united fracture approximately 25–30mm from the acromial end. One side is flared, and the other is rounded, forming a pseudo-joint. Five healed middle ribs
145	3	middle adult	M	clavicle	L	Non-united fracture approximately mid-shaft, with healed irregular new bone formation on both sides which articulated with one another. The ends of the bones are displaced such that the medial portion of the clavicle over-laid the lateral portion (anteriorly)
158	3	old adult	M	ribs		Mid-shaft fractures on four middle ribs. One rib also has a lytic lesion (oval with rounded edges – approximately 4.4 × 2.8mm in size) approximately 20mm away from fracture, possibly indicative of infection. This individual also had evidence of trauma to the skull (see below)

from the coronal suture approximately 46 and 30mm posteriorly, and 12 and 10mm wide, but did not extend into the internal table. Given the linear nature of the injuries, it is possible that a large blade was used to inflict these injuries, probably in a 'face-to-face' position.

Disablement

Three middle adult males from Period 2/3 also had collapsed vertebrae. Burial 153 had T6 to T8 flattened on the left side of the body, and T9 flattened on the right side of the body, resulting in scoliosis. In contrast, the anterior surface of the first lumbar vertebrae of Burial 121 was wedge shaped, resulting in kyphosis. Burial 176 also had kyphosis as a result of three wedge-shaped vertebrae (T12, L1 and L3). In this case, the vertebrae appear to have collapsed as a result of large lesions on the inferior surfaces of the body (with the exception of L3). It is possible that these individuals sustained these fractures as a result of a vertical force injury. As well as suffering from collapsed vertebrae, Burial 121 had spondylosis of L5. Skeleton 141 also had spondylosis of the fifth lumbar vertebra, while uncommonly, Burial 171 had spondylosis of both L3 and L4.

An old adult ?male (Burial 128) had a fused sacro-iliac joint on the right side (the left side was missing), as well as fusion between T3 and T4 and the fourth ribs (with no joint space left between the vertebrae) and fusion between C5 to C7 (T5 to L1 were missing). The osteophytes on the cervical vertebral bodies were square and 'bamboo' like in appearance, with fusion also occurring between the lamina and transverse processes. In addition, the atlas was fused to the occipital in such a way that this individual's head would have been slightly raised and tilted to the right side.

There was one possible case of osteochondritis dissecans in the Tarbat sample (not included in the prevalence Illus above). A middle adult male from Period 2/3 (Burial 171) had a depression on the superior portion of the articular surface of both acetabulae (approximately 10mm in size, but triangular in shape). In addition, the femoral heads had plaques of new bone formation (associated with porosities) near the fovea capitis.

Medieval Portmahomack

The majority of individuals from the medieval period at Tarbat lived to relatively older ages in comparison to other medieval Scottish assemblages, with the exception of Glasgow Cathedral (twelfth to fifteenth century phase). At that site, most individuals died as middle or old adults. There was also an almost identical ratio of females to males at Tarbat and Glasgow Cathedral.

The stature of the medieval individuals from Tarbat was slightly less than their Scottish contemporaries. In addition, the medieval females were, on average, less tall than the females from Period 2. Overall, however, the average medieval female height of 5' 1" and the average male height of 5' 6" were not largely different than the average modern Scot (females: 5' 4" and males: 5' 10" (Knight 1984)).

Similarly, the high frequency of dental disease in medieval females may be indicative of a difference in diet (and oral hygiene) between the sexes. It is possible that women may have been eating more high carbohydrate foods (or more sugary foods) than the males. It has been suggested that the consumption of animal protein may be associated with better dental health (Larsen 1997). However, medieval teeth were more likely to have caries and dental enamel hypoplasia. In addition, female teeth from the medieval period were more likely to have caries, dental enamel hypoplasia, calculus and ante-mortem tooth loss than the male teeth.

The high prevalence of dental enamel hypoplasia at Tarbat in comparison to Glasgow Cathedral suggests that environmental stress during childhood may have been experienced more often (or more severely) by the Tarbat individuals, particularly by the females.

In contrast to other Scottish assemblages (with the exception of Glasgow Cathedral), the Tarbat individuals did not have very many infectious lesions on their bones (Phase 2 = 8.1% and the medieval period = 9.3%). In all assemblages, including Tarbat, the majority of the lesions were on the lower limbs.

Analysis of the articulated burials suggested that metabolic disease was low at Tarbat, with very few individuals showing signs of cribra orbitalia (9% in Phase 2 and 3.8% in the medieval period). A similarly low percentage was also observed at Glasgow Cathedral (4.2%), whereas in other assemblages, higher percentages of individuals were affected. It is noted, however, when the disarticulated remains were analysed, several orbits were affected by cribra orbitalia, suggesting that the prevalence of anaemia may have been underestimated in the articulated sample from Tarbat.

Unlike other Scottish assemblages, there were several cases of rickets observed in the Tarbat articulated and disarticulated remains. These children may have been swaddled or kept indoors (out of the sun) and/or ate foods which lacked Vitamin D.

Tarbat also differed from other Scottish assemblages by having five possible cases of neoplastic disease (two from articulated burials, one from the disarticulated material and two from the 'charnel' deposit). One case was a possible metastatic carcinoma, perhaps secondary to prostate cancer. Another was a possible primary tumour to the face (basal cell carcinoma?) with secondary changes (metasteses) to the scapula, pelvis, ribs and a lumbar vertebra. The changes on the disarticulated bone remains undiagnosed, although osteoclastoma may be a possibility.

Although the Tarbat individuals died at relatively older ages in comparison to most other Scottish groups, there was evidence that the medieval men, and particularly the women, suffered from some environmental stress. They were slightly shorter in stature than their contemporaries, and the high prevalence of dental enamel hypoplasia suggests that they likely suffered from nutrition-infection interactions during childhood. The number of medieval children with rickets (and perhaps also anaemia) at Tarbat is suggestive of nutritional deficiencies, although anaemia may also result from other conditions – including chronic disease or parasitic infection (Roberts & Manchester 1995). There was also evidence of non-specific infection on the crania of several sub-adult skull fragments from the disarticulated remains. Thus, while the adults who survived childhood lived to relatively old ages, childhood morbidity and mortality were prevalent at medieval Tarbat. Those individuals who did survive to adulthood suffered from age related diseases including osteoarthritis, spinal joint disease and osteoporosis.

The low percentage of individuals with infectious lesions at Tarbat, and the lack of specific diseases such as tuberculosis and leprosy may suggest that the population was not dense enough for these diseases to become prevalent (see Larsen 1997). The presence of infectious lesions on the skeleton is indicative of long-term responses to pathogens. Thus, while acute diseases may have been present, there is evidence to suggest that some individuals survived long enough to ilicit a skeletal response, and therefore, may have had relatively healthy immune systems (Ortner 1991).

Medieval trauma

Twelve per cent of the medieval population had suffered fractures. Two medieval individuals had suffered blade attacks. The first case was a young adult male (Burial 117) who had three sharp-edged cut marks on the skeleton. One was present on the left parietal (near the occipital), and extended 53mm in length. It was slightly angled, so that it sheared the outer table of the skull, and only partially extended into the internal table. The second cut was

Table D4.2.2
Period 4 Fractures

Skeleton	Phase	Age	Sex	Bone	Side	Description
62	4	old adult	M	5th metatarsal		Non-united fracture at the base (tuberosity)
5	4	old adult	F	rib		Healed fracture of a middle rib
64	4	old adult	M	fibula	L	Incomplete fracture on distal end (appears like a crack in the articular surface) with evidence of healing
74	4	old adult	M	3rd metacarpal	L	Fracture of the styloid process
105	4	old adult	F	fibula	R	Well-healed incomplete fracture on distal end

on the proximal end of the posterior surface of the left femur, and was 33mm in length. Another was found on the proximal end of the right femur (posterior-lateral surface). This cut was approximately 4mm deep, but only the cortex was affected. There was no evidence of healing suggesting that the individual died at the time the cuts were made. The placement of the cuts – and the type of cuts – suggested a violent attack from behind, with a sharp weapon such as a sword.

An old adult male (Burial 113) had a healed wound to the right parietal bone (near the occipital), possibly as a result of a sharp blade. The wound was oval – approximately 45mm by 35mm – with definite edges associated with a flat surface, suggesting that the bone was sheared. Within the oval, the bone surface was very slightly irregular, but did not affect the inner table of the skull. The interpretation of a healed blade injury may be supported by the number and type of other fractures present on the skeleton. Together, these injuries suggest that this individual likely experienced violent conflict earlier in his life.

There was one case of a mother and her preterm foetus dying together (Burial 67, 68).

Disablement

Trauma to the vertebrae can result from compression fractures caused by a vertical force induced by a hyperflexion injury, or secondary to osteoporosis (Roberts & Manchester 1995). One example of the latter may be observed on Burial 95, an old adult female from the medieval period. The bones of this individual were light and it is likely that one of her thoracic vertebral bodies collapsed as a result of osteoporosis.

An old adult male from Phase 4 (Burial 90) demonstrated fusion of the bodies (square), apophyseal joints and laminae between T4 and T5 (all vertebrae were present). In addition, T4 was slightly collapsed on the right side, resulting in scoliosis. Ossification of ligaments was also present on a number of lumbar vertebrae, but only L4 and L5 were fused. In this case, the fusion was large and bulbous in appearance. It was also noted that this individual had an area of ossification on the base of the skull (lateral to the left occipital condyle), resulting in limited mobility to raise the head, and causing the head to be permanently faced slightly to the left side. No sacral-iliac fusion was present.

References

Knight, I 1984 *The Heights and Weights of Adults in Britain*. London: HMSO.

Larsen, C S 1997 *Bioarchaeology: Interpreting Behaviour from the Human Skeleton*. Cambridge: Cambridge University Press.

Ortner, D J 1991 'Theoretical and methodological issues in paleopathology', *in* Ortner D J & Aufderheide A C (eds) *Human paleopathology: Current Syntheses and Future Options*, 5–11. Washington: Smithsonian Institution Press.

Roberts, C & Manchester K 1995 *The Archaeology of Disease*, 2nd edn. Stroud: Sutton Publishing Ltd.

Wenham, S J 1987 *Anatomical and microscopic interpetations of ancient weapon injuries*. BSc thesis, University of Leicester.

Digest 4.3 STABLE ISOTOPES OF CARBON AND NITROGEN AND DIET

SHIRLEY CURTIS-SUMMERS (University of Liverpool) (summary from full archive report, OLA 7.2.2.1)

Introduction

Human bones and teeth from forty burials were analysed for stable isotopes of carbon and nitrogen, with a view to determining choices and changes in diet. Of these, five were from Period 1 (pre-monastic), thirteen from Period 2 (monastic), four from Period 3 (post-monastic) and twenty from Period 4 (medieval) (see Illus 3.25 for summary).

Faunal

Faunal samples were included to provide baseline isotopic data to interpret the human $\delta^{13}C$ and $\delta^{15}N$ values. Mean $\delta^{13}C$ and $\delta^{15}N$ values for the monastic period cattle (n = 7) were –22.1‰ ± 0.3‰ (1σ) and 5.9‰ ± 1.2‰ (1σ) respectively. One cattle sample (C3122/10) from the monastic period is considerably lower when compared to mean $\delta^{15}N$ values from cattle in the same period. This difference (Δ = 3.0‰) may be due to a number of factors, such as originating from a different geographical region and consuming different types of fodder or grazing on unimproved pasture, which resulted in lower $\delta^{15}N$ values. For example, $\delta^{15}N$ values in chaff and cereal straw are suggested to be lower and more variable than in grain.

The faunal baseline shift in $\delta^{15}N$ values from the monastic to the late medieval period is reflected in the human isotope ratios. The $\delta^{15}N$ ratios for monastic individuals are around +2–5‰ higher than the corresponding cattle and pigs, reflecting a trophic level increase, which are higher than the fauna by around $\delta^{15}N$ +2–6‰ and in $\delta^{13}C$ by around +2–3‰

Human – Period 1 (550–700)

The pre-monastic (Period 1) burials (Burial 166, Burial 169 and Burial 172) showed similar $\delta^{13}C$ values to the Monastic burials (Period 2) that followed. One adult male from Period 1 (Burial 169) had slightly lower $\delta^{15}N$ values than the rest of the monastic group, although not of sufficient magnitude to suggest a trophic level difference. The two adult females from Period 1 (Burial 172 and Burial 166) were buried in long cist graves, which may suggest their burials were of a status higher than that of a servant. However, the isotope values of these individuals suggest that they were consuming similar foods to the monks, who succeeded them in Period 2. The female sample numbers for Period 1 (n = 2) and Period 2 (n = 2) were too small to provide an informative statistical comparison against the corresponding males.

Period 2 Monastic (c 700–c 830)

The monastic human (n = 21) $\delta^{13}C$ values range between –21.2‰ and –18.9‰ (Δ = 2.3‰), with a mean of –20.4‰ ± 0.6‰ (1σ). The $\delta^{15}N$ values range between 10.0‰ and 14.6‰ (Δ = 4.6‰), with a mean of 12.2‰ ± 1.2‰ (1σ). Relative to the faunal data, human $\delta^{13}C$ values for the monastic periods reflect a predominantly terrestrial C3-based diet with no input of C4 or marine resources. $\delta^{15}N$ values for these individuals are a trophic level higher (+2–5‰) higher than the corresponding cattle and pigs. This, along with the archaeological faunal remains, suggests the early medieval monastic community were consuming a significant amount of terrestrial animal protein, such as pork, beef and dairy products. One adult male from Period 2 (Burial 144; cal AD 680–890) had atypical isotope results, with $\delta^{13}C$ and $\delta^{15}N$ values within the range of the Period 4 inhabitants, suggesting this individual's diet may have included some marine protein.

Period 3 (post-Monastic)

Only seven burials were defined as belonging to this period (ninth–eleventh century), which follows the destruction of the monastery. The results from the four analysed here (Burial 136, 147, 152, 158) suggests that it belongs nutritionally to the monastic group (Period 2), rather than the medieval group (Period 4).

Period 4 (medieval, twelfth–sixteenth century)

Medieval human (n = 19) $\delta^{13}C$ values range between –20.4‰ and –17.1‰ (Δ = 3.3‰), with a mean of –18.8‰ ± 0.9‰ (1σ). Medieval human $\delta^{15}N$ values range from 12.7‰ to 16.6‰ (Δ = 3.9‰), with a mean of 14.8‰ ± 1.0‰ (1σ). The $\delta^{13}C$ and $\delta^{15}N$ values are therefore higher in the lay individuals compared to the earlier monastic individuals, representing a diachronic change in diet over these periods at Portmahomack.

The faunal baseline shift, which is reflected in the human isotope ratios, suggests that contrary to the earlier periods, $\delta^{13}C$ and $\delta^{15}N$ values from the lay individuals reflect a significant trophic level increase in $\delta^{15}N$ and a shift towards higher $\delta^{13}C$ ratios. Based on archaeological and isotopic evidence, the lay inhabitants at Portmahomack had a diet that probably included beef, cereals (eg wheat, barley), pork, lamb, dairy foods and marine fish.

Although it has been suggested that manuring significantly increases $\delta^{15}N$ values in cereals, a major component of cereal grain in the late medieval individual's diet would be needed to reflect such high $\delta^{15}N$ values, which does not appear evident. Other explanations for greater $\delta^{13}C$ and $\delta^{15}N$ values in these individuals include increased $\delta^{13}C$ values in herbivores that grazed on seaweed, or on salt marshes, which can increase $\delta^{15}N$ values. Such occurrences would result in a shift in human carbon and nitrogen isotope ratios, through consumption of these animals.

Mean $\delta^{13}C$ and $\delta^{15}N$ isotope values for the medieval lay male and female bone collagen revealed little significant statistical difference, suggesting both men and women from this group consumed similar foods of C3 plants and terrestrial and marine protein. However, atypical isotope results were found in one adult female (Burial 105) from Period 4 who had the lowest $\delta^{13}C$ (–20.4‰), and $\delta^{15}N$ (12.7‰) values of this group. The isotope results from this individual fell within the Period 2 group and differed from the other medieval individuals in both $\delta^{13}C$ (Δ = 1.3‰) and $\delta^{15}N$ (Δ = 2.0‰), suggesting a more terrestrial-based diet.

When individual $\delta^{13}C$ and $\delta^{15}N$ values are plotted for the 26–45 years and 46+ years age groups from the monastic burials, no significant difference in diet relating to age is apparent for the corresponding males. The 26–45 male (Burial 93) has the highest δ13C and $\delta^{15}N$ isotope values out of the whole group and a whole trophic level difference compared to, for example, the two 45+ males (Burial 64 and Burial 113) that have the lowest $\delta^{15}N$ isotope values out of the males from this group. This may reflect a division in the types of animal protein that were being consumed, with some of the younger individuals possibly consuming different types of marine protein than the older individuals.

Conclusion

When the early medieval/monastic and late medieval/lay isotope data from Portmahomack are compared with a selection of comparable sites, a pattern emerges that is consistent with recent studies, which suggests a diachronic change in diet. The early medieval monastic community ate predominantly terrestrial plant and animal protein, while the subsequent parish church community at Portmahomack ate terrestrial plant and animal protein plus marine fish. This temporal increase in carbon and nitrogen isotope ratios was also found in the faunal baseline and may reflect a change in husbandry practices in the later medieval period, such as increased manuring and/or salt marsh grazing. No dietary differences relating to sex was found in the medieval population, but younger adults had higher $\delta^{15}N$ values and although this finding was only weakly significant, it may suggest they ate more marine protein than the older individuals. No significant change in diet from childhood to adulthood was found in either the monastic or medieval populations.

Overall, the results are suggestive of a monastic community that reared animals for a number of uses, including human consumption, but chose not to exploit nearby marine resources, relying heavily on terrestrial-based foods. In contrast, the isotope evidence suggests the mid–late medieval (*c* AD 1100–1600) inhabitants at Portmahomack consumed a wide variety of foods, including animal protein from pork, beef, lamb and fish, which is supported by the faunal remains present. These individuals exploited marine resources, either by choice or through necessity.

Table D4.3.1
$\delta^{13}C$, $\delta^{15}N$ human bone and dentine collagen results and archaeological data from Portmahomack

Burial No[a]	Mass Coll (mg)	$\delta^{13}C$	$\delta^{15}N$	Collagen Yield (%)[b]	C:N[c]	Age[d]	Sex[d]	Period[e]
166	44.4	−21.0	10.8	10.4	3.2	Adult	F?	1
169	37.8	−20.7	10.0	8.8	3.2	26–45	M	1
172	41.9	−20.8	10.9	10.1	3.2	46+	F	1
116	43.9	−20.3	13.0	11.0	3.2	26–45	M	2
124	21.3	−20.8	11.4	5.1	3.2	17–25	M	2
124T	1.2	−21.2	11.7	0.6	3.3	17–25	M	2
127	45.4	−20.4	11.8	10.6	3.2	26–45	M?	2
128	18.4	−20.5	11.7	4.4	3.3	46+	M?	2
140	8.1	−20.3	12.5	2.0	3.2	17–25	M	2
144	10.6	−19.1	14.6	2.4	3.2	46+	M	2
144T	25.5	−19.9	14.6	8.1	3.2	46+	M	2
147	21.5	−20.4	11.2	5.4	3.2	26–45	M	3
147T	12.0	−20.5	12.2	4.7	3.2	26–45	M	3
151	25.8	−20.6	12.6	6.6	3.2	46+	M	2
152	25.3	−20.5	11.7	6.0	3.2	26–45	M	3
152T	7.4	−20.9	12.6	3.5	3.2	26–45	M	3
154	37.5	−20.4	11.8	9.3	3.2	26–45	M	2
158	33.9	−20.3	12.4	8.6	3.2	46+	M	3
158T	12.0	−20.5	12.8	4.7	3.2	46+	M	3
160	32.7	−20.7	11.1	7.7	3.2	46+	M?	2
164	34.1	−20.2	12.8	8.3	3.2	26–45	M	2
168	15.1	−20.0	12.3	3.8	3.2	26–45	M?	2
171	11.7	−19.7	12.2	2.9	3.2	26–45	M	2
174	53.5	−21.1	11.4	12.4	3.2	adult	F?	2
112	28.1	−18.9	14.3	7.1	3.2	46+	M	4
112T	17.1	−19.5	14.1	7.5	3.2	46+	M	4
136	5.5	−21.1	11.9	1.3	3.3	46+	M	3
35	9.4	−17.3	15.4	2.4	3.2	17–25	M	4
64	29.5	−19.3	13.9	7.8	3.2	46+	M	4
69	4.8	−19.7	14.4	1.2	3.6	46+	F	4
83	26.8	−19.4	14.9	6.4	3.2	26–45	F?	4
85	22.1	−18.0	15.1	5.2	3.2	17–25	M?	4

Burial No[a]	Mass Coll (mg)	$\delta^{13}C$	$\delta^{15}N$	Collagen Yield (%)[b]	C:N[c]	Age[d]	Sex[d]	Period[e]
88	14.8	−18.4	15.0	3.5	3.2	26–45	F	4
88T	10.5	−19.2	13.8	4.9	3.2	26–45	F	4
90	14.5	−17.9	15.1	3.7	3.2	46+	M	4
91	15.1	−19.8	14.0	3.5	3.2	26–45	F	4
93	35.1	−17.1	16.6	8.7	3.2	26–45	M	4
97	22.4	−18.3	14.9	5.2	3.2	46+	F?	4
98	32.5	−17.9	15.8	7.7	3.2	26–45	M	4
100	16.6	−19.3	15.0	3.8	3.2	26–45	F	4
100T	12.1	−19.1	15.8	5.6	3.2	26–45	F	4
102	31.5	−17.8	16.1	7.5	3.2	26–45	F	4
103	27.1	−18.0	15.5	7.0	3.2	26–45	M	4
105	27.4	−20.4	12.7	6.8	3.2	46+	F	4
106	14.8	−18.7	15.5	3.4	3.2	46+	F	4
108	28.2	−19.5	14.7	6.8	3.2	26–45	M	4
109	49.2	−18.2	14.4	11.5	3.2	46+	M	4
113	23	−19.1	13.8	5.8	3.2	46+	M	4
113T	16.1	−20.0	13.1	7.7	3.2	46+	M	4

a Human bone samples taken from ribs. 'T' denotes tooth sample (permanent 1st molar root)
b Yield (%) = Mass mg collagen / weight (bone) mg × 100
c Acceptable C:N ratio (see DeNiro 1985)
d Ageing and sexing (M = male, F = female, ? = probable) information extracted from King (2000)
e Periods: 1 = Pre-monastic, 2 = Monastic, 3 = Post-Monastic, 4 = Medieval

Digest 4.4 COMBINED STRONTIUM AND OXYGEN ISOTOPE DATA AT PORTMAHOMACK

LAUREN WALTHER (formerly of University of Durham), JANET MONTGOMERY (University of Durham) and JANE EVANS (British Geological Survey)

(see Illus 3.26 for summary)

Introduction

The movement of people and populations in past societies is an abiding theme in both archaeology and bioarchaeology. The migration of peoples to different areas and environments may explain changes in the archaeological record but can arise through many causal factors, such as marriage, agriculture, war and cultural differences (Price et al 2004). Both radiogenic and stable isotope analysis is increasingly used to directly detect migration and diet in the past by analysing the skeletons of the people who migrated, rather than inferring human mobility from the appearance of new artefacts and cultural practices. The isotope systems most frequently used to detect human migration are those of strontium and oxygen. These provide independent information related to the place of origin of an individual: strontium isotopes in the environment vary geographically with solid and drift geology (Bentley 2006; Evans et al 2010) and oxygen isotopes vary with climate, altitude and distance from the sea (Longinelli 1984; Darling et al 2003; Daux et al 2008). These two elements are found in the environment and, primarily through the ingestion of food (strontium) and water (oxygen), become incorporated into the human skeleton, linking the person to the place they sourced their food and drink. Strontium and oxygen isotope analysis was, therefore, undertaken on thirty-one individuals buried at or near Portmahomack, to investigate the degree of residential mobility amongst the population by identifying local and non-local origins.

Materials

Tooth samples for strontium and oxygen isotope analysis were obtained from human permanent dentition (molars and premolars) of twenty-nine individuals from the Tarbat Old Church (St Colman's Church) site in Portmahomack and two individuals from Balnabruach, near Portmahomack. In addition, two prehistoric individuals were included that were discovered in 1992 during ground preparation for a pump house near Balnabruach. Daphne Home Lorimer conducted the skeletal report on the prehistoric human remains in 1995 (Lorimer 1995). Field Archaeology Specialists Ltd (FAS) excavated the skeletons at Tarbat Old Church between the 1994 and 2002 field seasons (Carver 2003) and Sarah E King (2000) performed the skeletal analysis. Thirty-one teeth were selected for strontium and oxygen isotope analysis to determine possible local origins of individuals buried in and near the church. Periods represented within this sample include: Period 0 (prior to sixth century AD); Period 1 (AD 550–700); Period 2 (AD 700–830); Period 3 (AD 830–1100); Period 4 (1100–1600); and Period 5 (1600–2000). Two main socio-economic populations were represented:

1. Periods 2 and 3 represented a monastic/post-monastic settlement at Portmahomack during the early medieval period, which was determined from the population demographic of the burials (Carver 2008). A large number of male burials, aged between 17 and 46+ years at death, were excavated, whilst few females and non-adults were present (King 2000; Carver 2008).
2. Period 4 contains males, females and non-adult burials ranging in age at death and is believed to represent the inhabitants of a medieval settlement (Carver 1997; King 2000; Carver 2008).

The analysis of the thirty-one enamel samples (one from each individual) was completed on two separate occasions. An initial pilot study of twelve teeth was followed by a larger sample of nineteen teeth (Walther 2012). Prior to sampling, a digital photographic record of each tooth was taken from the buccal, lingual, mesial, distal, occlusal and root angles.

Methods

Core enamel was used for strontium and oxygen isotope analysis because several studies have shown that it is considerably less susceptible to diagenetic change than bone or dentine and retains lifetime values from the time of tooth formation, ie childhood (Budd et al 2000; Montgomery 2002; Hoppe et al 2003). Each tooth forms during a well-constrained period of time in an individual's life and thus contains elemental strontium and oxygen absorbed from the diet during that period. With few exceptions, all the teeth in human permanent dentition complete their crowns between 2.5 and 15 years of age (Table D4.4.1). Consequently, the period of life represented by each isotope measurement will depend on the specific tooth selected for analysis (see Table D4.4.2 for details of the samples measured in this study).

Tooth sample preparation followed guidelines outlined by Montgomery (2002). Enamel was removed from the teeth using tungsten carbide burrs and diamond-edged dental saws. All surface enamel and adhering dentine was mechanically removed and enamel that was visibly cracked, discoloured or carious was not sampled. In addition, a dentine sample was taken from the crown of four teeth (16, 41, 127 and 140) to monitor diagenetic strontium: dentine has been shown to absorb labile soil strontium and is a useful indicator of local strontium ratios pertaining during the period of burial (Montgomery et al 2007). Cleaned chips of core enamel and dentine were sealed in containers and transferred to the class 100, HEPA-filtered laboratory facility at the NERC Isotope Geosciences Laboratory (NIGL) in Keyworth, UK. Strontium isotope samples were prepared and measured as outlined in Evans et al (2006). The concentrations of $^{87}Sr/^{86}Sr$ were determined by Thermal Ionisation Mass spectrometry (TIMS) using a ThermoTriton thermal ionisation multicollector mass spectrometer. The NBS 987 International $^{87}Sr/^{86}Sr$ standard gave a value of 0.710251 ± 0.00001 (2s, $n = 18$). Laboratory contamination, monitored by procedural blanks, was negligible (< 100pg).

Oxygen isotope ratios are reported in parts per mil (‰, $^{18}O/^{16}O$) relative to the international standard Standard Mean Ocean Water (SMOW). Oxygen isotopes for the twelve pilot samples were measured by conversion to silver phosphate, following the method outlined in Chenery et al (2010). Phosphate oxygen isotope ratios ($\delta^{18}O_p$) were obtained using thermal conversion continuous flow isotope ratio mass spectrometry (TC/EA-CFIRMS) with a ThermoFinnigan thermal conversion elemental analyser gas chromatography (GC) column coupled to a ThermoFinnigan DeltaplusXL via a ConFlo III continuous flow interface. The samples were measured in triplicate, corrected for non-linearity and drift, and converted to the VSMOW scale against NBS120C. Estimated analytical precision,

Table D4.4.1
Permanent dentition crown mineralisation and root completion times for the teeth used in this study. Source: Gustafson and Koch (1974); third molar data from Anderson et al (1976)

Tooth	Initial crown mineralisation	Crown complete	Eruption	Root complete
First molar	Peri-natal–birth	2.5–4.25 years	5–8 years	9–11.5 years
Second molar	2.5–3 years	7–8 years	10–14 years	14–16 years
Third molar	8–11 years	11.5–15 years	–	17–19 years
First premolar	1.5–2 years	4.5–7 years	8–12 years	12–14.25 years
Second premolar	2–2.5 years	6–8 years	9–14 years	12–15.5 years

based on the reproducibility of international and in-house standards, is ±0.16‰ (1SD).

Oxygen isotopes for the second batch of nineteen enamel samples were determined by measurement of enamel carbonate using a GV IsoPrime dual inlet mass spectrometer. Carbonate oxygen isotope ratios ($\delta^{18}O_c$) were normalised to v-PDB using an in-house reference material calibrated against NBS19 certified reference material. Analytical precision was estimated as ±0.02‰ (1SD). In order to facilitate comparison between the initial pilot batch and the subsequent nineteen samples, $\delta^{18}O_c$ values were reported relative to SMOW using the equation from Coplan (1988) (SMOW = 1.03091 × δ^{18}O PDB +30.91). These ratios were then converted to $\delta^{18}O_p$ using the regression formula published by Chenery et al (2012):

$$(\delta^{18}O_p = 1.0322(\pm 0.008)*\delta^{18}O_c - 9.6849\ (\pm 0.187))$$

This equation has an associated maximum error of ±0.013‰, 1SD.

Results

The isotope results are presented in Table D4.4.2. The $^{87}Sr/^{86}Sr$ sample for Skeleton 152 failed and could not be re-measured during the timescale of this project. Strontium isotope ratios for the thirty individuals measured exhibit a wide range of ratios from 0.7097 to 0.7152, with a median value of 0.7112 (Illus D4.4.1). The assumption of normality is rejected with 95% confidence (Anderson-Darling, $p = 0.038$). Strontium concentrations range from 57ppm to 200ppm and are consistent with other archaeological individuals from Britain (Evans et al 2012). There is no correlation between $^{87}Sr/^{86}Sr$ and strontium concentrations ($r^2 = 0.16$).

The $\delta^{18}O_c$ values for the nineteen samples range between 24.6‰ and 27.4‰ (±0.16‰ 1SD), with a mean value of 26.0‰ ± 1.6‰ (2SD). As described above, to facilitate comparison with the pilot data these were converted to $\delta^{18}O_p$ using the equation from Chenery et al (2012). The resulting range of $\delta^{18}O_p$ values obtained from the Portmahomack individuals was 15.7‰ to 18.6‰, with a median and mean value of 17.4‰ (±1.6, 2SD, n = 30) (Illus 4.4.2). The assumption of normality is accepted with 95% confidence (Anderson-Darling, $p = 0.254$). There is no correlation between $\delta^{18}O_p$ values and $^{87}Sr/^{86}Sr$ of individuals ($r^2 = 0.09$). An estimated uncertainty to encompass reasonable measurement and conversion errors for $\delta^{18}O_p$ values of ±0.2‰ (1SD) is shown in Illus D4.4.3 and 4; at 1SD there is only a 66% probability that the true value lies within this range and this should be borne in mind when assigning origins. In contrast, there is a 99.9% probability that the true value for $^{87}Sr/^{86}Sr$ lies within the symbols.

The range of strontium isotope ratios that would be expected for human inhabitants of the Devonian Old Red Sandstone of the Tarbat peninsula was estimated from published measurements of mineral waters, stream waters, plants and archaeological dentine from geologically comparable biospheres in Scotland. These provide a range of values from 0.7093 to 0.7116 with a single outlier at 0.7133 and a mean of 0.7098 ± 0.0010 (1s, n = 29) (Evans et al 2010). The four dentine samples measured from burials at Portmahomack range from 0.7098 to 0.7116, which agrees well

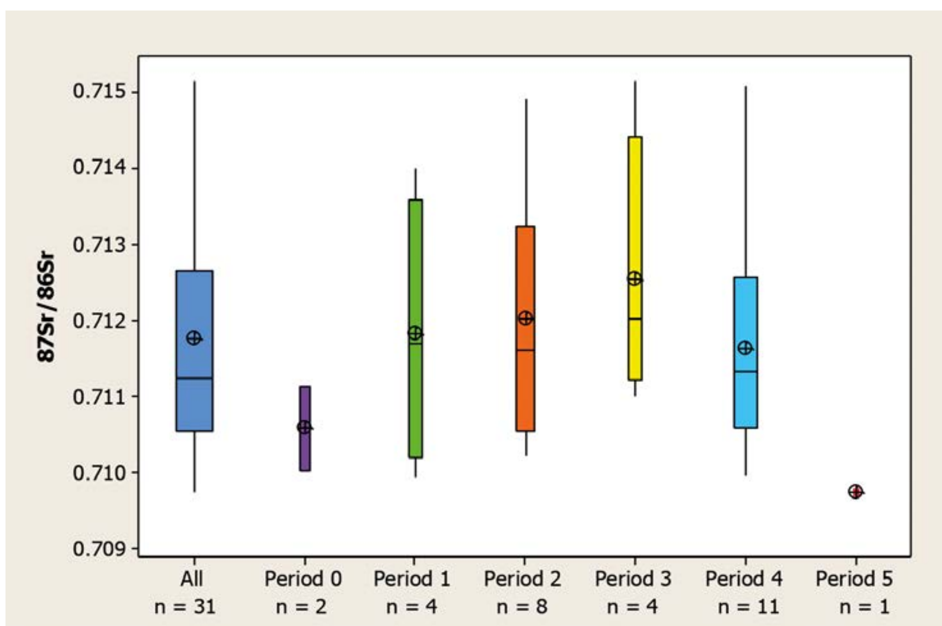


Illustration D4.4.1
A Box and Whisker plot of strontium isotope results by period. Mean (circle) and median (line) values are shown. Box width indicates size of sample (n) and contains 50% of the individuals (the Interquartile Range). Whiskers indicate the range of the data. No outliers (values that exceed 1.5×IQR) are present

Table D4.4.2

Sample details and strontium and oxygen isotope results for skeletons from Portmahomack. The $\delta^{18}O_p$ values for the twelve pilot samples are measured but for the remainder they are calculated from the $\delta^{18}O_c$ c value. Calculated $\delta^{18}O$ phosphate and drinking water (from phosphate) values are in italics and were obtained using the equations in Chenery et al 2012 and Daux et al (Eq. 6, 2008). External reproducibility and measurement errors are estimated at ±0.002% (2SD) for $^{87}Sr/^{86}Sr$, ±0.02‰ (1SD) for $\delta^{18}O_c$ and ±0.16‰ (1SD) $\delta^{18}O_p$

Burial	Period	Sex	Age	Tooth	Tissue	$^{87}Sr/^{86}Sr$	Sr ppm	$\delta^{18}O_c$‰	$\delta^{18}O_p$‰	$\delta^{18}O_{dw}$‰
Balnabruach A	0	n/k	n/k	M2	enamel	0.71003	142	26.6	*17.7*	*−6.5*
Balnabruach C	0	n/k	n/k	M2	enamel	0.71113	90	25.8	*17.0*	*−7.5*
016	4	juv	6.6–10.5	M1	enamel	0.70995	129	–	18.4	*−54*
					dentine	0.7098	348	–	–	–
017	5	m	26–45	P1	enamel	0.70975	146	27.4	*18.6*	*−5.7*
030	4	m	46+	M3	enamel	0.71068	106	25.4	*16.6*	*−8.2*
035	4	m	17–25	M1	enamel	0.71158	74	–	18.5	*−5.2*
036	4	m	46+	M3	enamel	0.71258	76	27.1	*18.3*	*−5.5*
041	4	m	17–25	M1	enamel	0.7.1510	147	–	18.5	*−5.2*
					dentine	0.71160	210	–	–	–
054	2	m	17–25	M1	enamel	0.71040	141	–	17.5	*−6.7*
062	4	f	46+	P2	enamel	0.71285	200	25.7	*16.8*	*−7.8*
086	4	juv	6.6–10.5	M1	enamel	0.71256	104	–	18.0	*−6.1*
088	4	f	26–45	P1	enamel	0.71065	124	27.4	*18.6*	*−5.1*
110	4	juv	10.6–14.5	M1	enamel	0.71134	149	–	18.4	−5.4
111	3	m	23–45	M3	enamel	0.71224	143	26.2	*17.3*	*−7.1*
117	4	m	17–25	M3	enamel	0.71019	153	26.0	*17.2*	*−7.2*
119	4	juv	10.6–14.5	M1	enamel	0.71059	101	–	18.5	*−5.2*
127	2	m?	26–45	M2	enamel	0.71112	165	–	17.5	−6.7
					dentine	0.71129	167	–	–	–
129	2	?m	17–25	M3	enamel	0.71492	109	24.6	*15.7*	*−9.5*
130	2	m	23–45	P2	enamel	0.7.1212	113	26.4	*17.6*	*−6.6*
136	2	m	46+	M3	enamel	0.71102	187	25.8	*16.9*	*−7.7*
140	2	m	17–25	M2	enamel	0.71334	85	–	17.3	*−7.1*
					dentine	0.7.1127	225	–	–	–
144	2	m	46+	M2	enamel	0.7.1022	152	26.0	*17.1*	*−7.4*
147	3	m	26–45	M3	enamel	0.71101	142	–	17.8	*−6.3*
152	2	m	26–45	P2	enamel	tailed	failed	25.1	*16.2*	*−8.8*
153	2	m	26–45	M3	enamel	0.71301	64	24.7	*15.8*	*−9.4*
156	3	m	26–45	M3	enamel	0.7.1182	124	26.1	*17.3*	*−7.1*
158	3	m	46+	P2	enamel	0.71516	87	26.2	*17.4*	*−6.9*
170	1	m	26–45	M2	enamel	0.70993	185	–	17.3	*−7.0*
172	1	f	46+	M1	enamel	0.71104	99	–	17.8	*−6.3*
186	1	m	26–45	P2	enamel	0.71235	82	25.0	*16.1*	*−8.9*
187	1	m	46+	M2	enamel	0.71401	57	26.0	*17.1*	*−7.4*

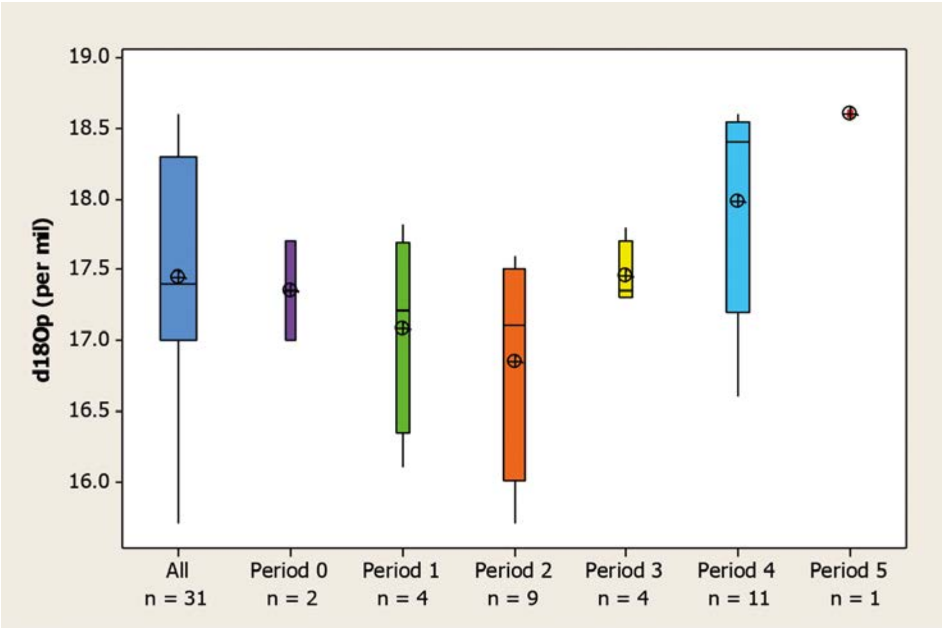


Illustration D4.4.2

A Box and Whisker plot of oxygen isotope results by period. Mean (circle) and median (line) values are shown. Box width indicates size of sample (n) and contains 50% of the individuals (the Interquartile Range). Whiskers indicate the range of the data. No outliers (values that exceed 1.5 × IQR) are present

with the published data above and suggest the dentine is incorporating strontium with an isotope ratio below 0.710 from the burial soil. These values may reflect the combination of soils derived from the underlying rocks and atmospheric strontium due to the coastal, maritime location of the site: rainwater, marine shell-sands, sea-splash and spray can lower or raise biosphere and human strontium isotope ratios towards 0.7092, which is the value of seawater and marine products (Montgomery et al 2003; Evans et al 2010). Sixteen individuals have a strontium isotope ratio that is consistent with origins on the coastal Old Red Sandstone at Portmahomack (Illus D4.4.3). Fourteen individuals from Periods 1 to 4 exhibit strontium isotope ratios which are higher than those expected for individuals originating from the Tarbat Peninsular and indicate origins in regions of older silicate or granitic rocks. These can be found widely in the Highlands of Scotland, where biosphere values and a small number of human enamel values exceeding 0.716 have been obtained (Evans et al 2012). No individuals have strontium isotope ratios indicative of origins in regions of basalts, chalks or limestones.

Evans et al (2012) defined the range for $\delta^{18}O_p$ in archaeological human enamel from across Britain to be 16.3–19.1‰ (mean = 17.7‰ ± 1.4‰ 2SD, n = 615). Inhabitants of eastern Britain were found to have a mean value of 17.2‰ ± 1.3‰ (2SD, n = 83) and western Britain a mean value of 18.2‰ ± 1‰ (2SD, n = 40). Using these estimates, the ranges for eastern and western Britain were calculated at the 1SD level and used in Illus D4.4.3 and 4. Only four individuals from Periods 1 and 2 (Burials 129, 152 (not plotted), 153 and 186) fall outside this 1SD range, having lower values; these are discussed further below. To facilitate comparison with geographical variation of mean annual precipitation in Britain, which ranges from −4.0‰ in the west to −9.0‰ in the east, measured and calculated $\delta^{18}O_p$ values can be converted to precipitation values; rainwater in Britain has been shown to be the principal source of ground and surface waters, and hence, drinking water (Darling & Talbot 2003; Darling et al 2003). However, there are several published equations to do this and all give slightly different results. Those in Table D4.4.2 were calculated using Daux et al (2008) Eq. 6 and range from −5.1‰ to −9.5‰ but the associated error is large (Pollard et al 2011). Based on the published oxygen isotope ratio precipitation map of Darling and Talbot (2003), individuals with $\delta^{18}O_{dw}$ above −7.0‰ are likely to originate in the higher rainfall regions of the western and south-western seaboard of Britain (and by extension Ireland) or the Western and Northern Isles. Individuals with values below −7.0‰ would be consistent with eastern, central and upland Britain and Ireland. Illus D4.4.3 shows that the majority of the early medieval population (Periods 1, 2 and 3) are consistent with origins in eastern or central Britain, whilst only individuals in Period 4 and 5 have $\delta^{18}O_p$ values above 17.9‰, suggesting origins in western Britain or the Northern Isles for a significant proportion of this later medieval sample. There is a statistically significant difference between the early medieval (Periods 2 and 3) and later medieval (Periods 4 and 5) $\delta^{18}O_p$ values (t-Test; $p<0.004$, n = 27). It is possible that some of the higher oxygen isotope ratios in this group may be due to analytical uncertainty, the sampling of first molars with a significant breastfeeding component, or a radically warmer climate in the second millennium AD, but none are likely to produce the required ~2‰ shift in $\delta^{18}O_p$ values away from the expected local values at Portmahomack. It is worth noting that the single named individual in the study, William Mackenzie in Period 5, is known to have originated in the west of Scotland and has an oxygen isotope ratio consistent with that which would be expected from the western seaboard (Evans et al 2012). These non-local individuals are discussed further below.

Discussion

Although the population sampled from Portmahomack is small, it nonetheless exhibits a wide range in both strontium and oxygen isotope ratios that are not indicative of a wholly sedentary population. Unfortunately, northern Scotland is not currently a well-characterised region for either oxygen or strontium isotopes of ancient humans due to its heterogeneous and ancient geology, the highland regions, and the shortage of excavated human and animal remains. Until these regions are better characterised for both isotope systems in humans, it is difficult to identify all possible places of origin within Britain, let alone beyond its shores. However, it is clear that the range of both strontium and oxygen isotopes obtained from Portmahomack represents a variety of origins for the population in the first and second millennium AD, both within and possibly outside Great Britain.

Period 0 and Period 1

There are a total of six samples dating from Period 0 (prior to the sixth century AD) and Period 1 (AD 550–700). The two Period 0 individuals from Balnabruach are within the local range for both strontium and oxygen isotope ratios (ie coastal Old Red Sandstone and east coast precipitation). In contrast, the four individuals dating to Period 1 are isotopically varied. A male skeleton (170) falls within the local isotope range for Portmahomack. The female long cist burial (172) falls in the oxygen isotope range for western, or possibly central,

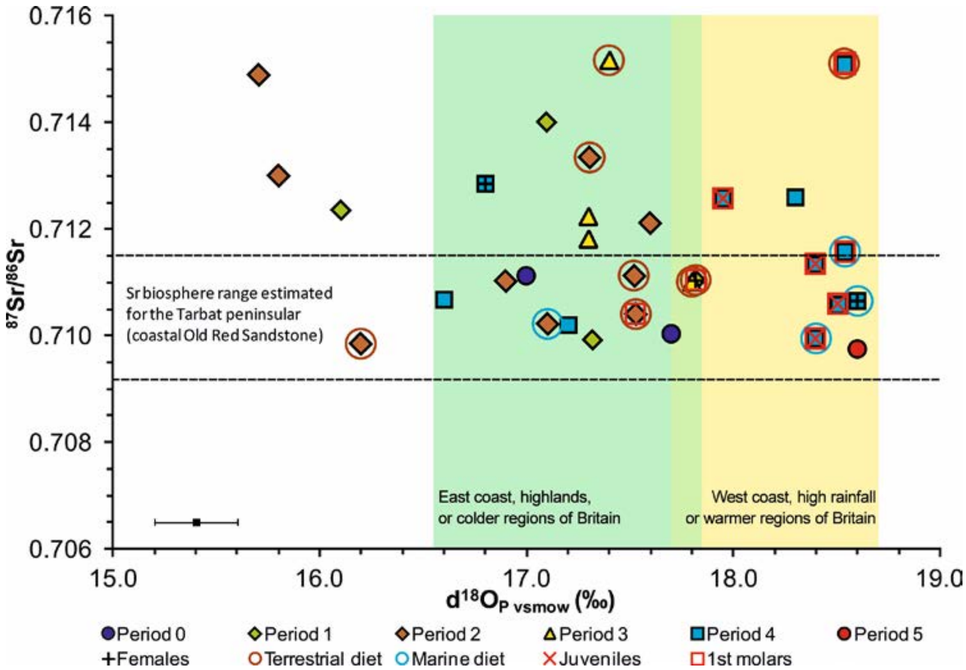


Illustration D4.4.3

A scatterplot of strontium and oxygen isotope ratios for the thirty individuals from Portmahomack. Burial 152 from Period 2 had a $\delta^{18}O$ value of 16.2‰ but no $^{87}Sr/^{86}Sr$ result so cannot be plotted here. The ranges for phosphate oxygen isotopes of humans originating from eastern and western Britain are given at 1SD level (Evans et al 2012). Estimated measurement error at 2SD is within the symbol for strontium (2SD) and for oxygen is conservatively estimated at ±0.2‰ (1SD) to encompass all measurement and calculation errors

with origins in the west: although measurement error introduces a margin of uncertainty to this conclusion, it is worth noting that this male individual was also unique with regards to burial style being the only wood-wicker matrix burial. There is evidence of migration from western Scotland, when Christians are believed to have visited the Northern Isles as early as the sixth century (James 1999) and migrations south from these islands, as well as east, may explain this individual. The remaining eight individuals have either strontium isotopes (111, 130, 140, 156 and 158), oxygen isotopes (152), or a combination of strontium and oxygen isotopes (129 and 153), that place them outside the range estimated for Portmahomack. Burial 156 was buried as a double burial with Burial 136, who seems to be of local origin; these two males have the same oxygen isotope ratios but a slightly different strontium isotope ratio. It is possible that they have the same geographical origins and the difference in strontium isotopes arises through a slightly different access to food resources, which can result in a range of ratios amongst a population (Montgomery et al 2007). Nonetheless, in sharp contrast to the local individuals, these eight appear to have been buried either shrouded or with a head support. Monasteries would contain

Britain. The other two male long cist burials (186 and 187) have high strontium isotope ratios, indicating they are not of local origin and came to Portmahomack from regions of older or granitic rocks, possibly away from the coast and/or in upland regions. The oxygen isotope ratio of 16.1‰ for skeleton 186 is very low and outside the range for eastern Britain at the 1SD level (ie 66% probability) as depicted in Illus D4.4.3, but would fall within the range at 95% probability. In contrast, such a value would lie outside the range for Britain as a whole at the 95% probability level (Evans et al 2012). It is, therefore, borderline, and this individual cannot be securely identified as of non-British origin.

Period 2 and Period 3

The majority of the burials dating to Periods 2 (AD 700–830) and Period 3 (AD 830–1100) consist of younger to older adult males with one female and no juveniles. Of the thirten individuals from Periods 2 and 3, only four males/probable males (54, 127, 136, 144) fall within the local range for Portmahomack. These four individuals were buried according to the predominant tradition: supine, unaccompanied and unmarked. Only one individual (147) from Period 2 or 3 has an oxygen isotope ratio that could be consistent

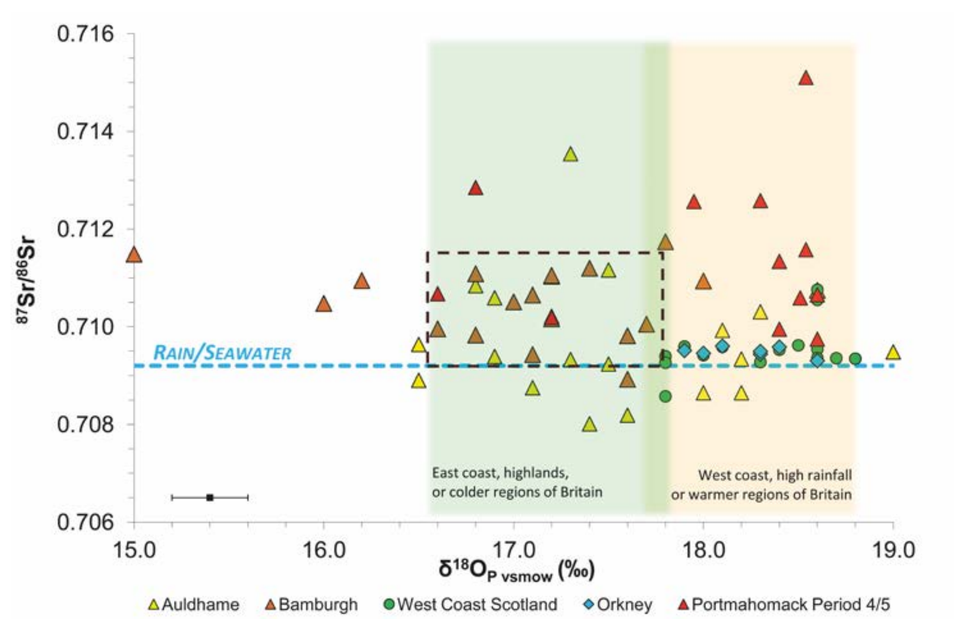


Illustration D4.4.4

A scatterplot of strontium and oxygen isotope data from Period 4 and 5 at Portmahomack compared to other published data from the Western Isles of Scotland (Evans et al 2012) and three medieval sites at Auldhame (Lamb et al 2012), Bamburgh (Groves et al 2013), Orkney (Toolis 2012). The ranges for phosphate oxygen isotopes of humans originating from eastern and western Britain are given at 1SD level (Evans et al 2012). The box indicates the estimated range for Portmahomack. Estimated error at 2SD is within the symbol for strontium (2SD) and for oxygen is conservatively estimated at ±0.2‰ (1SD) to encompass all measurement and calculation errors both clerics and lay individuals from a variety of places and it is perhaps not unusual or unexpected to find individuals in a monastic cemetery who originated elsewhere; such a finding was made in a recent isotopic study of the clerics buried at Whithorn Priory in Dumfries and Galloway (Müldner et al 2009).

The first five (111, 130, 140, 156 and 158), have oxygen isotopes which could indicate origins in eastern Britain or Ireland rather than their western or southern seaboards. However, of particular note are the three male individuals from Period 2 (129, 152 and 153), whose oxygen isotope ratios of 15.7‰, 16.2‰ and 15.8‰ respectively are exceedingly low for either Great Britain or Ireland. Whilst statistically these are not sufficiently low to feature as outliers amongst the Portmahomack population (Illus D4.4.2), such values fall outside the 2SD $\delta^{18}O_p$ range (16.3‰ to 19.1‰) but within the 3SD range for Britain (15.6‰–19.8‰). This gives only a 2.5% probability based on oxygen that these individuals are of British or (by extension as a result of comparable $\delta^{18}O$ precipitation values) Irish origin (Evans et al 2012). Such low oxygen isotope ratios are indicative of origins at higher altitude or in colder, more northerly or more continental regions. Scandinavia, central Europe or mountainous regions of Scotland may thus all be suitable regions of origin. The strontium isotope ratios for 129 and 153 (the sample for 152 failed) would also support origins on old rocks which are found in Scandinavia and the Scottish Highlands. It is worth noting here that Burial 152 had three severe, and possibly fatal, blade wounds.

Period 4 and 5

The medieval burial assemblage from Period 4 (1100–1600) is very different from that of Periods 2 and 3 and includes males, female, and non-adults ranging in age from approximately six to 46+ years. As was found in Periods 2 and 3, there is considerable variability in strontium isotope ratios amongst this group: they range from 0.7099 to 0.7151 (Illus D4.4.1) and, in isolation, this may simply reflect the heterogeneous and ancient geology of northeastern Scotland beyond the Tarbat peninsula. However, of the eleven individuals in Period 4, only two adult males (30 and 117) fall within the strontium *and* oxygen isotope range estimated for Portmahomack (Illus D4.4.3). One other individual, an older adult female (62), has an oxygen isotope ratio consistent with eastern Scotland, but her strontium isotope ratio suggests origins away from the coast on ancient Palaeozoic rocks. The most striking characteristic of the individuals in Period 4 is that, whilst possessing a range of strontium isotopes that suggests they do not share a single common geographic origin, the remaining eight have high oxygen isotopes ratios (ie 18.0‰ or above) that are unlikely to be consistent with origins in eastern or central Britain or Ireland. This non-local group is not restricted to male individuals but includes a female (88) and all the juveniles (16, 86, 110 and 119) measured in the study (Illus D4.4.3). As the first molars measured for these four individuals complete crown formation by the age of five, they must have arrived in Portmahomack during childhood, between the ages of five and death at, variously, 6.5 to 14.5 years of age. It is possible, therefore, that their time at Portmahomack was short, as at least two of these children (16 and 86) appear to have died within two years of arriving. In addition, the non-local group includes the three Period 4 individuals in this strontium/oxygen study (Burials 16, 35 and 88) who were found to have consumed a diet high in marine protein (Curtis-Summers & Montgomery D4.3), one of which is a juvenile (16). The clustering of the strontium, oxygen, carbon and nitrogen isotope data thus suggest a group of immigrant consumers of marine protein, possibly from the western seaboard or Northern Isles, is present in the later medieval period. It is also possible such migrant individuals may be involved in, or connected with, the medieval fishing trade, which may underpin the high level of mobility in this population (Barrett et al 2004).

The analysis of human skeletal remains from Portmahomack by King (2000) revealed the general health of people in Period 4 was poor in comparison to contemporaneous sites within the region. They are slightly shorter in stature and this is particularly apparent amongst females. Stress indicators – such as linear enamel hypoplasia and cribra orbitalia – were recorded and this combination may evidence a population under environmental stress and possible malnutrition (King 2000), which could have been a migratory push factor if these conditions were indicative of their putative homeland in the west.

Combined strontium and oxygen isotope data is only available for a few geographically and temporally comparable populations: on the east coast of northern Britain from seventh–seventeenth century Auldhame in East Lothian (Lamb et al 2012) and Bamburgh in Northumberland (Groves et al 2013); from the thirteenth–fourteenth century cemetery at St Thomas' Kirk in Orkney (Toolis 2008); and burials of various date from the west coast of Britain (Evans et al 2012). As expected, the data from Orkney and the west coast cluster in the range for western Britain and have strontium isotopes dominated by marine strontium ($^{87}Sr/^{86}Sr = 0.7092$) (Illus D4.4.4). The individuals from Auldhame and Bamburgh exhibit wide ranges in oxygen isotopes across the full range for Britain (Auldhame) and beyond (Bamburgh). Several individuals from Auldhame have $^{87}Sr/^{86}Sr$ below 0.7092, which is indicative of the Carboniferous limestone that occurs extensively in southern Scotland, and only one individual has $^{87}Sr/^{86}Sr$ above 0.712, which points to origins on the older and granitic rocks of northern Scotland. Lamb et al (2012) concluded that very little migration to Auldhame was visible in the individuals analysed, which contrasts with the situation at Portmahomack where migrants appear to predominate amongst the study sample.

Environmental and dietary stress is unlikely to explain the presence at Portmahomack of the single individual in Period 5 (1600–2000). Burial 17 was buried in a coffin and has been identified as William Mackenzie. According to Carver (2008), William Mackenzie was a parish minister of Tarbat from 1638 until his death in 1642. His strontium and oxygen isotope ratios are entirely consistent with origins in the Western Isles (Illus D4.44). Based on age at death and the first premolar selected for analysis, William Mackenzie travelled to Portmahomack from the western part of Scotland after the minimum age ranges of 4.25–7 years of age.

Conclusion

Migration to Portmahomack from various regions within and outside of Great Britain was detected during the monastic phases of Periods 2 and 3 (AD 550–1100) and the medieval Period 4 (1100–1600). However, in Periods 2 and 3 the majority of the migrants appear to be from the eastern part of mainland Great Britain or Ireland and there are suggestions that origins may be linked to burial rite. Two, possibly three, burials within this phase have such low oxygen isotope ratios that there is only a 2.5% probability that they originate from Great Britain and Ireland. Such values would be found at higher altitude, and in colder, more continental or more northerly regions such as Scandinavia or central Europe.

In the medieval Period 4, the majority of individuals investigated appear to originate from the western or southern seaboard of Britain or Ireland, or the Northern Isles. This non-local group includes males, females and juveniles and implies the medieval population at Portmahomack were highly mobile. Given the evidence that they were marine protein consumers and the osteological evidence for nutritional stress, this may be linked to the fishing trade or to migration due to economic factors. The lack of comparative sites in the north-eastern part of Scotland makes it difficult to compare Portmahomack to similarly sited, contemporaneous sites, and further isotopic studies of humans excavated from Scotland are recommended to elucidate and interpret Scotland's past more clearly.

References

Anderson, D L, Thompson, G W & Popovich, F 1976 'Age of attainment of mineralization stages of the permanent dentition', *Journal of Forensic Sciences* 21: 191–200.

Barrett, J H, Locker, A M & Roberts, C M 2004 '"Dark Age Economics" revisited: The English fish bone evidence AD 600–1600', *Antiquity* 18: 618–36.

Bentley, R A 2006 'Strontium isotopes from the earth to the archaeological skeleton: A review', *Journal of Archaeological Method and Theory* 13: 135–87.

Budd, P, Montgomery, J, Barreiro, B & Thomas, R G 2000 'Differential diagenesis of strontium in archaeological human dental tissues', *Applied Geochemistry* 15: 687–94.

Carver, M 1997 *Bulletin of the Tarbat Discovery Programme Number 3*. York: University of York.

Carver, M 2003 *Bulletin of the Tarbat Discovery Programme Number 7*. http://www.york.ac.uk/archaeology/staff/sites/tarbat/bulletins/bulletin7/contents.html.

Carver, M 2008 *Portmahomack: Monastery of the Picts*. Edinburgh: Edinburgh University Press.

Chenery, C, Müldner, G, Evans, J, Eckardt, H & Lewis, M 2010 'Strontium and stable isotope evidence for diet and mobility in Roman Gloucester, UK', *Journal Archaeological Science* 37: 150–63.

Chenery, C A, Pashley, V, Lamb, A L, Sloane, H J & Evans, J A 2012 'The oxygen isotope relationship between the phosphate and structural carbonate fractions of human bioapatite', *Rapid Communications in Mass Spectrometry* 26: 309–19.

Coplan, T B 1988 'Normalization of oxygen and hydrogen isotope data', *Chemical Geology* (Isotope Geoscience Section) 12: 293–7.

Darling, W G, Bath, A H & Talbot, J C 2003 'The O & H stable isotopic composition of fresh waters in the British Isles. 2. Surface waters and groundwaters', *Hydrology and Earth System Sciences* 7: 183–95.

Darling, W G & Talbot, J C 2003 'The O & H stable isotopic composition of fresh waters in the British Isles. I. Rainfall', *Hydrology and Earth System Sciences* 7: 163–81.

Daux, V, Lécuyer, C, Héran, M A, Amiot, R, Simon, L, Fourel, F, Martineau, F, Lynnerup, N, Reychler, H & Escarguel, G 2008 'Oxygen isotope fractionation between human phosphate and water revisited', *Journal of Human Evolution* 55: 1138–47.

Evans, J, Chenery, C A & Montgomery, J 2012 'A summary of strontium and oxygen isotope variation in archaeological human tooth enamel excavated from Britain', *Journal of Analytical Atomic Spectroscopy* 27: 754–64.

Evans, J A, Montgomery, J, Wildman, G & Boulton, N 2010 'Spatial variations in biosphere $^{87}Sr/^{86}Sr$ in Britain', *Journal of the Geological Society* 167: 1–4.

Evans, J, Stoodley, N & Chenery, C 2006 'A strontium and oxygen isotope assessment of a possible fourth century immigrant population in a Hampshire cemetery, southern England', *Journal of Archaeological Science* 33: 265–72.

Groves, S E, Roberts, C A, Lucy, S, Pearson, G, Gröcke, D R, Nowell, G, Macpherson, C G & Young, G 2013 'Mobility histories of 7th–ninth century AD people buried at early medieval Bamburgh, Northumberland, England', *American Journal of Physical Anthropology* 151: 462–76.

Gustafson, G & Koch, G 1974 'Age estimation up to 16 years of age based on dental development', *Odontologisk Revy* 25: 297–306.

Hoppe, K A, Koch, P L & Furutani, T T 2003 'Assessing the Preservation of Biogenic Strontium in Fossil Bones and Tooth Enamel', *International Journal of Osteoarchaeology* 13: 20–8.

James, H G 1999 'Excavation of a medieval cemetery at Skaill House, and a cist in the Bay of Skaill, Sandwick, Orkney', *Proc Soc Antiq Scot* 129: 753–77.

King, S 2000 'Part 2: The Human Remains from Tarbat Old Church, Portmahomack: The Specialist Report', *in* Carver M (ed) *Bulletin of the Tarbat Discovery Programme Number 6* (http://www.york.ac.uk/depts/arch/staff/sites/tarbat) 86 pages.

Lamb, A L, Melikian, M, Ives, R & Evans, J 2012 'Multi-isotope analysis of the population of the lost medieval village of Auldhame, East Lothian, Scotland', *Journal of Analytical Atomic Spectrometry* 27: 765–77.

Longinelli, A 1984 'Oxygen isotopes in mammal bone phosphate: a new tool for paleohydrological and paleoclimatological research?', *Geochimica et Cosmochimica Acta* 48: 385–90.

Lorimer, D H 1995 'Report on the human bones found at the Portmahomack Drainage Site, Archaeological Section, Highland Region'. http://www.tarbatdiscovery.co.uk/Balnabruach%20Man/Report%20on%20the%20human%20bones%20found%20at%20the%20Portmahomack%20Drainage%20Site.pdf.

Montgomery, J 2002 *Lead and strontium isotope compositions of human dental tissues as an indicator of ancient exposure and population dynamics*. Unpublished PhD Thesis, Department of Archaeological Sciences, University of Bradford.

Montgomery, J, Evans, J A & Cooper, R E 2007 'Resolving archaeological populations with Sr-isotope mixing models', *Applied Geochemistry* 22: 1502-1514.

Montgomery, J, Evans, J A & Neighbour, T 2003 'Sr isotope evidence for population movement within the Hebridean Norse community of NW Scotland', *Journal of the Geological Society* 160: 649–53.

Müldner, G, Montgomery, J, Cook, G, Ellam, R, Gledhill, A & Lowe, C 2009 'Isotopes and individuals: diet and mobility among the medieval Bishops of Whithorn', *Antiquity* 83: 1119–33.

Pollard, A M, Pellegrini, M & Lee-Thorp, J A 2011 'Technical note: Some observations on the conversion of dental enamel $\delta^{18}O_P$ values to $\delta^{18}O_w$ to determine human mobility', *American Journal of Physical Anthropology* 145: 499–504.

Price, T D, Knipper, C, Grupe, G & Smrcka, V 2004 'Strontium isotopes and prehistoric human migration: the Bell Beaker Period in central Europe', *European Journal of Archaeology* 7: 9–40.

Toolis, R 2008 'Excavation of medieval graves at St Thomas' Kirk, Hall of Rendall, Orkney', *Proc Soc Antiq Scot* 138: 239–66.

Walther, L 2012 *Strontium and Oxygen Isotope Analysis of Burials Recovered from an Early Christian site at the Tarbat Old Church in Portmahomack, Scotland*. Unpublished MSc thesis, Department of Archaeology, University of Durham.

Digest 4.5 STARCH

BECCA WALTERS (formerly of University of York) (summary of full report, OLA 7.2.3)

Fifteen individuals were examined from the main periods of occupation at Tarbat, but only thirteen starch granules were recovered from seven individuals.

Out of the thirteen starch granules that were discovered, seven could be considered as either oat or wheat granules, while one could be possibly be identified as a barley granule.

There was no result from Period 1. Two individuals in Period 2 had been eating barley, and oats or wheat. Three individuals in Period 4 had been eating oats or wheat and some tubers. The individual from Period 5 (The Rev Mackenzie) had been eating oats or wheat.

Table D4.5.1
Starch granules identified in dental calculus

Burial	Period	Size of granule	Shape of granule	Possible identification
22	5	9.53µm, 9.13µm	Round	Oat or wheat
16	4	27.61µm (length) 20.79µm (width)	Oval	Tuber
16	4	9.11µm, 10.28µm	Round	Oat or wheat
16	4	10.85µm, 9.87µm	Round	Oat or wheat
91	4	14.55µm (length), 11.23µm (width)	Oval	Bean
91	4	7.32µm (length), 5.27µm (width)	Oval	Bean
100	4	13.13µm, 13.69µm	Round	Oat or wheat
100	4	5.80µm, 4.04µm	Round/slightly oval	Undetermined
144	2	15.09µm (length), 17.46µm (width)	Round/slight oval	Barley
127	2	13.82µm, 11.71µm	Round	Oat or wheat
127	2	13.72µm (length), 11.02µm (width)	Round/slightly oval	Oat or wheat
Burial 127 [F128] (attached to above mentioned granule)	2	10.20µm (length), 9.45µm (width)	Round/slightly oval	Oat or wheat
149	1	11.27µm, 11.83µm	Round/bell-shaped	Undetermined

From OLA 7.2.3, Table 5.7: The measurements were taken for the length and width, or in the cases of round granules, measurements were taken along the arms of the cross.

Digest 5.1 CATALOGUE OF EARLY MEDIEVAL SCULPTURE

MARTIN CARVER (University of York) and NICKY TOOP (FAS Heritage)

K	Key pattern	YSS	Yellow sandstone
I	Interlace	GSS	Grey/green sandstone
S	Spiral	RSS	Red sandstone
A	Animal	SS	Sandstone
H	Human	a,b	Type of border profile (U = unidentified)
P	Plant	Group I	Group of similar ornament and border, including conjoining pieces
TR44	Part of same conjoining group, but not directly conjoining		
IB	NMS accession no.		
ECMS	Allen & Anderson 1903, part 3, pp 73–5, 91–3		

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
1	IB190 ECMS no 1	Churchyard, until *c* 1850. On OS 1907 E of church, near Dingwall Monument. Other half said to have been thrown into a grave.	650 × 1100 × 150	YSS	Damaged and worn	Base of cross slab with tenon (Cross A)	Lower part of cross slab, including tenon. Three decorated faces. A: inhabited vinescroll border surrounding figural panel. B: incised interlace. C: crescent and V-rod, serpent and Z-rod, animal, possibly Pictish beast	U		X		X	X	X	
2	IB280-1 ECMS no 2, 2a, 2b, 2c	Churchyard, before 1776	490 × 470 × 50 (two pieces); 320 × 460 × 50; 210 × 190 × 40	GSS	Fragmented (four pieces) and worn	Central panel of a cross slab (Cross B)	Four fragments of upright slab. Central interlace shaft, with panels of interlaced serpents and raised bosses.	U		X	X	X		?	
3	ECMS no 3	Churchyard, before 1903 (now lost)	150 × 90 × 50	–	Not known (lost)	Fragment	Fragment of relief carved interlace			X					
4	IB282 ECMS no 4	Churchyard, *c* 1850	270 × 190 × 35	YSS	Worn	Fragment	Possible cross armpit			X					
5	IB283 ECMS no 5	Churchyard, before 1850	310dia × 55	GSS	Very worn	Fragment (Cross B?)	Boss, comprising seven small spiral? bosses in a wreath of interlace and key pattern		X	X	X				
6	IB131 ECMS no 6	Grave-digging, E side of N aisle, late nineteenth century	340 × 300 × 40	GSS	Very worn	Fragment (Cross A or B)	Wreath boss decorated with key pattern, with central raised boss (now plain) surrounded by smaller spiral bosses (three survive)		X		X				
7	IB130 ECMS no 7	Grave-digging, E of E gable, late nineteenth century	240 × 175 × 15 (three fragments)	YSS	Good	Fragment	Fragment of trumpet spiral decoration				X				
8	IB284 ECMS no 8	Churchyard, before 1889	250 × 160 × 60	GSS	Worn	Fragment	Fragment of key pattern (Cross B?)		X						
9	IB285 ECMS no 9	Churchyard, before 1903	220 × 180 × 190	YSS	Worn	Fragment (Cross C?)	Fragment with two opposed decorated faces. A: spiral ornament. B: curved edge of an interlace panel			X	X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
10	IB286 ECMS no 10	Manse garden wall, before 1903	470 × 310 × 170	YSS	Worn	Edge of slab (Cross C)	Sub-rectangular fragment with two adjacent carved faces. A: spiral and peltae design, with flat-band moulding. B: relief-carved inscription in insular majuscule, with traces of interlace			X	X				
11	Miller 1889	Seen at Invergordon Castle before 1889 (now lost)	Not known	GSS	Not known (lost)	Fragment	'small boss richly fretted like a knot of young adders interlaced' (Miller 1889)			X					
12	IB209	Reported in 1927 as from churchyard	170 × 190 × 40	YSS	Worn	Cross slab	Flat-band moulding divides a horizontal panel of interlace from an animal panel comprising a cockerel and fox			X		X			
13	IB250	Grave-digging in churchyard before 1939	430 × 350 × 80	RSS	Good	Panel	Two opposed faces decorated, and adjacent edges dressed. A: sunken crosses with moulded borders, within a rectangular panel. B: key pattern within flat-band moulding	U	X						
14	In situ	Rebuilt into the relieving arch supporting the belfry. Seen 1984 by G Stell	210 × 160 × ?	YSS	Worn	Fragment	Panel of interlace design, with flat-band moulding adjacent	U		X					
15	Ritchie 1915	Seen in 1914 leaning against boundary wall of church. Dug up from beneath a recumbent stone dated 1778; broken up and recycled	1000 × 600 × 175	RSS	Not known	Slab	Slab with Maltese cross formed from five circles								
16	In situ	Built into blocked doorway of the south wall of the nave (east among pieces of a seventeenth-century grave stone. Blocked post 1843	250 × 220 × ?	SS	Worn	Fragment	Fragment with letter 'A' in insular majuscule. Possible incised decoration								
17	–	Found during clearance of the crypt in 1991 by Jill Harden	215 × 190 × 25	SS		Fragments (3 no)	Three conjoining fragments. Double moulded border (flat band and thinner inner), with partial spirals and interlace knot	U		X	X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
18	–	Found during clearance of the crypt in 1991 by Jill Harden	82 × 111 × 72	SS		Fragment	Roughly shaped rectangular fragment with spiral decoration and single flat-band moulding	U			X				
19	–	Found by Ian Fisher and removed from the southern wall of the graveyard by Niall Robertson in 1994	340 × 126 × 80			Slab	Roughly shaped rectangular stone bearing a simple cross in relief								
20	19/72	Located in 1995 built into the crypt vault and extracted in 1997. 19/F2 C1040	710 × 410 × 178		Good	Slab (Cross C)	The *Dragon Stone* or *Apostle Stone*. Face 1: panels of spirals and dragon. Face 2: two lions disputing a deer carcass; four clerics	U			X	X	X		Ass. with TR10
21	17/9	Located during 1996 excavations, recovered 1997. 17/F2 C1016	510 × 195 × 45		Good	Slab	Small cross-slab bearing a hollow-armed cross one side and a chisel-ended cross the other	–							
22	17/10	Located in excavations of 1996, built into foundations of earlier church. Extracted 1997. 17/F2 C1016	1065 × 460 × 230			Sarcophagus	The Boar Stone. Two adjacent faces decorated. Face1: lion and boar in relief on panels; divided single flat band moulding. Face 2: cross in relief	U				X			
23	14/272	Found during Glebe Field excavations in 1996. 14/C1002	55 × 30			Fragment (Group I)	Fragment of spiral in relief	–			X				
24	16/1	Found in service trench on N side of church in 1996. 16/C1001	470 × 245 × 130		Good	Cross-incised slab	Roughly shaped stone with crude cross scratched upon it								
25	16/3	Found in service trench on N side of church in 1996. 16/C1008	231 × 195 × 47		Good	Cross-incised slab	Roughly shaped stone with crude cross incised on it								
26	19/1044	Re-used as a lintel in the N light of the crypt. Found in 1997 and left in situ, 19/F19 C1044					Part of cross shaft								
27		Removed by Niall Robertson from graveyard	560 × 150 × 140			Poss shrine-post	Stone post with side-grooves, possibly a shrine-post or part of a *cancellum*								

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
28	24/131	Found re-used in a medieval drain cover in the Glebe Field excavations in 1997. 14-24/C1370	775×480×100		Good. Unfinished?	Slab	Trial piece or slab, with bull, cow (or two cows), one licking a calf, in low relief. Part of horseman/ woman	U			X	X			TR35
29	17/361	Found in the western wall of the crypt in 1997. 17/F97 C1295	325×325×72				Fragment with part of stepped cross in low relief								
30	17/465	Found built into the foundations of the south wall of the early church in 1997. 17/F63 C1180	560×620			Cross-incised slab	Part of cross-slab with incised hollow angled cross								
31	17/466	Found built into the foundations of the south wall of the early church in 1997. 17/F63 C1180	190×180×70			Cross-incised slab	Part of cross-slab with incised hollow angled cross								
32	23/44	Found in rubble blocking beneath arch in west end of the church during restoration in 1997	140×90×60		Good	Fragment	Small fragment with two decorated faces. Face 1: flat band moulding and vestiges of spiral design, with C-shaped connectors. Face 2: largely plain, with incised key pattern	U		X	X				
33	17/467	Found in the foundations of the S wall of the early church during restoration 1998	524×212×56		Good	Slab	Cross slab with cross in low relief, with four circles in cross arms								
34		Found in rubble foundations of the external stairs leading to the upper floor of the north aisle during restoration 1998	350×350×75			Slab	Fragment of cross slab with two opposed decorated faces. Face 1: hollow angled cross in low relief. Face 2: double moulded border?	U							
35	24/1798	Found 1998 in Sector 2 excavations, lining a medieval drain. 14-24/ F166 C1453	380×330×80			Fragment of panel (shrine)	Fragment showing lion, above which is a cloven-footed ‘manticora’ depicted, possibly menacing a lamb. Top displays four incised lines forming a border	U				X			TR28
36	14/2119	Found 1998 in Sector 2 excavations 14-24/C1506	85×50×30		Good	Fragment	Small spiral fragment				X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
37	14/2122	Found 1998 in Sector 2 excavations 14-24/C1510	89×45×20	YSS	Good	Fragment	Small fragment of median incised interlace, single strand surviving, 22mm wide			X					
38	14/2120	Found 1998 in Sector 2 excavations 14-24/C1510	114×88×35	YSS	Good	Fragments (Group III)	Conjoining fragments of a fragment of median incised interlace; three interlaced strands visible, *c* 25mm wide			X					*Set 3* TR156 TR177
39		Found 1999 by Richard Blosse in stones originating from the Manse steading	100×100×50	YSS	Worn/ mortar visible on surface	Fragment (architec-tural?)	Prominent, semi-circular boss, decorated with even, single-strand interlace. Strands measure 7mm wide.			X					
40		Found 1999 by Richard Blosse in stones originating from the Manse steading	370×270×190	SS	Worn and damaged	Fragment	Decorated on two opposing faces. Face 1: square key pattern. Face 2: Interlace above a panel of spirals		X	X	X				
41	20/267	20/F73/C1175	185×116×33	YSS	Worn and damaged	Fragment	Fragment of hollow armed cross								
42	14/2121	14-24/C1510	120×90×75	YSS	Fine cracks	Fragment	Edge fragment with two adjacent faces bearing roll-moulded and flat band moulding with outer rounded moulding (30mm) inner rounded moulding (10mm) and wider, flat band (40mm)	b							TR243 Similar to TR62
43	14/2136	14-24/C1510	75×92×55	YSS	Good	Fragment (Group IV)	Fragment with two adjacent faces decorated; one plain dressed face, and one bearing double roll-moulded border (30mm outer, 15mm inner) with 35mm flat band. Vestiges of design, possibly spirals	b			X				*Set 1* TR55 TR68 TR78 *TR44* *TR47* *TR59* *TR73* *TR94*
44	14/2137	14-24/C1510	135×85×65	YSS	Good	Fragment (Group IV)	Fragment with two adjacent carved faces; one plain dressed face, and one bearing double roll-moulded border (30mm outer, 15mm inner) with 35mm flat band	b							*Set 1* TR55 TR73 TR94 *TR43* *TR47* *TR59* *TR68* *TR78*
45	14/2138	14-24/C1510	110×80×65	YSS	Good	Fragment (Group 1)	Two worked faces; one plain dressed face, one bearing border moulding. Outer roll-moulding (30mm), inner roll-moulding (10mm) and flat band (35mm wide)	a							*Set 1* TR54 TR129 *TR58*

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration K	Decoration I	Decoration S	Decoration A	Decoration H	Decoration P	Conjoins
46	14/2164	14-24/C1510	45×37×20	YSS	Good	Fragment	Possible border moulding, with an incised ellipse. Parallels with border known to have been associated with spiral	U							Like TR117
47	14/2165	14-24/C1510	30×30×10	YSS	Good	Fragment (Group IV)	Small fragment of sandstone. Edge of moulded border, with one slightly rougher side, and a smoother, rounded edge	a							*Set 1* TR78
48	14/2174	14-24/C1593	12×21×10	YSS	Good	Fragment	Small fragment with a single carved face, representing rounded moulding 1.2m wide	U							
49	14/2178	14-24/C1588	35×115×35	YSS	Good, ferrous staining	Fragment	Thin fragment with one decorated face, carved with triangular key pattern		X						TR63
50	14/2272	14-24/C1510	70×65×95	YSS	Good	Fragment	Edge fragment with two worked faces. One bears double roll-moulded border (outer 30mm, inner 15mm) with flat band, other is plain worked face	a							
51	14/2273	14-24/C1510	80×55×40	YSS	Good	Fragment	Edge fragment with two worked faces. One bears double roll-moulded border (outer 30mm, inner 15mm)	a							
52	14/2276	14-24/C1510	60×25×25	YSS	Good	Fragment	Single carved face, bearing part of roll-moulded border. No complete widths	U							
53	14/2278	14-24/C1510	40×23×40	YSS	Good	Fragment	Edge fragment with two worked faces. One is rounded, probably edge of roll-moulded border (20mm+), second is plain	U							
54	14/2282	14-24/C1510	90×70×55	YSS	Good. Some ferrous staining	Fragment	Edge fragment with two worked faces. One bears double-roll moulded and flat band border (30mm, 10mm and 20mm+ respectively). Second face is plain	a							*Set 1* TR45 TR58
55	14/2284	14-24/C1510	60×85×55	YSS	Good	Fragment (Group IV)	Edge fragment with two worked faces. One bears double-roll moulded and flat band border (30mm, 10mm and 35mm respectively). Second face is plain	a							*Set 1* TR43 TR44 *TR78* *TR59*

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
56	14/2286	14-24/C1510	230×80×75	YSS	Good	Fragment	Corner fragment, with three worked faces. One has the corner of a double roll-moulded and flat band border (30mm, 15mm). Other two are plain	a corner							*Set 2* TR79
57	14/2288	14-24/C1510	45×90×45	YSS	Good	Fragment (Group IV)	Edge fragment with two worked faces. Remains of double roll-moulded and flat band border. Outer, rounded border broken away (prob 30mm), inner roll-moulding 10mm and flat band 50mm	d							
58	14/2296	14-24/C1510	60×60×10 (two fragments)	YSS	Good	Fragment	Two conjoining fragments. Vestiges of flat band moulding	a							*Set 1* TR54
59	14/2311	14-24/C1510	70×65×45	YSS	Good	Fragment (Group IV)	Edge fragment, with two worked faces. One plain face, one bearing double roll-moulded and flat band border (30mm, 15mm and 20mm+)	a							*Set 1* TR68 *TR43* *TR44* *TR55* *TR78*
60	14/2318	14-24/C1510	75×70×50	YSS	Ferrous staining	Fragment (Group IV)	Edge fragment, with two worked faces. One is plain worked surface. The second has two border types, forming a T-junction, between two presumed panels. One panel has double roll-moulded and flat-band border (30mm, 10mm respectively, flat band broken). Second panel has a single, roll-moulded border, 30mm wide	U							*Set 1* TR101 TR107 *TR74* *TR97*
61	14/2321	14-24/C1510	120×105×60	YSS	Good	Fragment (Group IV)	One worked face, bearing triangular key pattern over an area of 100mm×80mm		X						TR88
62	14/2324	14-24/C1510	100×100×50	YSS	Ferrous staining	Fragment (Group IV)	Edge fragment, with two worked faces. One with double roll-moulded border (30mm, 10mm) – rest broken away. Second face has double roll-moulded and flat band border (30mm, 10mm, 30mm) with triangular key pattern above (10mm wide)	b	X						*Set 2* TR66
63	14/2325	14-24/C1510	90×40×35 (2 fragments)	YSS	Good, some flaking	Fragment (Group IV)	One worked face, bearing triangular key pattern		X						TR49

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
64	14/2327	14-24/C1510	60×30×20 80×60×25	YSS	Good, some cracking	Fragment	One worked face, carved up to 3mm deep. Double roll-moulded border with flat band. Broken at both edges so only width of inner moulding can be measured (10mm)	u							
65	14/2328	14-24/C1510	45×45×40	YSS	Good, some abrasion	Fragment	Edge fragment with two worked faces. One plain, the other bearing double roll-moulded border, 30mm (outer) and 12mm (inner)	u							
66	14/2337	14-24/C1510	45×40×20	YSS	Good, some mineral staining	Fragment	Edge fragment with two carved faces. One is rounded, but width of moulding is broken away. Second face has double roll-moulded strip (30mm outer, 10mm inner)	b							*Set 1&2* TR62
67	14/2340	14-24/C1510	30×25×20	YSS	Good, some staining	Fragment	Small fragment with one worked face, with internal corner of border moulding, being a strip 10mm wide. Vestiges of inner flat band	a?							*Set 2* TR56?
68	14/2345	14-24/C1510	140×90×65	YSS	Good	Fragment (Group IV)	Two worked faces, with edge broken away. Double roll-moulded and flat band border represented by inner, rounded strip (10mm) wide and part of adjacent flat band and beginnings of outer rounded moulding	a							*Set 1* TR43 TR59 TR78 *TR44* *TR55*
69	14/2350	14-24/C1510	100×100×50	YSS	Good	Fragment (Group IV)	One worked face, with part of a flat band border strip, 27mm wide, adjacent to triangular key pattern	u	X						*Set 1* TR72
70	14/2352	14-24/C1510	100×100×85	YSS	Good, some lamination	Fragment	One worked face. Single, flat band 45mm wide and 3mm deep. ?internal panel or border	u							
71	14/2354	14-24/C1510	90×50×55	YSS	Good, some abrasion	Fragment	Edge fragment with one worked face. One face plain. Second has a double roll-moulded and flat band border (30mm, 10mm and 10mm+)	a							
72	14/2357	14-24/C1510	60×110×50	YSS	Good	Fragment (Group IV)	Edge fragment with two worked faces, broken away at the corner. One face plain. Second has double roll-moulded and flat band border (*c* 30mm, 10mm, 30mm) with triangular key pattern, up to 5mm in relief	a	X						*Set 1* TR69

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
73	14/2361	14-24/C1510	60×45×30	YSS	Good	Fragment (Group IV)	Edge fragment with two worked faces. One is plain and flat. Second has double roll-moulded border, outer strip 30mm inner strip 10mm	u							
74	14/2364	14-24/C1510	350×200×80	YSS	Good, some lamination	Large fragment (Group IV)	One worked face. Vestiges of border moulding, with inner flat band (30mm), rounded strip (10mm) but broken away before the edge. Remaining surface decorated with triangular key pattern	u	X						*Set 1*
75	14/2369	14-24/F304/ C1721	65×60×10	YSS	Good	Fragment	One worked face, carved with triangular key pattern		X						
76	14/2370	14-24/C1510	70×40×75	YSS	Good	Fragment	One worked face, with double roll-moulding, 10mm inner and 20mm+ outer, broken before the edge	u							
77	14/2382	14-24/C1510	70×35×25	YSS	Good	Fragment	Edge fragment with two worked faces. One is plain. Second has fragment of roll-moulded border, 30mm wide	u							
78	14/2383	14-24/C1510	50×40×20	YSS	Good	Fragment (Group IV)	One worked face, with remains of double roll moulding, outer strip 30mm+, inner 10mm	U							*Set 1* TR47 TR43 TR55 *TR44* *TR68* *TR59*
79	14/2384	14-24/C1510	40×20×25	YSS	Good	Fragment	Edge fragment, with two worked faces. One plain, one bearing outer roll-moulding of a border design, 25mm wide	a							*Set 2* TR56
80	14/2385	14-24/C1510	45×30×45	YSS	Quite abraded	Fragment	Edge fragment, with two worked faces. One plain, one with outer strip of roll-moulded border, 30mm wide	U							
81	14/2389	14-24/F304/ C1721	160×60×100	YSS	Some staining	Fragment	One worked face. Flat band, broken but at least 45mm wide, with pocked surface, above which is the beginning of a finer, rounded relief design	U							
82	14/3402	14-24/C1510	20×32×20	YSS	Good	Fragment	Small fragment, with possible rounded moulding and flat band	U							
83	14/3404	14-24/C1510	35×22×12	YSS	Good	Fragment	Small fragment with one worked face, part of a rounded band, 12mm wide	U							

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
84	14/3405	14-24/C1510	35×35×10	YSS	Good	Fragment	Small fragment, one worked face, comprising a rounded band, 35mm wide, possibly border or animal design	?							
85	14/3406	14-24/C1510	75×135×35	YSS	Good	Fragment	One worked face, with vestigial carving suggesting a broad flat band and possible rounded border adjacent	U							
86	24/3841	14-24/C1547	135×135×100	YSS	Good	Fragment (Group IV)	Edge fragment with two worked faces. One plain worked surface with some pitting. Double-roll moulded and flat band border (30mm, 10mm, 30mm). Triangular key pattern	a	X						
87	24/3846	14-24/C1547	30×90×75	YSS	Good	Fragment	Corner fragment with two worked faces. One plain. Second has double roll-moulded border 30mm, 10mm, 15mm, beginnings of a possible spiral design	a	?		?				
88	24/3895	14-24/C1547	150×145×70	YSS	Good	Fragment (Group IV)	One worked face, with 120mm×100mm area of triangular key pattern		X						TR61
89	24/4013	14-24/C1547	80×85×45	YSS	Good	Fragment	Edge fragment with two worked faces. One plain, one with double roll-moulded and flat band border (30mm, 10mm, 30mm), with rounded strip of design – possible key pattern	a	?						
90	24/4024	14-24/C2537	40×75×13	YSS	Good, abraded	Fragment	One worked face, plain flat band 40mm wide with thinner band, 10mm wide.	u							
91	24/4040	14-24/C1547	17×13×4	YSS	Good	Fragment	Very small fragment, part of a rounded band, 10mm wide – interlace?			?					
92	24/4042	14-24/C1547	27×20×3	YSS	Good	Fragment	Very small fragment with rounded face, possibly part of interlace strip			?					
93	24/4043	14-24/C1547	23×16×7	YSS	Good	Fragment	Small fragment, one worked face. Rounded face, possible border?	?							
94	24/4045	14-24/C1547	50×25×20	YSS	Good	Fragment (Group IV)	Edge fragment, two worked faces. One plain, one rounded, possibly part of roll-moulded border	U							
95	24/4103	14-24/C1805	35×35×20	YSS	Good	Fragment	Edge fragment, two worked faces. One plain, one rounded, possibly part of roll-moulded border	U							

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
96	24/4324	14-24/C1811	42×20×5	YSS	Good	Fragment	One worked face. Rounded fragment, possibly border or interlace	?		?					
97	24/4719	14-24/C1877	190×115×50	YSS	Good	Fragment	Large, irregular fragment, with one worked face. Largely plain and smooth, with part of rounded border moulding, 30mm wide and 4mm deep along one edge	U							
98	14/2302	14-24/C1510	140×50×45	YSS	Black accretions and staining	Fragment	Edge fragment with two worked faces. High relief, roll moulded border, 45mm wide, with vestiges of relief carving above. Second face flatter strip (20mm wide)	U							
99	14/2305	14-24/C1510	120×40×35	YSS	Stained	Fragment	Edge fragment, two worked faces. One plain and slightly pitted. High relief rounded border, 45mm wide	e							TR106
100	14/2320	14-24/C1510	156×92×45	YSS	Abraded	Fragment	Corner fragment, three worked faces. One side has a thick, rounded border (60mm), with a flat face adjacent. Face 2 has a roughly worked plain face. Face 3 is a more finely dressed, plain face. Conjoins animal design	U							TR227 TR260
101	14/2330	14-24/C1510	70×40×40	YSS	Good	Fragment	Edge fragment with two worked faces. One is plain. The other has a rounded border (35mm). Forms a divide between a panel containing key pattern and a blank panel.	f							*Set 1* TR45 TR107 *TR74* *TR97*
102	14/2343	14-24/C1510	230×55×60	YSS	Some abrasion	Frieze?	Edge fragment with two worked faces. One face is plain and roughly worked (?later). Second face has a flat, possible border along one edge, with a perpendicular strip (possibly a panel divide). Panel has unidentifiable, rounded carved design								TR22?
103	14/2356	14-24/C1510	55×65×65	YSS	Good	Fragment	Edge fragment with two worked faces. One is plain. Second has a double roll-moulded and flat-band border (30mm, 10mm and 20mm)	C							TR104

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
104	14/2366	14-24/C1510	105×75×60	YSS	Slight cracking	Fragment	Edge fragment with two worked faces. One is plain. Second has a double roll-moulded and flat-band border (30mm, 10mm and 20mm). Flat band has a small, curvilinear decoration (possible spiral)	C							TR103
105	14/2681	14-24/C1607	70×60×27	YSS	Good	Fragment	Corner fragment. Two apparently plain faces. The remaining worked face has a right angle of two rounded border strips, one 35mm wide, the other 50mm wide	U							Like TR111
106	14/3714	14-24/C1510	145×50×65	YSS	Good	Fragment	Edge fragment with two worked faces. One is plain, the second has a broken off fragment of rounded border, 40mm wide	e							TR99
107	24/3843	14-24/C1547	90×90×60	YSS	Abraded	Fragment (Group IV)	One worked face. Roll-moulding across the centre (30mm and 1mm) divides a flat, plain surface from a flat band (broken off). Conjoining fragments show this to be part of an internal panel divide	A							*Set 1* TR60
108	24/3892	14-24/C1547	90×75×55	YSS	Good. Some staining	Fragment	Corner fragment with three worked faces. One face plain. Second face probably plain, although some indentations may be vestigial carving. Third face has corner of rounded border moulding, 30mm wide, with possible inner strip	U							
109	24/4012	14-24/C1547	160×50×50	YSS	Good	Fragment	Edge fragment with two worked faces. One is plain, second has a rounded border, 45mm wide	e							
110	24/4026	14-24/C1805	37×28×8	YSS	Good	Fragment	One worked face, showing an internal corner of rounded border moulding, at least 25mm wide and 6mm deep	U							
111	24/4039	14-24/C1547	77×80×34	YSS	Good	Fragment	Corner fragment with three carved faces. Two plain faces. Third has a right-angled corner of rounded border moulding, 45mm wide. Back sheared away in one clean break	U							

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
112	24/4046	14-24/C1547	30 × 30 × 10	YSS	Good	Fragment	Small fragment with one worked face. Possibly a corner of a moulded strip, at least 10mm wide	U							
113	24/4720	14-24/C1545	157 × 83 × 20	YSS	Good	Fragment	One worked face, with a fragment of rounded border moulding, 55mm wide and 10mm in relief, above a flat dressed surface	U							Similar to TR38
114	14/2139	14-24/C1510	120 × 80 × 40	YSS	Good/ fragmented	Fragment (Group I)	Triple spiral in low relief, with vestiges of a straight edge suggesting it lies next to a border				X				*Set 1* TR129
115	14/2140	14-24/C1510	65 × 45 × 12	YSS	Good/ fragmented	Fragment	Outer edge of spiral design, three strands measuring 10mm thick				X				
116	14/2160	14-24/C1510	85 × 90 × 35	YSS	Good/ fragmented	Fragment	Fragment of a small triple spiral, 50mm diameter, with vestiges of connection				X				
117	14/2161	14-24/C1510	45 × 34 × 18	YSS	Good/ fragmented	Fragment	Outer edge of spiral design, possibly connectors between two spirals				X				
118	14/2162	14-24/C1510	60 × 15 × 15	YSS	Crumbling/ fragmented (three pieces)	Fragment	Small fragment of outer edge of spiral design, one arm extending and expanding beyond the spiral				X				Like TR46
119	14/2166	14-24/C1510	15 × 15 × 4	YSS	Good/ fragmented	Fragment	Tiny fragment of a single, curved, rounded strand – possibly a spiral				?				
120	14/2173	14-24/C1593	30 × 17 × 6	YSS	Good/ fragmented	Fragment	Tiny fragment of two adjacent rounded curving strands, 8mm thick, likely to be from a spiral				X				
121	14/2245	14-24/C1510	50 × 35 × 10	YSS	Good/ fragmented	Fragment	Fragment of three adjacent rounded curving strands, forming the outer edge of a spiral				X				
122	14/2274	14-24/C1510	55 × 43 × 22	YSS	Good/ fragmented	Fragment (Group I)	Fragment of a flat-band border, 30mm wide, with rounded design adjacent	a							TR124
123	14/2275	14-24/C1510	120 × 75 × 45	YSS	Good/ fragmented	Fragment (Group I)	Flat-band border (35mm) with triple spiral, radius 45mm. Appears to be near corner, with small incised ellipse	a			X				TR140
124	14/2277	14-24/C1510	85 × 95 × 45	YSS	Good/ fragmented	Fragment (Group I)	Flat-band moulding (30mm) with adjacent spiral design, comprising possible fragment of C-shaped connection with incised ellipse	a			X				TR122

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration K	I	S	A	H	P	Conjoins
125	14/2281	14-24/C1510	100 × 75 × 35	YSS	Good/ flaking	Fragment (Group I)	Outermost edges of three possible spirals with intermediate designed formed by two strands with elliptical pellet between				X				
126	14/2293	14-24/C1510	30 × 25 × 5	YSS	Good/ fragmented	Fragment	Small fragment of two curving rounded strands, possibly part of a spiral				X				
127	14/2297	14-24/C1510	70 × 55 × 8	YSS	Crumbling/ very fragmented (eleven pieces)	Fragment (Group I)	Two bands of spiral design, forming expanding strands between spirals, with two opposing incised ellipses				X				
128	14/2304	14-24/C1510	115 × 115 × 120	YSS	Good/ fragmented	Spiral boss (Group II; Cross C?))	Three adjacent dressed or decorated faces. Face 1: High relief spiral with plain moulded border and three small ellipses; Face 2 (side) vestigial carving of uncertain form above coarsely dressed area; Face 3 (base) dressed face	A			X				
129	14/2310	14-24/C1510	85 × 55 × 30	YSS	Good/ fragmented	Fragment (Group 1) (Group IV)	Ornate spiral design in low relief, with the outer edges of two larger spirals; divided by expanding double strand which terminates in two smaller spirals with C-connector, with incised ellipses. Adjacent to flat border	a			X				*Set 1* TR45 *TR54* *TR58*
130	14/2367	14-24/C1510	125 × 110 × 75	YSS	Good, minor surface discoloura-tion	Fragment	Complete, high relief spiral boss, with smaller spiral and incised ellipses forming surrounding design				X				
131	14/2368	14-24/C1510	105 × 70 × 15	YSS	Good/ discoloured	Fragment	Fragment of three curving rounded strands, forming outer edge of spiral design. Vestiges of straight edge adjacent				X				
132	14/2371	14-24/C1510	35 × 40 × 8	YSS	Good/ fragmented	Fragment	Fragment of three curving rounded strands, forming outer edge of spiral design. Strands 8mm wide and up to 2mm deep				X				
133	14/2372	14-24/C1510	35 × 22 × 6	YSS	Good/ fragmented	Fragment	Fragment of two curving rounded strands, forming outer edge of spiral design. Strands 15mm wide (outer) and 8mm wide (inner), and up to 2mm deep				X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
134	14/2373	14-24/C1510	50 × 23 × 12	YSS	Good/ fragmented	Fragment	Fragment of two curving rounded strands, forming outer edge of spiral design. Strands 10mm wide.				X				
135	14/2374	14-24/C1510	37 × 21 × 4	YSS	Good/ fragmented	Fragment	Fragment of spiral, showing central, rounded end of one strand, part of second strand				X				
136	14/2375	14-24/C1510	22 × 15 × 6	YSS	Good/ fragmented	Fragment	Tiny fragment of rounded strand, diverging, possibly at edge of a spiral design				?				
137	14/2377	14-24/C1510	27 × 20 × 5	YSS	Good/ some crumbling at edges	Fragment	Small fragment of outer two strands of a spiral design, strands 10mm wide				X				
138	14/2379	14-24/C1510	34 × 14 × 6	YSS	Good	Fragment	Small fragment of a single strand of spiral, *c* 10mm wide				?				
139	14/2380	14-24/C1510	62 × 39 × 14	YSS	Good/ some black accretions	Fragment	Small fragment with vestige of a curving, rounded strand. Not regular enough to be a spiral but possibly part of similar design				?				
140	14/2388	14-24/C1510	30 × 35 × 32	YSS	Good/ fragmented	Fragment	Fragment of flat-band moulding with outer three strands of spiral design	U			X				TR123
141	14/2502	14-24/C1510	210 × 230 × 90	YSS	Good/ black staining	Fragment	Fragment of spiral designs, representing strands connecting spirals, with possible edge of spiral evident				X				TR143
142	14/2508	14-24/C1510	89 × 73 × 32	YSS	Good/ fragmented	Fragment	Small fragment with vestigial carving showing an incised curving line, possibly a spiral				?				
143	24/3842	14-24/F304/ C1721	170 × 70 × 30	YSS	Good/ fragmented	Fragment	Small fragment of spiral panel, with vestiges of edge of spiral, and curving connecting carving – double-disc?				?				TR141
144	24/3847	14-24/F304/ C1721	105 × 52 × 27	YSS	Good/ discoloured	Spiral boss (Group II; Cross C?)	High relief triple spiral boss, 55mm radius, possible edge of border evident adjacent				X				
145	24/3891	14-24/C1510	78 × 78 × 20	YSS	Good/ discoloured	Spiral boss (Group II; Cross C?)	High relief triple spiral boss, 40mm minimum radius				X				TR147
146	24/4015	14-24/C1547	52 × 45 × 15	YSS	Good/ discoloured	Fragment	Single strand spiral, carved in low relief, possibly an animal joint				X	?			
147	24/4041	14-24/C1547	38 × 15 × 5	YSS	Good/ discoloured	Fragment	Small fragment of two adjacent curving strands, part of outer edge of spiral				X				TR145

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration K	Decoration I	Decoration S	Decoration A	Decoration H	Decoration P	Conjoins
148	24/905	14-24/C1310	300×240×170	YSS	Slightly worn/ discoloured	Fragment	Large block of sandstone, with small part of a relief-carved face surviving, (65mm×70mm) showing single strand interlace, possible surrounding larger rounded motif			X					
149	14/2135	14-24/C1506	97×42×21	YSS	Good, with possible red pigment	Fragment	Tight single strand interlace. Irregular interlace, with single strand, 8mm wide. Difficult to trace design			X					Relates to TR14
150	14/2163	14-24/C1593	60×65×60	YSS	Good, some mineral staining	Fragment (Group III)	Small fragment of median-incised interlace, showing three strands, between 20 and 22mm wide, forming a triangle			X					
151	14/2167	14-24/C1510	20×20×5	YSS	Good	Fragment	Very small, thin fragment of median-incised interlace, representing a 20mm length of one strand			X					
152	14/2177	14-24/C1510	70×30×10	YSS	Good/ fragmented/ possible red pigment	Fragment	Small fragment of a strand of median-incised interlace, 30mm wide, one end rounded			X					
153	14/2179	14-24/C1510	82×40×8	YSS	Good	Fragment	Small curving fragment of one interlace strand, 30mm wide and 82mm long			X					
154	14/2271	14-24/C1510	35×20×5	YSS	Good/ fragmented	Fragment	Small fragment of one strand of median-incised interlace in two pieces, 35mm long and 20mm wide			X					
155	14/2279	14-24/C1510	100×48×50	YSS	Good	Fragment (Group III)	Fragment of flat band border with curving strand of median-incised interlace, 25mm wide	U		X					TR159
156	14/2280	14-24/C1510	30×30×13	YSS	Good	Fragment (Group III)	Small section of one strand of median-incised interlace, 30mm wide and 30m long			X					*Set 3* TR38, TR177
157	14/2291	14-24/C1510	85×66×84	YSS	Good, some mineral staining	Fragment (Group III)	Flat band moulding with three curving strands of median-incised interlace, 25mm wide	U		X					TR183
158	14/2294	14-24/C1510	30×25×6	YSS	Good	Fragment	Very small fragment of one strand of median-incised interlace, 30mm long and up to 25mm wide			X					

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
159	14/2298	14-24/C1510	95×165×37	YSS	Good, some laminating	Fragment	Flat band moulding, 47mm wide, with a suggestion of roll moulding beneath. Above border, two strands of median-incised interlace 25mm meet with an incised ellipse between	U		X					TR155
160	14/2303	14-24/C1510	60×45×20	YSS	Good, possible red pigment	Fragment	Two median-incised interlace strands, 25mm wide, crossing at right angles			X					
161	14/2309	14-24/C1510	140×90×55	YSS	Good, some flaking	Fragment (Group I)	Median-incised interlace with strands 25mm wide; remains of one strand survive with vestiges of two more evident			X					
162	14/2312	14-24/C1510	45×70×56	YSS	Good, red pigment	Fragment (Group III)	Three strands of median-incised interlace, 30mm wide. Evidence for red pigment on one half of the strand			X					*Set 3* TR163 TR171
163	14/2313	14-24/C1510	42×46×40	YSS	Good, red pigment	Fragment (Group III)	Two crossing strands of median-incised interlace, 28mm wide, with evidence for red pigment			X					*Set 3* TR162 TR171
164	14/2314	14-24/C1510	65×25×14	YSS	Good, some flaking, possible red pigment	Fragment	Two crossing strands of median incised interlace			X					
165	14/2315	14-24/C1510	60×32×8	YSS	Good, some mineral staining	Fragment	Single, rounded, curving strand, 32mm wide and 60mm long			X					
166	14/2317	14-24/F304/ C1721	55×37×8	YSS	Good	Fragment	Small fragment of one curving strand of median-incised interlace, 37mm wide and 55mm long			X					
167	14/2319	14-24/C1510	100×45×25	YSS	Good, with some mineral staining	Fragment	Small area of carving, showing one length of a strand of median-incised interlace, 30mm wide and 35mm long			X					
168	14/2326	14-24/C1510	60×45×15	YSS	Good, with mineral staining, traces of red pigment	Fragment	Small fragment of a curving strand of median-incised interlace 25mm wide. Traces of pigment on one edge of curve			X					
169	14/2329	14-24/C1510	60×25×10	YSS	Good	Fragment	Single curving strand of median-incised interlace, 25mm wide and 60mm long			X					
170	14/2333	14-24/C1510	155×60×55	YSS	Good, some weathering and some mineral staining	Fragment (Group III)	Four strands of median-incised interlace, 30mm wide			X					

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
171	14/2349	14-24/C1510	95 × 37 × 70	YSS	Good, some laminating, traces of red pigment	Fragment (Group III)	Two crossing strands of median-incised interlace, 25mm wide			X					*Set 3* TR162 TR163
172	14/2363	14-24/C1510	32 × 20 × 5	YSS	Good	Fragment	Rounded, curving strand, 17mm wide and 32mm long, possible suggestion that strand divides in two			X					
173	14/2376	14-24/C1510	30 × 25 × 8	YSS	Good	Fragment	Fragment of one strand of median-incised interlace, 25mm wide and 30mm long			X					
174	14/2378	14-24/C1510	40 × 22 × 3	YSS	Good	Fragment	Fragment of one curving strand of median-incised interlace, 22mm wide and 40mm long			X					
175	14/2381	14-24/C1510	27 × 14 × 4	YSS	Good	Fragment	Fragment of curving strand, apparently one half of a strand of median-incised interlace			X					
176	14/2386	14-24/F304/ C1721	50 × 45 × 12	YSS	Good, some mineral staining	Fragment	Two crossing strands of interlace, 24mm wide			X					
177	14/2505	14-24/C1510	90 × 70 × 25	YSS	Good, some mineral staining	Fragment (Group III)	Fragment of sandstone with very small area of carving surviving, representing one strand of median-incised interlace, 25mm wide and less than 10mm long			X					*Set 3* TR156 TR38
178	14/2647	14-24/C1510	23 × 10 × 8	YSS	Good, slight flaking	Fragment	Rounded fragment, tentatively identified as interlace			?					
179	14/2679	14-24/C1607	14 × 13 × 8	YSS	Good	Fragment	Small fragment with a rounded face, with centrally incised line, suggesting median-incised interlace strand			X					
180	14/3403	14-24/C1510	31 × 25 × 16	YSS	Good	Fragment	Small piece of a rounded, curving strand, possibly part of single strand interlace			?					
181	24/3851	14-24/C1547	55 × 25 × 10	YSS	Good, trace of red pigment, some mineral staining	Fragment	Small section of a single strand of median-incised interlace, 25mm wide, rounded at one end			X					
182	24/3852	14-24/C1547	28 × 55 × 12	YSS	Good, slight mineral staining	Fragment	Small length of a curving, rounded strand, 28mm wide and 55mm long			X					
183	24/3890	14-24/C2645	150 × 90 × 85	YSS	Good, slight crumbling	Fragment (Group III)	Median-incised interlace, showing two strands. Some suggestion of a border adjacent	U		X					TR157

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
184	24/4010	14-24/C1547	55×65×80	YSS	Good, some mineral staining	Fragment (Group III)	Two crossing strands of median-incised interlace, each 25–30mm wide			X					
185	24/4011	14-24/C1547	80×50×18	YSS	Good	Fragment	Two crossing, curving rounded strands, 25mm and 30mm across			X					
186	24/4016	14-24/C1547	30×27×8	YSS	Good, slightly worn	Fragment	Short section of a rounded strand, 30mm wide, 27mm long			?					
187	24/4017	14-24/C1547	70×30×7	YSS	Good, some reddening	Fragment	Curving, rounded strand, 30mm wide and 70mm long			?					
188	24/4018	14-24/C1547	53×30×5	YSS	Good, some mineral staining	Fragment	Slightly curved, rounded strand, 30mm wide and 53mm long			?					
189	24/4025	14-24/C1547	45×15×17	YSS	Good	Fragment	Small fragment, with rounded profile and incised line, suggesting median-incised interlace			X					
190	24/4027	14-24/F304/ C1721	19×14×7	YSS	Good; trace of red pigment	Fragment	Very small fragment of median-incised interlace, full width not surviving			X					
191	24/4028	14-24/C1805	27×15×6	YSS	Good	Fragment	Small fragment of a rounded strand, 27mm wide			?					TR192
192	24/4029	14-24/C1805	40×27×6	YSS	Good	Fragment	Small fragment of a rounded strand, 27mm wide			?					TR191
193	24/4037	14-24/C1547	26×30×10	YSS	Good, some mineral staining	Fragment	Small fragment of a rounded strand, 26mm wide			?					
194	24/4038	14-24/C1547	46×27×8	YSS	Good	Fragment	Small fragment of a rounded strand, 27mm wide, with vestiges of a second strand crossing the first			X					
195	24/4047	14-24/C1547	25×24×12	YSS	Good	Fragment	Small fragment of a rounded strand, 24mm wide, slightly rounded at one end			?					
196	24/4102	14-24/C1812	50×45×13	YSS	Abraded	Fragment	Two crossing strands, 25mm wide			?					Cf TR176/ 182/195
197	24/4323	14-24/C1811	42×16×5	YSS	Good	Fragment	Straight strand with rounded profile, 16mm wide and 42mm long	?		?					
198	24/4248	14-24/C1547	64×27×13	YSS	Good	Fragment	Curving strand with rounded profile, 27mm wide and 64mm long, possibly crossed by another strand at one end			?					

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
199	24/4954	14-24/C2537	64 × 35 × 21	YSS	Good	Fragment (Group III)	Section of median-incised interlace, 25mm wide and 62mm long, crossing a second strand, of which only the vestiges survive			X					
200	14/2172	14-24/C1593	60 × 60 × 65	YSS	Good	Fragment	Triangular fragment with a V-shaped design, the identity of which is not clear								
201	14/2246	14-24/F304/ C1721	124 × 45 × 28	YSS	Good/ fragmented/ possible red pigment	Fragment	Fragment of human figure, frontal facing, with face and robe detail. Forked beard with square collar and beginning of book						X		TR20?
202	14/2254	14-24/F304/ C1721	57 × 42 × 33	YSS	Good, some mineral staining	Fragment	Fragment bearing only vestigial carving, including a smooth area in relief, with a curved edge and incised decoration, and vestiges of four rounded strips. Possibly a human figure, with hair, eye and hair represented						?		
203	14/2287	14-24/C1510	45 × 80 × 90	YSS	Good	Fragment	Smooth face with a recessed right angle, possibly representing raised panels								
204	14/2322	14-24/C1510	167 × 70 × 60	YSS	Good, some mineral staining	Fragment	Finely dressed face, with incised line delineating a 17mm wide flat band border. Relief carved design resembling an animal foreleg, decorated with a triangular motif	U				?			
205	14/2323	14-24/C1510	285 × 80 × 35	YSS	Good/ very fragmented/ possible red pigment	Fragment (Cross C)	Cloven-hoofed foreleg and part of hind leg of an animal. Adjacent plain border	e				X			
206	14/2338	14-24/C1510	90 × 80 × 80	YSS	Good, some mineral staining	Fragment (architec-tural)	Three-dimensional rounded fragment, with rounded strands forming part of a possible zoomorphic design, possibly an eye. Possible chair finial					?			
207	14/2341	14-24/C1510	25 × 35 × 13	YSS	Good, some mineral staining and accretions	Fragment	Small fragment with a small V-shaped cut at one edge, possibly part of a key pattern or spiral design			?	?				
208	14/2362	14-24/C1510	40 × 25 × 15	YSS	Good/ fragmented	Fragment	Roughly R-shaped, open ended design in relief, resembling a beak					X			

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
209	14/2387	14-24/C1510	30×30×12	YSS	Good	Fragment	Small fragment bearing a design of relief-carved concentric bands, 18mm and 8mm in diameter, with vestige of relief carving adjacent. Possible eye					?			
210	14/2504	14-24/C1510	125×94×31	YSS	Good	Fragment	Fragment with small recessed triangle, identity uncertain								
211	14/2506	14-24/C1510	52×40×25	YSS	Good	Fragment	Fragment with small triangular cut, identity uncertain								
212	14/2507	14-24/C1510	125×86×13	YSS	Good	Fragment	Fragment with small triangular cut, identity uncertain, possible vestige of key or spiral design								
213	14/2509	14-24/C1510	65×60×25	YSS	Good	Fragment	Two adjacent smoothly dressed faces, undecorated corner piece								
214	14/2566	14-24/C1778	98×64×45	YSS	Good	Fragment	Two adjacent tooled faces, undecorated corner piece								
215	14/3271	14-24/C1911	85×60×15	YSS	Good	Fragment	Irregular fragment with a high-relief shape resembling a foot						X		
216	24/3844	14-24/C1547	280×260×89	YSS	Good	Fragment	Affronted, rearing horses/hippocamps, with part of heads and hooves depicted, with interlaced limbs and plain roll moulded border	U				X			
217	24/3845	14-24/C1547	154×115×55	YSS	Good, some cracking and staining	Fragment (architec-tural)	Section of plain border with rounded, high relief carving decorated with incised lozenge lattice, shown by conjoining fragments to be hair. Adjacent face plain but dressed	U					X		*Set 5* TR223 TR263
218	24/3848	14-24/C1547	150×70×150	YSS	Good/ fragmented	Fragment	Fragment showing part of two panels divided by a single flat-band border, with top border also showing. Right hand panel shows a bird's head with median-incised interlaced decoration, circular eye and incised beak detail	U		X		X			
219	24/3860	14-24/C1602	50×65×40	YSS	Good	Fragment (architec-tural?)	One face carved, with a curved profile, bearing four adjacent rounded strands each 12mm in width					?			Similar to TR206

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
220	24/3889	14-24/C1545	110×80×75	YSS	Good	Fragment	One carved face, with slightly convex profile, decorated with a symmetrical, curvilinear design in low relief						?		
221	24/3901	14-24/C1547	147×121×98	YSS	Good/ discoloured	Fragment	Corner fragment with three faces. Face 1: Head of Pictish beast with eye (possible ochre pigment), and top of mane, adjacent to plain, moulded border. Face 2: possible animal foot Face 3: plain with pocked tooling	e				X			TR222
222	24/3902	14-24/C1547	130×75×165	YSS	Good/ discoloured	Fragment	Two adjacent carved faces. Face 1: Beak, torso and foreleg of a Pictish beast, remains of mane visible and ending in single spiral. Double spiral joint. Face 2: plain face with pocked tooling	e				X			TR221
223	24/4014	14-24/C1547	130×54×65	YSS	Good, some fine cracks and laminating	Fragment (architec-tural)	Single worked face, showing part of a relief-carved eye, 30mm×25mm						X		*Set 5* TR217 TR263
224	24/4044	14-24/C1547	14×20×5	YSS	Good	Fragment	Since, rounded strand, 14mm wide and 20mm long	?		?					
225	13/84	Found during Jill Harden's excavation in the crypt	125×85×55	YSS	Weathered	Fragment	Incised double volute cross terminal?								
226	13/89	Found during Jill Harden's excavation in the crypt	100×100×55	YSS	Weathered	Fragment	Decorated on two opposing sides. Hollow-armed crosses on both sides, one side coarser/ more weathered than the other								
227	24/8038	14-24/F527/ C3194		YSS	Good	Fragment	Small leg conjoining to TR260	U				X			TR100 TR260
228	24/5519	14-24/C2537	15×12×9	YSS	Good	Fragment	Very small fragment of ?median-incised interlace		X						
229	24/6313	14-24/C2537	128×144×50	YSS	Good	Fragment	Well-preserved fragment of spiral pattern, carved in relief. One near complete triple spiral, 80mm in diameter, with fragments of small spiral and trumpet pattern/volutes between, including incised ellipse				X				*Set 4* TR231 TR233 TR237 TR239
230	24/6314	14-24/C2537	140×80×50	YSS	Good	Fragment	Small fragment of spiral panel, showing trumpet design and outer edge of spiral				X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
231	24/6317	14-24/C2537	44×28×45	YSS	Good	Fragment	Small fragment of the outer edge of a triple spiral, showing three rounded strands				X				*Set 4* TR229 TR233 TR237 TR239
232	24/6318	14-24/C2537	35×31×6	YSS	Good	Fragment	Small fragment with vestiges of carving along one edge, apparently a roll-moulded band (10mm), with hint of an adjacent flat band	U							
233	24/6319	14-24/C2537	120×88×50	YSS	Good	Fragment (Group I)	Part of a spiral panel, with two small triple spirals within a trumpet design, decorated with incised triangles and ellipses, with the outer edge of a larger spiral				X				*Set 4* TR229 TR231 TR237 TR239
234	24/6320	14-24/C2537	100×30×8	YSS	Good	Fragment (2 pieces)	Single strand of median-incised interlace in two pieces, 30mm wide and 60mm long			X					
235	24/6322	14-24/C2537	50×35×20	YSS	Good	Fragment	Small fragment of relief carving, possibly part of trumpet design between spirals, with adjacent straight edge suggesting flat-band border	U			X				
236	24/6323	14-24/C2537	45×25×10	YSS	Good	Fragment	Small fragment with curving strands, possibly a small triple spiral			X					
237	24/6357	14-24/C2645	120×60×50	YSS	Good, flaking	Fragment (Group I)	Fragment of triple spiral design, showing the outer two strands of a triple spiral, the rest of which has flaked off				X				*Set 4* TR229 TR231 TR233 TR239
238	24/6358	14-24/C2645	78×92×45	YSS	Good	Fragment	Two adjacent carved faces. One plain, the other showing double roll moulded border, with flat band. Outer moulding 32mm, inner moulding 13mm, flat band 47mm	d							
239	24/6359	14-24/C2645	45×33×45	YSS	Good	Fragment (Group I)	Small fragment of the outer two strands of a triple spiral design				X				*Set 4* TR229 TR231 TR233 TR237
240	24/6360	14-24/C2645	50×30×6	YSS	Good	Fragment	Expanded, central end of a strand of a triple spiral				X				
241	24/6324	14-24/C2537	90×45×44	YSS	Good	Fragment	Small fragment of flat-band border, 46mm wide, with adjacent curving relief-carved design apparently part of trumpet pattern/ spirals	U			X				

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
242	24/6362	14-24/C2645	105×93×75	YSS	Good	Fragment (two pieces)	Two adjacent carved faces. Both have roll-moulding and flat band border – roll-moulding 30mm (outer) and 12mm (inner) with 35mm wide flat band. One face has a fragment of possible spiral design adjoining	g			X				
243	24/6365	14-24/C2645	40×40×15	YSS	Good	Fragment	Fragment of rounded border moulding, 40mm long	U							*Set 2* TR42
244	24/6367	14-24/C2645	60×30×6	YSS	Good	Fragment	Central part of a strand of a spiral				X				
245	24/6370	14-24/C2645	50×35×25	YSS	Good	Fragment	Single curving strand of median-incised interlace, 30mm wide and 50mm long, with vestiges of a possible crossing strand			X					
246	24/6371	14-24/C2645	30×30×8	YSS	Good	Fragment	Small fragment with rounded face, possible fragment of roll moulding	U							
247	24/6413	14-24/C2645	22×10×3	YSS	Good	Fragment	Very small fragment of a curving, rounded strand, 10mm wide and 22mm long. Possible interlace or spiral fragment			?	?				
248	24/6414	14-24/C2645	18×10×3	YSS	Good	Fragment	Very small fragment of a curving rounded strand, 10mm wide and 18mm long. Possible interlace or spiral fragment			?	?				
249	24/6614	14-24/C2645	60×55×30	YSS	Good	Fragment	Fragment of roll-moulded border, 30mm wide	U							
250	24/6614	14-24/C2645	42×26×5	YSS	Good	Fragment	Very small fragment, roughly triangular, with incised ellipse. Part of spiral panel design				X				
251	24/6614	14-24/C2645	45×15×15	YSS	Good	Fragment	Very small fragment, showing the edge of a straight, rounded strand, *c* 10mm wide, part of border moulding	U							
252	24/6614	14-24/C2645	30×21×12	YSS	Good	Fragment	Very small fragment with a dressed faced and incised, straight edge, apparently part of a border	U							
253	24/6614	14-24/C2645	25×10×8	YSS	Good	Fragment	Small fragment of rounded moulding, 8mm wide (incomplete), possible border fragment	U							
254	24/6614	14-24/C2645	15×15×3	YSS	Good	Fragment	Very small fragment of rounded moulding, 15mm wide	U							

TR No	Find No	Discovery/ Context	Dimensions (mm)	Stone	Condition	Mon type	Brief description	Border	Decoration						Conjoins
									K	I	S	A	H	P	
255	24/6614	14-24/C2645	25 × 15 × 4	YSS	Good	Fragment	Very small fragment of rounded moulding, 15mm wide	U							
256	24/6978	14-24/C2946	25 × 10 × 10	YSS	Good	Fragment	Very small fragment of rounded moulding, 10mm wide	U							
257	24/8040	14-24/C3390	185 × 120 × 111	YSS	Good	Corner (Group IV)	Corner fragment, with two decorated faces. Face 1: Roll moulded and flat-band border with adjacent median-incised interlace. Face 2: Border fragment, with roll moulded border and part of a perpendicular panel division, with incised decoration. Possible key pattern	h	X	X					*Set 1* TR62
258	24/8041	14-24/C2701	280 × 80 × 70	YSS	Good	Fragment (Group III)	Two conjoining fragments of median-incised interlace, which gives out to a less regular design and possible border	U		X					
259	24/8041	14-24/C2701	30 × 45 × 11	YSS	Good	Fragment (Group III)	Small fragment of median-incised interlace, 30mm wide			X					
260	24/7811	14-24/F527/ C3194	200 × 200 × 50			Large fragment	Rear end of animal, carved in relief, comprising upper back legs and tail, with haunches and body detailed in ribbed/spiral relief								TR227 TR100
261	24/7812	14-24/C2701					Group of three median incised interlace								
262	24/8041	14-24/C2701					Median incised interlace								
263	24/8039	14-24/C3463	72 × 56 × 30		Good	Fragment of head	Head with criss-cross hair. Joins with TR217 and 223 to make a corbel								*Set 5* TR217 TR223
264	24/2195	14-24/C1343	210 × 130 × 100	RSS	Good	Fragment architectural									

Undecorated fragments: 14.2181, 14.2182, 14.2184, 14.2185, 14.2283, 14.2285, 14.2289, 14.2290, 14.2292, 14.2295, 14.2299, 14.301, 14.2306, 14.2307, 14.2308, 14.2316, 14.2331, 14.2332, 14.2334, 14.2335, 14.2336, 14.2339, 14.2342, 14.2344, 14.2347, 14.2348, 14.2351, 14.2353, 14.2358, 14.2359, 14.2360, 14.2263, 14.2365, 14.2503, 14.2680, 14.2748, 14.2888, 14.3398, 14.3399, 14.3400, 14.3401, 14.3407, 14.3715, 14.3869, 14.3853, 24.3854, 24.3856, 24.3857, 24.3858, 24.3893, 24.3897, 24.3898, 24.3899, 24.3900, 23.4115.

Digest 5.2 MEDIEVAL MEMORIALS

LAWRENCE BUTLER† (University of York)

Four slabs are described and discussed. Two are clearly late medieval (illustrated), the third is seventeenth century and the fourth is of uncertain date, but probably medieval.

1. Cross-slab grave-cover from east end of Tarbat Old Church (Illus 7.13a, b)

Description

Tapering cross-slab grave-cover (of coarse sandstone?) with chamfered edges and a low relief design. The main feature is a cross-head with eight fleur-de-lys terminals springing from two interlaced or overlapping diamonds. In the centre of the cross head is a circular ring, whilst at the upper corners of the slab are two further circles, one (left) with a hollowed centre, the other with six petal-shaped depressions. The cross head is supported on a broad shaft with two incised lines running its full length. These incised lines do not continue into the large fleur-de-lys at the upper junction with the cross head nor into the uneven three-step base.

Flanking the shaft are two shields (left) and a sword (right). The upper shield has a beast, probably intended to be a lion rampant. The motif or charge on the lower shield is too indistinct to hazard a suggestion. The sword has a broad tapering blade with a rounded point (perhaps indicating a scabbard), a guard of slightly down-turned quillons, a hilt of concave sides and an unusual pommel of two uneven lobes in the form of a Y. On the blade, just below the quillons, is a sunk concave diamond, which also might indicate decoration on a scabbard, though no sword belt is shown. The outer (right-hand) quillon overlaps the chamfered edge of the slab, as do two of the fleur-de-lys terminals of the head. The chamfer has chevron ornament formed either of lanceolate leaves or (at base and lower right of slab) of simple incisions.

Discussion

The design of the cross head can be readily paralleled in northern England. There has been far less recording of this monument type in Scotland, but Northumbrian patterns extend into the Lothians and Fife. The interlaced diamond design occurs in four churches in Cumbria: Barton (Ryder 2005: 135, slab 1), Warcop (op cit: 46, slab 1), Isel (op cit 127, slab 1) and Dearham (op cit 172–4, slabs 4, 8 and 9). In Northumberland, the same design occurs in three examples: Bywell St Andrew and Stamfordham in the central Tyne valley, and at Knaresdale in the south Tyne (Ryder 2000, 56 & 85 fig 7, slab 3; 71 & 101, fig 23, slab 2; 76 & 108, fig 30, slab 1; Ryder 2003, 113, fig 6). In County Durham, the diamonds are more clearly interlaced and the motif is set within a circle, though the fleur-de-lys heads remain outside the circle: eg Aycliffe slab 3 (Ryder 1985, 12–13 & fig 1 (p 16), design 13). Sometimes the entire design may be placed within a sunk circle. A few slabs show a central ring (Brancepeth slab 3) or a plain disc (Medomsley slab 5), whilst the majority enclose a central rosette (fourteen examples). On four other slabs the central zone is damaged. This same design of head also occurs just south of the River Tees, within North Yorkshire.

The roundels in the upper corners occur sporadically in the northern counties of England, north of the Trent–Mersey line, sometimes as a sun and a crescent moon, sometimes as stars and sometimes as rosettes of six or eight petals. The steps at the base are also a common feature in northern England, though many slabs with the interlaced diamond design at the head have a base of a plain semi-circular mound or a cusped ogee arch. In the fourteenth and fifteenth centuries, the sword guard with the down-turned straight quillons is as common as the sword with a straight guard. However, the pommel is more usually leaf-shaped, either plain or five-lobed (Ryder 1985: p 19 and fig 2). The notched Y-shaped pommel occurs in only two examples: Dearham, Cumbria (Ryder 2005, 172, slab 2), and Hamsterley, County Durham (Ryder 1985, 92, slab 1).

There are slabs with incised and with low relief designs showing shields in the three northern counties of England. In Cumbria, there are fifteen slabs clearly showing heraldic arms and a further seven slabs with plain shields which might have been painted. In Northumberland, there are fourteen slabs with heraldic charges and six with plain shields. In County Durham, there are four shields with heraldic charges and plain shields on six slabs. The running leaf pattern on the edge chamfer occurs in Cumbria at Appleby St Lawrence, Morland and Crosscanonby (Ryder 2005, 25–6, slab 2; 38, slab 2; 170, slab 2), but not in County Durham and Northumberland.

The most useful survey of memorial sculpture in northern Scotland has been that by Steer and Bannerman (1977). In the West Highlands, as on Iona, Oronsay and Kintyre, it is easy to find parallels on grave-slabs for the type of sword, but not for the design of the pommel (ibid 167–70, fig 19). Sometimes the sword is shown within its scabbard. The sword is placed to the right-hand side of the cross-shaft (as here at Tarbat), whilst the left-hand side has panels of floral design. It is interesting that these floral panels have been linked to Northumberland (by Lamont 1968, 34–5, discussing Islay) as being inspired by a slab at Hexham, in the central Tyne valley. The cross heads in the West Highlands do not closely parallel the design at Tarbat. Where there are well-defined bases (Class I slabs on Iona and Islay: Steer & Bannerman 1977, 17–18, plates 1–2), they have a floral design within a semi-circle. There are no roundels or rosettes, and heraldry only occurs on late fourteenth-century low-relief military effigies. These show a warrior in a quilted surcoat carrying a shield on his left arm, holding a lance in his right hand and wearing a sword, usually with drooping quillons and an elaborate pommel, prominently displayed in a waist belt (ibid 22–6, plate 8). The English examples of this cross design and sword type suggest a date in the early fourteenth century, but for this example in Easter Ross, so far north from Northumbria, it is probable that the central decades 1340–70 may be more likely.

2. Cross-slab grave-cover from internal west end of Tarbat Old Church (Illus 7.13c)

Description

Cross-slab grave-cover, broken into two equal pieces. Similar red sandstone to above. There are two designs on this slab, an incised sword and four initials, the latter are likely to be a later inscription. The sword is similar to that on slab 1, but originally it was the only design on the slab. The sword has a tapering blade ending in a rectangular scabbard chape. The quillons are straight and down-turned, with each arm ending in a diamond-shaped terminal.

The hilt has a slight taper in its width, and ends in a plain round pommel. The sword design is common in the late fourteenth and fifteenth centuries (Steer & Bannerman 1977, 167–70).

The four initials A M R M are in relief within a sunk rectangular panel, to the right of the sword's hilt. The style of the lettering suggests a seventeenth-century addition, perhaps to two members of the Munro family.

Discussion

Although there are a number of examples in northern England where the sword is the only carving on the slab, these usually have the sword in the centre of the slab, so that the four arms of the sword can substitute for the cross of the Crucified Christ. At Tarbat, the sword is close to the left-hand margin of the stone in its present condition, but the left-hand margin appears to have been deliberately cut, whilst the right-hand margin is more worn and tapering.

3. Fragments of grave-cover slab re-used in blocked doorway

A slab, either broken in three pieces or, more likely, shown on three separate photographs. It is a coarse red sandstone. This slab has three main elements. Around two sides are the incised letters of a border inscription within a frame. Although individual capital letters can be identified, the full text cannot be recovered; the inscription appears to be in English not Latin. The second element is a sunk roundel at the head of the slab in which is an ornate shield. This has an upper margin of half-round crenellation, straight sides and a bottom margin of two concave bases meeting at a point. The heraldic charge is of a stag and tree (? for Mackenzie). Below the roundel is a sunk rectangular panel which has, in low relief, a skull and cross-bones at the centre (as originally designed), a sexton's bell, an hourglass and either a miniature spade or an arrow at the top of the panel. For this design, a seventeenth-century date is most likely.

4. Slab re-used within blocked doorway of Tarbat Old Church

Description

Probably a grave cover, but with irregular edges. The stone appears to be metamorphic and not sandstone. The only design that can be discerned is an incised triangular shape with another line(s) near the apex to create a diamond shape. Three possibilities may be suggested. The first is that this is a shield with the heraldic charge of a chevron. The second is this is intended to show an object suspended by a cord, such as a hunting horn. The third is that this is a letter A. For the last two suggestions, the broken edge is at the bottom of the slab, but for the first suggestion the broken edge is at the top. There are faint suggestions of a rectangular object near the opposite margin: this could be a book with a fastening clasp, usually interpreted as the Gospels, indicating the symbol of a priest. There are no diagnostic features, but a late medieval date is likely.

References

Lamont, W D 1968 *Ancient and Medieval Sculptured Stones of Islay.* Edinburgh: Oliver & Boyd.

Ryder, P F 1985 'The Medieval Cross Slab Grave Cover in County Durham', *Architectural and Archaeological Society of Durham and Northumberland, Research Report No. 1.* Durham.

Ryder, P 2000 'Medieval Cross Slab Grave Covers in Northumberland, 1: South-West Northumberland', *Archaeologia Aeliana*, 5th Series, Vol. XXVIII: 51–110.

Ryder, P 2003 'Medieval Cross Slab Grave Covers in Northumberland, 3: North Northumberland', *Archaeologia Aeliana*, 5th Series, Volume XXXII: 91–136.

Ryder, P 2005 'The Medieval Cross Slab Grave Covers in Cumbria', *Cumberland and Westmorland Antiquarian and Archaeological Society*, Extra Series: Vol. XXXII. Kendal.

Steer, K A & Bannerman, J W M 1977 *Late Medieval Monumental Sculpture in the West Highlands.* Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland.

Digest 6 CATALOGUE OF DIAGNOSTIC ARTEFACTS

6.1 Catalogue of cited objects (by period)

This is an index of the objects illustrated or referred to in the text. Full descriptions will be found in Digest 6.2–6.18 and in the OLA at 7.1.

Period 0 Prehistoric to *c* AD 500
(Chapter 4)

Two Mesolithic–Neolithic blades (24/4230 C1805; 6081 C2004).

Three scrapers of the late Neolithic to Bronze Age (24/1001 C1000; 6002 F419 C2170; 6176 C1881).

Awl (24/7868).

Tool fragment (24/7871; C3398).

Neolithic leaf-shaped arrowhead (14/1937; C1002) [Illus D6.1.1].

Neolithic leaf-shaped arrowhead (14/4376; C2793) [Illus D6.1.1].

Neolithic leaf-shaped arrowhead (14/2655; C1663) [Illus D6.1.1].

Neolithic leaf-shaped arrowhead (25/1651; F179 C1377) [Illus D6.1.1].

Late Neolithic–Bronze Age barbed and tanged arrowhead (14/3410; C2968) [Illus D6.1.1].

Carved stone ball 70mm diam, grooves typically 5mm D (17/366; F86 C1237) [Illus 4.3].

Trough querns

Trough quern fragment, retaining lower end of grinding trough and profile across quern edges, grinding surface smoothed, gabbro, 550mm L × 350mm W × 230mm Th (24/3875; F97 C1285) [Illus D6.1.2].

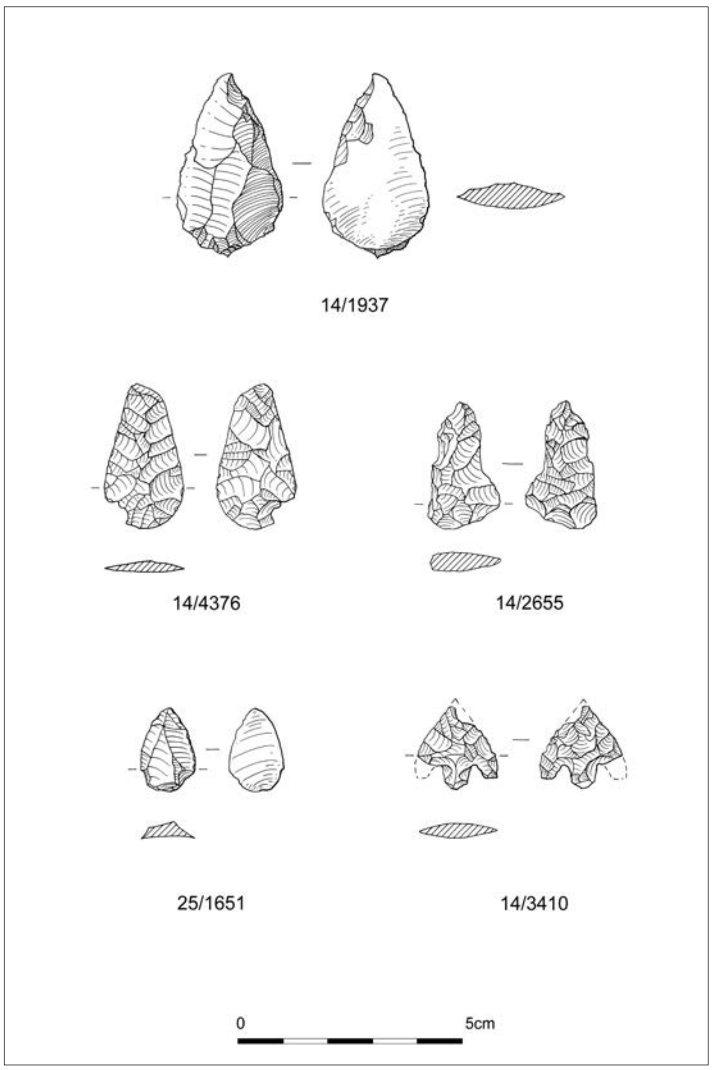


Illustration D6.1.1

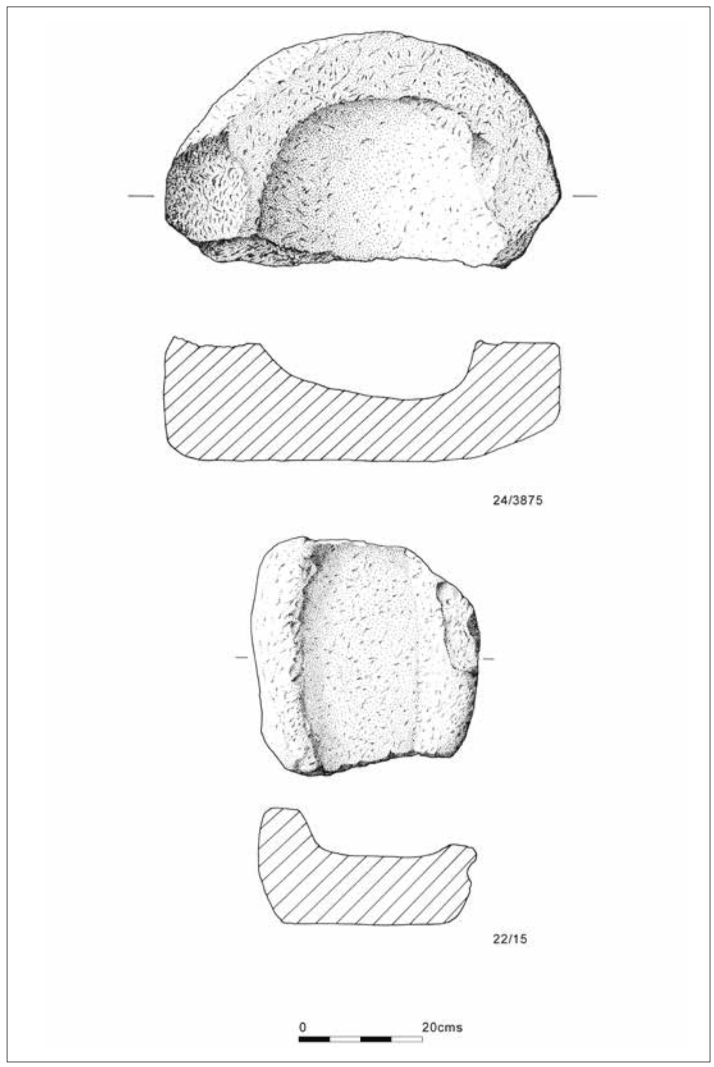


Illustration D6.1.2

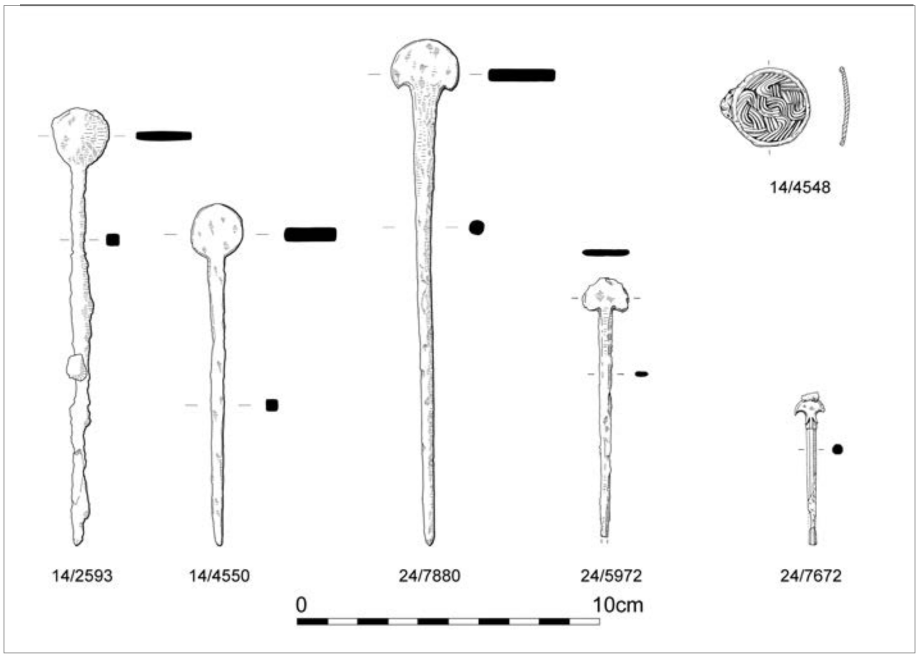


Illustration D6.1.3

Trough quern of grinding trough with end and edges missing, pink granite, 360mm L × 330mm W × 210mm Th (22/15) [Illus D6.1.2].

Trough quern edge fragment retaining part profile, grinding surface smoothed, possibly metamorphic gneiss, 260mm L × 190mm W × 150mm Th (14/4310; C2961).

Trough quern fragment of edge and part grinding surface, smoothed, syenite, 230mm L × 160mm W × 190mm Th (24/4593; C1326).

Trough quern fragment of edge and part grinding surface, mica schist 400mm L × 340mm W × 170mm Th (24/8048; F577 C3580).

Saddle quern fragment, roughly worked flat base and sides, working trough smoothed from use, extensive modern plough damage, quartz arenite, 310mm L × 150mm W × 90mm Th (29/42).

Period 1 Early Pictish

Sixth/seventh century (Chapter 4)

Dress pins [Illus D6.1.3 see also Illus 4.22]

Iron dress pin, complete with flat, disc-shaped head, 143mm × 19mm W (head), 5mm Th (shank) (14/2593; C1607).

Iron dress pin, complete with flat, disc-shaped head, 112mm × 13mm W (head), 3mm Th (shank) (14/4550; C3455).

Iron dress pin, complete with flat, elliptical head, 167mm × 22mm W (head), 8mm Th max (shank) (24/7880; C3351).

Iron dress pin, complete with flat, elliptical head, 86mm × 13mm W (head), 3mm Th (shank) (24/5972; C2109).

Copper alloy dress pin, near-complete, shank tip missing, elliptical head with faceted border and flared collar, shank octagonal in profile, 50mm × 10mm W (head) × 3mm Th max (shank) (24/7672; C3029) [Illus D6.1.3]

Harness mount

Harness mount: mercury-gilded, leaded bronze with Style II insular ornament, slightly concave with raised rim, 25mm diam. × 1mm Th, sixth/seventh-century (14/4548; C3428) [Illus D6.1.3; see also Illus 4.23].

Period 2 Monastic

Eighth century (Chapter 5.6, 5.7)

Plough pebbles from east boundary wall. Probably residual from Period 1 [fifty-three examples, see OLA 7.1.3.4;] [Illus 4.24].

Silver porcupine sceat series E. 11mm Diam; weight 0.55g. The coin dates to *c* AD 715–35. Redeposited in Period 3 from layers making up the Period 2 road (S13) (24/2283; F18 C1150; displaced to pit F185. EMC 1999.0147; see Blackburn in Digest 6.2) [Illus D6.1.4].

Leather pieces; cattlehide, five fragments, probably from a shoe (24/7810; from stone culvert F341 C3545 in S7; see report by Clare Thomas in Digest 6.16).

Object associated with stone carving

Iron sculptor's chisel with double-bevelled cutting edge and slightly burred head, 151mm L (24/4921; C2968) [Illus D6.1.5; see also Illus 5.3.56].

Objects associated with vellum working (Sector 2) [Illus 5.6.13, 14 and 15]

Handled hook

Iron hook with mineral-preserved wooden handle with clenched end, 200mm L, 75mm L (handle) × 11mm Th (hook) (14/2012 and 2016; F72 C1400) [Illus D6.1.7; see also Illus 5.6.5].

Blades [Illus D6.1.6]

Iron half-moon knife (*lunellarium*), vertical tang onto curved blade 74mm L × 68mm W (24/4575; C1875) [Illus D6.1.6].

Illustration D6.1.4

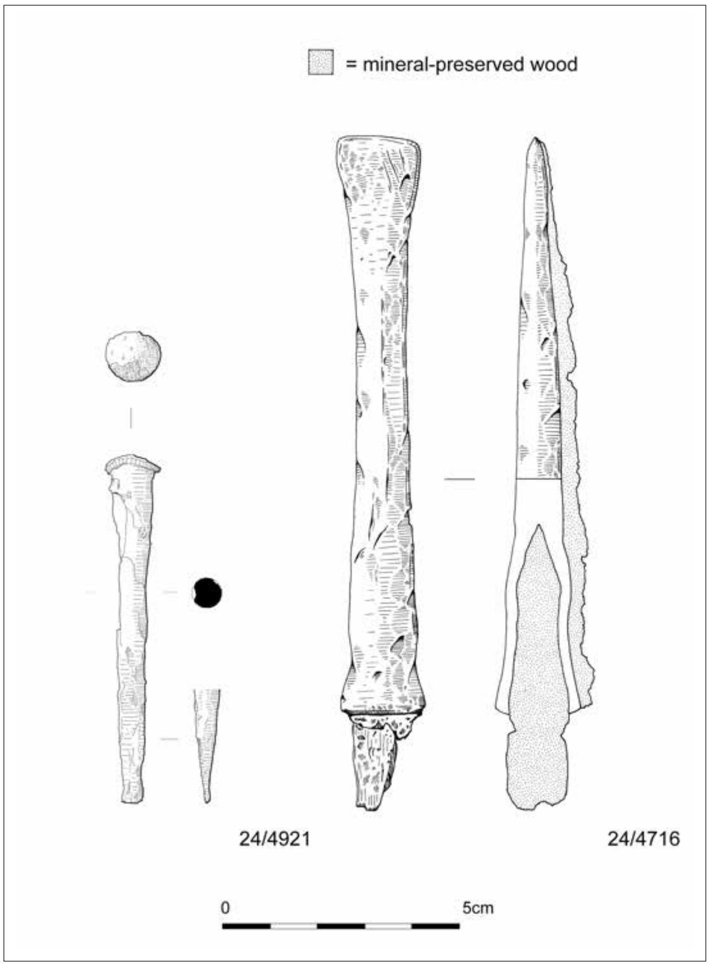


Illustration D6.1.5

Iron whittle tang blade, 60mm L (blade) 24mm L (tang) (24/6596; F180 C2144).

Iron whittle tang blade, 69mm L (blade) 9mm L (tang) (24/7670; C3083).

Iron whittle tang blade, 62mm L (blade) 4mm L (tang incomplete) (24/7673; F528 C3175).

Iron whittle tang blade, 72mm L (blade) 49mm L (tang) (24/7681; C3140).

Pumice rubbers

Pumice rubber, complete sub-triangular with sub-rectangular profile, perforation at top, areas of wear and visible white residue, 69mm L × 53mm W × 44mm Th (24/4019; C1827) [Illus D6.1.6].

Pumice rubber, complete, sub-rectangular with sub-rectangular profile, right-angled perforation at top, areas of smoothing from use, 105mm L × 39mm W × 40mm Th (24/4752; C2123) [Illus D6.1.6].

Pumice rubber, complete sub-rectangular with triangular profile, perforation at top, some areas of wear, 90mm L × 35mm W × 27mm Th (24/4793; F373 C1869) [Illus D6.1.6].

Pumice rubber, sub-rectangular, one corner missing, worn, 66mm L × 61mm W × 44mm Th (14/3958; C1998).

Pumice rubber, near-complete, sub-rectangular, one corner missing, slightly faceted, areas of wear, 63mm L × 31mm W× 28mm Th (24/6784; C2950).

Pumice rubber, complete, sub-oval, sub-rectangular profile, perforation at top, worn, 78mm L × 35mm W × 25mm Th (24/7307; C3229).

Pumice rubber, drop-shaped, worn, visible white residue, 108mm L × 74mm W × 40mm Th (24/7308; C3083).

Pumice rubber, small fragment of top with part perforation, 26mm L × 17mm W × 14mm Th (24/7704; C3135).

Rubber with perforation, fine-grained limestone. Two conjoining fragments 78mm L × 37mm W × 30mm; 44mm × 49mm × 29mm (24/6656; C2649).

Rubber fragment with double perforation, in soft powdery limestone, 71mm L × 66mm W × 24mm Th (24/8468; F526 C3535).

Pucks, slickers and whetstones [ninety-eight examples, see OLA 7.1.3.2, Inventory of stone objects]

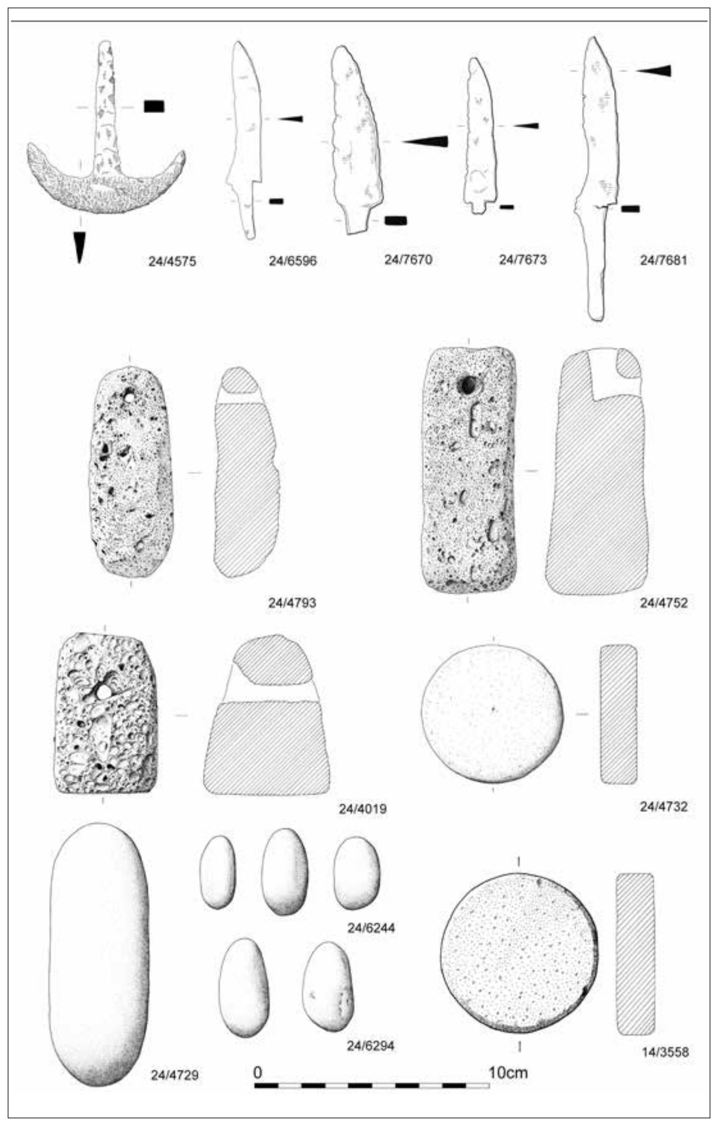


Illustration D6.1.6

Slicker, sub-rectangular in form and profile, haematite stained micaceous metaquartzite 112mm L × 42mm W × 30mm Th (24/4729; C2109) [Illus D6.1.6].

Whetstone, discoid, with smoothed edge and faces, medium to fine-grained, dark red ferruginous sandstone, 90mm reconstructed Diam × 6 to 12mm Th (8/211; F9 C1021).

Whetstone, discoid, micaceous schist 66mm Diam × 15mm Th (14/3558; C2438) [Illus D6.1.6].

Whetstone, discoid, medium to fine-grained, red ferruginous sandstone, 67mm Diam × 11.5mm Th (24/4577; C1326).

Whetstone, discoid, metaquartzite, 60mm Diam × 15mm Th (24/4732; C2109) [Illus D6.1.6].

Whetstone, irregular sub-rectangular form and profile in buff feruginous micaceous sandstone, bears naive interlace doodle, 83mm L × 20mm W × 13mm Th (24/4854; C2353) [Illus D6.1.7].

Whetstone, trapezoidal profile, marked by grooves from sharpening; 153mm × 33mm to 30mm × 24mm Th (24/4706; C2109) [Illus D6.1.7].

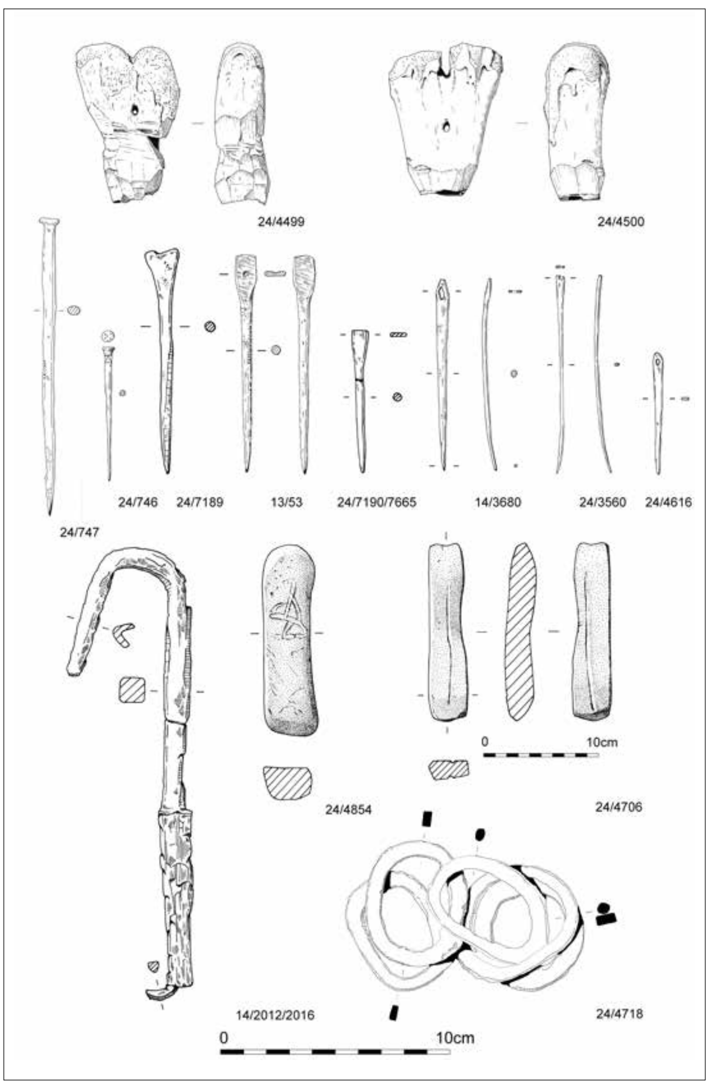


Illustration D6.1.7

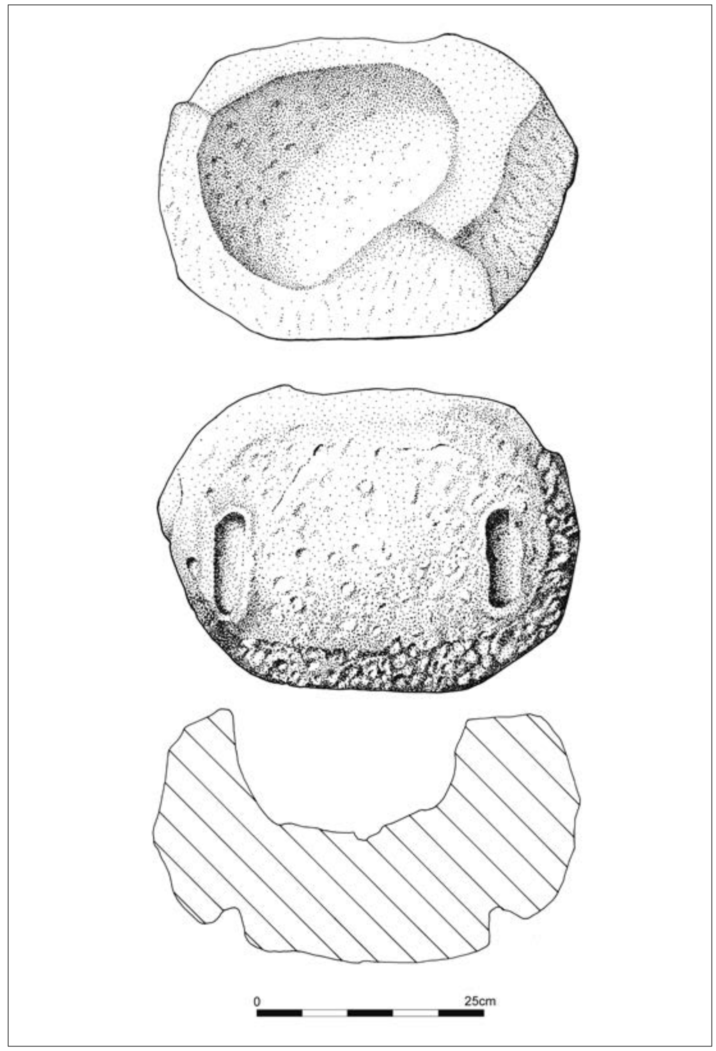


Illustration D6.1.8

Vellum pebbles [241 examples, see OLA 7.1.3.2] Illustrated: 24/6244, 6294 [Illus D6.1.6; Illus 5.6.11 and 15]**.**

Bone pegs [These are the most evidently worked of more than 20 examples of cattle metapodials thought to have served as stretcher frame pegs in the vellum yard; see Digest 6.4 at 3.2.2; Illus 5.6.10]**.**

Bone peg cut from the distal end of a cattle metapodial, nutrient foramen visible, much of shaft and condyles worn down, mid-shaft is thinned, and features irregular cut marks, 72mm L × 46mm W (incomplete) × 22mm Th (14/4499; F393 C1957) [Illus D6.1.7].

Bone peg cut from the distal end of a cattle metapodial, nutrient foramen visible, 64mm L × 46mm W across condyles (Bd), but incomplete, 22mm Th (14/4500; F393 C1957) [Illus D6.1.7].

Styli (Digest 6.4 at 4.1)**.**

Bone stylus with expanded head, with flat upper edge, two conjoining pieces; 61mm L × 7mm W (head) × 3mm Th (shank) (24/7190 and 7665; F507 C2844) [Illus D6.1.7].

Polished bone stylus 95mm L × 9mm W (head) ×3mm (max (shank) Th (13/53) [Illus D6.1.7].

Pins

Pig fibula pin, MacGregor's Group 1 (head unperforated or trimmed), 98mm L × 15mm W (head) × 5mm Th (shank) (24/7189; C3157) [Illus D6.1.7].

Pin, probably of postcranial bone, finely made and highly polished from use, shank of subcircular section and waisted profile, 130 L × 6–7mm W (head) × 5mm Th (24/746, F132 C1354) [Illus D6.1.7].

Pin, probably of postcranial bone, finely made and highly polished from use, shank of evenly tapering profile and subcircular section. Head decorated with five dots, unevenly arranged, under head decorated with parallel incised lines containing zig-zag ornament, 57mm L × 5–6mm W (head) × 5mm Th (24/747, F132 C1354 [Illus D6.1.7].

Needles [Illus D6.1.7].

Needle, bone or antler, head broken at mid-point across perforation; otherwise complete, 83 L × 3mm Th (14/3560; C2435).

Needle, bone, largely complete, short and straight in profile; slight faceting on head, which features a round, 2 × 2mm perforation, gently tapering profile, blunt tip, 52 L × 4mm Th (14/3680; F395 C2447).

Needle, bone or antler, complete, curved profile, ovoid section, finely pointed tip, and lozengiform head with longitudinally extended perforation (4mm × 1mm) 83mm L × 3mm Th (24/4616; C1877).

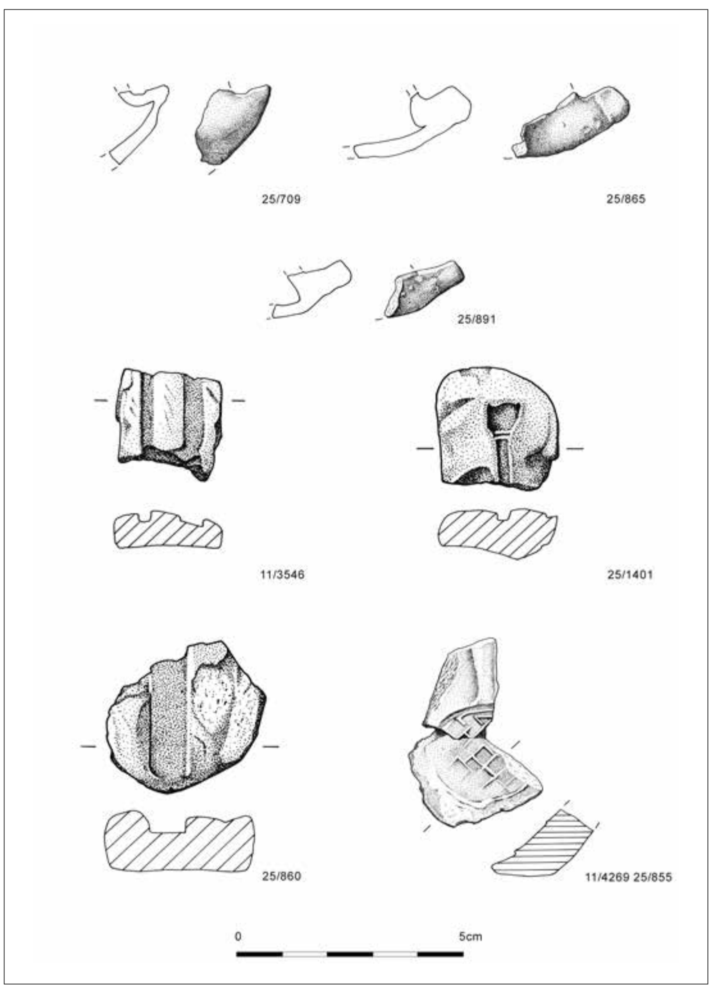


Illustration D6.1.9

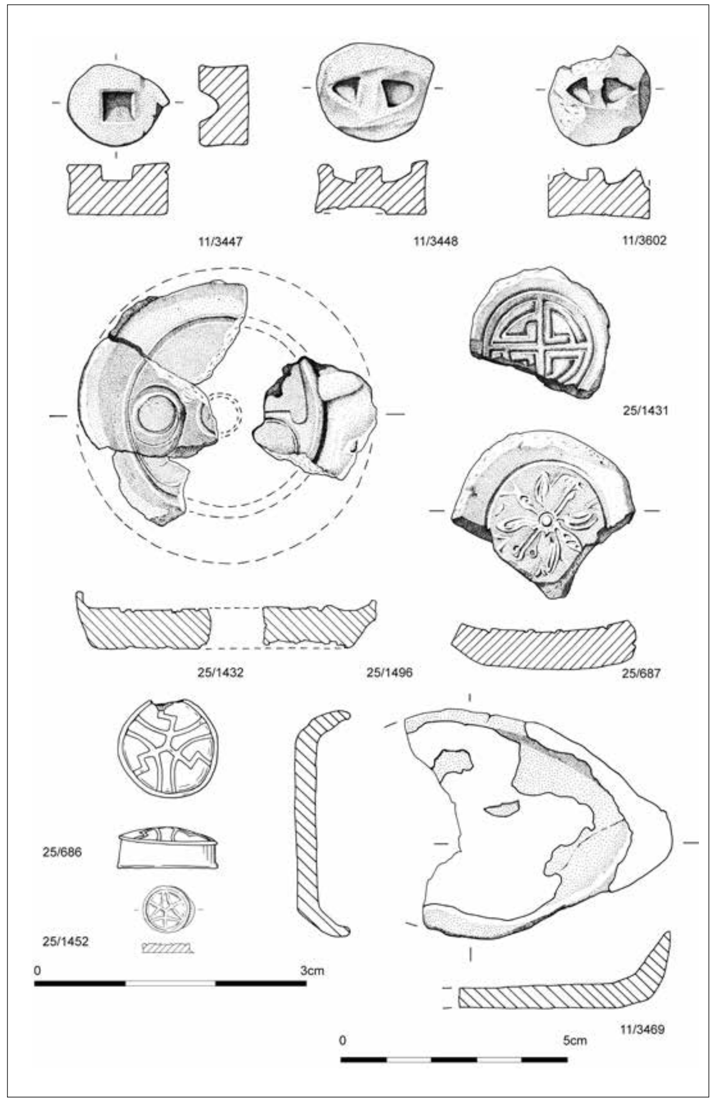


Illustration D6.1.10

Wood-working chisel

Iron, long-handled wood-working chisel, with socketed handle and mineral-preserved ?alder handle 243mm L × 24mm Diam (24/4716; C2109) [Illus D6.1.5].

Iron hoops

Group of five iron hoops, corroded together, of varying circular, sub-rectangular, sub-oval and D-shaped form, 53mm × 40mm × 7mm Th; 54mm × 4mm × 7mm Th; 56mm × 39mm × 5mm Th; 59mm × 45mm × 5mm Th; 49mm Diam × 7mm Th (24/4718; C2109) [Illus D6.1.7].

Stone basin or mortar

Near-complete mortar or basin pecked from large sandstone boulder with deep smooth central bowl and two parallel recessed slots on the underside. Possible basin supported by a trestle in the manner of a folding seat. 470mm L × 320mm W × 290mm Th (24/4707; C1868) (S9) [Illus D6.1.8; Illus 5.6.18].

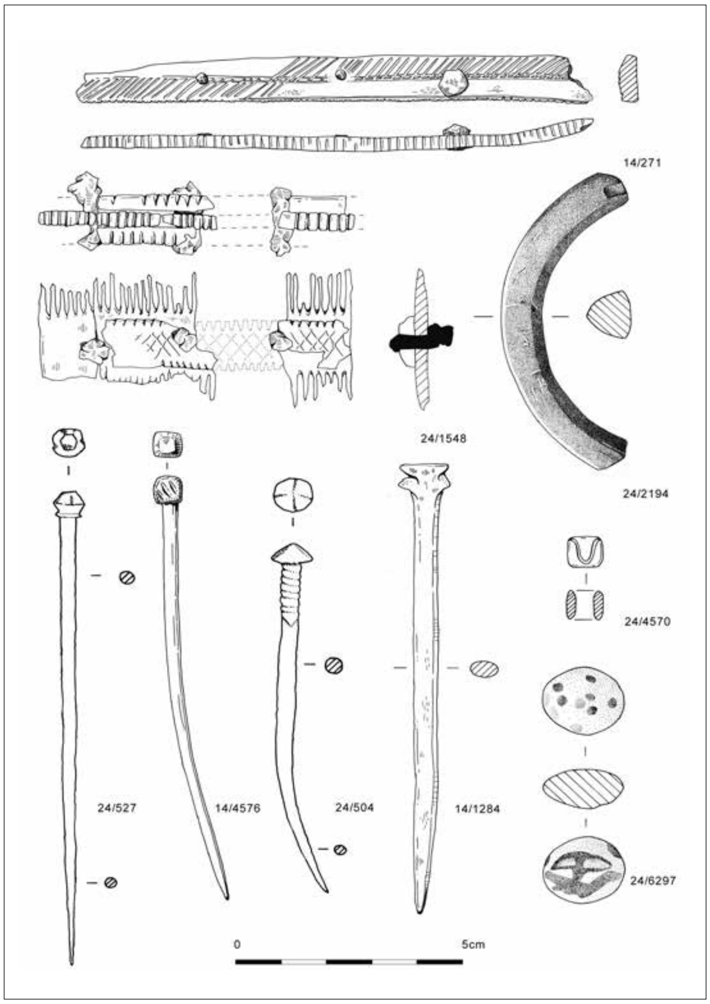


Illustration D6.1.11

Book plaque?

Fragment of copper alloy cast with insular ornament 33mm L × 27mm W × 1mm Th. Wt 3.6g (14/1286; C1002) [Illus 5.6.19].

Objects associated with Period 2 Glass and Metalworking (Sector 1), excluding slag, for which see 6.9

Crucibles (Spall in Digest 6.5)

Crucible, Type G1, handle and part body 4.5mm Th × 12mm W × 7mm L (25/865; C1001) [Illus D6.1.9].

Crucible, Type G2, 3.5mm Th (25/709; C1002) [Illus D6.1.9].

Crucible, Type G1, handle and part body, 5mm Th × 6.5mm W × 10mm L (25/891; C1002) [Illus D6.1.9].

Crucible body sherd, with opaque yellow glass on interior surface. Fabric white, gritty, rather crumbly, wheel-thrown. Exterior grey/orange. Possible inclusions of metal ore in glass, 41mm L × 31mm W × 7mm Th (11/3551; C1250).

Two-thirds of a low-walled heating tray, eye-shaped heating tray with flat base. Patches of opaque yellow glass on interior surfaces, but also spreading to exterior in places. Stirring marks visible where trails have been lifted out. Fabric as 11/3551, hand-modelled, 62mm L × 45mm W × 17mm H (11/3469; C1250) [Illus D6.1.10; Illus 5.7.9; Illus D6.8.3].

Moulds (Spall in Digest 6.6)

Geometric disc mould, two conjoining fragments of upper mould with part ingate derived from the casting of a small domed disc bearing an eroded geometric interlace pattern on a disc 23mm Diam (11/4269 and 25/855; C1002 and F176 C1250) [Illus D6.1.9; Illus 5.7.8].

Four conjoining fragments of spiral decorated glass disc mould, circular disc measuring *c* 44mm Diam (25/1432 and 1496) [Illus D6.1.10; Illus 5.7.9].

Circular glass mould with floreate cross matrix, mould Diam 50mm, stud Diam 32mm (25/687; C1002) [Illus D6.1.10; Illus 5.7.9].

Circular glass mould with interlace cross matrix, domed profile, mould Diam 32mm, stud Diam 25mm (25/1431; F179 C1377) [Illus D6.1.10; Illus 5.7.9].

Square glass, two conjoining fragments of small drum of rolled clay mould 23.5mm L × 20.5mm W × 10.5mm Th (11/3576 and 3651; F176 C1250).

Square glass stud mould on small drum of rolled clay, domed stud profile, mould 19mm L × 17mm W × 10.5mm Th, stud 5mm L × 5.5mm W × 2.5mm D (11/3447; F176 C1250) [Illus 6.1.10; Illus 5.7.9].

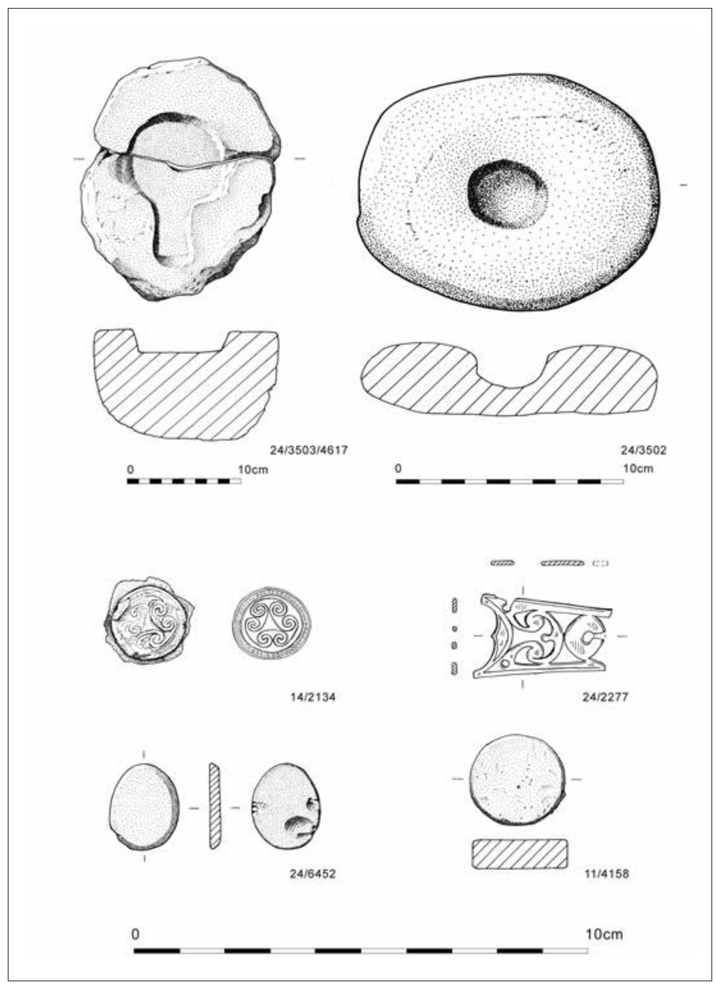


Illustration D6.1.12

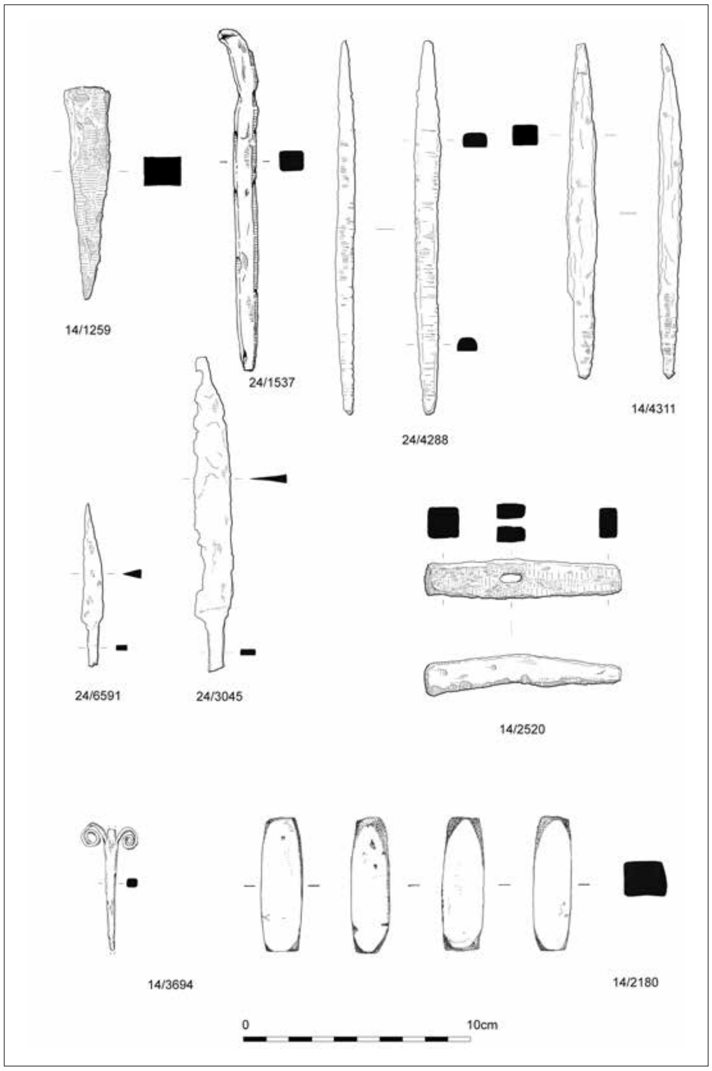


Illustration D6.1.13

Double triangular glass stud moulds on small drum of rolled clay, domed stud profile, mould 23mm L × 21mm W × 11.5mm Th, studs 5mm L × 5.5mm W × 2.5mm D (11/3447 and 3602; F176 C1250) [Illus D6.1.10; Illus 5.7.9].

Lower valve mould fragment for small buckle or link (11/3546; F176 C1250) [Illus D6.1.9].

Lower valve mould fragment for dress pin with possible horned head and collar (25/1401; F179 C1377) [Illus D6.1.9].

Lower valve mould for bar. The bar would measure min. 32mm L × 6.5mm W (25/860; C1002) [Illus D6.1.9].

Lower valve mould fragment for simple strap end and link (11/3643; F176 C1250).

Upper valve mould fragment for plain disc or rear valve of decorative escutcheon (11/3569; F176 C1250).

Complete lower valve mould for plain disc or rear valve of decorative escutcheon (25/1486; F179 C1377).

Lower valve mould fragments for plain disc or rear valve of decorative escutcheon (11/3548; F176 C1250).

Lower valve mould fragment for plain disc or rear valve of decorative escutcheon (25/759; F179 C1377).

Lower valve mould fragment for plain disc or rear valve of decorative escutcheon (25/761; F179 C1377).

Lower valve mould fragment for plain disc or rear valve of decorative escutcheon (25/899; C1002).

Lower valve mould fragment for plain disc or rear valve of decorative escutcheon (25/1433; F216 C1459).

Glass studs

Blue glass stud with silver wire inlay. Main body of stud is of cobalt blue bubbly transparent glass, with a Y-shaped inlay formed by three arcs of silver wire, filled with opaque whitish glass, now discoloured by corrosion, possibly originally red or yellow. Between the arms of the Y is another tripartite division formed by three zig-zags, also formed by silver wire. The circular border also holds silver wire. On the upper surface, the glass is decayed and devitrified in places, particularly the white, probably due to contact with the metal. The upper surface is convex, with vertical sides. The rear surface is not flat and has part of a flange and indentations showing where the soft glass was pushed into the mould. There is a small flake missing from one edge, 11mm Diam × 4mm Th (25/686; C1002) [Illus D6.1.10; Illus 5.7.10].

White glass stud with moulded decoration on upper face. Opaque white glass, with a few bubbles. The grooved decoration, 0.3mm wide and intended for silver wire inlay as in 25/686, consists of a Y-shape overlain by three curved lines forming a triangle with concave sides, all lying within a circular border. Upper surface convex, lower uneven with flange on one side, 5mm Diam × 1mm Th (25/1452; F216 C1459) [Illus D6.1.10; Illus 5.7.10].

Glass-working debris

Spall from lump of cullett. Pale blue transparent glass, surface opalescent, 20mm × 6mm × 3mm (11/362; C1002).

Irregular dribble of molten glass, colour varies from olive green to opaque yellow, irregular lumps of opaque yellow inclusions, 30mm × 4mm × 4mm (25/1385; F179 C1457).

Irregular rod of opaque yellow glass, broken at one end, rounded at the other; waste from trail production, 12mm × 2mm × 2mm (25/1458; F222 C1471).

Droplet of molten glass, broken, cobalt blue, very bubbly, abraded, 3mm × 3mm × 4mm (11/4136; F34 C1048).

Muscovite mica sheets: 16mm × 25mm (11/4467; F426 C1655); 14mm × 14mm (11/4468; F455 C1733); 13mm × 18mm (11/4469; F429 C1662); 18mm × 12mm (11/4470; F429 C1661).

Period 3 Scotto-Norse

Ninth-eleventh century (Chapter 6)

Objects from Period 3A contexts in Sector 2

Personal objects

Comb, probably antler. Connecting plate with one iron rivet, one perforation close to end. Not easily assignable to type; probably Type 2 (seventh–ninth century AD) or 7/8c (tenth–twelfth century AD). 47mm L × 12mm W × 2mm Th (24/48; C1284) [see Ashby in Digest 6.4].

Double-sided composite comb, antler, Type 11 or 12 (*c* seventh–ninth-century AD). Three fragments of connecting plate, four toothplates, 13 teeth (24/1548; C1284) [Illus D6.1.11; see Ashby in Digest 6.4].

Comb connecting plate, antler, from single-sided composite comb (Type 8a; *c* tenth–twelfth century AD), with five iron rivets, evenly spaced (*c* 25mm between each). Decorated with pair of central lines along apex. Decorative toothcuts, indicative of six teeth per cm. 113mm L × 13mm W × 4mm Th (14/271; C1002). [Illus D6.1.11; see Ashby in Digest 6.4].

Copper alloy stick pin with mushroom-shaped head incised with four lines, shaft decorated with spiral terminating in zig-zag, 87mm L × 9mm Diam (head) × 4mm Th (shank) (24/504; C1002) [Illus D6.1.11].

Copper alloy stick pin 105mm × 7mm Diam (head) × 3mm Th (shank) (24/4576; C1878) [Illus D6.1.11].

Copper alloy stick pin with faceted head and collar, 115mm L × 3mm Th (shank) (24/527; C1292) [Illus D6.1.11].

Decorated wound glass cylinder bead. Glass cobalt blue, very bubbly and streaky. Decorated with single marvered running swag trail, now completely decayed, but with traces of colourless glass, perhaps indicating original reticella twisted trail. H 7mm; Diam 8mm; hole Diam 4mm (24/4570; F432 C1877) [Illus D6.1.11; Illus 6.4; Campbell in Digest 6.7).

Bone pin, with ornate head 110mm L × 11mm W × 4mm Th (24/1548; C1284) [Illus D6.1.11; see Ashby in Digest 6.4].

Stone gaming board with unfinished incised layout; 200 × 132 × 17mm; (14/3932; C1660) [Illus 6.6; see Hall in Digest 6.18].

Stone lamp or mortar 110mm Diam × 57mm H × 35mm Th (24/6847; F149 C1415).

Iron pricket of three welded strips forming tapering shank and central spike, with curled arms 58mm L × 24mm W × 4mm Th (shank) (14/3294; C1663) [Illus D6.1.13].

Objects associated with working jet-like material [see Hunter in Digest 6.3].

Cannel coal bangle (24/2194; C1501) [Illus D6.1.11].

Bangle roughout, possible albertite (24/3591; C1538).

Gaming piece roughout, shale (14/4192; C2117).

Objects associated with metal and glass working in Sector 2 (excluding slag, for which see 6.9)

Painted pebble, small, quartzite, one side bears six small spots, the other a diamond enclosing two crossing lines, 17mm L × 16mm W × 9mm Th. From levelling over Period 2 strata (24/6297; C2578) [Illus D6.1.11; Illus 6.4].

Bodysherd of decorated glass vessel, yellowish-green colour. The decoration is a single reticella trail, of opaque yellow and transparent yellow-green, partially marvered. The yellow trails have bled into the body of the vessel forming a row of spots along both margins, 13mm L × 9mm W × 0.5mm Th, trail 3mm W, Diam of vessel (?)50–60mm (24/2885; C1501) [Illus 6.4].

Roman carnelian cabochon, oval with bevelled rear and three spalls from removal from setting on top face, 20mm L × 13mm W × 2mm Th, second century AD (24/6452; C2701) [Illus D6.1.12; Illus 6.4].

Silvered, copper alloy disc decorated with six interlocking C-spirals and pelleted border with riveted iron stud to rear, 16mm Diam (14/2134; C1225) [Illus D6.1.12; Illus 6.4].

Copper alloy complete but damaged fretwork mount, based on C-spiral with circular disc and connecting peltae to either side picked out with fine lines, peltae and disc marked by rivet holes, 29mm L × 15–20mm W × 2mm Th (24/2277; C1501) [Illus D6.1.12].

Oil lamp mould. Two conjoining fragments of complete oil lamp mould, red ferruginous sandstone, 220mm L × 168mm w × 100mm Th; lamp matrix 150mm L × 88mm W × 22mm deep (24/3503 and 4617; C1545) [Illus D6.1.12; Illus 6.15].

Fire-gilding mortar

Possible fire-gilding mortar, natural rounded flat pebble with small depression ground in, very smooth interior, surface heat-affected, 120mm L × 100mm W × 25mm Th; hole 30mm Diam × 20mm deep (24/3502; C1545) [Illus D6.1.12; Illus 6.15].

Tools

Iron whittle tang blade, 52mm L (blade) × 20mm L (tang) (24/6591; 2578) [Illus D6.1.13; Illus 6.17].

Iron whittle tang blade, 118mm L (blade tip missing) × 22mm L (tang incomplete) (24/3045; 1520) [Illus 6.1.13].

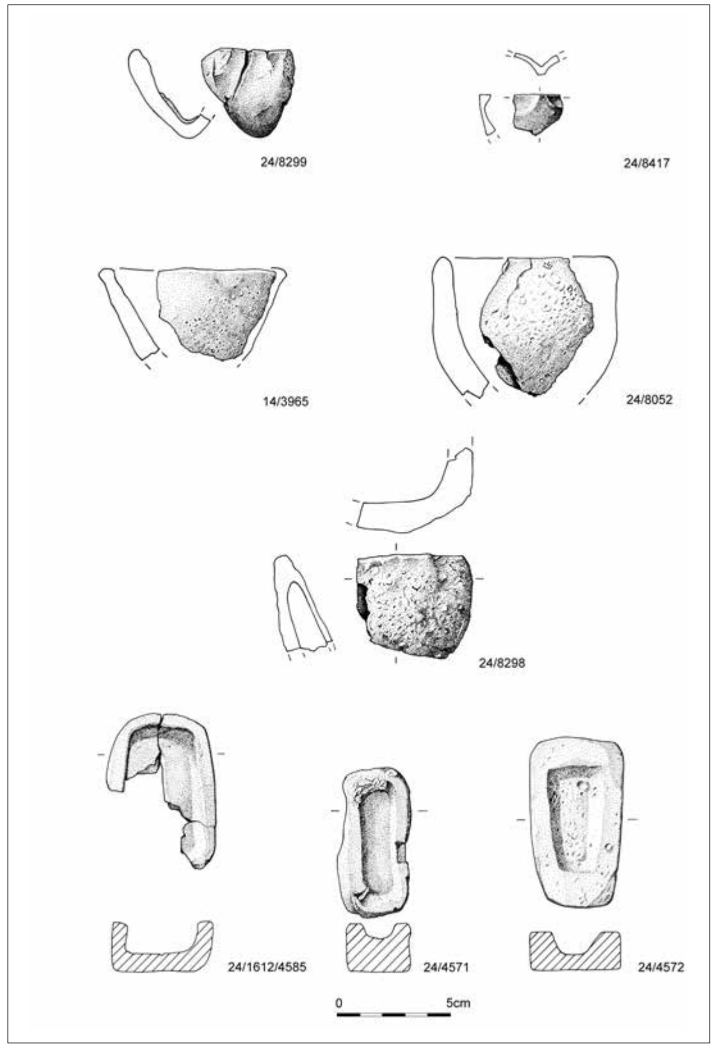


Illustration D6.1.14

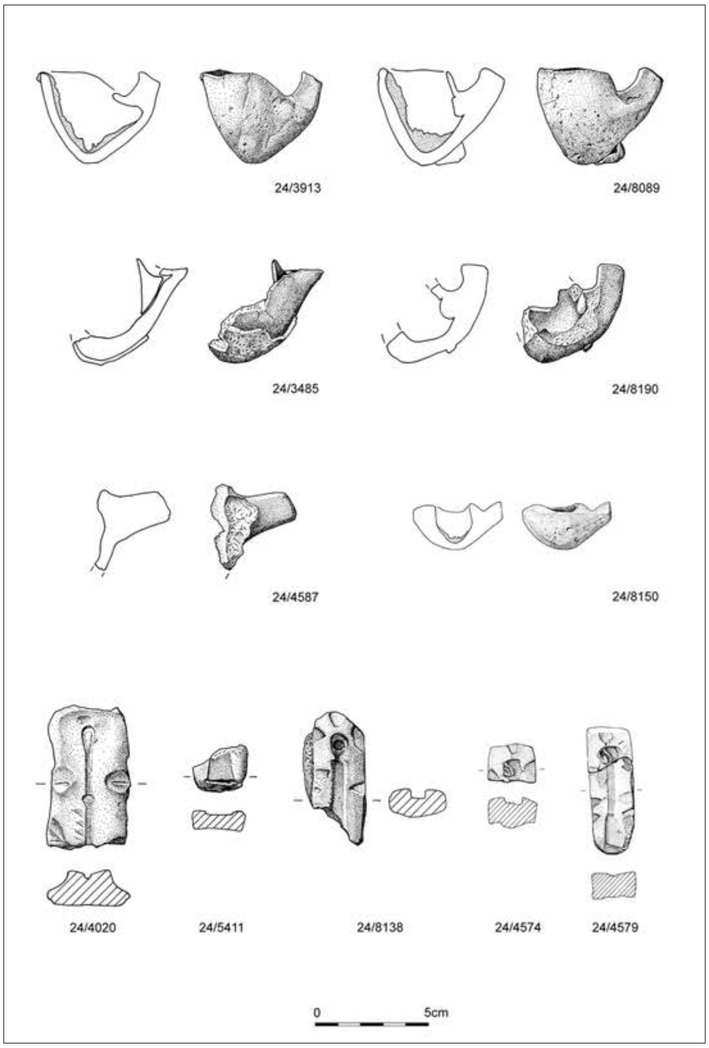


Illustration D6.1.15

Iron handled hook, broad curved hook with mineral-preserved wooded handle with clenched end, 220mm L × 100mm L (handle) × 8mm Th (hook) (24/4804; C1545).

Iron hammer head, sub-square and slightly burred face with chisel-shaped peen and sub-oval eye for a wooden handle, 86mm L × 17mm W × 12mm Th (14/2520; F199/1548) [Illus D6.1.13; Illus 6.17].

Iron punch, burred head, sub-square cross-section, 151mm L × 10mm W × 8mm Th (24/1537; C1419) [Illus D6.1.13; Illus 6.17].

Iron punch, slightly burred end, waisted, square cross-section, 95mm L × 20mm W × 16mm Th (head) (14/1259; C1002) [Illus D6.1.13; Illus 6.17].

Iron file, D-shaped in section, tanged with vestigial file teeth visible, 164mm L × 10mm W × 7mm Th (24/4288; C1613) [Illus D6.1.13; Illus 6.17].

Iron file, sub-square in section, tanged with vestigial file teeth visible, 147mm L × 11mm W × 10mm Th (14/4311; C1384) [Illus D6.1.13; Illus 6.17].

Touchstone (?), complete small rectangular form with rectangular profile made in dark metaquartzite 58mm L × 19mm W × 15mm Th (14/2180; C1607) [Illus D6.1.13].

Clay *tuyère*, complete. Wt 90.2g (24/7116; C2867) (OLA 7.1.6.4).

Crucibles [see Digest D6.5 and OLA 7.1.6.2 for details].

Type A1 (24/8299; 8417) [Illus D6.1.14].

Type A2 (24/8298; 8052; 14/3965) [Illus D6.1.14; Illus 6.9].

Type G (24/3485; 4587) [Illus D6.1.15].

Type G1 (24/3913; 8089; 8150; 8190) [Illus D6.1.15; Illus 6.9].

Type I crucibles or trays (24/4585 conjoins 1612; 4579; 4571; 4572) [Illus D6.1.14; Illus 6.9; Illus 6.14].

Moulds [see Digest D6.6 and OLA 7.1.6.3 for inventory]

Mould for possible dress pin of brooch-pin style (24/4020) [Illus D6.1.15].

Moulds for zoomorphic dress pins or stud-heads (24/4020, 5411; 8138; 4574; 4579) [Illus D6.1.15; Illus 6.10].

Mould for possible styli form dress pin (24/5411) [Illus D6.1.15].

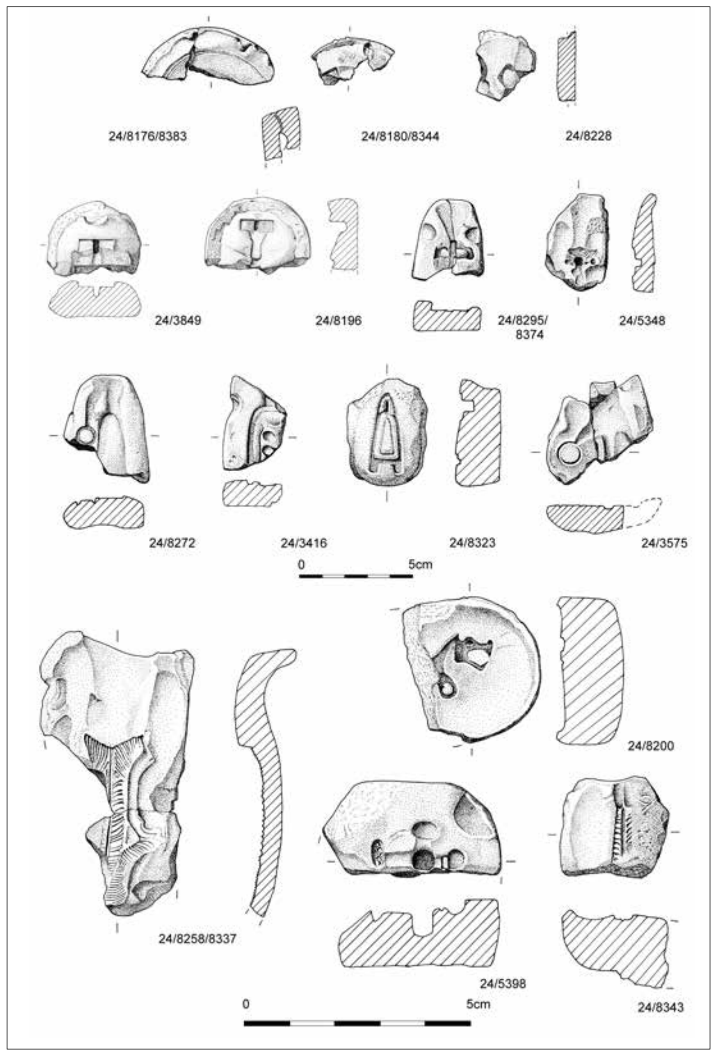


Illustration D6.1.16

Mould fragments for ?brooch (24/8344 conjoins 8180, unites with 24/8176, conjoins 8383) [Illus D6.1.16; Illus 6.11].

Mould for rings (24/8228) [Illus D6.1.16].

Moulds for buckle plates? (24/3849; 8196; 8374) [Illus D6.1.16].

Moulds for belt fittings? (24/5348; 8323) [Illus D6.1.16].

Moulds for strap ends (24/3575; 8727; 3416) [Illus D6.1.16].

Moulds for zoomorphic mount – dragon (24/8200) [Illus D6.1.16; Illus 6.13a].

Moulds for zoomorphic mount – fish. Two conjoining fragments of upper valve bear the part matrix of a fish with symmetrical tail, part body and fin defined by parallel ridged decoration. (24/8258 conjoins 8337) [Illus D6.1.16; Illus 6.13b].

Mould for zoomorphic mount consisting of an upper valve with the impression of a tapering strip with gilled decoration from a central spine leading to possible animal-head terminal (24/8343) [Illus D6.1.16].

Lower valve with part object (24/5398) [Illus D6.1.16].

Moulds for finger rings (24/8368; 4573; 5410; 8121; 8432) [Illus D6.1.17].

Matrices for rings (14/371 and 3736; 24/1310; 3850; 4734; 5440, 5770; 8107; 8219; 8236; 8287).

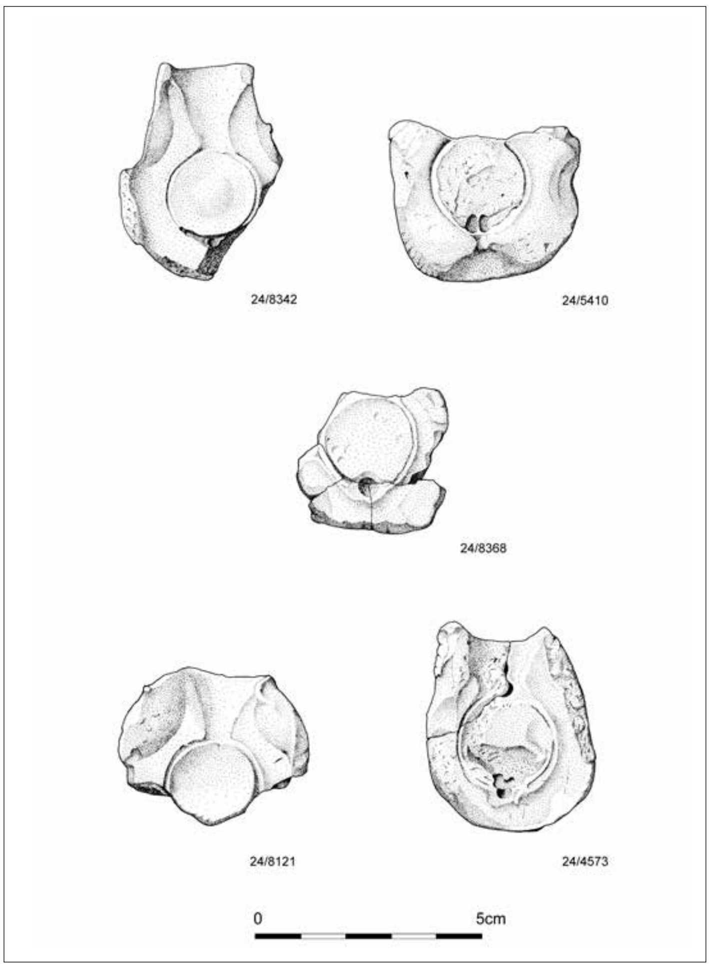


Illustration D6.1.17

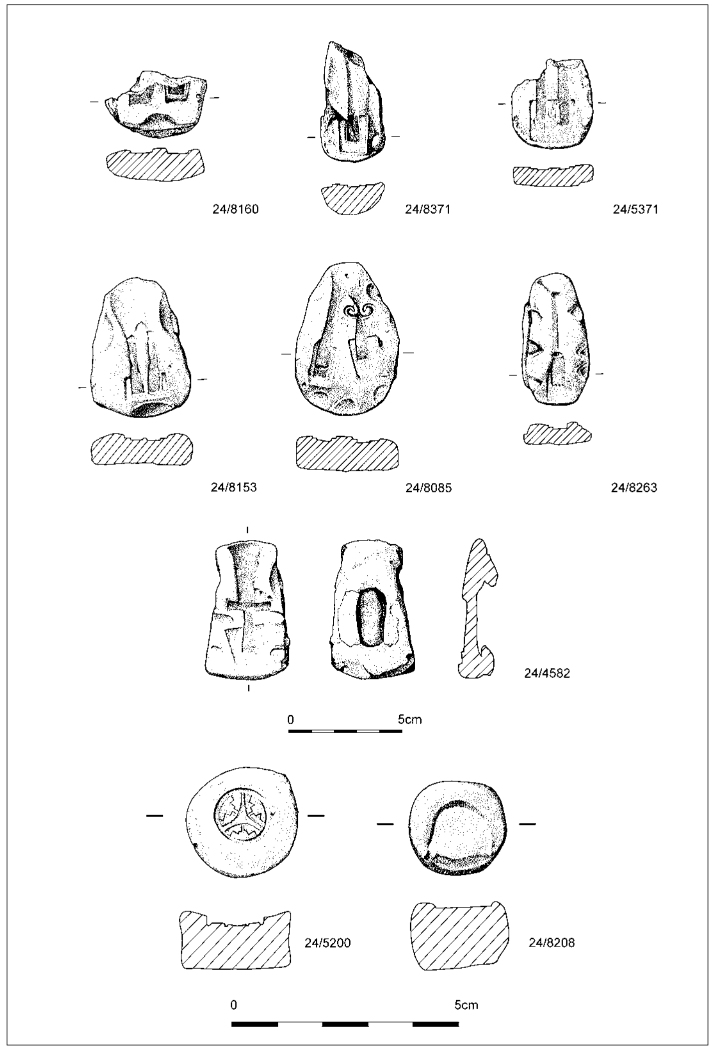


Illustration D6.1.18

Moulds of tabbed objects (24/8106; 8372; 5371; 8020; 8153; 8085; 8263; 4582) [Illus D6.1.18].

Mould for a glass stud, elaborately decorated and bears the matrix of a small circular stud containing a tripartite Y-shape division and three pairs of stepped lines radiating from the centre, 24mm Diam Stud 12.5mm Diam (24/5520) [Illus D6.1.18; Illus 6.16].

Mould for a glass stud, badly eroded shallow, small oval matrix measuring 11mm × 9mm (24/8208) [Illus D6.1.18].

Moulds for weights

Weight moulds of Type A (24/8195 conjoins with 8221; 24/8172 unites with 8270; 24/8319 unites with 8292; 8086; 8273; 8130) [Illus D6.1.19; Illus 6.14].

Weight moulds Type B (24/8194; 8152; 8206) [Illus D6.1.20; Illus 6.14].

Stone ingot moulds

Flat sandstone tablet with part elongated sub-rectangular ingot, heat affected, medium to coarse-grained, red, ferruginous sandstone,

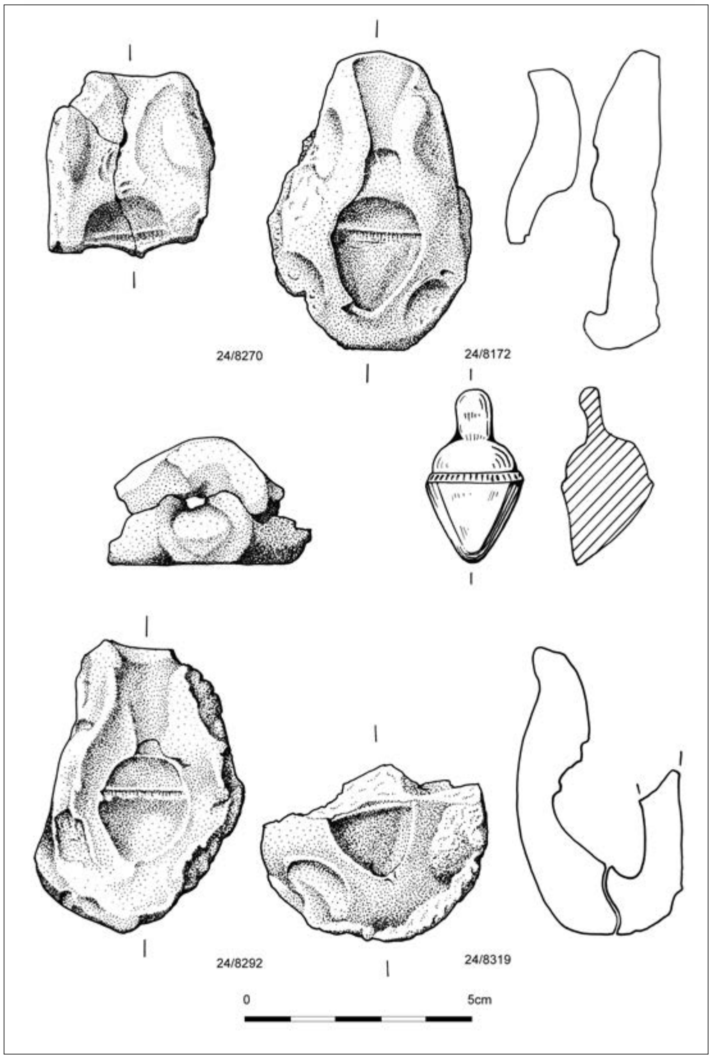


Illustration D6.1.19

100mm L × 60mm W × 18mm Th; ingot min. 92mm L × 10mm W × 2mm deep (24/3505; C1538) [Illus 6.15].

Three conjoining pieces of broken natural flat elongated sandstone pebble with double ingot mould matrix (24/4594 and 4618; C1501 and C1545) [Illus 6.15].

Flat, thick trapezoidal sandstone ingot mould with complete ingot matrix, heat affected, two damaged corners, possible vestiges of ingot matrix on reverse, medium to fine-grained, buff, ferruginous, sandstone, 120mm L × 60 to 30mm W × 35mm Th (24/4619; C1545) [Illus 6.15].

Roughly shaped tile of sandstone with small, shallow oblong ingot matrix, heat affected, fine to medium-grained, buff, ferruginous sandstone, 97mm L × 80mm W × 23mm Th; matrix 55m × 8mm × *c* 2mm deep (24/7849; C3581).

Two conjoining fragments of faceted sandstone slab with sub-circular shallow matrix measuring 59mm Diam, possibly heat-affected interior, medium to fine-grained, buff sandstone, 120mm L × 78mm W × 26mm Th (24/7846 and 7900; C3478 and C3581).

Lead weight retrieved from plough by a metal-detectorist in Sector 1, at the north end. Cylindrical in shape, Wt 26.3g, 21.8mm Diam × 7.1mm Th (11/4158) [Illus D6.1.12].

Rotary quern re-used in flue of S1 (11/627; F79 C1106) [Illus 6.20b].

Period 4 Medieval

Twelfth–sixteenth century (Chapter 7)

[Medieval pottery, see Digest 6.15].

[Coins, see Digest 6.14].

Fishing equipment [Illus D6.1.21]

Iron netting tool, complete with forked point and drop-shaped eye handle, 114mm L × 12mm W (head) × 8mm Th (shank) (24/611; C1345) [Illus 7.28].

Iron fish hook 115mm L × 5mm Th (24/896; C1376).

Iron barbed fish hook fragment, 35mm L (24/1882; C1421).

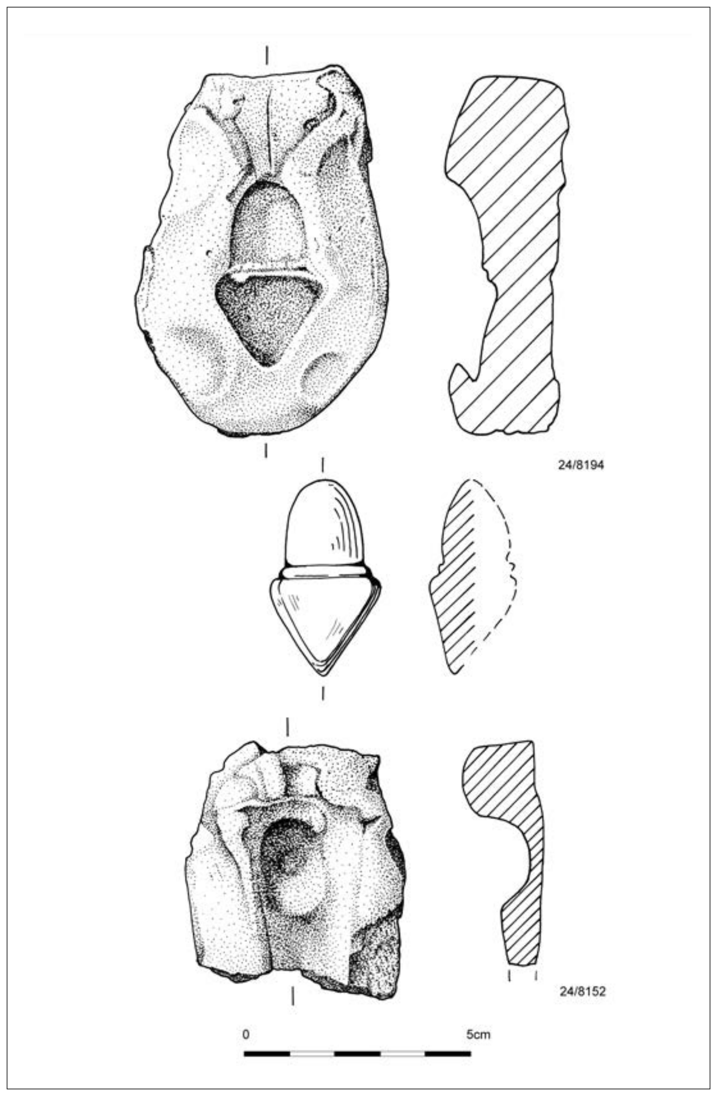


Illustration D6.1.20

Iron barbed fish hook, 75mm L × 2mm Th (shank) (24/2665; C1462).

Lead fishing weight retrieved from ploughsoil by metal-detectorist in Sector 2 (24/4650) [Illus D6.1.21].

Lead fishing weight retrieved from ploughsoil by metal-detectorist in Sector 2 (29/40) [Illus D6.1.21].

Objects associated with metalworking in Sector 2

Grindstones

Grindstone, smoothed from use, with part of central square hole. Reconstructed Diam 328mm × 72mm Th (24/1659; F137 C1332) [Illus D6.1.22].

Grindstone, fragment of edge, smoothed from use. Reconstructed Diam 240mm × 80mm Th (24/2175; C1339) [Illus D6.1.22].

Grindstone, large fragment with edge and central hole with iron staining. Reconstructed Diam 260mm × 55mm Th (24/2196; C1342) [Illus D6.1.22].

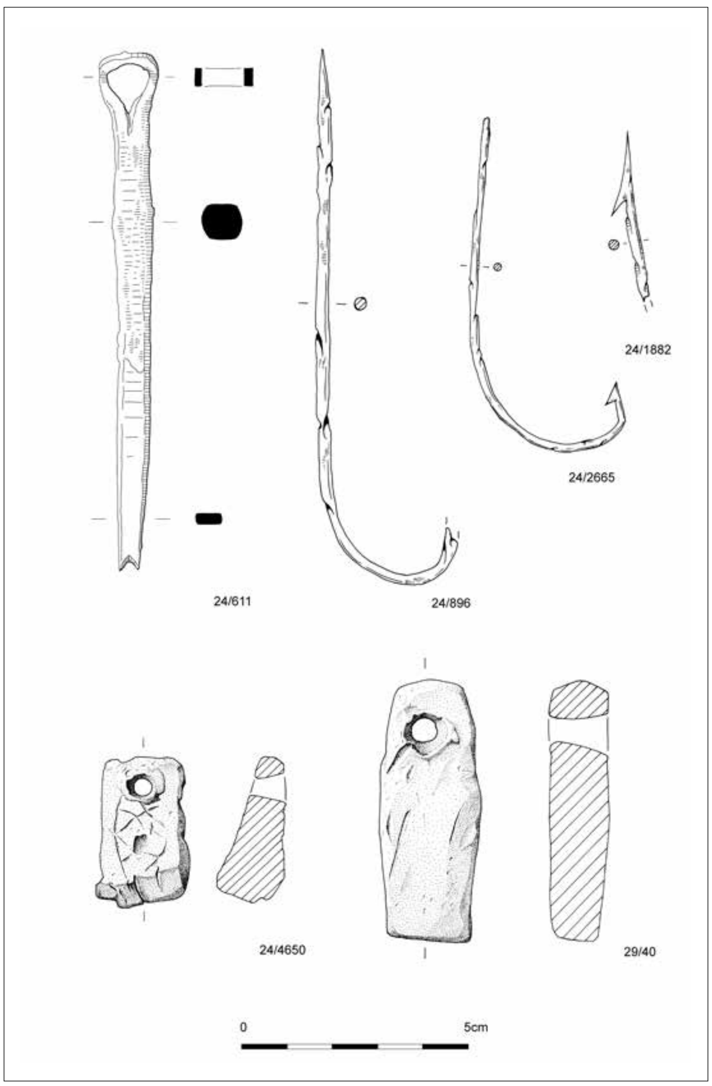


Illustration D6.1.21

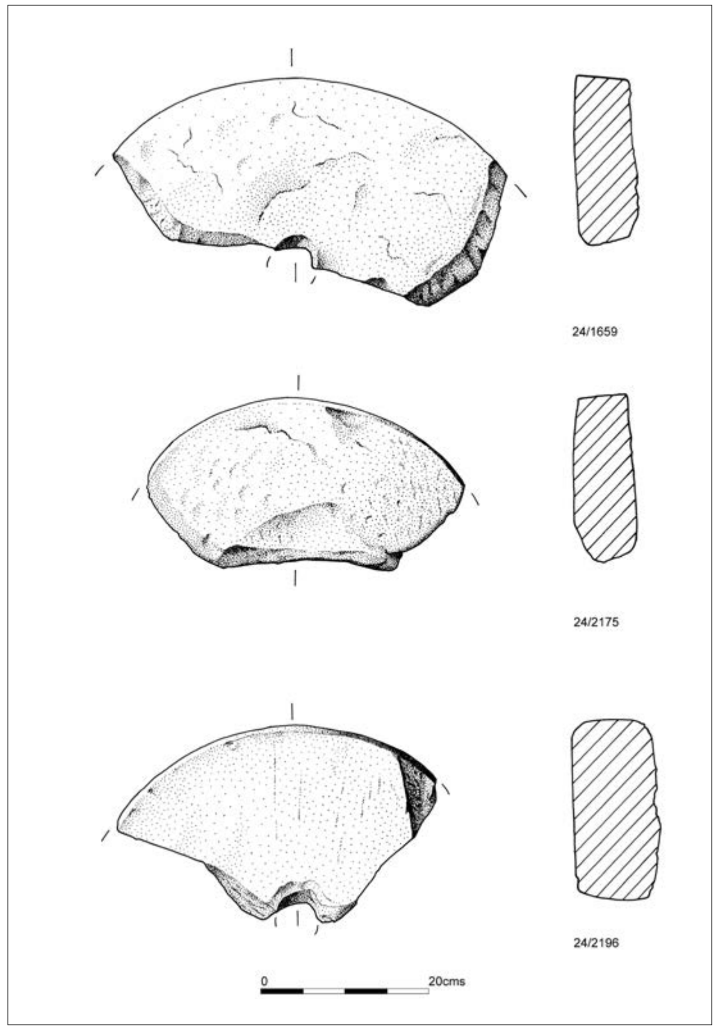


Illustration D6.1.22

Mortar

Two conjoining halves of complete large stone mortar or metal-working mould for wrought sheet-working, made from pecked large natural cobble of medium to fine-grained, buff, ferruginous sandstone, with circular depression and four corresponding channels in rim, all heat-affected, 208mm Diam × 119mm H, depression 110mm Diam × 50mm H (14/1480 and 1577; C1099).

Horse equipment [Illus D6.1.23]

Iron horseshoe, Clark Type 4, complete, branch badly corroded, four tapering, sub-square nail holes on quarter, ?three on branch, plain heel, right-angle calkin, nails in situ, 140mm L × 120mm W × 7mm Th (24/2514; C1343).

Iron horseshoe, Clark Type 4, toe, quarter and heel, four tapering, sub-square nail holes on quarter, one further surviving on toe, plain heel, 120mm L × 120mm W × 7mm Th (24/2871; C1462).

Iron horseshoe, small Clark Type 3, branch, toe – very worn – and part quarter, three nail holes on branch, at least three on quarter, right-angled calkin, 95mm L × 96mm W × 8mm Th (24/3019; C1462).

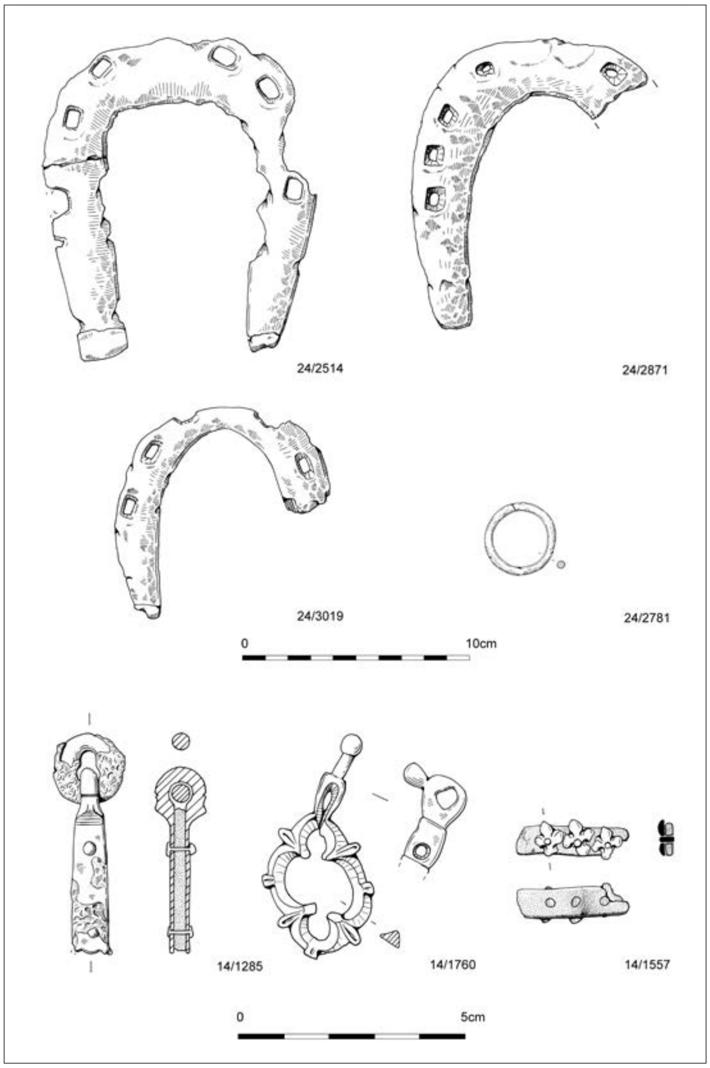


Illustration D6.1.23

Iron ring, possibly snaffle cheek piece. 32mm Diam (24/2781; C1462).

Leather spur strap with three copper alloy fleur-de-lys mounts 24mm L × 8mm W (14/1557; C1008).

Copper alloy link and strap connector with mineral-preserved leather strap 50mm L × 8mm W (14/1285; C1002).

Harness pendant; copper alloy, quatrefoil openwork pendant with angular projections and drilled hole for swinging from suspension mount (14/1760; C1153).

Domestic items [Illus D6.1.24]

Sliding bolt for casket, iron 73mm L (14/1267; C1002).

Pricket, iron, welded strips one with folded terminal. 102mm L × 15mm Th (14/1628; C1099).

Personal Items

Iron key with cruciform ward and simple slot cut into bit, hollow stem flush with bit, part shank and bow missing, 62mm L × 27mm W × 17 (bit) × 5mm Th (stem) (24/412; C1242).

Iron key, brassed, notched ward (25/511; C1002).

Pin, copper alloy, wire-wrap headed 58mm L (15/2; C1003).

Pin, silver, wire-wrap headed 31mm L (15/4; F17 C1020).

Pin, silver, wire-wrap headed 24mm L (15/112; C1025).

Pin, silver (15/25; C1020).

Buckle and plate, copper alloy, wire-wrap headed, 21mm L (14/485; 487; C1002).

Zoomorphic oval buckle, copper alloy, 37mm L × 27mm W × 2mm Th (25/750; C1000), retrieved from ploughsoil by metal-detectorist in Sector 1.

Strap end, copper alloy, paired sheet plates, one side with chip carved line decoration and decorative terminal, 40mm L × 17mm W (11/4552; C1000).

Bar mount, copper alloy, with D-shaped cross-section and two copper alloy rivets in situ 16mm × 4mm (14/1279; C1002).

Bar mount, copper alloy, with D-shaped cross-section and two copper alloy rivets in situ 13mm × 3mm (14/1449; F2 C1004).

Strap connector, copper alloy, strip folded and with two rivet holes, decorated with punched zig-zag of double dot rows 28mm L × 8mm W × 0.5mm Th (11/659; C1002).

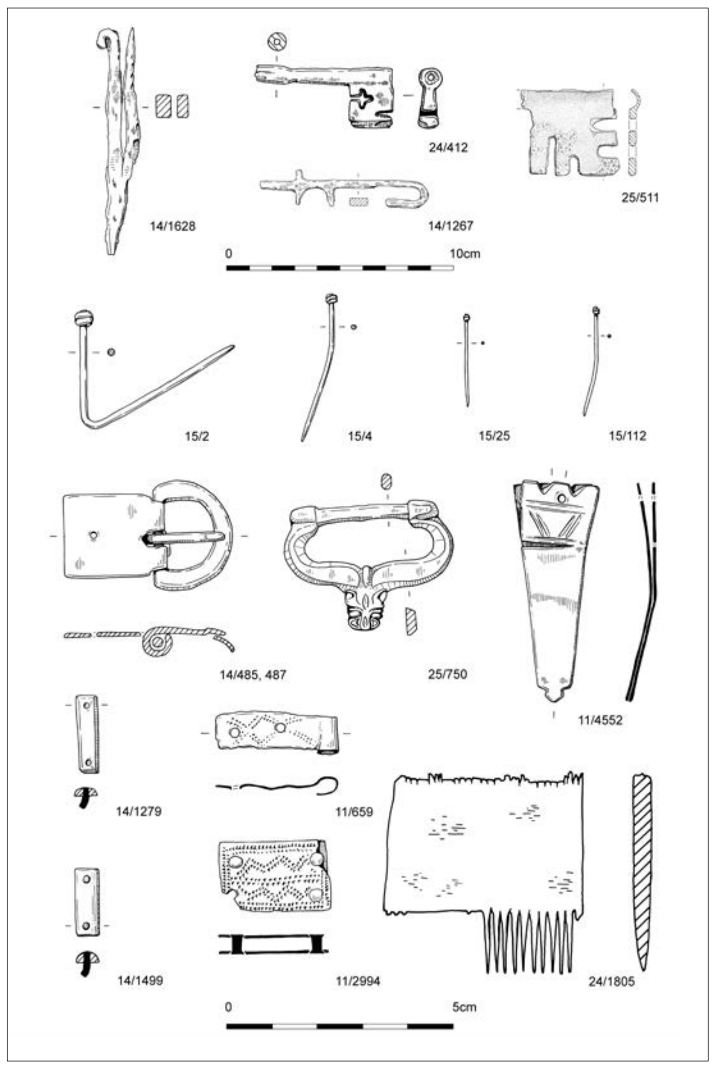


Illustration D6.1.24

Belt fitting, copper alloy, two rectangular sheets connected by four rivets, three in situ, decorated with punched zig-zag and lines of double dots, from same item as 11/659 (11/2994; C1002).

Comb, bone, miniature. Type 14b (*c* fifteenth century or later) W 23mm H 24mm Th 4.2mm (24/1805; C1000) [Illus D6.1.24]. See Ashby in Digest 6.4.

Glass hanging lamp

Fragment of rounded vertical rim from a hanging lamp, potash-rich glass, Diam uncertain, thirteenth–fifteenth century (17/168; F51 C1153) [see Wilmott in Digest 6.15].

Rotary querns

Fragment of upper rotary quernstone; garnet mica schist; 330mm Diam × 50mm Th (14/1696; F2 C1125) [Illus 6.1.25].

Small fragment of upper rotary quernstone with part central and handle hole, garnet mica schist, *c* 250mm Diam × 30mm Th (14/1938; F121 C1329) [Illus 6.1.25].

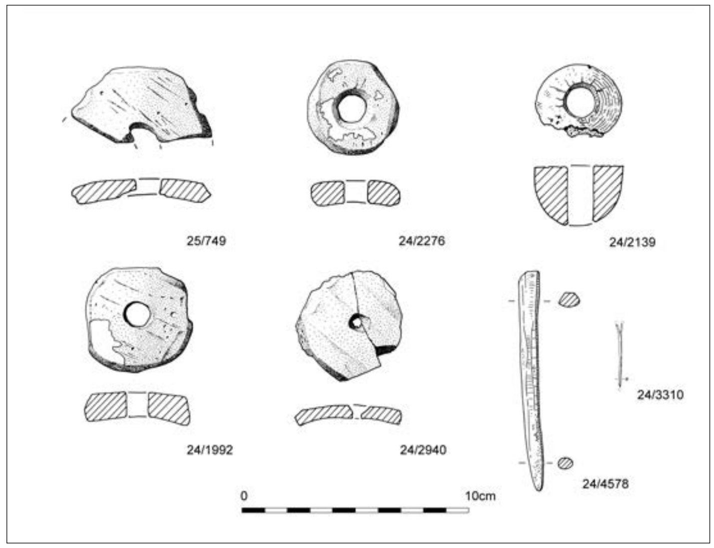


Illustration D6.1.26

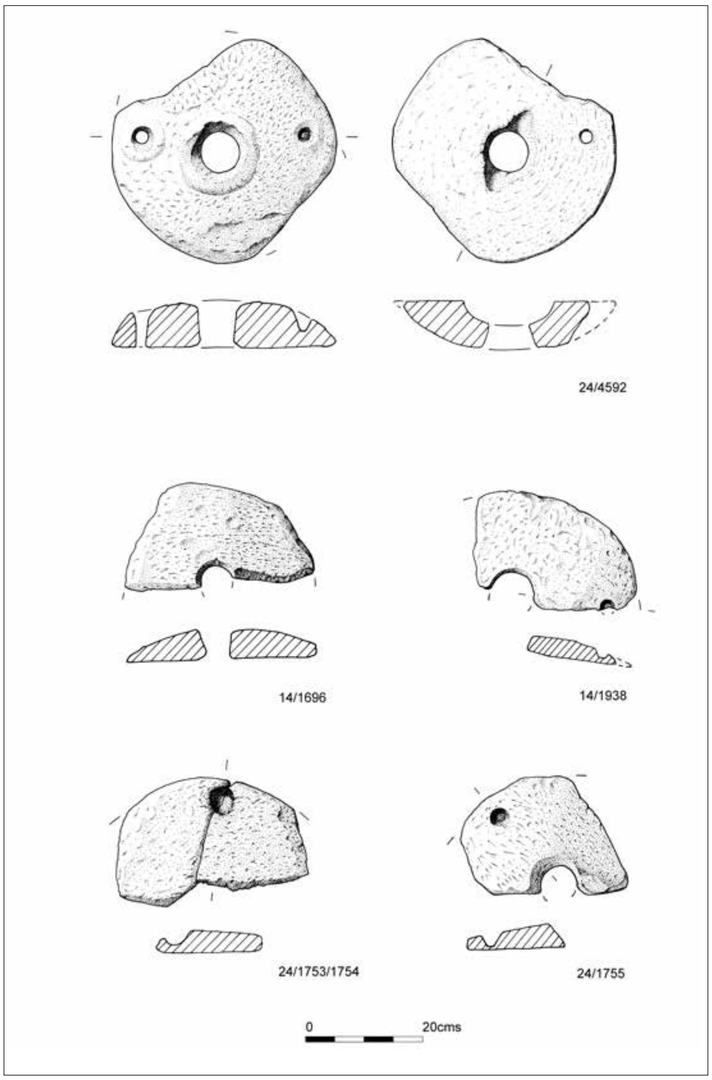


Illustration D6.1.25

Four fragments of two conjoining pairs of ?lower rotary quernstone, garnet mica schist, *c* 300mm Diam × 40mm Th (14/1947; 1999; 2000; 2001; C1074).

Fragment of upper rotary quernstone, garnet mica schist, 460mm L × 330mm W × 40–110mm Th (24/1755; C1280) [Illus 6.1.25].

Fragment of upper rotary quernstone with handle hole, garnet mica schist. 300mm L × 220mm W × 50mm Th (24/985; C1000).

Near-complete upper rotary quernstone with two handle holes and central hole with notched underside, mica schist. Reconstructed Diam 380mm × 30–70mm Th; central holes 80mm Diam narrowing to 60mm Th (24/4592; C1326) [Illus D6.1.25; Illus 7.28].

Two conjoining fragments of upper rotary quernstone, coarse-grained garnet mica schist, 190mm L × 190mm W × 30mm Th (24/1753 and 1754; C1280).

Three small fragments of upper rotary quernstone, coarse-grained garnet mica schist. Reconstructed Diam 340 × min. 25mm Th (24/1756 and 1757; C1280).

Possible fragment of lower rotary quernstone, coarse-grained sandstone conglomerate, 320mm L × 250mm W × 60mm Th (24/1451; F92 C1369).

Textile-working

Spindle whorl of re-used sherd of Scottish Redware ceramic, central drilled cylindrical perforation 10mm Diam whorl 45mm Diam × 10mm Th (24/1992; C1483) [Illus D6.1.26].

Spindle whorl, made from cattle femur head central cylindrical perforation (not hour-glass-shaped) of 13mm Diam, 37mm Diam × 23mm H (24/2139; C1000) [Illus D6.1.26].

Spindle whorl of re-used sherd of Scottish Redware ceramic, central drilled perforation 12mm Diam 40mm Diam × 11mm Th (24/2276; C1284) [Illus D6.1.26].

Spindle whorl of re-used sherd of Scottish Redware ceramic, 44mm Diam × 6mm Th (24/2940; C1378) [Illus D6.1.26].

Half-fragment of spindle whorl of re-used sherd of Scottish Redware ceramic, central drilled perforation 7mm Diam, reconstructed Diam whorl 48mm × 6mm Th (24/1366; C1378).

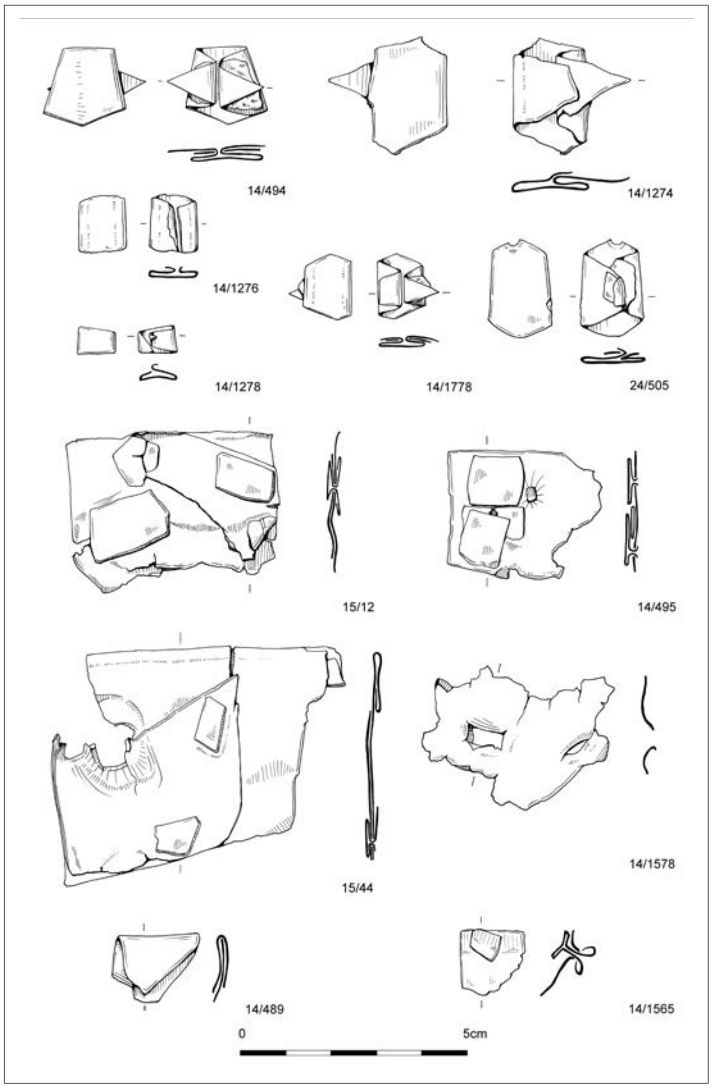


Illustration D6.1.27

Half-fragment of spindle whorl of re-used sherd of Scottish Redware ceramic, central drilled perforation 10mm Diam, reconstructed Diam whorl 64mm × 9mm Th (25/749, C1000) [Illus D6.1.26].

Picker-cum-beater, probably red deer antler, curved profile, slightly faceted section, 97 × max 6mm Th (24/4578; C1877) [Illus D6.1.26].

Iron needle, eye damaged, tip missing, 29mm L (24/3310; C1408) [Illus D6.1.26].

Boots and hose (17/367; Burial 43 F83 C1228)

Boots: Two turnshoes, with an upper attached to a single sole with an edge-flesh seam. The uppers appear to be of one-piece design, with a butted edge-flesh seam linking quarters and vamp wing on the inside of the foot. These were high shoes or low boots, fastened by two straps and a buckle, fifteenth century [see Thomas in Digest 6.16; OLA 7.1.9].

Hose: Fragments of a yellowish-fawn textile were found in association with the leather shoes. The textile is a heavily felted wool tabby. fifteenth century (ie plain weave) [see Walton Rogers in Digest 6.14; OLA 7.1.10].

Tinkering waste [Illus D6.1.27 *illustrated]

Copper alloy vessel rim fragment (14/492 C1002).

Copper alloy paperclip rivets (14/494* C1002; 14/1274* C1002; 14/1276* C1002; 14/1278 C1002; 14/1778* C1094; 24/505* C1002).

Copper alloy vessel repair patches (14/489* C1002; 14/1563 C1007; 14/1565* C1008; 14/1578* C1097) 15/12* C1018; 15/44* C1025; 24/56; C1242).

Copper alloy folded sheet scrap (14/1562 C1007; 14/1561 C1007; 14/1579 C1079.

Leaded copper alloy waste dross (14/1868 C1175).

Copper alloy droplet (14/1813 C1071).

Copper alloy folded sheet waste (14/1903 C1094).

Copper alloy waste dross (14/1448 C1002; 14/1501 C1002; 14/1503 C1002; 14/1505 C1004; 14/1560 C1008; 14/1815 C1204).

Copper alloy sheet scrap (14/60 C1002; 14/61 C1001; 14/490 C1002; 14/493 C1002; 14/500 C1002; 14/511 C1002; 14/1275 C1002; 14/1277 C1002; 14/1498 C1002; 14/1504 C1002; 14/1506 C1004; 14/1555 C1006; 14/1558 C1008; 14/1559 C1008; 14/1564 C1008; 14/1570 C1008; 14/1892 C1072; 24/1 C1002; 24/19 C1002; 24/57 C1002; 24/1540 C1409).

Digest 6.2 AN EIGHTH-CENTURY COIN FROM PORTMAHOMACK

MARK BLACKBURN† (Fitzwilliam Museum, Cambridge)

The discovery of a small eighth-century coin in the 1998 excavation season has a significance that is far wider than the light it sheds on the settlement at Portmahomack, for it is the most northerly pre-Viking coin from the British Isles.

Throughout the early Middle Ages, Scotland was essentially without coinage – the first coins produced in Scotland were struck for David I (1124–53) – although the Vikings, who were used to using a mixture of silver coin and bullion in Scandinavia, brought this practice to the areas of Norse settlement, principally in the Northern and Western Isles. Before the first chronicled raids on the British Isles – starting in AD 789 – only a very few Anglo-Saxon and related coins reached Scotland, and those have all been found south of the Firth of Forth. They form two groups, one from the south-west (Whithorn Priory and nearby Mochrum) and the other the south-east coast (Aberlady and Dunbar). The Tarbat find is, then, a good 220km further north than Dunbar as the crow flies, or more than 300km as one would sail around the coast.

Significantly, the Tarbat coin was produced not in England, but in the Low Countries. It is of the very plentiful variety of early penny known as the 'Porcupine' type, named after the enigmatic design on the obverse, which summons up connotations of quills bristling from a curved back. Within the 'Porcupine' type (Series E), the Tarbat find belongs to the middle phase dated AD 715–35. Coins of this phase have been found mainly in Frisia and the lower Rhineland, where they are thought to have been made. At least 780 specimens were present in the Kloster Barthe hoard in eastern Frisia and there were some 400 examples among the prolific site finds from Domburg, a port in the Rhine mouth, but they also reached England and Merovingian France in fair numbers.

The interesting question to ponder is how did this Continental coin reach the Tarbat peninsula? By sea, of course; but was it in a ship plying across the North Sea and up the Scottish coast, or had the coin already reached England and circulated there before moving northwards up the coast? The chances weigh quite strongly in favour of direct shipment, for in England in the 720s, Continental coins would have been a minority. The argument is reinforced by the Dunbar find, which was also a Continental issue, in this case of the 'Woden/Monster' type (Series X) from western Denmark (EMC 1999.0148). Together these two finds – the most northerly from the British Isles – provide important evidence for contact between eastern Scotland and the Continent, fifty years or more before the traditional date for the beginning of the Viking Age.

Context

From a Period 3 pit (F185). The 3-D position of the find and subsequent sequencing of strata suggests that the coin had been redeposited from layers cut by the pit and assigned to the make up or use of the Period 2/3 road S13 (OLA 6.2.1/3.3; 1.2.3, p 32). But its precise original context remains unknown. The coin dates to *c* AD 715–35.

Editor's Note

After the sad death of Mark Blackburn, an update on the Portmahomack sceatta was sought from Dr D M Metcalf. He kindly reported that in a recently published corpus of 3,500 specimens (Metcalf & Op den Velde 2009, 2010) the coin is classified as a Series E secondary phase variety *c* Metcalf notes that the bold dots at the root of the 'quills' are an irregular and unusual feature, suggesting the coin might be an imitation. He examined the coin to see if there was a test cut across the raised parts of the design, which would indicate that the coin had been in Scandinavia, but such signs were missing. He concluded that 'where the coin originated we cannot say' (pers comm 1 December 2014).

Reference

Metcalf, D M & Op den Velde, W 2009, 2010 *The Monetary Economy of the Netherlands c 690–c 760 and the Trade with England. A Study of the 'Porcupine' Sceattas of Series E.* Vols 96 and 97. Netherlands: Jaarboek voor Munt- en Penningkunde.

Digest 6.3 THE JET-LIKE MATERIAL

FRASER HUNTER (National Museums of Scotland)

Tarbat produced a small but interesting collection of six black organic-rich stone finds which indicate on-site working of this material. There are three broken fragments of unfinished bangle roughouts (24/3591, Period 3; 24/6238, unstrat; 24/6237, ?Period 2) and a discoidal roughout probably intended for a gaming counter (24/2117; Period 2). A further object is a bangle that had been reshaped after breakage, probably for use as a pendant, although it was abandoned before completion (24/5078). The quantities are small and scattered, but clearly indicate on-site working beyond the excavated area. From their visual characteristics a range of raw materials is represented. The shale and cannel coal are likely to come from the Brora shale deposits, only 15km away across the Dornoch Firth; this is the only local source of such raw materials (Gibson 1922, 32–6), although they have not yet been analytically discriminated. More unusual is the highly compact black material with a clean conchoidal fracture, represented by 24/3591 and 6238; this is visually similar to albertite, known from Strathpeffer (Sheridan et al 1998, 127).

Such black organic-rich stones were popular for jewellery in the early medieval period in areas where the raw material was available, as they could readily be polished to take a fine shine. The tradition was a long-lived one, continuing from later prehistory. It was common on both religious and secular sites (Hunter 2008, 200–2); the availability of the raw material at Brora created a local hotspot for its use in eastern Sutherland and neighbouring areas. Analysis of early medieval material from the Clyde estuary suggested that the religious sites were producer rather than consumer centres (Hunter 2008, 202, fig 6.51); the Tarbat evidence supports this model, as one of the two finished items was in the course of being reworked. Unfortunately, insufficient survives to characterise the production technology in detail.

Catalogue

24/2194

Bangle fragment, D-sectioned, the interior slightly rounded; well finished and polished to a high lustre, with fine abrasion scratches from polishing. Material: black, compact, laminar structure, conchoidal fracture; probably cannel coal. 70.5mm L × 8.5–0.5 W × 10–10.5mm H; internal diameter 60–65mm (35% surviving) (C1501; Period 3 dumping over boundary wall) [Illus D6.1.11].

24/3591

Working debris. Accidental flake from a part-prepared roughout, preserving the natural face and two perpendicular sides rounded by cut facets; the corner has also flaked off accidentally. The fragment probably broke off while making the perforation, as the inner edge is curved in plan and worked by chisel-like vertical cuts. The curve suggests it was a bangle roughout. Material: black; conchoidal fracture with little ‘scallops’; perhaps albertite. 43.5mm × 24mm × 23.5mm Th (C1538; late Period 3 dumping over boundary wall).

24/4192

Discoidal roughout, probably for a counter or gaming piece. Rather faceted in plan, with the vertical edges and faces abraded. A small protruding crystalline inclusion is central to one face; the positioning suggests this is unlikely to be accidental, and it was probably incorporated as a deliberate feature. This would suggest there was no intention to perforate the piece, and indeed at this stage in finishing a perforation would normally have been started, so a role as a counter or gaming piece is most likely. The abrasion traces show it was unfinished. Material: laminar nature indicates it is shale. Diam 30.5mm, Th 7.5mm (C2117; Period 3 dumping in eastern roadside ditch).

24/5078

Bangle fragment reworked after breakage. D-sectioned, well-rounded bangle with some residual circumferential polishing scars. The bangle split horizontally and was modified for re-use, with the ends neatly cut square and one of them collared; further reshaping was in progress when the piece was abandoned, with circumferential facets cut from the outer edge and along one inner edge. It was perhaps intended as a pendant. Deep scallops along the facets are probably natural conchoidal fractures as the piece was worked. The fracture pattern and deep black colour suggest it is a cannel coal, slightly laminar in nature. L 30mm, W 10mm, Th 8*mm, internal diameter 55–60mm (14% survives) (C1000, ploughsoil).

24/6237

Fragment from a part-prepared squared roughout with parts of three surviving edges: one naturally rounded, one flaked, one flaked and knife-trimmed. Some slight abrasion on surviving face; other lost. Laminar, coarse – shale? 48.5mm × 28.5*mm × 11.5*mm (C2074, early Period 2 construction dumps at base of boundary wall; residual from Period 1 or early Period 2).

24/6238

Accidentally broken roughout, irregularly fractured with no original edges, but one of the faces preserves what is probably a curving incised marking outline. Too little survives to estimate its diameter accurately, but the size indicates it was intended for a bangle. This surface has been abraded to smooth it; only a little of one surface survives, but remains of abrasion indicates it was original; this preserved width indicates the bangle would be rather narrow. Material: black, conchoidal fracture, very like 3591; perhaps albertite. 28mm × 18.5mm × 7.5mm Th (C1002, ploughsoil).

References

Gibson, W 1922, *Cannel Coals, Lignite and Mineral Oil in Scotland*. London: HMSO (Memoirs of the Geological Survey of Scotland, Special Reports on the Mineral Resources of Great Britain 24).

Hunter, F (with a contribution by Jones J M) 2008 ‘The oil shale artifacts and related material’, *in* Lowe C, *Inchmarnock: an early historic island monastery and its archaeological landscape*, 193–202. Edinburgh: Society of Antiquaries of Scotland.

Sheridan, A, Davis, M & Hunter, F 1998 ‘Objects of cannel coal and similar materials’, *in* McCullagh, R P J and Tipping, R (eds) *The Lairg Project 1988–1996: the Evolution of an Archaeological Landscape in Northern Scotland*, 123–7. Edinburgh: STAR.

Digest 6.4 BONE AND ANTLER OBJECTS

STEVE ASHBY (University of York)

1.0 Introduction

A small group of bone and antler artefacts (thirty-four individual objects) were recovered from excavations at Portmahomack. Most date to the early medieval period, and they provide an interesting insight into activities that took place on, or close to, the site. The objects may be broadly divided into three categories: personal items, those that relate to particular crafts or activities (textile manufacture, vellum production, and writing) and a number of 'miscellaneous' items for which no single function can be confidently asserted. Below, each of these categories of object is catalogued and discussed in turn, before the implications of the collection as a whole are discussed.

2.0 Personal items

2.1 Combs [Illus D6.1.11]

Of the six combs and fragments from Portmahomack, three that are sufficiently well preserved for discussion fit easily into an early medieval (Anglo-Saxon and Pictish) tradition. Though fragmentary, they comprise combs that are probably of Types 11/12, 2a/b, and 8a (dating broadly between the seventh and twelfth centuries; Ashby 2006; Ashby 2007; Ashby 2011). 24/1805 is probably best explained as a later medieval one-piece comb (Type 14b) than as the toothplate from an early medieval composite form.

As far as is visible – and with the possible exception of 24/1805 – the combs seem to be manufactured in antler (probably red deer, though this could not be confidently ascertained in most cases) rather than post-cranial bone. The process by which composite combs are manufactured has been detailed elsewhere (see Ambrosiani 1981; Galloway & Newcomer 1981; Ulbricht 1978; cf Ashby 2013) and herein it suffices to say that the Portmahomack examples were fabricated through the assembly of several small toothplates and pairs of longer connecting plates, these being fixed together with a rivet at every other toothplate edge (what I have termed elsewhere the 'alternating-edge' method), as seems to have been the tradition in early medieval England and Scotland (see Ashby 2011). The combs are unornamented or simply decorated with incised motifs such as cross-hatch and opposing obliques. Microscopic analysis of surviving teeth demonstrates the presence of low-level beading and striation, suggesting that these combs were used, but in the absence of experimental investigations into use wear, it is impossible to quantify the extent or intensity of use that these phenomena represent.

24/1548 Composite comb

Antler. Fragmentary. Three fragments of connecting plate, four toothplates. Double-sided, composite, type 11 or 12 (*c* seventh–ninth century AD). Connecting plates straight in profile and flat in section, and decorated with sawn cross-hatch ornament. Connecting plate edge features decoratively sawn toothcuts. Thirteen teeth remain partially complete and show evidence of minor wear in the form of transverse striations. Teeth are undifferentiated and arranged with five teeth per cm on each edge. Iron rivets. Connecting plate attached to one toothplate by a rivet at one edge. Two other toothplates indicate 'alternating edge' riveting, while one features staining on both edges; this may have been positioned centrally, next to the endplate, or simply represents a repair. Not measured: fragmentary (C1284).

24/1805 Simple comb

Probably postcranial bone. Very fine one-piece miniature comb (no evidence of rivets), Type 14b (*c* fifteenth century or later). Bone. Teeth undifferentiated; fourteen teeth per cm. Ten complete teeth preserved, 8mm long. Central area between teeth is 16mm in height. 23mm W × 24mm H × 1.8mm Th (C1000).

14/271 Comb connecting plate

Antler. From a single-sided composite comb (Type 8a; *c* tenth–twelfth century AD). Five iron rivets, evenly spaced (*c* 25mm between each). Section slightly triangular. Decorated with a pair of central lines along apex, dividing plate into two horizontal panels, decorated with alternating fields of saw-cut obliques. Execution of ornament is simple, but aesthetically effective. Decorative toothcuts, indicative of six teeth per cm. 113mm L × 13mm W × 4.2mm Th (C1002).

24/48 Comb

Probably antler. Connecting plate with one iron rivet, one perforation close to end. Oblique lines from rasping on reverse. Not easily assignable to type; probably Type 2 (seventh–ninth century AD) or 7/8c (tenth–twelfth century AD). 47mm L × 12mm W × 2mm Th (C1242).

24/1563 Comb tooth

Indeterminate bone/antler. Minor beading close to tip. Rectangular section, tapering profile. 17mm L, 2mm Diam (C1284).

14/3105 Comb tooth

Indeterminate bone/antler. Short and broad. Minor striation close to tip. Rounded section, tapering profile. 11mm L, 3mm Diam (C1002).

2.2 Pins

Thirteen pins and related points, representing a variety of forms, were recovered from Period 2, 3 and 4 contexts. Roman and early-medieval pins are classified by MacGregor (1985, 113–22), though not all of the Portmahomack examples fit easily into this classification. Well-preserved examples include: 24/7189, a pig fibula pin of MacGregor's Group 1, characterised by the head being neither perforated nor narrowed (see MacGregor et al 1999, 1950); four pins (14/59, 2645, 24/746 and 747) that might be best described as flat- or nail-headed; and one example (14/1284) distinguished by the remains of what appears to have been an ornately carved thistle-or vase-shaped head, broadly paralleled at Whithorn (Nicholson 1997b, fig 12.138, 7.1 and 7.2). The pins also display a variety of forms of shank. Though none are of the 'hipped' type characteristic of many early medieval sites in England and Scotland (see MacGregor 1985, 116), there is nonetheless some diversity. 24/747 has a gently tapering shank, while 14/1284 is parallel-sided, 24/746 displays a clear swelling at the waist, and 14/3196 is distinguished by the characteristically curved profile of the antler tine from which it is cut. Other examples are incomplete or poorly preserved (14/4539 is highly fragmented, while 14/1796 has been damaged by burning) and comment on their shank or tip form cannot be confidently made. 24/746 and 747 are long pins and display an extremely high level of polishing. In addition, pin 24/747 is unique within the context of the collection in that it features conspicuous decoration. Its head is decorated with an uneven arrangement of five circular impressions, while just below the head, a pair of incised circumferential lines form a collar, and roughly cut obliques decorate the area that lies between them.

The chronology of bone pins is not one of high resolution, given the potential for conservatism in design once a model has been found to be fit for purpose. Nicholson dates nail-headed pins to the tenth century (Nicholson 1997b, 496) on the basis of examples from Jarlshof (Hamilton 1956, 148) and Lincoln (Mann 1982, 10), but such pins are known from contexts as early as the Roman period (MacGregor 1985, 117–18), and the type does seem to have had an early medieval currency in Scotland in particular (see MacGregor 1975; MacGregor 1985, 118). An eighth- or ninth-century date for these pins certainly does not seem out of the question. Pin 14/1284, with its complex vase- or thistle-shaped head is equally difficult to date, but broad parallels are known from Norse contexts in Orkney (Smith 2007, 479) and Shetland (Hamilton 1956, 125). It is notable that neither this, nor the nail-headed form is well represented at York (MacGregor et al 1999; Rogers 1993; Ashby & Spall 2005).

The function of pins cut in skeletal materials has been the subject of uncertainty over a considerable period; one might argue that we know little more about their diversity of function than could be said in MacGregor's (1985, 113) review.

Some were clearly employed as dress fasteners, others as hair pins; testament to both uses comes from their recorded position in a number of Anglo-Saxon burials (see MacGregor 1985, 113–16 for the classic review). This uncertainty is paralleled in the study of copper alloy pins (see review in Rogers 2009, 40–1), and a definitive answer does not seem imminent in either case. However, it might be argued that burial contexts are not illuminating in terms of the use of these objects in life, and we instead have to draw deductions from the objects themselves. Thus, morphological traits of these pins have been interpreted in functional terms; the 'hipped' shanks characteristic of early medieval pins might indicate a use different to those with a more regular shank profile, while shank and head diameters might also relate to diverse means of use (see Rogers 2009, 41). However, one must take care not to interpret all morphological variation in functional terms. Indeed, the attempt to isolate a single use for these sorts of items may not actually be productive and may not reflect the ways in which they were perceived by their makers and users (cf Pestell's [2009, 126] discussion of the legitimacy of drawing a distinction between 'styli' and 'styliform pins'). If a clear classification relating to function is not obvious to us, then it is possible that this was also the case in their period of use. Nonetheless, it is possible to speculate a little on at least some of these items. For the large, highly conspicuous pins 24/746 and 747, one might propose a function in dress, hair arrangement, or a similar highly visible context. Though the ornament on 24/747 is roughly executed, it nonetheless represents an active attempt to embellish the object, which – given its size and polish – would already have been quite noticeable.

14/1284 Pin

Complete. Ornate, complex-head form, straight, untapering shank. Postcranial bone. Slight curved profile. Head dimensions 11mm × 4mm. L 110mm. Max shank diameter 5.3mm (C1002).

24/746 Pin

Probably postcranial bone. Complete. Finely made and highly polished from use. Shank of sub-circular section and waisted profile. Oval head, 7.4mm × 6.5mm. Undecorated. Fine point. L 130mm. Max. shank diameter 4.8mm (F132 C1354).

24/747 Pin

Probably postcranial bone. Complete. Finely made and highly polished from use. Shank of evenly tapering profile, sub-circular section. Oval head, 6mm × 5.5mm. Head decorated with five dots, unevenly arranged. L 130mm. Under the head there are a pair of parallel circumferential lines (2.5mm apart), and zig-zag ornament connects them. Fine point. L 57mm. Max shank diameter 5.1mm (F132 C1354).

14/4541 Pin

Faceted section. Probably postcranial bone. Truncated below head. L 52mm, Max. W 2mm, Th 5mm (C3455).

14/4539 Pin/needle

Probably postcranial bone. Round section, curved profile. Truncated below head. L 41mm, Diam 2mm (C3305).

14/307 Pin or Point

Postcranial bone. Circular section, pointed. Gently tapering profile. Perhaps made of split rib. Truncated below head. L 46mm, W 3mm, Th 2mm (C1002).

24/4639 Pin

Indeterminate bone/antler. Highly fragmented pinhead and upper portion of shank. Not measured. L < 10mm; W unknown (C2004).

24/916 Pin

Probably postcranial bone. Broken into two halves, round section, straight tapering profile. L 73mm, Max Diam 3.5mm (F137 C1367).

24/7189 Pig fibula pin

MaGregor Group 1 (head unperforated or trimmed). L 98mm, Head W 15mm, Shank mid-point Diam 5mm (C3157).

14/59 Pin

Probably postcranial bone. Nail-headed, sub-circular section, waisted profile. Head 6mm × 8mm, L 47mm inc, shaft max Diam 5mm (C1001).

14/1796 Pin

Indeterminate bone/antler. Circular section, burnt (calcined). 3 shaft frags. Large frag L 25mm, Diam 4mm (C1002).

11/2645 Pin

Probably postcranial bone. Nail-headed, flattened section. Head 4mm × 5mm, L 37mm inc, shaft Diam 3mm (C1370).

14/3196 Pin or Point

Antler. Curved profile. Round, but slightly faceted section. L 91mm, W max. 6mm, max. Th 5mm (1915).

3.0 Craft-working items

3.1 Textile tools

3.1.1 SPINDLE WHORLS

A single spindle whorl (24/2139) was recovered unstratified. Bone and antler spindle whorls are common finds from early medieval settlement excavations, and the corpus is sufficiently well understood for us to confidently identify a little diversity in form. The Portmahomack example is of rudimentary manufacture, being cut from the head of a large bovid femur. Cattle femora do appear to have been the skeletal element of choice for this form of whorl, though miniature skeuomorphs manufactured on pig femora are also known (Walton Rogers 1997, 1741). In most cases, femurhead whorls seem to have been rudimentarily manufactured; examples at Coppergate were roughly cut prior to drilling; and, going on the presence of gnawing marks and other phenomena, some do not seem to have been cleaned fully prior to disposal (Walton Rogers 1997, 1742–3). The Portmahomack example displays similar puncture marks, as well as the distinctive crackalure that is diagnostic of sub-aerial weathering. One might thus propose that it ended its life exposed on open ground, or perhaps on an open dump or midden. The practice of cutting whorls from the heads of cattle femora (as opposed to the more time-consuming process of carving discoidal whorls from bone, antler, or pedicle) seems to have become common from the Late Saxon period (Walton Rogers 1997, 1743). However, as Nicholson (1997b, 496) points out, decisions regarding such expeditiously produced items must have been fundamentally driven by raw material availability. It is thus unwise to load them with too much chronological, cultural, or technological significance, and in truth, there is little more that can be said of the single example from Portmahomack. Nonetheless, it stands as a key piece of evidence for the production of textiles on site.

24/2139 Spindle whorl

Cattle femur head. Cylindrical perforation (not hour-glass-shaped) of 13mm diameter through centre. Articular surface shows crackalure and gnawing marks. Broken away on one aspect, revealing cancellous tissue. Basal edge is straight, but roughly removed. Diam 36.8mm, H 23mm (C1000).

3.1.2 WEAVING IMPLEMENTS [Illus D6.1.26]

The only confidently identifiable object of this category is the pin beater (24/4578) from C1877. This item would have been employed in the lifting of warp and beating of weft threads. On morphological grounds, Walton Rogers (1997, 1755–75) has identified three types of pin beater, each with distinctive wear patterns: the cigar-shaped pin-beater (associated with the warp-weighted loom, thus dating between the Roman period and the Viking Age, but being particularly common at Middle Saxon sites), a flattened, chisel-ended 'picker-cum-beater' (dating between the late ninth and fourteenth centuries, and no doubt associated with the two-beam loom), and a longer, more curved form (broadly contemporaneous with the picker-cum-beater, and probably also associated with the two-beam loom (Walton Rogers 1997, 1756–7).

The Portmahomack example fits best into Walton Rogers' 'picker-cum-beater' type. Many examples of this form feature cross-hatch or other simple ornament mid-way down the shaft of the object. It has been speculated that the requirement was for a rough surface so that the user was easily able to grip was as important a rationale for the incision of such decoration as any aesthetic concern (see MacGregor et al 1999, 1966). In the present case then, it is interesting that this example does not feature decoration of this kind, but that the central area is marked by a natural groove that no doubt had its origin in the rugose outer surface of red deer antler. The preservation of morphology in this area of the object alone is thus telling. Together with the spindle whorl (24/2139), this object is evocative, notwithstanding the fact that it is the only example from the site.

24/4578 Picker-cum-beater

Probably red deer antler. Preserved natural groove close to shaft mid-point. Curved profile, slightly faceted section. L 97mm, max W 7mm, max Th 6mm (C1877).

3.2 Objects associated with the production of vellum and manuscripts

3.2.1 NEEDLES [Illus 5.6.14; Illus D6.1.7]

Identification of bone needles is less straightforward than one might imagine (Walton Rogers 1997, 1783). A large collection of 'needle-like objects' is known from Anglo-Scandinavian York, but, on the grounds of a pervasive polish, and distinctive wear around the eye, Walton Rogers identifies only three as clear examples of needles. Her caution is well founded; many of the heavy, wide-headed perforated points frequently referred to as needles would be unfit for purpose.

However, in the case of Portmahomack, it is possible to make a reasonably confident identification on three objects (24/4616, 14/3560 and 3680). Although they do not preserve the extensive polish identified by Walton Rogers on her three York examples, in terms of morphology and overall dimensions, the Portmahomack artefacts are closer to her 'needles' than they are to her other 'needle-like objects', and their heads certainly seem sufficiently narrow to pass easily through cloth or hide. Their round section would also facilitate such a use (cf Walton Rogers 1997, 1785). It is of course possible that these objects played a role in the postulated working of hide and vellum at Portmahomack, but it is impossible to empirically confirm this.

24/4616 Needle

Indeterminate bone or antler. Complete. Curved profile, ovoid section, finely pointed tip, and lozengiform head with longitudinally extended perforation (4mm × 1mm). Traces of wear at base of perforation. Not highly polished. L 83mm, max. Th 3mm (C1877).

14/3560 Needle

Indeterminate bone or antler. Head broken at mid-point across perforation; otherwise complete. Not highly polished. L 83mm, max. Th 3mm (C2345).

14/3680 Needle

Largely complete. Short and straight in profile; slight faceting on head, which features a round, 2 × 2mm perforation. Gently tapering profile, blunt tip. L 52mm, max Th 4mm (F395 C2447).

3.2.2 PEGS [Illus D6.1.7]

These pegs (14/4499 and 4500) have been cut from the distal ends of cattle metapodials and show signs of wear around the condyles. Though they are not diagnostic in isolation, they are arguably consistent with a use in the stretching out of hide that constituted a key component of the process of vellum manufacture. The smooth areas between the condyles of the distal articulation and the broken point at mid-shaft may relate to wear from a thong or cord of some sort; this is consistent with the proposition that the pegs were turned in order to increase the tension under which a hide was being held, in a manner somewhat akin to the tuning pegs of a stringed musical instrument. They were found in a right-angled alignment of metapodials worked to differing degrees 14-24/F393 C1957.

14/4499 Metapodial peg

Cut from the distal end of a cattle metapodial. Nutrient foramen visible. Much of shaft and condyles worn down, revealing cancellous material. Mid-shaft is thinned and features irregular cut marks. L 72mm, max W 45.9mm (incomplete), Th 22mm (F393 C1957).

14/4500 Metapodial peg

Cut from the distal end of a cattle metapodial (metacarpal). Nutrient foramen visible. Condyles worn down, revealing cancellous material. L 64mm. Width across condyles (Bd) 46mm, but incomplete. Th 21.7mm F393 C1957).

4.0 Writing equipment

4.1 Styli [Illus 5.6.14; D6.1.7]

Styli – implements used to inscribe writing on wax writing tablets – are now relatively well-known from Roman and early medieval sites (the tablets themselves are considerably less well represented). Styli are known in iron, non-ferrous and precious metal, as well as bone, and have been comprehensively reviewed in a recent survey by Tim Pestell (2009). It is not my aim to recapitulate that review herein, and it suffices to say that several received wisdoms regarding styli – notably their assumed monastic associations and 'Middle-Saxon' date are now much less secure. This revision comes as a result of both the accumulation of single finds and the recovery of an unprecedented haul of twenty-two examples from Flixborough. Bone styli are less well-known than their metal counterparts, but concerns that the material is unfit for purpose are unfounded (see MacGregor 1985, 124 for discussion).

Two objects (13/53 and 24/7190, 7665) from Portmahomack are herein identified as styli (a third, less likely candidate (24/7189) is catalogued above as a pin). Both 13/53 and 24/7190 have the broad, straightsided shanks and well-defined, sharply tapering tips that one would expect of a stylus, but while 13/53 has clearly defined shoulders and a sub-rectangular eraser-head, the head of 24/7190 takes a more sub-triangular form. The significance (chronological or otherwise) of such morphological variation is as yet unascertained. Indeed, the general lack of stratified examples means that no detailed chronology exists for the morphological development of this class of object (Pestell 2009, 125). At the time of writing, Pestell is developing a classification based on the form of the expanded head that was used as an eraser. It would be interesting to see where the Portmahomack examples fit within this scheme, but we await publication in order to compare them against the diagnostic criteria of each class, and to ultimately draw information related to their chronological range, geographical distribution and cultural implications. In the present context, though it has been shown that the occurrence of styli is not limited to monastic sites, it is interesting that a close parallel for the Portmahomack example comes from Whitby (Peers & Radford 1943; MacGregor 1985, 124). In Scotland, objects of similar form are known from the multi-period settlement site of Skaill, Deerness in Orkney, though here they are identified as 'spatulate-headed pins' (Porter 1997, fig 8.3).

Ewan Campbell has observed that finds of styli are rare in Celtic monastic sites in comparison to England (there are none from Iona or Clonmacnoise), and he draws attention to the use of scratching on slates as a way of learning how to write, as at Inchmarnock (Campbell 2010, 140; Lowe 2008). On the other hand, as in England, correlates of writing and manuscript production are spreading to secular sites in the eighth century: madder, orpiment, seaweed and neonatal bones have been recovered at the Dalriadic capital of Dunadd, which may also be the place of origin of the Loch Glashan book satchel (Campbell 2010, 142; Lane & Campbell 2000, 223, 226–7).

13/53 Stylus

Bone. Quite polished. Oblique striations on spatulate head. Indentation in centre of head on one face. L 95mm, Head width 9mm, max shaft diameter 3mm (from crypt clearance).

24/7190, 7665 Stylus

Expanded head, with flat upper edge. Traces of vivianite. L 61mm, Head W 7mm, max Shank Th 2.7mm (conjoins 24/7189; F507 C2844).

5.0 Miscellaneous items

In addition to those objects for which, on the grounds of either morphology or context, an identification can be made with some confidence, there exists a small but diverse collection of objects of insecure identity and/or function. Some of these items are idiosyncratic objects that cannot be securely identified, while others fit into recognised typologies but which sadly lack an understood function. It is of course possible that some of these objects had functions related to those discussed above, but this cannot be unambiguously ascertained, and one might note that these items tend to lack the distinctive polish characteristic of the tools we know to have been used in textile manufacture (see above). Thus, herein the objects are briefly discussed, and only tentative suggestions as to function are made. A number of undiagnostic pointed objects were recorded. These are described below, though little can be confidently suggested regarding their function (for further discussion of similar objects, see MacGregor 1985, 174–6; MacGregor et al 1999, 1989–91). Of a little interest is 24/4749, which is the roughly worked proximal end of a small bovid metapodial. The diaphysis has been chopped through obliquely, close to what would have been the mid-point of the bone, and the resultant fractured end worked with a knife to form a point. Similar objects are well represented in early medieval contexts across Europe, and display a surprising degree of morphological regularity, which may perhaps be suggestive of some identity of function.

A similar group of tools has been identified by MacGregor (and referred to by him as 'socketed points'). These objects, usually manufactured on the proximal ends of large mammal metapodials, are distinguished by the removal of epiphyseal material and cancellous core, such that a hole drilled in the proximal articulation connects with the medullary cavity to form a continuous channel. On the basis of their presence in association with a leather workshop in York (MacGregor 1982), MacGregor (1985, 175) suggests a role for these objects in craft or industrial activity. Roes (1963, 47) goes one step further, arguing that similar objects may have acted as tallow horns, used in the lubrication of thread in order to ease the effort of needlework, while Mann (1982, 31) suggests that examples from Flaxengate, Lincoln, could have been used as gouges. MacGregor (1985) is cautious not to easily accept such a specific function for what is a morphologically undiagnostic and technologically rudimentary object, and we would be well served by doing likewise.

Moreover, only a single example is known from Portmahomack, and this is cut on the metapodial of a small mammal (sheep/goat), and lacks the socket of MacGregor's tools. Nonetheless, the working of coarse materials such as leather and hide would necessitate the use of sturdy tools, and 24/4749 may have found utility in just such a role.

Indeed, in the context of evidence for needlework and parchment production at Portmahomack, one might tentatively suggest that its presence here is best interpreted in this light. Also of note is a *Bos* scapula (24/6900), which although showing little sign of active working, may be best interpreted as a shovel of some sort (being recovered, as it was, from the ashy silts used to raise and level the ground surface), and a worked tine from the antler of a red deer (24/7862). The latter has a very even, square-sided, 3mm-wide groove incised into it (presumably developed through wear) and a function as some sort of peg, on which a rope or thong was tied off, seems most likely. Interestingly, its surface has been removed towards its distal end, in a way analogous to that seen on the socketed metapodial points discussed above. No precise function is assignable, but the object would not be inconsistent with a use in pegging out vellum, in a way akin to that which has been proposed for 14/4499 and 4500 above. Indeed, Radley (1971, 5) proposed that similar worked tines recovered from Anglo-Scandinavian deposits at Ousegate, York, were used in a tannery to peg out hides, and it is not too much of a stretch to imagine this item being used to hold recently tawed vellum under tension at Portmahomack.

Two further objects (14/4540 and 24/7863) merit close consideration here. These are split longbones (an equid metapodial and a *Bos* tibia respectively), and their treatment is similar: they have been split axially. This initial splitting was presumably undertaken with an axe, but the pieces were subsequently worked with knife and rasp to form regular objects of angular C-shaped section. The edges are smooth and square, such that the objects form long, narrow, open-ended 'trays'. The type does not seem to be well-represented in early medieval English and Scottish contexts, though it is known in early medieval Ireland (J Boyle pers comm). One might speculate on a role as a vessel or channel for a fluid of some sort.

24/6900 Cattle scapula

Spinus and proximal articulation complete. A small (18mm × 12mm) sub-circular perforation in blade area, and damage to the edge probably represent recent breaks. Vivianite on ventral aspect. L 300mm; W 164mm. Articulation: 46mm × 57mm (C2991).

14/4401 Unidentified object

Bone. Cut from the distal end of a small bovid femur. The condyles have been roughly cut to form a smooth, curved surface. Function unclear. L 21mm, W 19mm, Th 22mm (C1384).

24/4749 Bone point

Cut from diaphysis and proximal articulation of sheep/goat metatatarsus. Hollowed diaphysis, but unsocketed at proximal articulation. Pointed edge is marked with a series of parallel notches formed during manufacture. L 85mm, Head width 18mm, Head Th 16mm (C1000).

24/7862 Worked antler tine

Probably red deer; grooved and halved above, revealing spongiose core. Parallel and straight-sided circumferential wear groove (3mm wide). L 123mm, max W 21mm, Th 14mm (C3338).

14/4540 Split equid metapodial

Shallow, angular, C-shaped section. Distal end of bone has been sharpened to a point and features a number of rough, parallel cutmarks. Function unknown. L 115mm, W 33mm, Th 16mm (C3428).

24/7863 Split *Bos* tibia

Angular, C-shaped section. Distal end of bone has been sharpened to a well-defined point. Function unknown. L 195mm, W 33mm Th 7mm (C3468).

6.0 Discussion

Assessing the extent to which the Portmahomack material might be described as having a 'monastic' character is less easy than might be expected. Chris Loveluck (2007) has demonstrated the difficulties of attempts to identify assemblage characteristics particular to high-status monastic or secular sites, and his arguments need not be rehearsed here. It suffices to say that broadbrush generalising models are unhelpful, that temporal change must be taken into consideration, and that any particular site must be assessed within its own regional context. However, direct comparison with northern Britain's other early medieval monastic sites is unenlightening. Other than a putative manuscript stamp, there is nothing particularly 'monastic' about the collections of worked skeletal material from Monkwearmouth and Jarrow (Riddler 2006). The same might be said of Whithorn (Nicholson 1997a; Nicholson 1997b), while the corpus from Inchmarnock is diminutive (Franklin 2008). More generally, few monastic assemblages contain significant quantities of ivory, or relate to the kinds of activities traditionally ascribed to monasteries by historians (one thinks in particular of the production and illumination of manuscripts). In this sense at least, the collection from Portmahomack might be said to be more distinctively monastic than many such assemblages, given its evidence for writing (in the form of styli) and parchment production (metapodial pegs and needles). Of course, in isolation such phenomena are far from diagnostic, and it is rather the accumulation of evidence at Portmahomack – including other finds (such as the *lunellarium* and pumice rubbers) and structures (such as the metapodial rows) – that makes a convincing case for this activity. In the absence of such evidence, comparable artefactual evidence may have been interpreted differently. Nonetheless, the presence of three identifiable bone sewing needles is in itself of note, as genuine needles are rarely identified (see above).

In more general terms, the collection from Portmahomack fits well within the repertoire of early medieval northern British boneworking. The combs, pins, textile and (possible) leather-working equipment are closely paralleled in: York (eg MacGregor et al 1999; Rogers 1993; Spall & Toop 2005) and Yorkshire (eg Stamper & Croft 2000); Lincoln (eg Mann 1982) and Lincolnshire (eg MacGregor 1987; Evans & Loveluck 2009); Orkney (eg Curle 1982) and Shetland (eg Hamilton 1956); and beyond the British Isles (eg Roes 1963). However, it is within the much more immediate context of the Portmahomack excavations that these objects will ultimately be most illuminating.

Acknowledgements

Thanks to James Boyle, Sonia O'Connor and Marloes Rijkelijkhuizen for advice and comments on *problematica*. All errors remain the author's own.

References

Ambrosiani, K 1981 *Viking Age Combs, Comb Making and Comb Makers in the Light of Finds from Birka and Ribe*. Stockholm University, Institute of Archaeology.

Ashby, S P 2006 'Time, Trade and Identity: Bone and Antler Combs in Northern Britain *c* AD 700–1400'. Unpublished PhD thesis, University of York.

Ashby, S P 2007 'Bone and Antler Combs', *in Finds Research Group Datasheet,* 40. Stoke-on Trent: Finds Research Group.

Ashby, S P 2011 'A Study in Regionality: Hair Combs and Bone/Antler Craft in the Northern Danelaw', *in* Petts D & Turner S (eds), 303–16. *Early Medieval Northumbria.* Turnhout: Brepols.

Ashby, S P 2013 'Making a Good Comb: Mercantile Identity in 9th to 11th-century England', *in* Ten-Harkel L & Hadley D M (eds) *Everyday Life in Viking Towns: Social Approaches to Towns in England and Ireland c800–1100*, 198–208. Oxford: Oxbow Books.

Ashby, S P & Spall, C 2005 'Artefact and Environmental Evidence: Bone, Antler, Ivory and Horn Objects', *in* Spall C & Toop N (eds) *Blue Bridge Lane & Fishergate House, York. Report on Excavations; July 2000 to July 2002*, Electronic Publication: http://archaeologicalplanningconsultancy.co.uk/mono/001, accessed 20th September 2005.

Curle, C L 1982 *Pictish and Norse Finds from the Brough of Birsay 1934–74.* Edinburgh: Society of Antiquaries of Scotland.

Evans, D H & Loveluck, C 2009 *Life and Economy at Early Medieval Flixborough* c *AD 600–1000, The Artefact Evidence, Excavations at Flixborough, Vol 2*. Oxford: Oxbow.

Franklin, J 2008 'Bone and Antler', *in* Lowe C (ed) *Inchmarnock: an Early Historic island monastery and its archaeological landscape*, 189–92. Edinburgh: Society of Antiquaries of Scotland.

Galloway, P & Newcomer, M 1981 'The craft of comb-making: An experimental enquiry', *University of London Institute of Archaeology Bulletin* 18: 73–90.

Hamilton, J R C 1956 *Excavations at Jarlshof, Shetland. Archaeological Reports 1.* Edinburgh: HMSO.

Loveluck, C 2007 'Changing Lifestyles, Interpretation of Settlement Character and Wider Perspectives', *in* Loveluck C (ed) *Rural Settlement, Lifestyles and Social Change in the Later First Millennium AD Anglo-Saxon Flixborough in its Wider Context, Excavations at Flixborough, Vol 4*, 144–63. Oxford: Oxbow Books.

MacGregor, A 1975 'The Broch of Burrian, North Ronaldsay, Orkney', *Proc Soc Antiq Scot* 105: 63–118.

MacGregor, A 1982 'Anglo-Scandinavian Finds from Lloyds Bank, Pavement, and Other Sites', *in* Addyman P V (ed) *The Archaeology of York 17*, 67–174. York: Council for British Archaeology.

MacGregor, A 1985 *Bone, Antler, Ivory and Horn: The Technology of Skeletal Materials Since the Roman Period*. London: Croom Helm.

MacGregor, A 1987 'Objects of Bone and Antler', *in* Beresford G (ed) *Goltho: The Development of an Early Medieval Manor c 850–1150*, 188–92. London: Historic Buildings and Monuments Commission for England.

MacGregor, A, Mainman, A J & Rogers, N S H 1999 'Craft, Industry and Everyday Life: Bone, Antler, Ivory and Horn from Anglo-Scandinavian and Medieval York', *in*

Addyman P V (ed) *The Archaeology of York 17*. York: Council for British Archaeology.

Mann, J E 1982 *Early Medieval Finds from Flaxengate 1: Objects of Antler, Bone, Stone, Horn, Ivory, Amber, and Jet.* London: Council for British Archaeology.

Nicholson, A 1997a 'The Antler', *in* Hill P (ed) *Whithorn and St Ninian: The Excavation of a Monastic Town, 1984–91*, 474–95. Stroud: Sutton Publishing.

Nicholson, A 1997b 'The Bone and Horn Artefacts', *in* Hill P (ed) *Whithorn and St Ninian: The Excavation of a Monastic Town, 1984–91*, 495–99. Stroud: Sutton Publishing.

O'Connor, T P 2000 *The Archaeology of Animal Bones.* Stroud: Sutton Publishing.

Peers, C & Radford, C A R 1943 'The Saxon monastery at Whitby', *Archaeologia* 89: 27–88.

Pestell, T 2009 'The styli', *in* Evans D H & Loveluck C (eds), *Life and Economy at Early Medieval Flixborough c AD 600–1000, The Artefact Evidence, Excavations at Flixborough, Vol 2*, 123–37. Oxford: Oxbow Books.

Porter, D 1997 'Small Finds', *in* Buteux, S (ed) *Settlements at Skaill, Deerness, Orkney: Excavations by Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981*, 96–132, BAR, British Series 260. Oxford: Archaeopress.

Radley, J 1971 'Economic aspects of Anglo-Danish York', *Medieval Archaeology* 15: 37–57.

Riddler, I 2006 'Objects and waste of bone and antler', *in* Cramp R (ed) *Wearmouth and Jarrow Monastic Sites*, 267–81. Swindon: English Heritage.

Roes, A 1963 *Bone and Antler Objects from the Frisian Terp-Mounds.* Haarlem: H D Tjeenk Willink & Zoon NV.

Rogers, N S H 1993 'Anglian and Other Finds from Fishergate', *in* Addyman P V (ed) *The Archaeology of York 17*. York: Council for British Archaeology.

Rogers, N S H 2009 'The pins', *in* Evans D H & Loveluck C (eds) *Life and Economy at Early Medieval Flixborough c AD 600–1000, The Artefact Evidence, Excavations at Flixborough, Vol 2*, 32–79. Oxford: Oxbow Books.

Smith, A N 2007 'Worked bone', *in* Hunter J R (ed) *Investigations in Sanday Orkney: Vol 1 Excavations at Pool, Sanday – A multi-period settlement from Neolithic to Late Norse times*, 459–514. Kirkwall: The Orcadian.

Spall, C & Toop, N (eds) 2005 *Blue Bridge Lane and Fishergate House, York, Report on Excavations, July 2000 to July 2002*, Electronic Publication: http://archaeologicalplanningconsultancy.co.uk/mono/001, accessed 20th September 2005.

Stamper, P A & Croft, R A, 2000 *Wharram: A Study of Settlement on the Yorkshire Wolds, VIII: The South Manor Area, York University Archaeological Publications 10.* York: University of York.

Ulbricht, I 1978 *Die Geweihverarbeitung in Haithabu*. Neumünster: Die Ausgrabungen in Haithabu 7.

Walton Rogers, P 1997 *Textile Production at 16–22 Coppergate, The Archaeology of York 17/11.* York: Council for British Archaeology.

Digest 6.5 CRUCIBLES

CECILY SPALL (FAS Heritage) with CATHERINE MORTIMER (OLA 7.1.6.2)

1.0 Introduction

A total of 325 fragments of crucible and complete or near-complete crucibles and heating trays were recovered during excavation in Sector 1 and 2. The fragments were individually recorded and the results form the catalogue. The crucibles were categorised using Heald's crucible typology of Scottish Iron Age crucibles (Heald 2003, 47–59). The results of fifty-nine EDXRF analyses of crucibles were also used (after Heald 2003: Appendix C). A further programme of EDXRF analysis was undertaken for the project by Dr Craig Kennedy, Senior Conservation Scientist, Historic Scotland, on a further nine crucibles and trays and seven droplets of metal from hearths and working surfaces and the results are reported here.

2.0 Typology

The following crucible types were identified: A1, A2, B2, G1, G2, G3 and I1 and I2 along with a variant form of Type I. Complete or near-complete crucibles (11) were easily assigned to type and a further 172 fragments were sufficiently diagnostic to also be assigned confidently to type. Where type could not be identified, the fragment was recorded as body, base or rim and wall thickness was measured.

Crucible fabric was also visually recorded with notes taken on clay, temper, relining, vitrification, slag deposits and visible metallic residues.

2.1 Type A1, A2 and B2 [Illus D6.1.14]

Heald Type A crucibles are pyramidal or triangular crucibles, being three-sided with a V-shaped profile with pointed or slightly rounded bases, common throughout the Scottish Iron Age. They are also known from a range of Early Historic sites in Ireland, including Lagore, Cathedral Hill, Armagh, Garranes and Garryduff among others (Comber 2004). The type is subdivided by Heald based on height and wall thickness: Type A1 is most frequently recorded and forms a cohort of crucibles measuring between 35–45mm high, in use throughout the Scottish Iron Age until the end of the eighth century; Type A2 are less common and larger measuring 60–70mm high.

Heald Type B crucibles are conical, being circular in plan with a V-shaped profile. Like Type A, Type B crucibles are subdivided by size with Type B1 assigned to vessels measuring *c* 40mm high and Type B2 measuring over 70mm high.

Unless sherds are large, the distinction between Type A1 and B1 and A2 and B2 is often not possible and the types are reported here together. A total of eighty-seven Type A/B1 and A/B2 crucibles were identified in the assemblage and greater numbers of both types were probably represented in the assemblage.

Type A/B1

Twenty-four Type A1 crucibles and a possible Type A1 were recorded. A further eighteen fragments were assigned Type A/B1. Four of these belonged to a small A1 type crucible, notable for their thin walls, small capacity and finely pinched spouts. Wall thickness for Type A/B1 was recorded as up to 9mm, but more frequently were considerably thinner, often being recorded as 4 to 5mm, and in some instances as thin as 2mm. Type A/B1 crucible fabric was commonly recorded as either fine with scarce mineral inclusions, particularly in thin-walled examples, or with mineral inclusions of rounded quartzose – presumably derived from a coarse-grained sand, which may have been washed and sorted prior to inclusion in the fabric – or crushed quartz or quartzite.

Capacity of Type A/B1 crucibles could be judged in the complete or near-complete examples and appears to have been between *c* 10 and 15cc. The small Type A1 noted clearly had a much smaller capacity closer to *c* 3 or 4cc.

Type A/B 2 [Illus 6.10]

Six Type A2 crucibles were identified, with a further possible example, including a near-complete, smashed example. A single Type B2 was identified, and then only because it was almost complete. A total of thirty Type A/B2 and 8 probable Type A/B2 were recorded, but the fragments were not large enough to be more diagnostic. Wall thickness for these crucibles was recorded as slim as 8mm, in a few examples, but generally, thick walls were a characteristic of the type and were recorded as more than 10mm thick, with many examples exceeding that and being up to 19mm thick (including re-linings).

Type A/B2 fabric was commonly recorded in cross-section as comparatively coarse with a frequent mineral temper of rounded quartzose, again probably a coarse, washed sand, or with crushed quartz or quartzite and notably with frequent voids. A large spall of a Type A/B2 crucible provided a section across rather than through the fabric, where impressions of burnt-out vegetable matter – possibly grass – could be identified. The frequent voids noted in cross-section in many other examples are considered likely to represent burnt-out vegetable matter.

Relining was noted on several Type A/B2 crucibles and, in one example, more than once. Extensive vitrification of the fabric, rim and exterior was commonly noted with glassy crucible slags and oxides ranging in colour from red, grey, black and pale green.

Capacity of Type A/B2 crucibles was clearly much greater than Type A/B1 and, where it could be judged using the largest sherds, it appeared likely to have been *c* 20cc.

2.3 Type G [Illus 6.10; Illus D6.1.9]

Heald Type G crucibles are identified as small, deep vessels formed around a thumb or finger, with a handle modelled by pinching overlapping wall fabric into a small lug handle. Type G1 crucibles have handles horizontally pinched, Type G2 are vertically pinched and Type G3 has a handle pinched from the side to form a tear-shaped vessel. A total of fifty-two fragments could be identified as from Type G crucibles, and a further seventeen were probably from Type G crucibles.

Heald does not give a date for this type of crucible, but Campbell and Lane suggest they are a seventh-century innovation with northern or western origins, being recorded at Dunadd in deposits of that date (Campbell & Lane 2000, 141). They have been recorded in quantity at the Brough of Birsay in eighth-century levels (Curle 1982, 40–1).

Type G1

Among this total of sixty-nine, nine complete or near-complete Type G crucibles were recorded as Type G1 and a further twenty-three Type G1 handles indicate a minimum of thirty-two examples in total. Rim, base and body sherds of fragments recorded simply as G-type crucibles suggest many more examples are probably represented. Single possible examples of Type G2 and Type G3 were identified, although examples of both types are rare nationally and their significance is therefore difficult to assess.

Wall thickness of Type G1 crucibles could be broadly grouped into thick-walled, where crucible walls were measured as between 8 and 11mm thick, and thin-walled crucibles, which were recorded more commonly and generally between 3 to 5.5mm thick.

The handles of Type G1 were formed by pinching the clay of the walls into a small lug, but in several instances this resulted in a deep internal void and a likely point of weakness in the finished vessel. Small clay plugs moulded by hand and pushed into this void were noted in several examples, often marked by part fingerprints.

Six Type G1 crucibles were notably small, including one complete example, but other likely examples could be identified by the slightness of the handles. These vessels were too small to have been formed around a thumb or finger and must have been formed over a fingertip or formed freehand. The complete small Type G1 is notably thick walled and appears to have been knife-trimmed, producing a number of facets. Its use resulted in vitrification of the fabric and a covering of red cuprous oxides.

By contrast, a notably large sub-rectangular lug handle, measuring 27mm wide and 15mm thick, was recovered with a body sherd that appears to have belonged to the vessel but does not conjoin. The lug and body sherd appear to belong to the broader family of Type G crucibles, and the handle appears likely to have been set close to the rim of the vessel. The fragment is unique and cannot be associated with further likely body sherds in the assemblage, but clearly represents a notably large crucible.

Fabric of Type G crucibles was much the same as for Type A and B crucibles. The clay was often reduced to dark grey and mineral temper recorded as crushed quartz or quartzite or sand. A small group of crucible sherds were made in a white to pale grey-firing fabric. Vitrification over the exterior, rim and handle was noted in most examples and tended to be red, possibly cuprous, oxides, with black, grey and pale green also noted. Internally, purple staining was noted in some examples, and small droplets of copper alloy sometimes trapped in the fabric, with one example from which the molten metal had not been poured quickly enough and much of its charge remained in the base and up to the pouring lip.

Capacity of most complete or near-complete Type G1 crucibles was calculated as between *c* 4.5 to 9cc, while the capacity of the complete small Type G1 was as little as 1cc. A large body sherd and part handle of a Type G1 indicated a considerably larger example, however, and could conceivably have held up to 20cc of molten metal. The large lug handle is also generally indicative of a large capacity vessel.

2.4 Type I [Illus 6.10; D6.1.14]

Five Type I crucibles or trays were identified in the assemblage from nine fragments.

Type I1 and I2

Five tray fragments consisted of rim fragments of apparently shallow circular or sub-circular/sub-oval vessels formed by hand. Three of these could certainly be a vessel family and have been assigned as Type I2. These possibly conjoining fragments describe a shallow tray, sub-oval in plan, perhaps up to 90mm long, flat bottomed and low walled. None of the sherds display any clear evidence for use in high-temperature processes. A fourth example has been identified as Type I1, being a rim sherd of a smaller dog-bowl type crucible, and which is completely reduced with some vitrification.

Type I variants

A total of four fragments cannot be assigned to Type I as the typology is currently defined by Campbell's site typology for Dunadd, where all examples were circular in plan form (equivalent to Dunadd Type B1 to B5). Nevertheless, the Tarbat examples are considered to belong within a broader group of mainly shallow, flat bottomed crucibles/trays, despite the sub-rectangular plan.

Three such fragments are clearly a vessel family, with two fragments conjoining and a third possibly conjoining (24/4585 and 1612). Notably, the two definitely conjoining fragments show a close fit on the interior with a wide gap on the exterior, suggesting the break was coincident with a large crack caused by distortion and stress under high temperature. The three fragments belong to a flat bottomed, sub-rectangular tray with rounded corners and straight-sided, relatively shallow walls measuring *c* 48mm long × 42mm wide.

3.0 Crucible type and metal-working practice

Some correlation between crucible type and different metal-working practices was identified by Heald in his survey of Scottish Iron Age crucibles (2003, 47–59). The results of EDXRF analyses undertaken towards this thesis have been transposed into the catalogue in the form of major, minor and trace levels. However, and most regrettably, these results, and those from a subsequent programme to analyse all Tarbat crucibles ongoing in 2006, have not been made available to the project, nor was a description of EDXRF hardware and technique provided for the former, making any quantitative statements impossible, and comparison with new EDXRF data problematic. The results of a second programme of EDXRF undertaken for the project by Historic Scotland have also been used in the following discussion.

Table D6.5.1 presents EDXRF results from Heald's thesis, while Table D6.5.2 and 3 present the results of analysis undertaken by Dr Craig Kennedy, Senior Conservation Scientist, Historic Scotland.

3.1 Type A and B

Analysis of Scottish and Irish Type A crucibles suggest they were used primarily for copper alloy working although silver alloy and silver-working, with a single known example of use in gold-working, have also been recorded (Heald 2003, 50). Type B crucibles are thought to be used for the working of copper alloys, possibly quarternary alloys (Heald 2003, 51).

EDXRF results for Type A crucibles from Tarbat support their use in working copper and silver alloys. Copper alloys (possibly quarternary alloys) were detected in Type A/B 1 (1) and 2 (3) crucibles and in Type A1 (2) crucibles. Two Type A1 crucibles had also been used to work leaded bronzes. The casting of silver alloys was recorded in Type A/B 1 (1) and Type A2 (2).

3.2 Type E

A single example of Type E or G crucible was recorded by Heald and analysed, but the fragment was absent on recording during 2011. EDXRF analysis detected the presence of copper and tin, suggesting bronze casting.

3.3 Type G

Analysis of Type G crucibles from Dunadd, Tarbat and Birsay showed them to have been used for working with copper and silver alloys and gold (Heald 2003, 54). Bronze and leaded bronze has also been detected. Results from Type G1 crucibles from Tarbat indicate leaded bronze (2) and silver alloy working (2), with those only identifiable as Type G suggesting silver alloy (6), bronze (1), copper alloy (1) and leaded bronze (2) were melted in them. Results from the analysis of a single Type G2 crucible suggested copper alloy casting.

3.4 Type I

Analysis of three Type I crucibles or trays was undertaken. Two Type I variants (sub-rectangular trays) reported comparatively high percentages of lead and tin, which may represent enrichment of the fabric during refining of precious metals. Results from a further Type I variant and a Type I2 crucible/tray suggesting the working of copper alloy.

3.5 Droplets

Seven metal droplets recovered from Period 3 metal-working hearths and working surfaces

Table D6.5.1
EDXRF results (after Heald 2003)

Period	Find	Type	Major	Minor	Trace	Casting
2	25/703	A/B1	Cu**, Sn, Pb	Sn	Br; Ag	silver alloy
2	25/708	G1	Cu, Pb; Cu, Pb	Sn		leaded bronze
2	25/709	G2	Pb**, Cu; Pb*, Cu			copper alloy
2	25/771	?G	Cu**, Zn*, Pb; Cu**, Pb, Zn	Ag, Sn; Ag		silver alloy
2	25/797		Zn, Cu, Pb, Ag, Sn; Cu**, Pb**, Sn, Ag, Zn			silver alloy
2	11/1137	G1	Cu; Cu	Sn, Pb; Sn, Pb		leaded bronze
2	11/3560			Cu; Cu; Zn, Cu	(Zn); (Pb)	copper alloy
2	11/3563	G1	Cu**, Ag**, Zn, Pb, Sn; Ag**, Br**, Cu, Sn	Zn		silver alloy
2	11/3572	E/G	Cu**	Cu; Cu	Sn; Sn	bronze
2	11/3585		Cu**; Cu**	Cu; Sn; Sn		bronze
3	14/2547	?G		Cu	(Zn, Pb); (Cu, Zn); (Cu, Zn)	?copper alloy
3	14/2737	A/B2			(Cu, Zn); (Cu, Zn)	?copper alloy
3	14/2583	–	Cu**; Cu**, Sn; Cu**, Sn; Cu, Sn	Pb; Pb	Pb	leaded bronze
3	24/1175	A1	Cu**; Cu**; Cu**		Sn, Pb, Zn; Sn, Pb, Zn; Sn, Pb, Zn	copper alloy
3	24/1509	A/B1		Cu, Sn	Cu; Pb, Zn	copper alloy
3	24/3477	–		Cu, Ag, Zn; Cu, Ag, Zn	Sn, Pb; Sn, Pb	silver alloy
3	24/3485	G variant	Cu		Sn, Ag, Zn, Pb	silver alloy
3	24/3913	G1	Cu**, Zn, Pb, Sn; Cu**, Pb, Sn, Ag; Cu, Pb; Cu**, Sn, Pb	Zn; Zn, Sn	Zn, Ag	silver alloy
3	24/4033	G	Cu**, Ag, Sn, Zn, Pb; Zn**, Br**, Cu, Ag, Sn; Cu**; Zn, Cu	Br, Pb	Pb	silver alloy
3	24/4548	?G	Cu; Cu**, Sn**, Pb**, Zn**, Cu*	Ag	Sn	silver alloy
3	24/4569	G1	Br**, Ag**, Sn**, Cu, Zn, Pb; Br**, Ag**, Sn**, Cu;	Cu		silver alloy
3	24/4584	G1	Sn*, Cu*, Zn, Pb	Ag		silver alloy
3	24/4585	I variant	Pb**, Sn; Pb**, Sn; Pb**, Sn			?separating residue
3	24/4620	A2	Cu**; Cu**, Sn; Cu**, Sn, Ag	Sn		silver alloy

were also analysed using EDXRF. The droplets were mostly identified as leaded bronze, with bronze also indicated.

4.0 Discussion

The results of crucible recorded and EDXRF analysis allow some insight into metal-working processes for Period 2 and Period 3, although the fragmentation of crucibles from Period 2 was markedly higher, which makes a discussion of differences in metal-working practice a little problematic. Overall, technology in terms of both crucible form and alloys worked remains broadly unchanged between these periods, nevertheless, different emphases can be detected in the data.

A total of thirty crucible fragments from Period 2 deposits could be identified to type and a further seventy-eight undiagnostic fragments were recorded. By contrast, a total of 143 fragments were identified to type from Period 3 deposits, with a further eighty-two undiagnostic fragments recorded. Some of the difference in the number of identifiable examples relates to the contrasting depositional history of crucibles by period, but is so large it is also a measure of the intensity of activity. The incidence of crucibles identified to type from Period 3 is much greater than from Period 2, which, given the fragmentation of Period 2 assemblages, is likely to be significant.

4.1 Period 2

The most commonly identified crucible from Period 2 deposits was Type G, or probably Type G (19), which may indicate an emphasis on silver-alloy working. Where Type G1 crucibles were clearly identifiable (7), the number included three notably small examples. Type A1 or A/B1 crucibles were also clearly in use during Period 2 (5) and likewise have associations with the working of silver and copper alloys. The capacity of

Table D6.5.2

Period	Find	Type	Cu%	Zn%	Pb%	Ag%	Sn%	Other%	Casting
2	11/4102	A1	5.19	0.11	5.51	–	0.93	88.22	copper alloy
2	25/1459	I variant	1.79	–	26.30	–	44.81	27.00	?separating residue
3	24/3480	I2	1.40	0.05	0.30	–	–	97.94	copper alloy
3	24/4620	A2	6.72	0.85	2.39	2.58	8.28	78.56	silver alloy
3	24/8223	A/B2	1.53	–	0.02	–	–	98.42	?copper alloy
3	24/8227	A/B2	0.58	–	0.02	–	–	99.26	?copper alloy
3	24/8314	A1	6.31	1.08	4.73	–	5.99	81.89	leaded bronze
3	24/8360	I variant	17.59	–	17.65	–	0.23	64.42	copper alloy
3	24/8416	A1	17.00	0.09	10.63	–	7.61	64.48	leaded bronze

Table D6.5.3

Period	Find	Type	Cu%	Zn%	Pb%	Ag%	Sn%	Other%	Casting
3	24/5565	droplet	46.39	0.08	2.88	–	27.15	22.96	leaded bronze
3	24/5661	droplet	48.24	–	8.95	–	13.64	28.77	leaded bronze
3	24/5662	droplet	51.85	–	0.19	–	18.66	29.17	bronze
3	24/6585	droplet	47.86	0.15	1.91	–	9.13	40.64	leaded bronze
3	24/6606	droplet	47.13	0.15	5.15	–	27.37	20.04	leaded bronze
3	24/7131	droplet	48.04	0.05	2.98	–	10.31	38.50	leaded bronze
3	24/7132	droplet	44.18	0.09	5.23	–	24.26	26.10	leaded bronze

both these crucible types is generally small and correspondingly small objects must have been cast. The crucibles point to the working of small individual quantities of silver and copper alloys.

There is a notable absence of Type A/B2 crucibles in Period 2 deposits and this does not seem to be because the crucibles were so fragmented that none could be identified, but rather that they were not in use. Type A/B2 crucibles are comparatively large capacity and suited for casting into correspondingly larger objects.

4.2 Period 3

Notwithstanding possible bias of the excavated sample at Tarbat, a real shift in intensity appears to be signalled in Period 3. Greater numbers of crucibles were in use, with a total of 143 identified to type. A total of thirty-four A/B1 type (including probable examples of Type A1) and forty-six A/B2 type (including probable examples, of both A2 and B2) were recorded. A further fifty Type G crucibles were represented, along with the majority of Type I crucibles/trays.

Not only was the number of crucibles recorded greater, but the types identified tended to be those with greater capacity, ie Type A/B2 and large G1 types. Analysis of both crucibles and droplets indicate that the same range of alloys was being worked, and castings clearly included silver alloy, but bronze, copper alloys, leaded bronzes and probably quarternary alloys were also being cast, and apparently more commonly.

At Tarbat, radiocarbon dating of a Period 3 metal-working hearth suggests the activity was taking place in the early to mid-ninth century, and this extends the chronology for Type A/B and Type G crucibles slightly.

References

Campbell E & Lane, A 2000 *Dunadd, an early Dalriadic Capital*. Oxford: Oxbow Books.

Curle, C E 1982 *Pictish and Norse Finds from the Brough of Birsay 1934–74*. Edinburgh: Society of Antiquaries of Scotland.

Comber, M 2004 *Native Evidence of Non-ferrous Metalworking in Early Historic Ireland*. Oxford: British Archaeological Reports.

Heald, A 2003 *Non-ferrous metalworking in Iron Age Scotland c 700 BC to AD 800*. Unpublished PhD thesis, University of Edinburgh.

Digest 6.6 CLAY MOULDS

CECILY SPALL (FAS Heritage) (OLA 7.6.1.3)

1.0 Introduction

A total of 709 fragments of clay mould were recovered during excavation within Sector 1 and 2. Each fragment was individually recorded and the results form the catalogue. The moulds derive from the working of non-ferrous metal and glass. In the case of metal-working, the moulds are characterised as bivalve and were recorded, where possible, as either lower (primary) or upper (secondary) moulds, lower or upper ingates or combinations of those. Where the fragment was not diagnostic, it was recorded simply as a mould fragment. Many fragments were severely eroded and could only be broadly identified as undiagnostic clay, although the fabric and character was the same as identifiable pieces and the clay could be differentiated from unspecialised daub fabric. In 117 instances, sufficient of the object matrix was preserved, allowing a range of castings to be identified including dress pins, finger-rings, studs, discs, mounts, escutcheons, as well as a range of newly identified objects.

2.0 Bivalve mould fragments

The technology of the bivalve mould is well understood and discussed in detail elsewhere (Curle 1982, 37–9; Lane & Campbell 2000, 201–2; Laing & Longley 2006, 32–5). The method of mould preparation did not differ at Tarbat from that identified at these sites (the Brough of Birsay, Dunnadd and the Mote of Mark).

At Tarbat, the lower valve was prepared on a flat surface and the model impressed deeply into it. The valve was keyed, normally in opposed pairs and singly at the bottom of the valve, executed with the tip of a knife or with fingertips (fingernail impressions were noted) and a flat, comparatively shallow ingate formed. The upper valve was then formed over the lower valve and model producing a convex mould with positive keys and a wide-mouthed, funnel-like ingate. The model was then removed and the valves sealed with luting clay, which appeared to have been applied in a wet or semi-liquid state, as smears from smoothing were commonly noted, often with sticky fingerprints. Once cast, the mould was broken open, resulting in higher fragmentation of the upper mould.

As a reflection of the breaking open of moulds, among the 709 fragments recorded, only twelve complete lower valves and four complete, or near-complete, upper valves were recorded. A total of 137 lower valve fragments were recorded, of which three retained part of the ingate, as well as seventeen further lower ingates. Upper valves were identifiable in 114 cases of which twenty-three retained part or all of the ingate. Upper valve fragments are likely to account for the majority of the fragments recorded simply as mould and undiagnostic clay.

3.0 Glass moulds

A total of nine glass moulds were identified in the assemblage. The moulds are distinguished from metal moulds as they are 'open', ie they do not show signs of uniting with another mould. Nor do the interiors of the moulds show signs of reduction, which is common in moulds that have received molten metal. An example of a one-piece mould was recovered from Lagore, Co Meath, with a stud of pale green glass in situ (Hencken 1950, 129–32, fig 62).

Two glass stud moulds from Tarbat are very similar to that from Lagore and have elaborate cross-ornament on small circular studs (25/687 and 1431) (Illus D6.1.9) and also find parallels with three stud moulds of identical design found at Iona (Graham Campbell 1981, 24, fig III.Ib). 25/1431 bears an interlace cross design, which George and Isabel Henderson identify as so familiar as to 'go unremarked on Insular cross-marked stones', and which can also be found in repoussé form on the underside of Bowls Nos 5 and 6 from the St Ninian's Isle treasure (Henderson & Henderson 2004, 109; Small et al 1973, Bowls Nos 5 and 6).

Two stud moulds appear to form a group, the best preserved is also elaborately decorated and bears the matrix of a small circular stud 12mm in diameter, containing a tripartite Y-shape division and three pairs of stepped lines radiating from the centre (24/5520) (Illus D6.1.17). The mould reflects the decoration on two glass studs from Tarbat, one with a diameter of *c* 12mm, and both of which are paralleled on a number of finished composite items from Scotland and Ireland, often used in conjunction with silver grilles and enamel. The bichrome glass and metal grille studs on the front of the Tara brooch from Co Meath are almost an exact match in terms of ornament and size. The second mould is badly eroded and no more than a shallow, small oval matrix, measuring 11 × 9mm, can now be discerned (24/8208).

Four fragments of the same spiral-decorated disc mould were recovered from Sector 1 (25/1432 and 1496). The reconstructed diameter suggests the casting was of a flat, circular disc measuring *c* 44mm. The spiral and peltae decoration is partly legible (Illus 5.7.9) and the disc would have been mounted onto a larger object, probably in a metal setting. Here again, the basal escutcheon from the St Ninian's Isle hanging bowl provides a close match. The escutcheon is similarly ornamented and the diameter within 10mm of the Tarbat mould, although the disc is *pressblech* not cast (Small et al 1973, Bowl No 8).

No glass studs of similar composition and size survive on contemporary pieces of metalwork and it is difficult to assess exactly how they would have been used. It may be significant that the only other known Scottish parallels come from Iona, particularly in light of the fact that access to glass-working, including window glass, is biased in favour of ecclesiastical sites in Britain. This reflects the high patronage enjoyed at sites such as Glastonbury, Whitby, Jarrow and Monkwearmouth, Whithorn and Iona. Glass-working from early medieval Ireland is also known from early Christian sites at Dunmisk, Movilla Abbey and Cathedral Hill, Armagh, but has also been recovered from high status secular sites enjoying comparable patronage, such as Lagore.

Four glass moulds form a clear group. Each mould appears to have been sliced off a rolled tube of clay, and where the matrices survive, small simple cells can be identified and the finished product appears to have been small domed square, circular or triangular glass studs (11/3576 conjoins 3651, 3447, 3448 and 3602) (Illus 5.7.9). Similar moulds were recovered from the glass stud making workshop at Lagore, where again, simple circular, triangular, square and sub-rectangular studs were being produced (Hencken 1950, 129–32) and many items of high status insular metalwork are embellished with simple studs imitating semi-precious gemstones. No other examples of such moulds are known from Scotland, but glass studs of similar form and size can be identified on Pictish metalwork – such as the glass studs on a number of silver and silver-gilt penannular brooches, including from St Ninian's Isle treasure (Small et al 1973, Brooch Nos 10, 18 to 20, 23 & 24) Rogart, Aldclune and Clunie (Henderson & Henderson 2004, 99–105).

4.0 Non-ferrous metal castings

4.1 Dress pins [Illus D6.1.12; 6.1.14]

Twelve valves bore the impressions of dress pins or part pin shanks (25/708 and 908; 24/3479, 3486, 4030 (double) and 8225). Identifiable pins included that of a stick pin with a horned head and collar (25/1401). A further example was fragmentary and appeared to be a part pin head matrix of possible styliform type (24/5411). A near-complete lower valve, missing the top end and ingate, appeared to represent a stick pin with scooped head, or a toilet implement such as an ear scoop (24/4020).

Three valves appear to relate to pins with zoomorphic heads. A near-complete lower valve retains a matrix of pin shank and irregular form head, which is eroded but may have been zoomorphic (24/8138). A complete lower valve matches a lower valve fragment and both appear to have been impressed with the same model. The complete valve describes a short pin *c* 20mm long with a zoomorphic head ornament, while the less complete example retains only part of the zoomorphic head (24/4574 and 4579) [Illus D6.1.14].

4.2 Finger rings and other rings [Illus D6.1.16]

Moulds for rings included five clear examples of finger-rings with integral cast bezels, which formed simple decoration either as a small group of lobes (24/4573, 5410 and 8360) or triangular (24/8121 and 8342). The diameters of all rings fell close together and were recorded as between 20.5 and 22mm. All the Tarbat finger-rings are closely paralleled at the Brough of Birsay (Curle 1982, 32–3).

Eleven simple ring matrices were identified and probably belong to finger-ring moulds, but not enough survived for clear identification (14/371 and 3736; 24/1310, 3850, 4734, 5440, 5770, 8107, 8219, 8236 and 8287). In support of this, where measurable, ring diameters were recorded as 17, 19 and 20mm.

One exception was a fragment of mould in a distinctive pale-pink-firing, very fine clay, which was unlike the clay used in the majority of moulds (24/8228). This fragment was very fragmentary but bore the part impression of three small possible ring or disc matrices and may be related to a possible brooch mould formed in the same distinctive clay fabric.

A further smaller valve appeared to be for the casting of a small ring or link, the cast object measuring *c* 10mm diameter.

4.3 Possible brooch mould [Illus D6.1.15]

Four valve fragments were found to conjoin to form two valve fragments (24/8180 conjoins 8344 lower and 8176 conjoins 8383 upper) and also to unite with each other. The fragments were identified initially as a group by the unusual pale-pink-firing, very fine clay fabric, and can be associated with a further valve fragment with three possible disc or ring matrices. The conjoining and uniting fragments appear to form part of a brooch hoop with possible facets and, while it is not clear how valve fragment 24/8228 relates to the possible brooch mould, the pieces form a distinct family. The unusual clay fabric, and the care with which the mould was made, suggest a fine and accomplished high-status product, which may well have been composed from a number of separately cast elements.

A further lower valve fragment was severely eroded but retained the deeper parts of a complicated, possibly bossed item (24/3598). The fragment bears four depressions, one sub-oval with vestigial possible fine interlace and possible neck, connecting to a deeper sub-circular depression, in turn connected by a collared neck to a smaller sub-oval depression, with a further separate depression. The exact item intended cannot be clearly identified, but the piece could represent an elaborate brooch terminal intended to be fastened to a separately cast hoop.

4.4 Buckles, belt fittings and strap-ends [Illus D6.1.15]

Seven valves, which may be related to the manufacture of buckles or belt fittings, were identified in the assemblage. A small sub-rectangular hoop may represent a small buckle or link from Sector 1 (11/3546). A group of four similar lower valves from Sector 2 bear the impression of a possible small buckle plate and part tongue, a simple bar with projecting tab (24/3849, 8196, 8373 and 8295 conjoins 8374). Two further valves appear to bear the impression of small possible belt fittings (24/5348 and 8323).

A small group of valves, which appeared to be related to the simultaneous casting of simple strap ends and links, were identified (11/3643; 24/3575, 5417 and 8272). A further valve bore a more complex impression of a tab with raised rim, containing a series of lobate impressions and may represent part of a strap end (24/3416).

4.5 Escutcheons, discs and mounts [Illus 5.7.8; Illus D6.1.9; Illus D6.1.15]

A total of nineteen escutcheon or disc moulds were identified. Many were eroded but appeared to represent simple plain discs or the backs of escutcheons, along with a smaller group of four highly decorative escutcheons and mounts.

Plain discs and escutcheons

Eleven plain discs or escutcheons were identified, although some may have borne decoration now lost (11/3548, 3569; 25/759, 761, 899, 1433, 1486; 24/3850, 4062, 5932, 8197). A possible bossed disc valve was among the group (25/1433), and a further four fragmentary escutcheon moulds were concave, suggesting they formed the back of a casting (24/5415, 8264, 8284, 8268 conjoins 8283).

Decorated escutcheons

Four fragmentary decorated escutcheons, discs and mounts were identified.

One example consisted of part of the upper mould of an escutcheon of possible sub-oval form, impressed with the part matrix of a dragon-like creature, including its head with open jaws and part spiral limb (24/8200) (Illus 6.13a). This animal form is already known in the Tarbat menagerie, being represented on TR20 and TR205.

Two conjoining fragments of upper mould with part ingate derived from the casting of a small domed disc bearing an eroded geometric interlace pattern, which would have resulted in a sunken grille-like pattern, probably to receive an inlay (11/4269 conjoins 25/855) [Illus 5.7.8].

Two zoomorphic mounts were suggested in the assemblage. Two conjoining fragments of upper valve bear the part matrix of a fish, with symmetrical tail, part body and fin defined by parallel ridged decoration (24/8258 conjoins 8337). The cast item may have been three-dimensional or flat-backed. As the former, the complete item may have been mounted onto a large composite piece of metalwork, perhaps the interior of a hanging bowl, or as the latter, as an appliqué mount. The ribbed style of decoration is similar to that employed on zoomorphic escutcheons on the hanging bowl from the St Ninian's Isle treasure (Small et al 1973, Bowl No 8). The other zoomorphic mount consists of an upper valve with the impression of a tapering strip with gilled decoration from a central spine leading to possible animal-head terminal (24/8343).

4.6 Possible weights [Illus D6.1.19; Illus D6.1.20]

A noteworthy group of moulds are unique in Scotland and are tentatively identified as for casting weights and fall into two types. A further lower valve with deeply impressed object appeared similar in overall form, but was unique in the assemblage (24/8152) [Illus D6.1.20]. This valve bore the impression of an object with a squat sub-cylindrical shaft leading to a bulbous terminal with crude similarities to doorknob spearbutts but, given the date and function of such objects, is unlikely to be meaningful in the context of Tarbat.

Type A [Illus D6.1.19]

Type A was represented in nine valves, both upper and lower (24/8195 conjoins 8221, 8086, 8273 and 8130), including four valves which unite to form two near-complete Type A matrices (24/8270 unites to 8172 and 24/8319 unites to 8292). Type A consists of a shape best described as acorn-like with a pyramidal lower half and small rounded knop, and in the case of Type A, sometimes with a circular tab at the top of the knop, which may have been drilled through following casting.

Type B [Illus D6.1.20]

Type B was represented by eleven valves, again both upper and lower, although none could be united (24/8194, 8096, 8140, 8093, 8128, 8222, 8324, 8235, 8094, 8206 and 8363). The objects cast in Type B valves clearly represent a very similar type of object with a pyramidal bottom half and a much taller knop, without clear evidence for a tab.

4.7 Objects with tabs [Illus D6.1.17]

A new group of fifteen valves and fragments are grouped here by a distinctive trapezoidal tab integrated into the object matrix. The items being cast included small tabbed individual tapering strips (24/8106, 8169, 8174, 8240 and 8371), sometimes paired and united by a single trapezoidal tab (24/5371, 8153 and 8335), tabbed strips with spiral terminals (24/4581 and 8085) and a tabbed strip with T-bar (24/4582). A further three valves could be grouped here since they bore fragmentary trapezoidal tabs (24/4580, 5397 and 8203).

A valve fragment from the Brough of Birsay was identified as having a trapezoidal tab integrated into the matrix (Curle 1982, 35, no 374) and other examples of tabbed matrices can be identified from the site (Curle 1982, 34, nos 343 and 348). Curle suggested the tab was designed to be folded round another object, which seems a reasonable suggestion, although it does not aid with deciding upon an identity for the Tarbat objects.

5.0 Discussion

The deposits which yielded mould fragments from Sector 1 are assigned to Period 2 activity because of their position overlying the infilled enclosure ditch and their spatial association with S1. In addition, the dating of two glass studs from the assemblage to the eighth century provides a date for the wider assemblage. The deposits which yielded assemblages of Period 3 were within Sector 2 where they were stratified above the ruins of Period 2 buildings, layers and features and were recovered along with fragmentary Period 2 sculpture.

Throughout both periods there are strong affinities with the technology, and in some cases the products, of the Pictish workshop at the Brough of Birsay. There are also artistic links with the St Ninian's Isle treasure, along with a number of other high status composite objects from Pictland and beyond. There are, however, distinct differences in the repertoire and the emphasis at Birsay appears to have been the production of small items of personal display, including small penannular brooches, stick pins, finger rings and small tacks or studs, whereas in both periods at Tarbat, highly accomplished craft-working is evidenced.

The Period 2 items at Tarbat included multiple examples of highly decorative castings in glass or non-ferrous metal, with evidence for inlaid metal grilles of the kind that adorn contemporary masterpieces. There is, however, a shift in Period 3 where smaller commodities are also produced with the finger rings providing a close – if not exact – connection to the Birsay workshop. Nevertheless, more specialist work is also evidenced in this period and the possible large brooch mould with its distinctive fine fabric, and the small glass stud mould that matches the Tara brooch, suggest that a brooch of that calibre could have been made at Tarbat in Period 3. Notably, this is the only brooch represented within the assemblage and this marks the Tarbat workshops apart from those at Birsay, Dunadd and Mote of Mark where smaller brooches were being produced, and likely in some number. The same can be said of dress pin moulds. The ornament on the small Period 3 glass stud mould matches the glass studs from Period 2 very closely, which is particularly noteworthy. Clearly, something of the Period 2 repertoire, if not the craftworkers themselves, persisted into Period 3 and the production of fine mounts and escutcheons is equally accomplished. Newly identified items also make their appearance in Period 3, including possible standard weights and tabbed items – again paralleled at Birsay but essentially unidentified in terms of purpose or function.

5.2 Period 2

Identifiable products from the Period 2 assemblage are dominated by the assemblage of seven glass stud moulds and nine decorative and plain escutcheons or mounts. The glass moulds belong with other forms of evidence for glass-working at the site, which so far is unique in early medieval Scotland. The manufacture of small glass studs with metal grilles and enamel inlay are found on high-status insular metalwork, but the larger glass studs being produced are not so easily paralleled. The evidence for the casting of items of lesser status was indicated by the dress pin and buckle moulds, but these are not numerous enough to constitute evidence for the mass production of small, low value items or commodities.

5.2 Period 3

A greater number of moulds were recovered from Period 3 deposits and the range of cast items was correspondingly more diverse. Items being produced clearly included finger-rings, dress pins, buckles, strap-ends and strips and in greater quantities by comparison with Period 2. In addition, a number of highly decorative items were also being manufactured, represented by the possible brooch mould, possible brooch terminal, small inlaid glass stud mould, the fish mount and items with tabs likely to belong to composite items. The possible casting of weights was also confined to this period.

References

Campbell E & Lane, A 2000 *Dunadd: An Early Dalriadic Capital*. Oxford: Oxbow Books.

Curle, C E 1982 *Pictish and Norse Finds from the Brough of Birsay 1934–74*. Edinburgh: Society of Antiquaries of Scotland.

Graham-Campbell, J 1995 'The bell and the mould', *in* Reece, R *Excavations in Iona 1964 to 1974, Institute of Archaeology Occasional Paper 5*, 23–5. Leicester: University of Leicester.

Hencken, H O'N 1950 'Lagore Crannog: an Irish royal residence of the seventh to tenth centuries AD', *Proceedings of the Royal Irish Academy* 53C: 1–247.

Laing, L & Longley, D 2006 *The Mote of Mark: A Dark Age Hillfort in South-west Scotland*. Oxford: Oxbow Books.

Small, A Thomas, C & Wilson, D M 1973 *St Ninian's Isle and its Treasure, Aberdeen University Studies Series Number 152*, Vol 2. London: Oxford University Press.

Digest 6.7 EARLY MEDIEVAL GLASS AND GLASS-WORKING WASTE

EWAN CAMPBELL (University of Glasgow) (OLA 7.1.2.1)

Vessel glass

Sherds from three very different types of vessel are present in the assemblage. The easiest to identify is 2885, decorated with a reticella glass rod of twisted opaque yellow and self-coloured glass. Vessels decorated with reticella rods are a hallmark of the eighth and ninth centuries, and are found distributed in Scandinavia and around the North Sea littoral, with a scatter further afield (Näsman 1984, 81–2, fig 9; Evison 2000a, fig 7). The place of manufacture has been widely debated (Evison 1988), and there may have been several production centres, but only *Hamwic* and Åhus have been fairly certainly identified as a source (Hunter & Heyworth 1998, 38, 61). Scottish examples are known from the Brough of Birsay (Campbell 2007, Pl 26; Hunter 1982, 47), Whithorn (Price & Hill 1997, 314–15, illus 10.12, no 83), and Inchmarnock (Campbell forthcoming). These, and the English examples from Whitby, Monkwearmouth, Barking Abbey, Flixborough and Beverley, are mostly from ecclesiastic contexts, but more recently examples have turned up on secular settlements such as York, Trowbridge, and Wicken Bonhunt (Evison 2000a, 86–8). Unused reticella rods have also been found at western monastic sites such as Iona, Armagh and Movilla, as well as secular sites such as Dunnyneill Islands. However, these rods were also widely used in bead manufacture, so their presence does not necessarily imply vessel manufacture. The Tarbat sherd cannot be assigned to a form, as it is too small, but reticella trails were applied to a wide variety of forms, such as jars, bowls and funnel beakers. Of these, the curvature of the sherd suggests a jar or bowl as the most likely form. It has been suggested that the Scandinavian distribution of reticella-decorated vessels can be correlated with that of Tating ware and the wine trade (Gaut 2008, 35), but there is no way of confirming this suggestion at Tarbat, where no imported pottery was recovered.

The blue sherd, 11/1901, comes from near the base of a narrow vessel, perhaps a cone or funnel beaker (see Digest 6.8, for colour photograph). This deep cobalt blue colour appears in Anglo-Saxon England in the seventh century, and was used in a restricted range of vessels associated with elite princely graves, possibly as diplomatic gifts (Campbell 1990). If the vessel was a cone beaker, it is likely to date to the seventh century. If it was a funnel beaker, an eighth- or ninth-century date would be appropriate, but this deep blue colour would be unusual at this period. The sherd is markedly abraded, and is not certainly ancient, so its status must remain equivocal.

The third sherd, 11/2471, is equally difficult. Decolourised glass with wheel-engraved decoration was produced in Late Antique contexts in the Mediterranean (Price 2000, 24–6), and a few sherds have been found in fifth- to seventh-century contexts in Britain, including Whithorn (Campbell 2007, 56–8). However, the decorative technique of the Tarbat sherd differs from these imports in that the engraving has not been done with the edge of a wheel, but in ground-down patches and deep scores with a pointed tool, possibly diamond-tipped. It is therefore perhaps more likely that this sherd is post medieval, but its antiquity cannot be ruled out.

Catalogue

24/2885

Bodysherd of decorated glass vessel. The glass is good quality, few bubbles, and a yellowish-green colour. The decoration is a single reticella trail, of opaque yellow and transparent yellow-green, partially marvered. The yellow trails have bled into the body of the vessel forming a row of spots along both margins. Trail 3mm wide. Diam of vessel (?)50–60mm; Th 0.5mm: size: 13mm × 9mm (C1501) [Illus 6.5e].

11/2471

Bodysherd of decorated glass vessel. The glass is of high quality, no bubbles, colourless (decolourised). The decoration is engraved, consisting of three deeply abraded sub-circular patches and three deeply incised lines, one with a series of deeper cross-hatches. Outer surface abraded. Size: 15mm × 8mm × 1.5mm. Possibly Late Antique or post-medieval. Found in medieval or post-medieval context 24/1368. Not illustrated.

11/1901

Bodysherd. The glass is high quality, no bubbles, light cobalt blue. Sherd from near narrow base of ?cone or funnel beaker. Th 2–4mm, size: 16mm × 7mm. Heavily abraded edges. Not certainly ancient. (C1369) [Illus D6.8.3].

Glass-working debris

The collection of glass-working debris from Tarbat is the most extensive in Scotland for the entire medieval period, and is important in showing the range of glass-working processes which took place in the early medieval period as it includes raw glass, molten droplets and trails, crucibles and heating trays. Similar collections are known from contemporary monastic sites in England and Ireland at sites such as Glastonbury (Bailey 2000), but the same range of glass-working activities also took place on secular high status sites such as Lagore and Garranes (Henderson 2000, 144–7). Glass was almost certainly not made from its mineral constituents in north-west Europe at this period, but was manufactured in the Mediterranean area on an industrial scale, and the raw material exported as lumps of cullett, broken from massive slabs. The cullett was then melted down to make vessels or other items such as beads and inlays (Freestone et al 2008, 32–3). The material can be divided into two groups, one of deep blue glass, and the other of opaque yellow.

The first stage in the glass-making process was the acquisition of cullett. Lumps of raw glass rarely survive from this period. There is one large block of red glass from near Tara, and a yellow one from Moynagh Lough crannog excavations, both in Co Meath, Ireland (Youngs 1987, 201), and much smaller shaped slabs from Glastonbury Abbey (Bailey 2000, 171; Evison 2000b, 189), but all that is usually found are glass mosaic cubes and selected sherds of glass, collected and destined for melting down (Campbell 2007, 92–6; Hill 1997, 296).

The large piece of blue cullett, 11/1000, is therefore an important addition to our knowledge of the raw materials available to early medieval Insular craftworkers (see Digest 6.8, for colour photograph). A small spall, 11/362, and a glass droplet, 11/4136, are probably derived from melting down this cullett. The glass stud, 25/686, may have been one of the products of this blue glass-working.

The other pieces are related to working of opaque yellow glass. The crucible fragment 11/3551 would probably have been used to prepare the opaque yellow glass by mixing lead-tin ores with raw glass, as was found at Dunmisk, Co Tyrone (Henderson 2000, 144). There are traces of metal ore within the glass adhering to the crucible wall. The thickness and curvature of this crucible show that it would have been quite large - the ones from Glastonbury held up to two litres of glass (Bailey 2000, 170, fig 13). This is larger than the general metalworking crucibles of the period, such as those from Dunadd (Lane & Campbell 2000, illus 4.40). The driblet of yellow and green glass, 25/1385, may have been associated with this stage of the process (see Digest 6.8 for colour photograph). The heating tray, 11/3469, would then have been used to re-melt the prepared opaque yellow glass (see Digest 6.8, for colour photograph). The stirring marks where trails of glass have been lifted are still visible on the base of this tray. The 'eyed' shape of this tray is unusual, though it is clearly related to 'dog-bowl' types found on many sites (ibid 134, type B), and some of the Birsay and Clatchard Craig examples are oval (Curle 1982, illus 25; Close-Brooks 1986, illus 27, 107). The fragment of trail or rod, 25/1458, is a remnant of one the trails lifted from this type of tray, possibly used to create a reticella rod by twisting with another of natural-coloured glass (see Digest 6.8, for colour photograph).

Catalogue of glass debris

11/362

Spall from lump of cullett. Pale blue transparent glass, surface opalescent. Size: 20mm × 6mm × 3mm (C1002).

11/1000

Large fragment from sub-spherical lump of cullett. Opaque blue glass, banded lighter and darker from turquoise to blueish white, very bubbly. Surface opalescent, devitrifying in places. Size: 36mm × 20mm × 9mm (C1145).

25/1385

Irregular dribble of molten glass. Colour varies from olive green to opaque yellow. Irregular lumps of opaque yellow inclusions. Size: 30mm × 4mm × 4mm (F179 C1457).

25/1458

Irregular rod of opaque yellow glass, broken at one end, rounded at the other. Waste from trail production. Size: 12mm × 2mm × 2mm (F222 C1471).

11/3551

Crucible body sherd, with opaque yellow glass on interior surface. Fabric white, gritty, rather crumbly, wheelthrown. Exterior grey/orange. Possible inclusions of metal ore in glass. Size: 41mm × 31mm × 7mm (C1250).

11/3469

Two-thirds of a low-walled heating tray. Eye-shaped heating tray with flat base. Patches of opaque yellow glass on interior surfaces, but also spreading to exterior in places. Stirring marks visible where trails have been lifted out. Fabric as 3551, hand-modelled. Size: 62mm × 45mm, Height 17mm (C1250).

11/4136

Droplet of molten glass, broken. Cobalt blue, very bubbly. Abraded. Size: 3mm × 3mm × 4mm (F34 C1048).

Beads

The fact that only two beads were recovered from the extensive excavations might be seen as surprising, but given that beads were predominately female attributes, this is understandable in a monastic context. Both beads from the site are in a bubbly blue glass, and it is possible they were manufactured on site, given the droplet of similar glass (11/4136). One of the beads, 14/3559, is tiny, of a type sometimes referred to as spacer beads for necklaces (Hunter & Heyworth 1998, 26). These are uncommon, presumably because they are so easily overlooked, but appear to have been made at *Hamwic* in the eighth/ninth centuries (ibid). The other bead, 24/4570, decorated with running swags, is a common type in both Anglo-Saxon and Scandinavian contexts, over a wide time range. The marvered trail decoration has almost completely decayed, leaving a groove, which suggests it may have been in opaque white glass, which is prone to decay. There are traces of colourless glass at places within this groove, which might suggest that the decoration was originally a bichrome twisted reticella trail of white and colourless glass. If that was the case, it indicates a connection with a later tradition of reticella beads found in Ireland, Scandinavia and later Anglo-Saxon England (Brugmann 2004, 41), from the seventh to tenth centuries. Given that the trail is missing, there is little more specific that can be said.

Catalogue of beads

14/3559

Tiny blue spacer bead. Wound, bubbly glass, opalescent decay. 3mm Diam, hole 2mm diam (C1941).

24/4570

Decorated wound glass cylinder bead. Glass cobalt blue, very bubbly and streaky. Decorated with single marvered running swag trail, now completely decayed, but with traces of colourless glass, perhaps indicating original reticella twisted trail. Height 7mm; Diam 8mm; hole 4mm diam (F432 C1877) [Illus 6.5d; Illus D6.1.11].

Studs

The two decorative domed glass studs from the site are the most spectacular glass finds, and are important in showing the type of material that was produced at Tarbat. The similarities in design of the two studs suggest they derive from, or were intended for, a single composite piece of metalwork. Both designs are based on a tri-partite division of the circular stud using a combination of arcs and straight lines to form pseudo-cloisons which would have been filled with silver. The smaller of the two, 25/1452, in opaque white glass, has grooves for silver wire decoration, but this is now lost or had not been applied, while on the larger, 25/686, the wire survives and can be seen on X-ray to be almost complete (see also Digest 6.8, for colour photograph. The pattern of decoration, a doubly tripartite division, one of arcs and one of straight lines, sometimes stepped, is paralleled in more elaborate versions on some of the smaller studs from the Derrynaflan patten (Ryan 1993, 30, pl 14; Ryan & O' Floinn 1983, pls 55, 57, 59, 61), and the same decorative elements are used in other studs. While the some of these studs have a quadripartite decorative scheme, many others are tri-partite. The central triangle with concave sides, which is so prominent in the Tarbat stud, is a particular feature of the Derrynaflan studs on Frames 1, 12 and 5 (ibid). These studs use blue and red for the decorative scheme, and this may have been the original colour scheme of 25/686 (as red enamel often fades to white), but blue and yellow is another possibility. The larger stud, 25/686, is similar in size to the Derrynaflan studs, and the Tarbat stud is clearly in the same workshop tradition, if not from the same craftworker. Very similar studs are seen on secular metalwork on the back of the 'Tara' brooch from Bettystown, a piece conventionally dated to the early eighth century, but otherwise, most surviving artefacts with these studs are ecclesiastical, such as the Ardagh chalice, Moylough belt-shrine and the Derrynaflan wine-strainer.

The smaller Tarbat stud has a similar decorative scheme, but in its most simplified form, without any stepped elements. The small size would seem to preclude its use on large items like a patten or chalice, but slightly smaller studs, almost identical to those on the Derrynaflan patten, are seen on the rear of the 'Tara' brooch (Youngs 1989, pl on 77 upper), though it is difficult to find a parallel for such a small stud. It may have been from a small brooch such as that from Co Westmeath (Youngs 1989, 206, no 211), which has small studs of about 7mm in diameter on its front face, or may have been a subsidiary stud like those on a possibly ecclesiastical mount also probably from Westmeath (Youngs 1989, 147, no 141). Most of the parallels quoted above probably date to the eighth century. The only piece from a well-dated archaeological context is a detached stud with gold wire inlay, which was found in an early eighth-century deposit at Deer Park Farms, Co Antrim (Youngs 1989, 206). An eighth-century date is the likely for both the Tarbat studs. The production of inlaid glass studs is attested at a number of secular and monastic sites, including Lagore and Iona, where moulds have been found, and at Garryduff and Dunmisk where unfinished studs were found (Henderson 2000, 146). Thus it seems that this type of stud was not made in an exclusively ecclesiastic milieu, but was also produced on high status secular sites.

Catalogue of Studs

25/686

Decorative glass stud with silver wire inlay. Main body of stud is of cobalt blue bubbly transparent glass, with a Y-shaped inlay formed by three arcs of silver wire, filled with opaque whitish glass now discoloured by corrosion, possibly originally red or yellow. Between the arms of the Y is another tripartite division formed by three zig-zags, also filled with silver wire. The circular border also holds silver wire. On the upper surface, the glass is decayed and devitrified in places, particularly the white, probably due to contact with the metal. The upper surface is convex, with vertical sides. The rear surface is not flat, and has part of a flange and indentations showing where the soft glass was pushed into the mould. There is a small flake missing from one edge. Diam 11mm, Th 4mm (C1002) [Illus 5.7.10].

25/1452

Tiny glass stud with moulded decoration on upper face. Opaque white glass, with a few bubbles. The grooved decoration, 0.3mm wide and intended for silver wire inlay, as in 686, consists of a Y-shape overlain by three curved lines forming a triangle with concave sides, all lying within a circular border. Upper surface convex, lower uneven with flange on one side. Diam 5mm, Th 1mm (F216 C1459) [Illus D6.1.10].

References

Bailey, J 2000 'Saxon glass-working at Glastonbury Abbey', *in* Price, J (ed) *Glass in Britain and Ireland, AD 350–1100,* 161–88. London: British Museum Press.

Brugmann, B 2004 *Glass beads from Early Anglo-Saxon graves.* Oxford: Oxbow Books.

Campbell, E 1990 'A blue glass squat jar from Dinas Powys, South Wales', *Bulletin Board of Celtic Studies* 36: 239–45.

Campbell, E 2007 *Continental and Mediterranean imports to Atlantic Britain and Ireland, AD 400–800.* York: Council for British Archaeology.

Campbell, E forthcoming *A Valsgärde-type bowl from Inchmarnock.*

Close-Brooks, J 1986 'Excavations at Clatchard Craig, Fife', *Proc Soc Antiq Scot* 116: 117–84.

Curle, C L 1982 *Pictish and Norse finds from the Brough of Birsay 1934–74.* Edinburgh: Society of Antiquaries of Scotland.

Evison, V 1988 'Some Vendel, Viking and Saxon glass', *in* Hardh, B, Larsson, L, Olausson, D & Petré, R (eds) *Trade and exchange in prehistory*: *studies in honour of Berta Stjernquist*, 237–45. Lund: Acta Archaeologica Lundensia.

Evison, V 2000a 'Glass vessels in England AD 400–1100', *in* Price, J (ed) 2000b, 47–104.

Evison, V 2000b 'The glass fragments from Glastonbury', *in* Price, J (ed), 189–200.

Freestone, I, Hughes, M J , & Stapleton, C P 2008 'The composition and production of Anglo-Saxon glass', *in* Evison, V, *Catalogue of Anglo-Saxon glass in the British Museum*. 29–46. London: The British Museum Press.

Gaut, B 2008 'Vessel glass from Kaupang: a contextual and social analysis', *Norwegian Archaeological Review* 40(1): 26–41.

Henderson, J 2000 'The production technology of early Irish Early Christian glass with special reference to beads and enamels', *in* Price, J 2000 (ed), 143–60.

Hill, P 1997 *Whithorn and St Ninian: The excavations of a monastic town 1984–91.* Gloucester: Sutton Publishing.

Hunter, J 1982 'Glass', *in* Curle, C L 1982 *Pictish and Norse finds from the Brough of Birsay 1934–74*, 46–7. Edinburgh: Society of Antiquaries of Scotland.

Hunter, J & Heyworth, M 1998 *The Hamwic Glass.* York: Council for British Archaeology.

Lane, A & Campbell, E 2000 *Excavations at Dunadd: an early Dalriadic capital.* Oxford: Oxbow Books.

Näsman, U 1984 'Vendel period glass from Eketorp II, Öland, Sweden. On glass and trade from the late 6th to the late 8th centuries AD', *Acta Archaeologica* 55: 55–116.

Price, J & Hill, P 1997 'Additional early medieval vessels', *in* Hill, P: 314–15.

Price, J 2000a 'Late Roman glass vessels in Britain, from AD 350 to 410 and beyond', *in* Price, J (ed) 2000b: 1–32.

Price, J (ed) 2000b *Glass in Britain and Ireland, AD 350–1100.* London: British Museum Press.

Ryan, M 1993 *Metal craftsmanship in Early Ireland.* Dublin: Country House.

Ryan, M & O'Floinn, R 1983 *The Derrynaflan hoard 1: a preliminary account.* Dublin: National Museum of Ireland.

Youngs, S (ed) 1989 *The work of angels: masterpieces of Celtic metalwork, 6th–9th centuries AD.* London: British Museum Press.

Digest 6.8 ANALYSIS OF THE GLASS AND GLASS-WORKING WASTE

JAMES PEAKE and IAN FREESTONE (School of History, Archaeology and Religion, Cardiff University) (OLA 7.1.2.2)

An assemblage of glass fragments from the Tarbat monastery excavations were analysed by SEM-EDXA. Of the blue glasses, two are modern. The third is a natron-type glass of Roman type, which is likely to represent re-use of early material by early medieval craftsmen. The remaining three glasses (all opaque yellow) are unambiguously consistent with early medieval glass technology. However, it was not possible to establish whether opaque yellow glass was being made at Tarbat, or simply being worked there.

Introduction

A small assemblage of glass and glass-working debris from the Tarbat monastery excavations was provided for analysis, the majority of which were assumed to be of early medieval date. This included one glass stud, two vessel fragments (one decorated with a reticella trail) and five fragments of glass-working waste – including crucible fragments, cullet and driblets. Unfortunately, the reticella fragment could not be sampled for analysis due to its fragility. This is the only assemblage containing glass-working waste from early medieval Scotland. It was hoped that compositional analysis would give further insight into glass production during the period.

Materials and methods

A list and brief description of each of the samples analysed is presented in Table D6.8.1, and images of the glasses and glass-working waste are presented in Illus D6.8.3.

Small samples were taken, mounted in epoxy resin and polished. They were coated with a thin layer of carbon and examined in the scanning electron microscope (CamScan Maxim). The chemical compositions of the samples were determined using an Oxford Instruments ISIS energy-dispersive X-ray analyser (EDXA) attached to the SEM. Relative analytical accuracy is believed better than ±2% for silica and ±5% for other elements present in concentrations greater than 10%, but greater for elements present in lower concentrations. Detection limits were 0.2% for most of the components analysed, 0.3% for lead and tin and 0.4%–0.7% for antimony, depending on the glass matrix. Results were taken from an average of three analyses, and were normalised to 100% to improve precision and comparability. Oxide compositions for the six glasses analysed are presented in Table D6.8.2.

Results

Blue glass

Samples 25/686 and 11/1901 are soda-lime-silica glasses, made using a relatively pure source of alkali, as indicated by their low potash and magnesia contents (Table D6.8.1). However, they have significant compositional differences, which suggest that they originate from different manufacturing traditions. The 18% soda, 2.2% alumina and small but significant amounts of manganese and antimony oxides in the stud 25/686 are fully consistent with weakly coloured Roman glass that was made between the first and fourth centuries AD. These glasses were decoloured using manganese and antimony oxides (eg Jackson 2005). The blue colour of this glass may derive from small amounts of cobalt present in the glass not detectable by EDXA (Freestone et al 2008).

Vessel glass 11/1901 is a particularly pure glass, containing lower levels of iron and aluminium oxides than the other glasses analysed, and is especially distinguished by a lack of chlorine. On the other hand, its lime content of 13.1% is high relative to soda-lime-silica glasses of the first millennium ad. The unusual composition, particularly the low chlorine content, strongly suggests that this soda-lime-silica glass dates to after the introduction of the Leblanc process for the production of synthetic soda in the early nineteenth century and that it is intrusive.

Opaque cullet 11/1000 is also unlikely to relate to the early medieval period. It is distinguished by a very high lime content (25.4%) and low soda (1.2%). The chlorine content is also very low (0.2%). Its composition is characteristic of post-medieval glasses of the high-lime low-alkali (HLLA) compositional type, which was in use between the sixteenth and nineteenth centuries (Dungworth et al 2006; Dungworth & Loaring 2009). The alumina and iron oxide contents and the presence of a small amount of phosphate are typical for HLLA glasses (Dungworth & Loaring 2009). No opacifier was observed in this sample, suggesting that its opaque appearance is due to the thickness of the fragment and the presence of bubbles.

Opaque yellow glass

All of the yellow samples analysed are coloured and opacified with lead-tin oxide, visible in the SEM as small crystals dispersed throughout the glass matrix (Illus D6.8.1 and 2). In all three samples, spot analyses identified these crystals as consisting of approximately 30–35% tin oxide and 60–65% lead oxide, corresponding to the cubic phase $PbSnO_3$ (Rooksby 1964; Tite et al 2008). It is apparent from the compositions (Table D6.8.1) that the two glass trails, 25/1385 and 25/1458, are essentially mixtures of soda-lime-silica glass and a component rich in lead and tin oxides. This is confirmed by the microstructures of the glasses, which are heterogeneous on a coarse scale. For example, Illus D6.8.2 shows large regions rich in lead and tin, with abundant tin oxide crystals, in a matrix which is richer in silica. Tin-oxide opacified yellow glasses, with high lead, are typical of the early medieval period in north-western Europe (Tite et al 2008).

Table D6.8.1
Glass and glass-working debris analysed

Find No	Description	Glass colour
25/686	Decorated glass stud with opaque white inlay	Transparent blue
25/1385	Irregular waste trail of glass	Opaque yellow
25/1458	Irregular driblet of glass	Opaque yellow-olive green
11/1901	Vessel glass	Transparent blue
11/1000	Large fragments of waste glass/cullet	Opaque blue
11/3469	Heating tray fragment containing glass patches	Opaque yellow

Table D6.8.2
EDX analyses of glass and glassworking waste[1]

Oxide (wt%)[2]	Find No					
	25/686	25/1385	25/1458	11/1901	11/1000	11/3469
Na_2O	18.0	8.1	5.5	12.1	1.2	0.0
MgO	0.7	0.4	0.3	0.3	2.0	0.3
Al_2O_3	2.2	2.0	2.3	1.0	3.2	5.8
SiO_2	66.9	36.7	27.9	71.3	58.5	13.2
P_2O_5	0.1	b.d.	b.d.	b.d.	1.7	10.2
SO_3	0.5	0.4	b.d.	0.6	0.6	0.5
Cl	0.6	0.6	0.5	b.d.	0.2	0.6
K_2O	0.6	0.5	0.4	0.4	2.8	b.d.
CaO	6.3	3.5	2.3	13.1	25.4	4.9
TiO_2	b.d.	b.d.	b.d.	b.d.	0.3	0.6
MnO	0.6	0.2	0.2	0.1	0.2	b.d.
Fe_2O_3	1.0	1.4	3.3	0.3	2.2	5.6
CuO	0.8	0.6	0.7	0.6	0.6	0.6
ZnO	b.d.	b.d.	0.2	b.d.	b.d.	b.d.
SnO_2	b.d.	2.7	6.9	b.d.	0.4	8.8
Sb_2O_3	0.9	b.d.	b.d.	b.d.	0.6	1.2
PbO	0.2	42.6	49.3	b.d.	b.d.	47.0

1 Average of three area analyses normalised to 100%; see text for details
2 b.d. = below detection. Detection limits were thought to be about 0.2% for most of the elements analysed, although this is marginally higher for lead and tin at about 0.25–0.3% and rises to over 0.5% for antimony in glasses with high calcium. Barium oxide and cobalt oxide were analysed for, but not detected

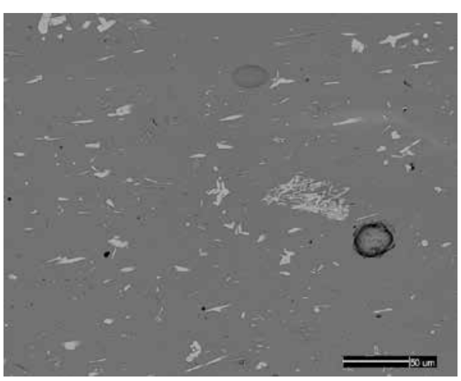


Illustration D6.8.1
A backscattered electron image showing crystals of lead-tin oxide dispersed throughout the glass matrix of sample 25/1458

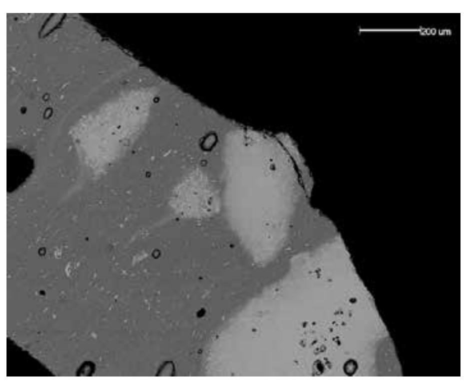


Illustration D6.8.2
A backscattered electron image showing crystals of lead-tin oxide dispersed throughout the glass matrix of sample 25/1385. The glass is very heterogeneous, as shown by sub-angular patches of lead-tin oxide opacifier crystals. The glass matrix appears brighter in the crystal-rich regions because it contains much more lead than the darker grey regions

The yellow deposit on the heating tray, 11/3469, differs from the other samples in terms of its high phosphate and low soda and silica contents. Removal of sodium and deposition of phosphate from the environment is typical of weathering processes observed in some glasses (Freestone et al 1985) and our interpretation is that this yellow material, rich in lead and tin, has resulted from the weathering of an opaque yellow glass, similar to those of the trails.

Discussion

The results indicate that two of the three blue glasses are post-medieval, so only the stud is of particular interest here. There is now a wide range of evidence in support of models of glass production in the first millennium AD which interpret soda-lime-silica glass to have originated largely in the Levant and Egypt, where it was made from its raw materials – on a scale of many tons – in large tank furnaces (Freestone 2006). This raw glass was distributed across the Mediterranean and Europe to be remelted and shaped into vessels, windows and other artefacts (Freestone 2003; Freestone & Hughes 2006; Freestone et al 2008).

As indicated above, the composition of the stud is characteristically Roman. Its soda, lime and alumina contents do not match the compositions of primary glass prevalent after the fourth century and the presence of antimony argues for an early date. Roman glass was re-used for inlay and enamelling until as late as the fourteenth century, including in the jewellery of Anglo-Saxon Britain (Bimson & Freestone 2000). Given that the design of the stud is characteristically early medieval (Campbell, pers comm), this is almost certainly the case here. Compositional parallels to the blue stud may be found from the Dalriadic capital of Dunadd (Henderson 2000a) and from the assemblage at Dunmisk, County Tyrone (Henderson 1988).

The yellow glasses are all opacified and coloured by crystals of lead-tin oxide, or lead stannate ($PbSnO_3$). Glass of this type was used in Europe from the second century BC and continued in use throughout the first millennium AD, and has been interpreted by Henderson to represent the continuity of a Celtic rather than a Roman tradition (Henderson 2000a; Henderson 2000b; Henderson & Ivens 1992). The minor compositional differences between the yellow glasses analysed are probably due to slight variations in the quantities of raw materials used in the glass recipes, combined with the notable heterogeneity of these glasses (Illus D6.8.2).

Table D6.8.3
Comparison of opaque yellow glass from Tarbat to published analyses of contemporary glass from elsewhere

Oxide (wt%)[1]	Sample		
	Schleitheim[2]	Dunmisk: 13[3]	Tarbat: 25/1385[4]
Na_2O	7.8	9.1	8.1
MgO	0.3	0.4	0.4
Al_2O_3	2.9	2.2	2.0
SiO_2	33.9	43.6	36.7
P_2O_5	<0.1	2.1	<0.1
Cl	n.a.	0.8	0.6
K_2O	0.2	1.2	0.5
CaO	2.7	2.9	3.5
Fe_2O_3	0.8	0.9	1.4
SnO_2	1.7	4.7	2.7
Sb_2O_3	n.a.	0.4	<0.4
PbO	49.5	32.9	42.6

1 n.a. = not analysed
2 Opaque yellow glass bead from Schleitheim, Switzerland. Mid-seventh-century Merovingian date (taken from Heck et al 2003)
3 Opaque yellow crucible glass from Dunmisk Fort, Co Tyrone, Ireland. Early Christian date (taken from Henderson 1988)
4 Opaque yellow waste trail of glass from Tarbat (taken from Table D6.8.2, this report)

Heck et al (2003) investigated a crucible and bead (Table D6.8.3) of Merovingian date from Schleitheim, Switzerland, and found that the yellow glass was prepared in two stages. First, lead-tin yellow pigment was prepared by heating a mixture of the oxides of lead and tin, which reacted with the crucible fabric to form crystals of lead-tin oxide in a lead-silica glass. This was then mixed with a pre-existing soda-lime-silica glass to form the yellow glass used to make beads. A similar process was used in post-medieval Venice to make yellow glass (Moretti & Hreglich 1984) and was probably widely used throughout the medieval period (Tite et al 2008). The sub-angular nature of the aggregates of lead-tin oxide crystals in sample 25/1385 (Illus D6.8.2) suggests that they were directly added to the soda-lime-silica matrix as crushed lumps of a lead-tin-silica material and that the resultant hybrid glass was not heated for long enough to fully disperse them. The duration of heating would have been minimised as lead-tin yellow is unstable, and the yellow glass can readily lose its colour at high temperatures.

The compositions of the soda-lime-silica glasses used to manufacture the yellow glasses cannot be determined accurately as the compositions may reflect contamination from a number of sources. However, the presence of antimony oxide in the relict glass on the heating tray (Table D6.8.1: 11/3469) suggests that the re-use of Roman material is a strong possibility.

Sample 11/3469 was the only glass analysed directly from a refractory ceramic. The flat, open shape of this heating tray is paralleled by heating trays associated with potential glass-working debris found elsewhere, for example, in early medieval Ireland, although the evidence for glass working is far from unambiguous in many cases, as noted by Henderson and Ivens (1992). It has been suggested that they were only used for softening glass prior to shaping it, as more closed shapes would have been necessary to melt it completely (Henderson & Ivens 1992). No evidence was observed in the SEM of partially fused primary raw materials that might suggest the making of glass, rather than its manipulation.

Overall, these results provide evidence only for the manipulation of opaque yellow glass at Tarbat. There is no evidence for primary glass making from raw materials and, as the lump of blue cullet is no longer considered early medieval, no evidence to support the manipulation of other colours. The opaque yellow glass appears to have been made using a technique which is closely paralleled in Merovingian Switzerland. We are unable to determine if it was made on site or brought in from elsewhere; the deteriorated condition of the glass on the heating tray limits our ability to speculate here.

This interpretation differs considerably from that previously put forward for glass industrial debris from Dunmisk, where it has been suggested that yellow glass was being made directly from its raw materials, including soda, and that the craft activity is a continuation of a specifically Celtic technological tradition (Henderson & Ivens 1992). This difference may relate simply to the character and positions of the sites, but we note the close similarities of the opaque yellows from Dunmisk and Tarbat, and that from Switzerland (Table D6.8.3), which strongly suggest a common technology. It may be that the quartz grains upon which so much depends in the interpretation of the crucible deposit from Dunmisk (Henderson 1988; Henderson & Ivens op cit) are relicts from the production of the lead-tin yellow pigment, rather than the soda-bearing glass.

Conclusion

Of the six glasses analysed, only four appear to be early medieval, and we have no evidence for the working of colours other than opaque yellow. The compositions of the glasses are strongly paralleled at Dunadd and Dunmisk, and are interpreted as evidence for an industry based largely on the re-use of soda-lime-silica glass which, at least in part, had its origins in the Roman period. Before the fourth century, opaque yellow glass was largely based upon the use of antimony oxides, and the lead-tin yellow pigment found here is characteristically early medieval. It was produced by adding pre-formed yellow pigment to a soda-lime-silica glass which, in some cases at least, was recycled material. The technique to produce the yellow pigment seems to have been quite widespread and was certainly carried out at Schleitheim in Switzerland (Heck et al 2003) and Dunmisk in Ireland (Henderson & Ivens 1992). However, we are unable to determine if this procedure was undertaken at Tarbat or if the yellow glass was imported. At present, the evidence at Tarbat seems to be limited to the hot manipulation of yellow glass.

References

Bimson, M & Freestone, I 2000 'Analysis of Some Glass from Anglo-Saxon Jewellery', *in* Price, J (ed), *Glass in Britain and Ireland AD 350–1100*, 131–6. London: British Museum Press.

Dungworth, D & Loaring, A 2009 'The composition of late sixteenth century to early ninth century window glass: the Shaw House Project', *Annales du 17e Congres de l'Association Internationale pour l'Histoire du Verre*: 377–82.

Dungworth, D, Cromwell, T, Ashurst, D, Cumberpatch, C, Higgins, D & Willmott, H 2006 'Glass and Pottery Manufacture at Silkstone, Yorkshire', *Post-Medieval Archaeology* 40(1): 160–90.

Evison, V & Marzinzik, S (eds) 2008 *Catalogue of Anglo-Saxon Glass in the British Museum*. London: The British Museum.

Freestone, I 2003 'Primary Glass Sources in the Mid-First Millennium AD', *Annales du 15e Congres de l'Association Internationale pour l'Histoire du Verre*: 111–15.

Freestone, I 2006 'Glass Production in Late Antiquity and the Early Islamic Period: A Geochemical perspective', *in* Maggetti, M & Messiga, B (eds) *Geomaterials in Cultural Heritage*, 201–16. London: Geological Society.

Freestone, I & Hughes, M 2006 'The Origins of the Jarrow Glass', *in* Cramp, R *Wearmouth and Jarrow Monastic Sites*, 147–55. Swindon: English Heritage.

Freestone, I, Hughes, M & Stapleton, C 2008 'The Composition and Production of Anglo-Saxon Glass', *in* Evison, V & Marzinzik, S (eds) *Catalogue of Anglo-Saxon Glass in the British Museum*, 29–46. London: The British Museum.

Freestone, I, Meeks, N & Middleton, A 1985 'Retention of Phosphates in Buried Ceramics: An Electron Microbeam Approach', *Archaeometry* 27(2): 161–77.

Heck, M, Rehren, T & Hoffmann, P 2003 'The Production of Lead-Tin Yellow at Merovingian Schleitheim (Switzerland)', *Archaeometry* 45(1): 33–44.

Henderson, J 1988 'The Nature of the Early Christian Glass Industry in Ireland: Some Evidence from Dunmisk Fort, Co Tyrone', *Ulster Journal of Archaeology* 51: 115–26.

Henderson, J 2000a 'Archaeological and Scientific Aspects of the Glass Technology', *in* Lane, A & Campbell, E *Dunadd: An Early Dalriadic Capital*, 212–17. Oxford: Oxbow Books.

Henderson, J 2000b 'The Production Technology of Irish Early Christian Glass with Specific Reference to Beads and Enamels', *in* Price, J (ed), *Glass in Britain and Ireland AD 350–1100*, 143–59. London: British Museum Press.

Henderson, J & Ivens, R 1992 'Dunmisk and Glass-Making in Early Christian Ireland', *Antiquity* 66: 52–64.

Jackson C 2005 'Making Colourless Glass in the Roman Period', *Archaeometry* 47(4): 763–80.

Lane, A & Campbell, E 2000 *Dunadd: An Early Dalriadic Capital*. Oxford: Oxbow Books.

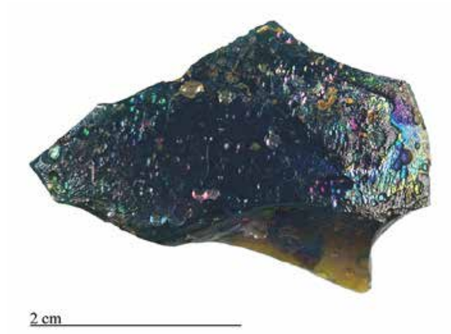
Moretti, C & Hreglich, S 1984 'Opacification and Colouring of Glass by the Use of Anime', *Glass Technology* 25: 277–82.

Price, J (ed) 2000 *Glass in Britain and Ireland AD 350–1100*. London: British Museum Press.

Rooksby, H 1964 'A Yellow Cubic Lead Tin Oxide Opacifier in Ancient Glasses', *Physics and Chemistry of Glasses* 5: 20–5.

Tite, M, Pradell, T & Shortland, A 2008 'Discovery, Production and Use of Tin-Based Opacifiers in Glasses, Enamels and Glazes from the Late Iron Age Onwards: A Reassessment', *Archaeometry* 50(1): 67–84.

25/686



11/1000

25/1385

24/1458

11/1901

11/3469

Illustration D6.8.3
Analysed glass from Portmahomack

Digest 6.9 IRON-WORKING SLAGS

CECILY SPALL (FAS Heritage) with CATHERINE MORTIMER (OLA 7.1.6.4)

1.0 Introduction

A total of *c* 590kg of slag was recovered from excavation across Sector 1 and 2 between 1994 and 2007. The assemblage recovered up to 2004 was assessed rapidly by Dawn MacLaren and Gemma Cruikshanks, National Museums Scotland, in 2006 and slags associated with smelting and smithing were identified and full cataloguing was recommended. A further three seasons of excavation also produced slag and vitrified material and the entire assemblage was subsequently catalogued in 2011–12.

2.0 Summary of assemblage

2.1 Recovery method

No on-site sub-sampling regime was implemented during fieldwork and the assemblage represents all slags excavated, collected either by hand (3-D positioned or recovered by feature) or recovered by the site soil sampling strategy. For a full description of the strategy, see Data Structure Reports; in summary, deposits were bulk sampled for coarse-sieving (100% or min.100l whichever was the greater) and further samples passed through a Sirāf tank (1mm mesh; min 10l or 100% if associated with metallurgical processes) capturing smaller grade slag and micro-slags which were collected by scanning a magnet through dry flotation residues sieved to 2mm and 500µm grade.

2.2 Recording methodology

The Tarbat material was identified visually and sorted into type, weighed, measured where appropriate and as far as possible identified as belonging to one of the following categories:

> dense slag (*ds*); ferruginous concretion with hammerscale (*fc*); flake or spheroidal hammerscale (*hs*); fuelash slag (*fs*); smithing hearth bottom (*shb*); tap slag (*ts*); tuyère (*ty*); undiagnostic iron-working slag (*uis*); vitrified furnace lining (*vfl*).

Hearth bottoms/slag cakes were measured (Diam or length and width × thickness) and weighed, or where incomplete, the diameter and/or the percentage of the whole represented were estimated, allowing the weight to be estimated. The *shb* dimensions were then tabulated to allow comparison of dimensions in relation to mass and density. Assemblages of hammerscale were scanned visually and estimates of the ratio of flake to spheroidal hammerscale recorded (noted as f:s in the catalogue). Good examples of smithing hearth bottoms illustrating the range of sizes, tap slag, hammerscale, vitrified furnace lining with evidence for tuyère holes and diagnostic tuyère fragments were selected for photographic recording and illustration.

2.3 Reconstructing metallurgical processes

Iron working begins with the bloomery process of smelting ore to win an iron bloom, followed by primary smithing whereby the slag-rich, spongy bloom is consolidated into a billet by hammering, followed by secondary smithing of a billet into objects. The first two stages happen at one site and are immediately sequential, while secondary smithing, ie the production of wrought objects from consolidated billets, can take place at a later stage and at a different site, along with the maintenance and repair of items and recycling of scrap. Each stage requires a range of resources and in turn produces a range of waste products, some diagnostic, allowing these metallurgical stages to be identified in overview.

Smelting produces diagnostic tap or rake slag, the former being a liquid 'gangue' of non-iron minerals, primarily silicates, released in a liquid state from the furnace shaft through a tapping arch in the furnace base or allowed to pool at the base, producing dense slag cakes. Tap slag was identified within the assemblage by its characteristic blue-black appearance, probably indicative of high manganese content and its flowing surface morphology and vesicular structure. Tap slag is relatively brittle and at Tarbat was often recovered in angular fragments, which conjoined within context groups. Raked slag is the product of the gangue being manually removed from the furnace shaft while still hot and plastic, although none was identified among the Tarbat residues.

Smelting slag cakes are plano- or concavo-convex in form and can sometimes be differentiated from smithing hearth bottoms on morphological grounds as they tend to be less vesicular or denser and can have run surfaces similar to tap slag. Where the distinction can be made visually, identification has been reinforced by comparing mean density (McDonnell 1994, 230). Morphologically, differentiation between these types of slag at Tarbat was difficult. Tap slag was recorded on the surface of plano-convex and concavo-convex or bowl-shaped slag cakes, but very rarely. Differentiation within the Tarbat assemblage was attempted by calculating density of all the slag cakes (*shbs*). Volume was calculated using πr^2 or πab (a = half length, b = half width) × thickness; density was then calculated by m/v = g/cm^3. Unfortunately, distinct cohorts were not identified, with density ranging across a spectrum from 0.3 to 2.3g/cm^3 with rare outliers. Comparison with data from Howe, where the mean density of smelting cakes and smithing hearth bottoms was recorded (here using the above calculation) as 1.7g/cm^3 and 1.3g/cm^3 suggests that both types of slag cakes are in fact present in all periods at Tarbat, but the actual point of departure between the two is not clear within the recorded data.

Primary smithing produces amorphous smithing slags and large thick flake hammerscale and high relative percentages of spheroidal hammerscale. Flake hammerscale is formed by oxides dislodged from the surface of hot iron by hammering, both during consolidation of a bloom and during secondary smithing; spheroidal hammerscale is formed when molten droplets of oxides are expelled under pressure and harden in the air during primary smithing of a bloom and during fire welding (McDonnell 1984; 1986a; Starley 1995).

Secondary smithing also produces flake and spheroidal hammerscale, amorphous smithing slag and smithing hearth bottoms (*shbs*), which are characteristically plano- or concavo-convex in form. Compositionally, they are primarily fayalitic (iron silicates). In a couple of instances, double *shbs*, one formed on top of the other, were recorded, indicating two episodes of smithing had taken place before removal of the slag cake from the smithing hearth. Where pieces of slag were clearly derived from a fragmented *shb*, it was catalogued as dense slag; these were recorded frequently since *shbs* are characteristically brittle and easily shattered (Bachman 1982, 5). Where recorded, the make-up tended to be vesicular throughout. Ferruginous concretions (*fc*) were recorded, characterised by brightly coloured rust deposits, and hammerscale could sometimes be discerned within the make-up. These are considered to be smaller grade smithing residues, including amorphous slag and hammerscale, which have become fused into a single mass by post-depositional processes, but may represent the floor surfaces of iron-working areas.

Recent studies using high-speed film have confirmed that spheroidal hammerscale can be the result of molten oxides expelled during the closing of a fire weld (Dungworth & Wilkes 2009; McDonnell 1986a, 146; Young 2011). A range of spheroidal microslags, some known as combustion spheres, can also be produced during primary smithing by accidental burning of the iron when over-heated; these can only be differentiated from spheroidal hammerscale by microscopic examination, but it has been assumed that the Tarbat spheroidal scale is indicative of fire welding techniques.

All stages of iron-working can produce residues which are not diagnostic of smithing stages or other high temperature processes. Vitrified furnace lining (*vhl*) has the characteristic appearance of a black to grey vitrified, glassy interior and brightly coloured (red to orange) oxidised exterior, with grey cinder margins. *Vhl* is not necessarily diagnostic of any stage of iron-working or actually metal-working per se. Nevertheless, the material was sometimes noted adhering to the edge of slag cakes and was almost exclusively recovered from features and deposits which also yielded other iron-working residues. Blowing holes for tuyères were frequently recogniseable in the Tarbat examples, demonstrating as a minimum that the hearth linings derived from a structure which required concentrated oxygen input, and therefore probably not domestic in nature.

Other material was more broadly indicative of high-temperature processes not necessarily connected with iron working, including a quantity of 'fuelash slag', sometimes recorded at other sites as 'cinder'.

3.0 Catalogue

3.1 Overview of the assemblage

Sector 1 produced an assemblage of *c* 21kg of slag and by contrast, Sector 2 produced *c* 560kg, being the focus for craft-working throughout all periods (Table D6.9.1). A catalogue was compiled during recording and forms part of the online archive for the project (OLA).

Most bloomery and smithing sites normally produce less than 200kg of slags (McDonnell 1989; 1991; Photos-Jones 2006, 137; 2010a) and the Tarbat assemblage can be considered to be substantial, one of the largest recovered in Scotland. Comparison with other sites, including multi-period sites and from urban and rural locations, confirms the comparatively sizeable assemblage (Table D6.9.2).

4.0 Metallurgical activity by period

The data recorded are presented in Table D6.9.3 by period and metallurgical process.

Table D6.9.1
Summary of slag by sector and intervention

Sector	Int	Weight (kg)
1	11	20.82
	25	0.53
	Total	21.35
2	8	17.11
	14	263.40
	24	269.10
	26	19.19
	Total	568.80
	Grand total	**590.15**

The majority of material derived from late Period 4 deposits (fifteenth to sixteenth century) and included slags indicative of both iron smelting and smithing (73%). A possible smelting hearth and the stance of a smiddy were identified in the field. Overall, much less material derived from deposits and features of Period 1 to 3 (sixth to eleventh century) (3%; 11%; 14%), but iron smithing was identified in all these periods with a relative emphasis on this activity during Period 3, along with some evidence for smelting.

4.1 Period 1

A group of Period 1 features yielded small quantities of smithing slags (*ds*, *uis* and *shbs*). Several features which produced these slags belonged to S11 or lay close-by. S11 hearth F535, gulley F547 and adjacent slag-filled pit F560 yielded just over 2.3kg of undiagnostic iron-smithing and dense slag, which indicates that secondary smithing was probably being undertaken in the building. Other slags recovered from Period 1 backfills and layers included four smithing hearth bottoms (F435, C3529 and C3177).

4.2 Period 2

More than half of the iron-working slags recovered from Sector 1 derived from Period 2 deposits and frequently from features belonging to S1 (*c* 11kg). The range of slags indicates secondary smithing was being undertaken in the building or nearby, although the quantity recovered does not indicate intensive activity. The make-up of the assemblage from nearby Period 2 features reflects that recovered from features belonging to S1, and the assemblage recovered from the building has therefore been assigned to Period 2 occupation. Features from within S1 (F49, F53, F65, F114, F130, F135, F138, F147, F390, F408, F426, F429, F472 and F484) produced about 1kg of slags, primarily fragments of dense slag and undiagnostic smithing slag, along with four incidences of flake hammerscale, recorded

Table D6.9.2
Slag quantities from sites in Britain and Ireland

Site	Quantity of slags	Period (Tarbat equivalent period)
Coppergate, York	248kg	Roman, Anglo-Scan to medieval (McDonnell 1992) (3/4)
Fishergate, York	220kg	Roman, Anglo-Saxon to medieval (McDonnell 1993) (2–4) Roman, Anglo-Saxon to medieval (Mortimer 2005) (2–4)
Walmgate, York	138kg	medieval and late-medieval (MacNab 2003) (4)
St Andrewgate, York	95kg	medieval and late medieval (Mortimer 2004) (4)
Eilean Donan Castle, Ross-shire	120kg	medieval (Mortimer 2009; Starley 2010)(4)
Killickaweeny, Co Westmeath	86kg	ninth to tenth century (Photos-Jones 2010b) (3)
Hoddom, Dumfriesshire	250kg	tenth to twelfth century (Photos-Jones 2006)
Brough of Birsay	14kg	eighth to twelfth century (McDonnell 1986b) (2/3)
Dornoch, Sutherland	12kg	eighth to fifteenth century (Coleman and Photos-Jones 2008) (2/3)
Johnstone I, Co Westmeath	2,000kg	sixth to sixteenth century (Photos-Jones 2010a) (1–4)
Lowpark, Co Mayo	1,372kg	early medieval (Wallace 2010) (2/3)
Seafield, Inverness	9kg	Iron Age (Heald, McDonnell & Mack 2011) (0)

Table D6.9.3
Summary of activities implied by slags by period

Activity	Classification	Weight by period (kg)				
		Period 1	Period 2	Period 3	Period 4	Total
Smelting	tap slag	–	0.13	1.29	4.31	5.73
Smithing	smithing hearth bottom	2.82	12.38	19.98	192.13	227.31
	dense slag	3.91	5.50	25.69	107.97	143.08
	hammerscale	–	0.01	0.88	0.06	0.94
	ferruginous concretion with h'scale	–	0.14	1.83	2.86	4.83
Undiag.	undiagnostic ironworking slag	2.64	9.73	56.18	115.24	183.80
Metallurgical/high temperature process	vitrified hearth/furnace lining	–	0.12	3.07	7.28	10.47
	fuelash slag	0.02	3.68	8.65	0.86	13.20
Grand total		**18.79**	**63.38**	**82.17**	**430.71**	**590.15**

in small quantities, and a smithing hearth bottom. Nearby Period 2 deposits trapped in the sinking fills of early Period 2 ditch S15 produced over 4.5kg of slags, including dense slag (recorded with adhering vitrified furnace lining), smithing hearth bottoms, vitrified furnace lining and a single possible instance of tap slag, although, as the fragment is isolated and small, it most probably represents fayalitic run slag from smithing, given the make-up of the associated assemblage. Nearby Period 2 features F34 and F401 produced 5.6kg of slags, including five smithing hearth bottoms and vitrified furnace lining.

Within Sector 2, just over 12kg of slags were recovered from Period 2 features and deposits. Too little was recovered from Period 1 for the Period 2 assemblage to be considered residual, indicating that smithing activity continued. The slags were recovered from secondary deposits and the locus for the activity was not identified, with only 4.4g of flake hammerscale recovered. Fuelash slag was frequently recorded (3.5kg) and may relate to a range of high temperature craft-working and domestic processes, and to the firey destruction of structures which marks the end of the period.

Slags recovered from Period 2 deposits and features included seven *shbs*, *ds*, *uss* and *vfl*; again small occurrences of possible tap slag were recorded, although fayalitic run slag is a more likely identification.

Slags were recovered from the backfill of the Period 2 enclosure ditch (S16, F36) where the feature was sampled within Int 8, but these are assigned to Period 4 activity; elsewhere the feature is levelled early in Period 4.

4.3 Period 3

A more significant component of the assemblage (109kg) was recovered from deposits of Period 3 origin, notably including from primary metal-working dumps. The assemblage was restricted to Sector 2 and indicated that both iron smelting and smithing was being undertaken.

A total of nearly 3kg of *ts* was recorded from Period 3 strata, indicating that smelting was being undertaken, although none could be associated with specific features. A similar quantity of *vfl* was also recorded, along with 0.8kg of *ty* fragments, including a single, complete tuyère recovered from deposits which made up the Period 3 metal-working terrace. The tuyère may be related to small, clay-built non-ferrous metal-working hearths which characterise the Period 3 metal-working complex.

The period also produced the most hammerscale (876g), accounted for largely by a single deposit from a pit (F288 C1667) which was extremely rich in hammerscale, producing 0.61kg. The quantity and ratio of 1:10 spheroidal to flake *hs* signals fire-welding was taking place nearby, although no features directly associated with iron-working were identified.

The Period 3 assemblage comprised *c* 20kg of *shbs* and *c* 26kg of *ds*, some of which is likely to represent shattered *shbs* along with 56kg of *uss*. A notably large *shb* was recorded measuring 240mm × 200mm × 80mm Th and weighing 3.1kg. The cake may represent a large smelting furnace base or indicate that large objects were being smithed. Comparison of the mean mass and dimensions of all Period 3 cakes with those recorded on other early medieval sites indicates that the Tarbat cakes are significantly larger overall (Table D6.9.4).

Period 3 also produced the greatest quantity of fuelash slag (over 8.5kg).

Table D6.9.4
Mean mass and diameter of slag cakes from early medieval sites in Britain

Site	Mean mass	Standard Dev	Mean diam	Standard. dev
Tarbat n = 25	991g	747	132mm	35
Coppergate (McDonnell 1992, 475) n = 163	385g	304	95mm	30
Fishergate (McDonnell 1993, 1225) n = 46	460g	265	100mm	20
Wharram Percy (McDonnell 2000, 156) n = 22	369g	–	95mm	–
Brough of Birsay (McDonnell 1986b, 201) n = 21	158g	–	57mm	–

This material generally consisted of very lightweight vitrified material, predominantly with a high silica content, where this could be discerned. The deposits which yielded quantities of the material could largely be identified with the primary burning horizon at the site, suggesting the origin of the material could have been the site-wide conflagration that destroyed S9 and affected upstanding features across the northern part of Sector 2.

Table D6.9.5
Mean mass and diameter of slag cakes from medieval sites in the Highlands

Site	Mean mass	Standard dev	Mean diam	Standard dev
Tarbat n = 77	1242g	682	132	28
Eilean Donan Castle (Starley 2010) n = 39	1165g	723	139	28

4.4 Period 4

The majority of the material was recovered from deposits of Period 4 origin. The material was recovered from secondary soil layers, which characterise the period across Sector 2, and also from isolated deposits traps, such as the late fills of Period 3 ditches and hollows created by subsiding Period 2 feature fills. The material was distributed fairly widely across the infilled monastic pool and within a concentrated area identified as the floor of a medieval smiddy associated with the remains of drystone walls. Unfortunately, the smithy was identified during post-excavation and no recovery of microslags in the field was undertaken.

Evidence for smelting took the form of a single possible smelting hearth (F11) and was recorded as a stone-lined shallow pit measuring *c* 0.6m in diameter. A total of 1.5kg of *ts* was recovered from the feature along with 0.65kg of *uis* and 0.20kg of *vfl*. Other evidence for smelting was recorded in the form of 1.25kg of tap slag and a slag cake with tap slag on its surface.

Evidence for secondary smithing was dominated by a smithy identified as an open-fronted stone-built structure measuring 9 × 10m in plan, abutting a stone-walled enclosure (S18). The walls enclosed a large spread of concreted slag, which included patches of in situ burning and some lenses of discolouration from copper alloy, perhaps from brazing. Slag recovered from this deposit (F109) and from nearby features included thirteen *shbs* – including two double *shbs* – along with 6.6kg of *ds*. Hammerscale was recorded from associated slag spread C1496. The wall core of an adjacent wall was filled with complete *shbs* (F189), while thirty-two others were recovered from a nearby spread of rubbly hardcore (C1326).

Examples of excavated smithies are few and comparable rural smithies include fourteenth and fifteenth-century examples from Goltho and Burton Dassett. The dimensions of the Tarbat smiddy are broadly comparable with the structures identified at these two sites (Goltho 8mm × 4m; Burton Dassett 14mm × 15m) (McDonnell 2000, 165).

Again, the size and weight of the Period 4 *shbs* are exceptionally large and compare well with an assemblage of *shbs* recovered from Eilean Donan Castle (Table D6.9.5). The *shbs* from Eilean Donan are associated with a late medieval episode of smithing of large iron items; a hearth filled with slags was radiocarbon-dated to 1450–1640 (95%) (Starley 2010). Items smithed at Tarbat are also likely to have been sizeable and, although speculative, may have included the manufacture of arms. Evidence for late medieval clan-based ironworking has been detected at Highland sites and is thought to have been stimulated by inter-clan warfare and conflict (Atkinson 2003).

4.4.1 Iron sources

The iron smelted at Tarbat during Period 3 and late Period 4 was almost certainly won from roasted bog ore. Alternative sources of iron ore from geological strata – carbonate, haematite and limonite – are not found nearby (Tylecote 1986, 124–5). The underlying solid geology of iron oxide-rich Old Red Sandstone, coupled with the wet, boggy conditions of parts of the site from the Iron Age onwards, would probably present ideal conditions for bog ore formation.

Iron smelting was identified across the firth at salvage excavations within the historic core of Dornoch, in deposits of eighth to fifteenth-century date, from which fragments of bog ore were positively identified (Coleman & Photos-Jones 2008, 13–15). A study of iron ore exploitation in the Highlands concluded that prior to the seventeenth century, small-scale iron smelting won ore from regenerative bog deposits (Photos-Jones et al 1998).

References

Atkinson, J 2003 'Late Medieval Bloomery Sites: Settlement and Industry in the Scottish Highlands', *in* Govan S (ed), *Medieval or Later Rural Settlement in Scotland: 10 Years On*, 35–44. Edinburgh: Historic Scotland.

Bachman, H 1982 'The Identification of Slags from Archaeological Sites', *Institute of Archaeology, Occasional Publication No 6*.

Ballin Smith, B (ed) 1994 *Howe: four millennia of Orkney Prehistory, Excavations 1972–82*. Edinburgh: Society of Antiquaries of Scotland.

Carlin, N, Clarke, L & Walsh, F 2010 *The Archaeology of Life and Death in the Boyne Floodplain: The Linear Landscape of the M4, Kinnegad-Enfield-Kilcock motorway*. Dublin: NRA Scheme.

Coleman, R & Photos-Jones, E 2008 'Early medieval settlement and ironworking in Dornoch, Sutherland: excavations at The Meadows Business Park', *Scottish Archaeological Internet Report* 28.

Cressey, M & Anderson, S 2011 'A Late Prehistoric Settlement and Metalworking Site at Seafield West, near Inverness, Highland', *Scottish Archaeological Internet Report* 47.

Dungworth, D & Wilkes, R 2009 'Understanding hammerscale: the use of high-speed film and electron microscopy', *Historical Metallurgy* 43(1): 33–46.

Gillespie, R F & Kerrigan, G 2010 *Of Troughs and Tuyères: the archaeology of the N5 Charlestown Bypass*. Dublin: NRA Scheme.

Govan, S (ed) 2003 *Medieval or Later Rural Settlement in Scotland: 10 Years On*. Edinburgh: Historic Scotland.

Heald, A, McDonnell, G J & Mack, I 2011 *in* Cressey, M & Anderson, S 'A Late Prehistoric Settlement and Metalworking Site at Seafield West, near Inverness, Highland', *Scottish Archaeological Internet Report* 47: 20–4.

Hunter, J R 1986 *Rescue excavations on the Brough of Birsay 1974–82*. Edinburgh: Society of Antiquaries of Scotland.

Lowe, C 2006 *Excavations at Hoddom, Dumfriesshire*. Edinburgh: Society of Antiquaries of Scotland.

McDonnell, G J 1984 'The study of early smithing residues', *in* Scott, B G & Cleere, H (eds) *Crafts of the Blacksmith*, 47–52. Belfast: The Ulster Museum.

McDonnell, G J 1986a *The classification of early ironworking slags*. Unpublished PhD thesis, Aston University.

McDonnell, G J 1986b 'Iron and Ironworking with technological discussion and analyses', *in* Hunter, J R *Rescue excavations on the Brough of Birsay 1974–82*, 198–203. Edinburgh: Society of Antiquaries of Scotland.

McDonnell, G J 1989 'Iron and its alloys in the fifth to eleventh centuries AD in England', *World Archaeology* 20: 373–82.

McDonnell, G J 1991 'The classification of slags from Launceston Castle, Cornwall', *Ancient Monuments Laboratory Report* 125/91.

McDonnell, G J 1992 'The ironworking residues', *in* Ottaway, P J 1992: 476–85.

McDonnell, G J 1993 'Ironworking residues', *in* Rogers, N S H 1993: 1224–28.

McDonnell, G J 1994 'The Slag', *in* Ballin Smith, B: 228–34.

McDonnell, G J 2000 'The Ironworking Evidence', *in* Stamper, P A & Croft R A (eds) 2000: 155–66.

Mortimer, C 2005 'Assessment of metal-working wastes', *in* Spall C A & Toop N J (eds) *Excavations at Blue Bridge Lane and Fishergate House, York*. www.archaeologicalplanningconsultancy.co.uk/mono/001.

Mortimer, C 2009 *Assessment of Metal-working debris from Eilean Donan Castle, Ross-shire*. Uunpublished technical report.

Ottaway, P J 1992 *Anglo-Scandinavian Ironwork from Coppergate, The Archaeology of York, The Small Finds 17/6*. York: Council for British Archaeology.

Photos-Jones, E, Atkinson, J A, Hall, A J & Banks, I 1998 'The bloomery mounds of the Scottish Highlands, Part 1: the archaeological background', *Historic Metallurgy* 32(1): 15–32.

Photos-Jones, E 2006 'Metallurgical waste', *in* Lowe, C 2006: 137–44.

Photos-Jones, E 2010a 'Johnstown 1, Metallurgical waste', *in* Carlin, N, Clarke, L & Walsh F *The Archaeology of Life and Death in the Boyne Floodplain: The Linear Landscape of the M4, Kinnegad-Enfield-Kilcock motorway*. Dublin: NRA Scheme.

Photos-Jones, E 2010b 'Killickaweeny 1, Metallurgical waste', in Carlin, N, Clarke L & Walsh, F, Scott, B G & Cleere, H 1984 *Crafts of the Blacksmith*. Belfast: The Ulster Museum.

Spall, C A & Toop, N J 2005 *Excavations at Blue Bridge Lane and Fishergate House*, www.archaeologicalplanningconsultancy.co.uk/mono/001.

Starley, D 1995 'Hammerscale', *Historical Metallurgy Society Datasheet 10*.

Starley, D 2010 *Assessment of Metal-working debris from Eilean Donan Castle, Ross-shire*. Unpublished technical report.

Rogers, N S H 1993 *Anglian and Other Finds from 45–54 Fishergate, The Archaeology of York, The Small Finds, 17/9*. York: Council for British Archaeology.

Stamper P A & Croft R A 2000 *Wharram, A study of Settlement on the Wolds*, 7, *The South Manor Area*. York: York University Archaeological Reports.

Tylecote, R F 1986 *The Prehistory of Metallurgy in the British Isles*. London: Institute of Metals.

Wallace, A 2010 'Appendix VIIIb: Metallurgical Residues from Lowpark', *in* Gillespie, R F & Kerrigan A *Of Troughs and Tuyères: the archaeology of the N5 Charlestown Bypass*. Dublin: NRA Scheme.

Young, T 2011 'Some preliminary observations on hammerscale and its implications for understanding welding', *Historical Metallurgy* 45(1): 26–41.

Digest 6.10 GEOLOGY OF STONE USED FOR SCULPTURE AND BUILDING

NIGEL RUCKLEY

Method

A project designed to identify the type and sources of stone used in carving and building at Portmahomack was undertaken from 1998, and included the following tasks:

(a) Examination of carved stones held in the collection of the National Museum of Scotland at their workshop in Granton, Edinburgh (NMS);
(b) The collection of a representative sandstone collection from quarries and exposures in the Tarbat peninsula;
(c) Literature search for former quarry sites and geological notes pertaining to the project;
(d) Brief examination of the sandstones used in Tarbat Old Church;
(e) The establishment of a database of magnetic susceptibility readings from geological samples and carved stones;
(f) The establishment of a database of published geological data on carved stones.

The local geology

Portmahomack lies almost at the centre of an arc of sandstones that extend from the south shores of the Moray Firth, across the Black Isle and northwards in a thin coastal strip of sandstone towards Helmsdale, where a mass of granite (*c* 420 Ma), emplaced during the late phase of the Caledonides, separates the strip from the extensive Old Red Sandstones of Caithness. The ages of these sandstones vary from Devonian (Old Red Sandstone) (410–360 Ma) centred on the Black Isle and Tarbat peninsula to Triassic (250–200 Ma) between Burghhead and Lossiemouth, and Jurassic (200–140 Ma) around Golspie.

The Tarbat peninsula, apart from the hill of North Sutor, is composed of Devonian sandstones belonging to the Old Red Sandstone Supergroup. The coastal strip from Tain eastwards towards Portmahomack and Tarbat Ness is comprised of Upper Old Red Sandstones of the Balnagown Group (UORS), whilst sandstones exposed along the coast from a little south of Shandwick and extending northwards along the southern coast of the peninsula to Wilkhaven are comprised of Middle Old Red Sandstones of the Strath Rory Group (MORS). The base of the UORS is conjectural, but is thought to run on a line from Nigg Bay to Hill of Fearn and then north east to Pitkerrie, Meikle Tarrel and on the coast at Wilkhaven. Middle and Upper Jurassic sediments of clayey siltstone, sandy siltstone interbedded with calcareous siltstone, and coarse, poorly fossiliferous bituminous siltstone are exposed on the foreshore south of Balintore. Drift deposits of either boulder clay or, nearer the coast, of raised beach deposits, limit rock outcrop to the coastal section. The Moinian psammitic granulite of the North Sutor comprises the largest inland exposure of rock.

Quarries are generally limited to coastal areas or places where the drift deposits are shallow, as in the Lower Pitkerrie area. Today there are no working quarries, but around a dozen quarries are known to have been in existence since the eighteenth century.

Stone used for Pictish sculpture

Only one of the stones from the group so far recovered at Tarbat can be said, with some degree of certainty, to come from the exposures in the immediate neighbourhood of Portmahomack; this is TR28, the 'Calf' stone.

A group of stones, defined by the presence of iron blebs or of Liesegang rings, include the finest of the Tarbat sculptures (TR1, TR10 and TR20), as well as the other monumental stones sited elsewhere on the Tarbat peninsula: Nigg, Shandwick and Hilton of Cadboll (this also applies to the additional flaked fragments recovered at the Hilton chapel in 1998). On this basis, the petrological verdict is that TR10 (the inscription) and TR20 (the Apostle Stone) could have come from the same geological formation. However, TR2 (and TR7) do not match TR10 and TR20 geologically and thus are unlikely to have formed part of the same monument. No rock exposures examined so far on the Tarbat peninsula showed the presence either of the iron blebs or the Liesegang rings, so the source for the major Tarbat monuments is as yet unidentified and may lie beyond the peninsula (Note: they have since been found by sculptor Barry Grove at Geanies. Ed).

Other stones likely to have been brought from further afield are the bosses TR5 and TR6 and the interlace panel TR2, which are of sandstone that might have affinities with the Triassic deposits on the south side of the Moray Firth.

The grave-marker TR21 is also probably imported. It is composed of clast-free colour-laminated fine grained sandstone. The broken surfaces exhibit 5YR7/1 'light grey' and darker 2.5YR5/2 'weak red' laminated bands. The darker bands, between 5mm and 10mm thick, are rich in biotite mica. The high mafic content of this sandstone gave a comparatively high magnetic susceptibility average reading of 0.1225 (compared with, for example, the 0.015833 of TR1). Although the quarry at Shandwick has reddish laminated sandstones with mica-rich bedding planes, TR21 bore no resemblance to the range of stone in the quarry and does not seem to come from the Tarbat peninsula.

Stone used for church building

Tarbat Old Church (St Colman's) contained a variety of sandstones from known and unknown sources. Most of the stone does not appear to be from the immediate vicinity of the building. Evidence of fire-burnt stones was apparent in the crypt. The resultant damage to the stones would invalidate any magnetic susceptibility readings.

South exterior wall

The basal stones forming the first visible horizon of the wall on the south side of the church (F63 C1180) (Church 2), to the right of the entrance, appear to be sandstone of UORS age. Some blocks are fine to medium grained, while other ones are of a coarser texture, up to coarse grain size. Clasts of mudstone or voids, where the softer mudstone has weathered out, can be up to l0mm long by 2mm thick. Weathering of the stones has reduced even more the original low mafic content and the mica content. The colour varies from 2.5YR 6/2 'pale red' to 2.5YR 5/2 'weak red'. They were probably extracted from outcrops in the Portmahomack to Tarbat Ness area.

The main fabric of the lower south external wall (F64 C1181) (Church 6) is comprised from a 10YR 6/6 'brownish yellow' well sorted medium sandstone. It is of massive appearance and well cemented, containing no mudstone or lithic clasts. The general appearance would suggest that the stone came from the MORS beds of the peninsula. The 10YR 5/4 'weak red' coloured fine to medium grained laminated sandstones used for the upper courses of the wall (when the wallhead was raised in the eighteenth century) (Church 6) immediately below the roof line are again not found locally.

Mica was evident on the bedding planes. Mudstone clasts varied from pea-size up to 80mm by 35mm. Some clasts have green-coloured reduction spots. The stone was not from the former quarry at Shandwick or from the Tarbat peninsula. It is of ORS appearance, possibly from the Black Isle/Cromarty Firth area.

Threshold stone

The threshold stone (F108 C1253) (Church 2), now split, is formed from an extremely fine grained sandstone. Clearly it is not from the immediate vicinity, but has affinities to MORS from the south side of the peninsula, on the shore near Balintore.

Crypt

The east wall of the crypt (F3 C1002) (Church 1 or 4) contained many fire damaged sandstone blocks. No glacial erratics were noted. The stones in general had more in common with MORS sandstones than the local UORS from Portmahomack beach. The west end of the crypt (F4 C1003) (Church 4) again showed evidence of major rebuilding and fire damage. No igneous or metamorphic erratics were noted, and the sandstones in general indicated a non-local source. Again, they appear to be from the MORS of the peninsula.

West end of nave

The pillars at the west end of the church are imported (Church 5). The grain is very fine and compact with a high quartz content. No lithic or mudstone clasts were noted and the 5Y 5/3 'olive' colour was noted to change to a 5YR 5/3 'reddish brown' on a weathered surface. The stone does not resemble any from the Tarbat peninsula. The very fine to fine current bedded sandstones forming the west belfry arch at the north-west corner of the church (Church 5) are 5Y 6/3 'pale olive' in colour. Mudstone clasts of 5Y 4/1 'dark grey' to 5GY 4/1 'dark greenish grey' colour can be seen and the bedding is picked out by grey 1mm thick laminae. Some Fe blebs are present with Fe staining on the surface. The stone is not from the immediate area of the church and sandstone with Fe blebs has not been recorded in the peninsula. The sandstone of the extant belfry provided a contrast to the stone found in the rest of the church (Church 6). The honeycomb nature of some blocks indicated its variable weathering qualities and other blocks were prone to algal staining. The colour on clean faces varied from 2.5Y 7/2 'light grey' to 2.5Y 7/4 'pale yellow'. The well-sorted very fine to fine grained sandstone exhibited numerous sedimentary structures, including current and planar bedding. The stone does resemble a sample from the former quarry at Cadboll, obtained last November by Mr B Grove. Again, this indicated that sandstones from the MORS were preferred for a high status building.

Conclusion

The stone outcropping on the west coast in the neighbourhood of the site is UORS, of reddish hue and often weathered. The stone outcropping on the east side of the peninsula is MORS, of yellowish hue and of higher quality.

One stone used for carving Pictish sculpture was obtained in the immediate locality (UORS TR28). Two of the grander carvings used stone from the east coast (MORS: TR1 and TR10 with TR20). A third (TR2, 5 and 6) may have used stone from triassic deposits on the south side of the Moray Firth. The grave marker TR21 was certainly imported from an unknown origin beyond the Tarbat peninsula.

If Church 1 survives in the east wall of the crypt, it was built in MORS (east coast). Church 2, the first medieval church, was built in UORS, apart from its threshold, which was of the better quality MORS. Church 4 (thirteenth century) was of MORS, as were Church 5 and 6 (post-medieval) including the Belfry. The pillars for Church 5 were imported.

[Ed. CAS & MOHC July 2013]

Digest 6.11 SOURCE OF THE PUMICE

ANTHONY NEWTON (University of Edinburgh)

All of the pumice is light grey to brown in colour and most of the pieces show signs of wear. In Scotland, pumice finds are most numerous in the Western Isles and in Orkney and Shetland. Pumice has also been found in the Easter Ross area, including a pumice pendant in an Iron Age cist at Golspie and a single piece was retrieved from a late Neolithic chambered cairn at Embo (Binns 1971) and Golspie (Newton 1999). All of the Tarbat pumice is morphologically similar to other pumice pieces found at over 150, mainly coastal, archaeological sites in Scotland, ranging from the Neolithic to the Norse and later medieval periods (Dugmore et al 2000; Newton & Dugmore 2003; Newton 1999, 2001; Dugmore & Newton 2012). The grey to brown pumice variations are not significant and do not indicate different sources. Pumice similar to the Tarbat pumice when analysed are dacitic in composition and have been related to eruptions from the Katla volcanic system in southern Iceland. It is likely that the pumice was retrieved from either local contemporary or raised shorelines.

References

Binns R E 1971 *The distribution and origin of pumice on postglacial strandlines in northern Europe and the western Arctic*. Unpublished MSc thesis, University of Wales.

Dugmore, A J, Newton, A J, Larsen, G & Cook, G T 2000 'Tephrochronology, environmental change and the Norse settlement of Iceland', *Environmental Archaeology* 5: 21–34.

Dugmore A J & Newton A J 2012 'Isochrons and beyond: maximising the use of tephrochronology in geomorphology', *Jökull* 62: 39–52.

Newton A J 1999 *Ocean-transported pumice in the North Atlantic*. Unpublished PhD dissertation, University of Edinburgh.

Newton, A J 2001 'The pumice', *in* Mithen S (ed) *Hunter gather landscape archaeology: The Southern Hebrides Project 1988–1998*, 403–5. Cambridge: McDonald Institute.

Newton A J & Dugmore A J 2003 'Analysis of pumice from Baleshare', *in* Barber J (ed) *Bronze Age farms and Iron Age farm mounds of the Outer Hebrides*, 135–8. Edinburgh: SAIR.

Digest 6.12 UNFINISHED GAMING BOARD

MARK HALL (Perth Museum) (OLA 7.1.3.4)

This broken piece of sandstone, measuring 200mm × 132mm × 17mm is incised with a graffito of an unfinished grid of lines that is most likely to have been intended to serve as a gaming board design (14/3932; C1660) (Illus 6.6). The design comprises six parallel incised lines, some doubly or triply incised, spaced at *c* 20mm intervals, crossed at one end by three parallel lines at *c* 15mm intervals, forming a partial grid containing ten complete or partial cells.

Although incomplete, it is comparable to boards from across Scotland (Hall 2007), particularly Orkney (eg Buckquoy (Ritchie 1979, 198–9), the neighbouring site of Red Craig house (Brundle 2004) and the nearby settlement site of Howe, Stromness (Ballin Smith 1994, 188)) and Shetland (eg Jarlshof (Hamilton 1956: plate xxxi, no 1)). The three Buckquoy farmstead examples are all incised on similar sized fragments of flagstone (2) and sandstone, measuring 190–2235mm × 170mm–175mm × 24–32mm. From the dun site of Dun Chonallaich, near Kilmartin, Argyll (Dal Riata), comes a further stone example, slightly bigger in size (Ritchie 1987, 62 and fig 2).

From a monastic context, we should note the flat beach pebble, measuring 235mm × 193mm × 20mm, from Inchmarnock, off Bute, and incised on both sides with gridded or cellular gaming boards. Face 1 has a neat design of 6 × 6 cells, with a distinctive central cell indicated (as per the examples already cited). Face 2 carries an erratic and unplayable design, similar in appearance to the board from Jarlshof cited above (which also carries a neatly executed board on its other face). From Inchmarnock, there are a further five boards with similar designs in various stages of completeness and size (from 60mm × 50mm × 3mm to 345mm × 265mm × 25mm), two of them found in re-use contexts as packing stones in a post hole and part of the lining of an early medieval grave (for a full discussion and catalogue of the boards see Ritchie 2008). The Inchmarnock boards can be interpreted as evidence for both play by the brothers and the teaching of elite pupils as part of its school function (Hall 2011, 150).

Such boards were not confined to graffiti-on-stone examples. Perhaps the finest example of a high status board of this type is that from Ballinderry crannog, Ireland, and dating to the tenth century. Made of wood and elaborately carved, it measures 249mm × 243mm (Graham-Campbell 1980, 23; Wallace & Ò Floinn 2002, 31 and pl 6, 22). Not quite as elaborate but undoubtedly special looking when complete, is the fragment of whalebone board (like Ballinderry marked with peg-holes) from the Brough of Birsay (Curle 1982: illus 50. 274).

As far as material, size and incompleteness go, there is no objection to the example from Tarbat being an unfinished example of a board for *gwyddbwyll*, *fidcheall* and *brandubh* or *tafl* (especially *hnefatafl*). Arguments have been advanced recently for these respectively British, Irish and Scandinavian games as being variants derived from a common Roman ancestor, Ludus Latrunculorum (Hall & Forsyth 2011). The dating and the north British, not to say Pictish, context of the Tarbat example would strongly suggest the game intended was *gwyddbwyll* or *brandubh*. The limited descriptions of *gwyddbwyll* suggest it may have been akin to the Irish version *brandubh*, which lacked the designation of special corner cells, a feature of the Scandinavian version (and also of *fidcheall*, probably the Irish adaptation of the Viking version).

The context and its dating have been described by the excavators as 'recovered from C1660 which was a layer overlying the "primary burning" horizon … associated with the destruction of the eighth-century monastery (Period 2), which was followed by landscaping – including layers such as C1660 – which marks the beginning of re-use of the site in Period 3 (ninth-century craft-working)'. The other finds from this context comprise animal bone, several pieces of slag and a whetstone, nothing really that sheds light on the context of use (though we might note that the board from Dun Chonallaich mentioned above had its back used as a whetstone and that a whetstone was also found with a possible whetstone (Morris 1989, 156)) but perhaps confirms the site destruction disturbance, interpreted as Viking attack.

Description

14/3932

Unfinished gaming board, broken medium to fine-grained, red, ferruginous sanstone tile with six parallel incised lines, some multiply incised, spaced at *c* 20mm, crossed at one end by three parallel lines spaced at *c* 15mm, forming partial grid, 200mm L × 132mm W × 17mm Th (C1660).

References

Brundle, A 2004 'The graffito on the gaming board from the Red Craig house, Birsay, Orkney', *in Papers and Pictures in honour of Daphne Home Lorimer MBE* at: http://www.orkneyjar.com/archaeology/dhl/papers/index.html (accessed on 30/03/2004).

Curle, C L 1982 *Pictish and Norse finds from the Brough of Birsay 1934–74*, Edinburgh: Society of Antiquaries of Scotland.

Graham-Campbell, J 1980 *Viking Artefact A Select Catalogue*. London: British Museum.

Hall, M A 2007 *Playtime in Pictland: The Material Culture of Gaming in Early Medieval Scotland*. Rosemarkie: Groam House Museum.

Hall, M A 2011 'Playtime: The Material Culture of Gaming in Medieval Scotland', *in* Cowan, T & Henderson, L (eds) *A History of Everyday Life in Medieval Scotland 1000–1600*, 145–68. Edinburgh: Edinburgh University Press.

Hall, M A & Forsyth, K 2011 'Roman rules? The Introduction of Board Games to Britain and Ireland', *Antiquity* 85.330: 1325–38.

Hamilton, J R C 1956 *Excavations at Jarlshof, Shetland*. Edinburgh: HMSO.

Morris, C D 1989 *The Birsay Bay Project Volume 1 Brough Road Excavations 1976–1982*. Durham: University of Durham.

Ritchie, A 1979 'Excavation of Pictish and Viking-Age farmsteads at Buckquoy, Orkney', *Proc Soc Antiq Scot* 108 (1976–77): 174–227.

Ritchie, A 1987 'The Picto-Scottish interface in material culture', *in* Small, A (ed) *The Picts A New Look at Old Problems*, 59–67. Dundee: Graham Hunter Foundation Inc.

Ritchie, A 2008 'Gaming boards', *in* Lowe, C *Inchmarnock: An Early Historic Island Monastery and its archaeological landscape*, 116–28. Edinburgh: Society of Antiquaries of Scotland.

Wallace, P F & Ò Floinn, R (eds) 2002 *Treasures of the National Museum of Ireland Irish Antiquities*. Dublin: Gill & Macmillan/National Museum of Ireland.

Digest 6.13 VIKING AGE WEIGHT

MONICA MALESZKA-RITCHIE

Description [Illus D6.1.12]

The lead bullion weight recovered from the monastic site at Portmahomack is very well preserved (11/4158; C1000). It is cylindrical in shape and weighs 26.3g (before conservation) It measures 21.8mm in diameter and 71mm in height. The top of the cylindrical weight has a small dent or cut, probably the result of damage in antiquity or during deposition. Two small markings are also visible, which may be the remains of two hollow-punched decorations. Both surfaces have slight cracks and scratches. As the weight has little evidence of corrosion and only minimal damage, it seems likely that its present weight (26.3g) is close to its original weight. On this basis, the weight generally conforms to the Viking Age metrological system, it was almost certainly intended to indicate the imprecise Viking øre (Owen 1999).

The context

The lead weight was recovered from the ploughsoil of the site by metal-detecting, where the archaeology was heavily truncated by ancient and modern ploughing. Although this ploughing has removed artefacts from their context, it is interesting that the weight seems to derive from an industrial zone of the site where some of the best-preserved artefacts have been recovered and a known workshop building exists. The focus of activity in this area is thought to have occurred during the eighth and ninth centuries AD.

Weight systems

Throughout the Viking period in Scandinavia (*c* late eighth–eleventh centuries AD), silver and gold was treated as bullion and there was no coin-based economy. Silver was obtained in vast quantities from the east in the form of Arabic silver coins, these were normally melted down in Scandinavia and recast into ingots for compact storage, or made into jewellery. Both ingots and jewellery could be cut up later if small change was required (the resulting fragments known as hack silver). Silver hoards, some of immense value and containing a variety of coins, objects and hack silver, were buried for safekeeping and were occasionally not retrieved. Payments for goods or services were made in silver measured by weight; any silver, whether coin, ornament, hack silver or ingots, was valid in this metal weight economy. The silver was often weighed using a small pair of scales, which were designed to fold up and fit into a small box for portability. Weights of lead, iron and other metals were used by merchants and chieftains to weigh out silver as required. Viking Age weights from archaeological contexts are normally found either in male graves or at trading centres such as Birka, Hedeby, Wolin, Truso and Dublin It is exceptionally rare to find a whole set of weights and the scales that accompany them (Owen 1999, 120–1).

In late medieval Scandinavia, the standard unit of weight was the mark, divided into eight øre (or ounces), each of which consisted of three ørtugar (singular ørtog) (eg Kruse 1988, 286; Owen 1999, 121) However, a number of archaeological studies have identified units apparently equivalent to half an ørtog, or one sixth of an øre, Kruse notes that a weight unit of one sixth of an ounce allows for the convenient division of the ounce both into halves and into thirds. A division into sixths is also consistent with the Viking tendency towards a duodecimal system (Kruse 1988, 289–9). There is little doubt that variations of this system were in use in the Viking Age. However, the actual systems underlying the exchange of Viking silver is not clear and it seems likely that weight systems varied across the Viking world.

A number of studies concerning weight systems have been undertaken on the basis of archaeological evidence. A W Brøgger's classic study, based on Norwegian finds, identified two separate øre standards, one of 26.5g and one of 24g. According to Brøgger, the heavier standard was used in the early Viking Age, with a later shift to the lighter standard (Brøgger 1921, 77–85, 102–3). Another early study by T J Arne, based on Swedish finds, identified a smaller weight unit of *c* 4g – and possibly another of *c* 4.25g – or half an ørtog (Arne 1914, 176–96). Both versions of these units find some corroboration in more recent studies. Kyhlberg identified units of *c* 4g and 4.266g on the basis of weights from Birka (1980, 259) while Steuer suggested units of *c* 4g and 4.26g on the basis of weights from Hedeby (1973, 10–17). Sperber came to similar conclusions, having studied the Swedish evidence. The system was adopted and adapted from the Islamic world as a result of the inflow of Arabic silver to the Baltic Sea region (Sperber 1996, 42–54).

The Islamic system was defined by the Caliph Abd ai-Malik in the year AD 696–7 and was based on the Islamic weight unit for gold, the mitqal, a coin weight established to be 4.233g (Hinz 1970). It was a dual system, intended to be used for both silver and gold without elaborate conversion of the weight figures, provided that gold was exactly 14 times more expensive than silver. Its sub-unit, the dirham, was set at 0.7 of a mitqal. However, the gold and silver prices changed and so did their relative values. The factor 0.7 became irrelevant and the simpler factor of two-thirds of a mitqal replaced it; this system is known as the Islamic trade system. The standard *mitqal* remained unchanged, but the dirham fluctuated by as much as 5% from 2.96g to 2.82g (Sperber 1996, 54).

The Swedish/Islamic system described by Sperber was based on the three-mitqal unit (12.7g). The actual weight sets used by merchants and traders were fractions based on these systems, and the standard unit weight was the ounce, or øre. Deviations within the standard øre of the Viking period weight systems are relatively small, the lowest being about 24g and the highest about 28g (Sperber 1996, 55). This Swedish/Islamic system in Scandinavia and the Baltic region has been recognised in the main in the type of weight that is spherical with flat poles or polyhedral ('cubo-octahedral') in shape. These weights probably had Islamic prototypes and were probably used for weighing precious metals on small portable scales (Sperber 1996, 61). However, in the Viking homelands there were other forms of weights. At the early Viking market place in Ribe, Denmark, a large number of cylindrical weights have been recovered through excavation around a bronze workshop. Some of them are very small, weighing about 1g, and none are much heavier than the equivalent of about one Scandinavian øre. It has been suggested that these small and simple weights from Ribe may have been used not only for weighing small quantities of precious metals in trade, but also for weighing out base metals in the workshop (Owen 1999, 124–5).

The north-west of the expanded Viking world also commonly used many different types and shapes of weight. One of the most interesting assemblages comes from Dublin, containing more than 200 lead weights. Discs, bowls, hemispheres and cones of both plain and perforated varieties, as well as rings, hammer-finished lumps and lead-filled copper alloy containers were recovered. The basic standard unit of the great majority of the weights from Dublin was 26.6g; with multiples or fractions of this weight being prevalent, no mater what their shape (Wallace 1987, 212–14). This is slightly heavier than the most common Scandinavian standard unit (24.4g ± 0.8g), an observation that, together with the absence of Scandinavian-type polyhedral weights, of stamped weight markings and the apparent infrequency of the one-third (ørtugar) unit in Dublin, strengthens the argument that the weight system of Viking Age Scandinavia and the Baltic was slightly different than that of Dublin (Owen 1999, 123). The basic standard unit from Dublin (26.6g) was close to the Roman and Carolingian ounces of 26.8g and 25.6g respectively. The weights from the Dublin excavations probably emphasise and underline Dublin's trade links with the ports of western England (the 'fuzzy unit of 26g': see Kruse's (1988) analysis of ingots from hoards found in England) and the north-west Continental region, and indicate the region's relative economic independence from the Scandinavian world (Wallace 1987, 213). Indeed, a possible changeover in the weight systems of Viking Age Ireland (from a lighter to a heavier øre standard) may be visible as a result of the excavations at the Kilmainham/Islandbridge (Dublin) ninth century cemetery, where weight specimens of both the light and heavy øre standard were recovered (Wallace 1987, 213).

A number of possibilities thus arise from the (albeit limited) archaeological evidence: a single øre standard of somewhere in the 24g–26.6g range, but only very approximately applied, two main standards of *c* 24g and 26.6g, both subject to considerable variation in different times and places; or no single standard across the Viking world, but a variety of similar local standards, with potential for some variation in weight standards over extended periods (Williams 2000, 33).

Discussion

The weights used during the Viking period vary a great deal in size and shape. However, the most common weights in the Baltic Viking Age were polyhedral and spherical weights with flat poles, which appear to have been used across a large geographical area. Lead weights similar to the Portmahomack weight are also very common in both Scandinavia and regions with a Scandinavian influence. These lead weights could be cast by almost anyone, anywhere. In many cases they were not subject to the same rigid control as the bronze weights, which were evidently manufactured in a very limited number of well-equipped workshops – such as that attached to the royal centre of Sigtuna.

There are only three comparable finds to the Portmahomack weight in the Scottish archaeological record, a lead disc-shaped weight of about 9.9g from Buckquoy, Birsay (Ritchie 1977, cat no 96) and the two lead weights from Scar, Orkney (associated with the excavation of the fine Viking boat burial) are both cylindrical in shape and both weigh 26.65g. They are decorated with what are probably weight markings (Owen 1999, 124). Unfortunately, neither of the weights was discovered in situ, although their association with the burial (thought to date to sometime between AD 875 and 950) is not in doubt (Owen 1999, 118). Elsewhere, the simple cylindrical form can be found in the weight assemblages from both Dublin and Ribe (Owen 1999, 125). Given the rarity of the Viking weight in the archaeological record of Scotland, the similarities between the Portmahomack weight and the Scar weights are both striking and intriguing, indeed, the correspondence of these weights to the Dublin øre standard may reward further research.

References

Arne, T J 1914 *La Suede et I'Orient.* Uppsala

Brøgger, A W 1921 *Ertog og øre Den Gamle Norske Vegt.* Kristiania: Dybwad.

Graham-Campbell, J 1980 *Viking Artefacts.* London: British Museum Press.

Gustin, I 1997 'Islam, Merchants, or King? Who was behind the manufacture of Viking Age Weight?', *in* Andersson, H, Carelli, P & Ersgard, L (eds) *Vision of the past. Trends and traditions in Swedish Medieval Archaeology*, 163–77. Lund: Lund University.

Hinz, W 1970 'Islamische Masse und Gewichte', *in Handbuch der Orientalistik, Erste Abteilung, Ergänzungsdand I.* Leiden/Köln: E J Brill.

Kruse, S E 1988 'Ingots and weight units in Viking Age silver hoards', *World Archaeology* 20.2: 285–301.

Kruse, S E 1989 'Silver storage and circulation in Viking-Age Scotland', *in* Batey, C E, Jesch, J & Morris, C D (eds) *The Viking Age in Caithness, Orkney and the North* Atlantic, 189–201. Edinburgh: Edinburgh University Press.

Kruse, S E 1992 'Late Saxon Balances and Weight from England', *Medieval Archaeology* 36: 67–95.

Kyhlberg, O 1980 *Vikt och värde. Arkeologiska studier i värdemätning, betalningsmedel och metrologi. I. Helgö. II. Birka.* Stockholm: Stockholm Studies in Archaeology.

Owen, O 1999 'The lead bullion weights', *in* Owen, O & Dalland, M (eds) *Scar. A Viking Boat Burial on Sanday, Orkney*, 118–26. East Linton: Tuckwell Press.

Ritchie, A 1977 'Excavation of Pictish and Viking-age farmsteads at Buckquoy, Orkney', *Proc Soc Antiq Scot* 108 (1976–7): 174–227.

Soderberg, A 1996 *Schmelzkugeln. Identifikation av en hantverks process. Fyndmaterial från Birka och Sigtuna.* Stockholm.

Sperber, E 1996 *Balances, Weight and Weighing in Ancient and Early Medieval Sweden.* Stockholm: Stockholm University.

Steuer, H 1973 'Gewichte aus Haithabu', *Berichte Dber die Ausgrabungen in Haithabu* 6: 9–22.

Steuer, H 1987 'Gewichtsgeldwirtschaft in fruhgeschichtlichen Europa', *in* Duwel, K, Jankuhn, H, Siems, H, Timpe, D (eds) *Untersuchungen zu Handel und Verkehr der vor – und frühgeschichtlichen Zeit in Mittel- und Nordeuropa, part* 4, *Der Handel der Karolinger – und Wikingerzeit*, 405–527. Gottingen.

Steuer, H 1997 *Waagen und Gewichte aus dem Mittelalterlichen Schleswig.* Koln.

Wallace, P F 1987 'The Economy and Commerce of Viking Age Dublin', *in* Jankuhn, H H (ed) *Der handel der Karolinger – und Wikingerzeit, Göttingen. Untersuchungen zu handel und verkehr der vor – und frühgeschichtlichen zeit in Mittel – und Nordeuropa,* part IV: 200–45.

Williams, G 2000 'Anglo-Saxon and Viking Coin Weights', *British Numismatic Journal* 69/1999: 19–36.

Digest 6.14 MEDIEVAL AND LATER COINS

NICK HOLMES (National Museums of Scotland)

Sixty-eight items have been examined, comprising both excavated and metal-detector finds, and these are here treated as a single group for the purpose of analysing the numismatic evidence for activity in the area. Notably absent from the assemblage are any coins minted before the beginning of the thirteenth century. Since finds of coins of this early period are scarce across Scotland as a whole, the fact that there are none in a relatively small group such as this is not necessarily significant, but it may be worth bearing it in mind in conjunction with the evidence from other types of datable artefact.

There are groups of silver pennies and halfpennies from each of the three major issues of the thirteenth and early fourteenth centuries, the majority being English issues, as is normal. From the Short Cross period (up to 1247 in England and 1250 in Scotland) there is one English penny and four cut halfpennies, with a single Scottish penny of William the Lion. Of the subsequent Long Cross coinage, there are three English pennies and three cut halfpennies of Henry III, but no specimen of the contemporary coinage of Alexander III. Of note is the issue from the small Somerset mint of Ilchester – an indicator that not only issues from the major urban mints found their way across the border into Scotland through normal trading activity. There are six pennies of the ubiquitous English Edwardian coinage, together with a single Scottish round halfpenny of John Baliol.

The presence of these nineteen coins is consistent with a continuous period of relatively small-scale human activity during the thirteenth century and the first half of the fourteenth, but coinage issues of the next hundred years or so are represented by just a single penny of Robert III. Hoard evidence indicates that Edwardian pennies continued to circulate in Scotland until well into the second half of the fourteenth century, but that they were increasingly replaced as the century progressed by Scottish issues of David II and Robert II, with some English issues of Edward III. In the first half of the fifteenth century, the coins in circulation seem to have been largely those of Robert III and James I, together with early issues of Henry VI. The presence of just one coin of any of these kings in Tarbat, while not in any way conclusive, might be a clue to reduced economic activity in the area in the later fourteenth and early fifteenth centuries.

The next concentration of coin finds comprises base metal Scottish issues of the later fifteenth and early sixteenth centuries. By this time, the coins held by ordinary people and used for everyday transactions would have been largely of billon, and in some cases pure copper. (As a result of the rising price of silver bullion, successive Scottish kings from David II onwards had reduced first the weight of their coins and then the fineness of the lower denomination issues.)

The Tarbat finds include small groups from the two most common of the billon penny issues – Class C of James III, minted during the later 1470s and early 1480s, and the second issue of James IV, which seems to belong approximately to the first decade of the sixteenth century. There is also a single example of the copper 'Crux Pellit' issue (formerly known as Crossraguel or Bishop Kennedy pennies). The exact period of issue of these coins is still not certain, but they appear more likely to belong entirely within the reign of James III than earlier, and they are considered to have been drastically devalued, probably from three pence to a farthing, in 1482.

The second issue pennies of James IV, which are exceedingly numerous, seem to have satisfied Scottish requirements for small denomination coinage until the reign of Mary, for whom small numbers of billon pennies were struck, followed by very large issues of lions/hardheads, tariffed at one and a half pence Scots, both prior to and during Mary's marriage to the French *Dauphin*, and briefly king, François. Both these denominations are represented at Tarbat, along with a single plack (four pence) of 1557. By this time, almost the entire population must have had access to low-value coins of various denominations, and the issues from the reigns of Mary and of James VI, prior to the Union of the Crowns in 1603, are regularly found in large numbers across Scotland. Of interest here is the French *double tournois* of François I. Coins of this type entered Scotland with French troops during the reigns of James V and Mary, and they are fairly frequent finds in areas close to where those troops were stationed, but the fact that one reached Tarbat is perhaps a little unexpected.

The list of coins below does not tell the full story of post-Union coin finds, since post-1603 Scottish copper issues are excluded from the Scottish Coin Finds Record, on account of their huge numbers and consequent low value as evidence for economic activity in a particular location. The metal-detector finds from this later period have not been examined therefore, and the list includes only those coins found during excavations, with the exception of the Dutch and Swedish issues. Low value issues from both these countries are found in Scotland from time to time, the Dutch issues, however, normally comprising copper *duits*. Finds of billon *stuivers* seem to be more common in the Highlands and the Northern Isles.

List of coins

From Sector 1 (ploughed field) and Sector 2 (middens and smithy)

SCOTLAND (41)

William the Lion Silver penny, third coinage, phase B (*c* 1205?–30), Hue Walter.

John Baliol Silver halfpenny, second ('smooth') issue (1292–6) (Furrow 25/F41 of rig and furrow).

Robert III Silver penny, heavy coinage, second issue (1390–1400), Aberdeen.

James II–III Copper 'Crux Pellit' issue (*c* 1450–82), type IIR.

James III Billon penny (1475–82), class Ci-Ciii*;* Another, class Ciii*;* Another, class Civ-Cv*;* two others, class Cvb.

James III ? Billon penny (*c* 1467–88?).

James IV three × billon pennies, second issue (*c* 1500–10), type III*;* two others, type IVd*;* Another, type IV(d?)*;* Another, uncertain type.

Mary Billon penny, first issue, type 1a (1547+); Another, type 3 (1554–5)*;* Billon plack (1557).

Mary or Mary and Francis Billon lion/hardhead (1555–60).

Mary and Francis two × billon lions/hardheads (1559), type 2*;* Another similar (1559–60), countermarked with star in heart.

James VI two × billon placks (1583–90), type 2*;* Billon hardhead, first issue (August 1588) three × others, second issue (November 1588); Copper twopence, first post-Union issue (1614); two × others, second post-Union issue (1623).

James VI or Charles I Copper twopence/turner (1614–29).

Charles I Silver 20 pence, uncertain issue (1636–42)*;* Silver 2 shillings, fourth coinage (1642)*;* Copper turner, second issue (1632–9)*;* Another, third issue (1642–50).

Charles II Copper turner (1663–8); Copper bawbee (1677–9).

UNIDENTIFIABLE

Copper, probably a Scottish turner or bodle (1642–97).

ENGLAND (17)

Henry II–Henry III, silver short cross series Cut halfpenny, class Vb1 (1205), Ricard, uncertain mint; Penny, class Vb2 (1205–7), Willelm L, London; Cut halfpenny (fragment), class Vc (1207–*c* 1210), Walter, London; Cut halfpenny, class VIIb (uncertain sub-class) (1222–*c* 1236), uncertain moneyer, Canterbury; Cut halfpenny, uncertain class (1180–1247), uncertain moneyer, London.

Henry III, silver long cross series (pennies unless stated) Penny, class 3b (1248–50), Walter, Lincoln; Penny, class 3c (1248–50), Nicole, London; Cut halfpenny, class 3, uncertain sub-class (1248–50), Randulf, Ilchester; Another similar, Henri, London; Cut halfpenny, class 5b–c (1251–72), uncertain moneyer, London; Penny, class 5c–h (1251–72), Robert, Canterbury.

Edward I–II silver pennies Class 3(d?) (1280–1), London; Class 4a2 (*c* 1282–3), Durham; Class 10cf2b (*c* 1306–7), Canterbury; Another similar, London; Class 10cf3a1 (*c* 1307–9), Canterbury; Otherwise unidentifiable (1279–1322).

GREAT BRITAIN (4)

Unidentifiable copper, probably a halfpenny (late seventeenth–eighteenth century).

Two × George III copper halfpenny (1806).

George III silver shilling (1820).

FRANCE (1)

François I Billon double tournois du Dauphiné, first period (1515–40), mint of Roman.

NETHERLANDS (2)

Overyssel Billon *stuiver* (1628).

Zeeland Brass coin-weight for an English gold noble, uncertain maker, *c* 1585–1625.

POLAND? (1)

Silver or billon 12 *groschen* (probably seventeenth century).

SWEDEN (1)

Frederik I Copper *1 ore* (174[ ]).

UNIDENTIFIABLE (1)

Copper disc of diameter 23.5mm.

Coins from Tarbat Old Church

The earliest coin in this group, by some margin, is the English penny of Henry III (cat no 6). Minted during the period 1248–50, this coin would have ceased to be legal tender in England at the commencement of Edward I's new coinage in 1279, and although this does not mean that it could not have continued to circulate in Scotland for some years after this date, the moderate amount of visible wear does not suggest prolonged handling.

Four of the Scottish coins are base metal issues of James III and IV, minted between 1467 and *c* 1510. It seems likely that the penny issues of James III, represented by nos 1 and 2, were demonetised after the introduction of the second issue of James IV in around 1500. The latter issue, represented by nos 3 and 4, is characterised by the presence of crowns and lis in the angles of the reverse cross, and this feature was no doubt intended to make these coins easily distinguishable from those they were intended to replace. These latest issues of James IV were minted in considerable numbers, and appear to have formed the bulk of the lowest-denomination coinage in circulation, until the appearance of the lions of Mary in the 1550s.

The latest coin (No 6) is a post-Union twopence of James VI, from the 1623 issue. These coins were fairly plentiful, but appear to have been replaced in circulation fairly quickly by the turner issues of Charles I, particularly after the introduction of the smaller and lighter 'Stirling' issue in 1632.

List of coins

From Tarbat Old Church (see also Table 7.2)

SCOTLAND

1. James III billon penny, class Ciii (*c* 1475–84) 13.0 × 14.0mm; 0.35g; edge ragged, slight surface corrosion; moderate wear (17/41/C1091).
2. ? James III billon penny (*c* 1467–88?) 14.0 × 13.0mm; 0.47g (0.31 after cleaning); much corrosion and surface accretion (17/95/C1132/F43).
3. James IV billon penny, second issue, type III (*c* 1500–10) 16.0 × 17.0mm; 0.77g; die axis 6.5 obv.: + I0coBVSDeIGR0:R[ ] rev.: + VIL / L0:e / DInB / VRGT slight surface corrosion; fairly worn (context not recorded).
4. James IV billon penny, second issue, type IV(d?) (*c* 1500–10) 14.0 × 15.0mm; 0.40g; die axis 1.5 obv.: + I0coBVS[ ] rev.: + V[IL] / L0De / eDIn / BVRG broken in two; some surface corrosion and accretion; fairly worn (17/94/C1132/F43).
5. James VI copper twopence, second post-Union issue (1623) 19.0 × 18.5mm; 1.83g surfaces corroded; degree of wear uncertain (17/11/C1061).

ENGLAND

6. Henry III silver penny, long cross 3b, by Walter at Lincoln (1248–50) 18.5 × 18.0mm; 1.47g; die axis 5.0 obv. * henRIcVSReX. III' rev.: WaL / TeR / ONL / INc; aL, eR and ON ligatured moderate wear (13/5).

Tarbat Old Church crypt 1991

SCOTLAND

Charles I turner, first issue (1629) 18.5 × 18.0mm; 1.61g; die axis uncertain. Partly corroded; fairly worn (19/66).

Charles I turner, second issue (1632–9) 16.5mm; 0.90g; die axis 330°. Some corrosion; slight to moderate wear (19/62).

Another similar

16.0 × 16.5mm; 0.70g; die axis 90° Chipped; some corrosion; moderate wear (19/63).

Another similar

16.0 × 16.5mm; 0.95g; die axis uncertain Much corrosion (19/64).

Charles I turner, third issue (1642–50) 20.0 × 19.5mm; 2.20g; die axis 180°. Some corrosion; fairly worn (19/58).

Charles I or II turner (1642–50 or 1663–9) 19.5mm; 1.71g; die axis uncertain. Active corrosion (19/59).

Two similar coins, fused together

Worn and corroded (19/60).

Charles II bawbee (1677–9) 6.58g. Some corrosion; very worn (19/69).

Inverness halfpenny token (1796), Dalton and Hamer Inverness-shire 4 or 5 9.66g. Some corrosion; fairly worn (19/71).

GREAT BRITAIN

George II halfpenny, otherwise illegible 7.79g. Very worn and corroded (19/68).

Illegible halfpenny, George II or III 6.89g. Worn flat (19/70).

George III halfpenny (1806) 9.27g Active corrosion (19/72).

FRANCE

Copper double tournois, otherwise unidentifiable (late sixteenth or seventeenth century) 19.5 × 20.0mm; 1.83g; die axis uncertain. Corroded (19/57).

Unidentifiable copper / copper alloy 18.5 × 19.0mm; 1.94g; die axis uncertain Corroded (19/61).

Unidentifiable copper / copper alloy 16.5mm; 1.05g; die axis uncertain. Corroded (19/65).

Digest 6.15 REPORT ON MEDIEVAL AND LATER GLASS

HUGH WILLMOTT (University of Sheffield) (OLA 7.1.2.3)

1.0 Introduction

One hundred and eight-four fragments of glass were recovered from excavations in the church during the Tarbat Discovery Programme. While the majority of the assemblage consists of window glass, a small quantity of vessel glass was found in the nave. The window glass comes from two distinct areas, the nave and the crypt, and is therefore discussed by area within this report.

2.0 Description

2.1 The nave

2.1.1 VESSEL GLASS

Three vessels were recovered from contexts in the nave. The only medieval fragment is a small portion of rounded rim from a hanging lamp, made in a potash-rich glass. Lamps are relatively common medieval vessels, particularly in ecclesiastical contexts, and are frequently found in the excavations of churches and monastic houses. First occurring in significant numbers in the early thirteenth century, they are a form that does not survive beyond the sixteenth century. The other two vessels present are post-medieval in date. The first is the rim and neck from a green glass thick-walled bottle. Although superficially resembling a wine bottle, the colour of the glass and the shape of the neck suggest that this might in fact be an early eighteenth-century mineral water bottle. Mineral waters were popular drinks amongst those who could afford them and were imported from across Europe, the spa at Bad Pyrmont, Lower Saxony, being the producer most favoured in the United Kingdom. The final vessel fragment is a late nineteenth-century mould-pressed jar rim.

2.1.2 WINDOW GLASS

Seventy-seven fragments of window glass were recovered from the nave area. The vast majority is undecorated and in the absence of edges relatively undiagnostic, although from the colour of the glass and its subsequent weathering most can be said to be medieval in date. Of these, only two fragments have any surviving evidence for surface painting and staining. This is not necessarily surprising, decorative window glass was a very expensive and specialist commodity. Furthermore, the medieval iron oxide paint and silver-based stains employed often do not survive in acidic archaeological conditions, and many of the fragments that now appear plain may once have been decorated. The earliest of the two painted fragments is probably thirteenth-century in date. Although extremely fragmented and without any edges, it is clearly painted with a scroll design that is found on 'stickwork' borders used around the edges of larger window compositions. The other painted fragment is also from a border. This is painted with the lower portions of several Gothic black letters that once formed an inscription, and are set against a stain wash. This style of decorative glass became popular in the fifteenth century and remained in use until the Reformation. Unfortunately, the fragment is too small to reconstruct any of the letters or interpret what the inscription might have been.

Although plain, several other fragments retain two or more edges that demonstrate that they also formed portions of rectangular borders used to frame the edges of larger glazing schemes, and these vary in width from 25–51mm. The remaining fragments are largely undiagnostic, retaining either one or no edges. However, these are likely to have originally formed part of other rectangular borders, or more likely central diamond-shaped quarries, the most common shape of the period. Five fragments of window glass were also found in the nave that are clearly later, being seventeenth or even eighteenth-century in date. One of these is the central 'bulls eye' from a crown of window glass. These are usually associated with poorer buildings that could not afford the thinner, clearer portions of glass made by this method, and its presence in the church might well indicate a change in its fortunes by this date.

2.2 The crypt

2.2.1 WINDOW GLASS

Excavations in the crypt produced a total of 104 fragments of window glass. In striking contrast to the nave, all this glass is early post-medieval and probably dates to the sixteenth or seventeenth century. Although most of the fragments are very small and relatively undiagnostic, it is possible to reconstruct other elements of the glazing pattern. Most interestingly, two quarries can be sufficiently reconstructed to show that they were originally large and rectangular in shape, rather than the more typical diamond design. This was a glazing type that only started to appear in the later sixteenth century, when the increasing supply and quality of window glass enabled larger quarries to be used. Also present in the assemblage are two complete triangular corner pieces that would have fitted into this standardised geometric design.

Catalogue

Vessel glass

The Nave

17/6

One fragment of rim from a press-moulded jar. Colourless glass. Rim diameter 80mm. Late nineteenth century (C1000).

17/168

One fragment of rounded vertical rim from a hanging lamp. Potash-rich glass. Diameter uncertain. thirteenth–fifteenth century (F51 C1153).

17/45

One fragment of rim and neck from a possible mineral water bottle. Green, high lime low alkali glass. Rim diameter 28mm. Early eighteenth century (C1011).

Window Glass

The Nave

17/5

Two miscellaneous fragments. seventeenth–eighteenth century? (C1002).

17/33

One miscellaneous fragment. seventeenth–eighteenth century? (C1003).

17/8

Three miscellaneous plain fragments, one edge. Late medieval (C1004).

17/14

One miscellaneous fragment. seventeenth–eighteenth century? (C1061).

17/15

One fragment of painted border 50mm wide. Decorated with the lower portion of Gothic black lettering and a line edging (C1061).

17/16

Three joining fragments from a rectangular border 51mm wide. Late medieval (C1061).

17/5

Fragments from a rectangular border of uncertain width. Late medieval (C1061).

17/2

One miscellaneous fragment of thick 'bull's eye'. seventeenth–eighteenth century? (C1065).

17/39

One curved and rounded crown glass edge. Late medieval (C1095).

17/161

One fragment of painted stickwork border, with no edges remaining. thirteenth–fifteenth century; one fragment of rectangular border 25mm wide. Late medieval; seven fragments of rectangular border of uncertain width. Late medieval; thirty-three small miscellaneous plain fragments, some edges but unreconstructable. Late medieval.

17/258

One fragment of rectangular border 33mm wide. Late medieval (C1147).

17/3

Two miscellaneous plain fragments, one edge. Late medieval (F7 C1099).

17/69

Twelve tiny miscellaneous plain fragments. Late medieval (F7 C1099).

17/79

One straight and rounded cylinder glass edge. Late medieval (F35 C1100).

17/202

One miscellaneous plain fragment. Late medieval (F59 C1166).

17/463

One straight and rounded cylinder glass edge. Late medieval (C1208).

The Crypt (Int 13)

Eighty miscellaneous quarry fragments, some portions of edges. Sixteenth–seventeenth century.

Four fragments from a rectangular quarry. Maximum surviving dimensions 52mm × 43mm. Sixteenth–seventeenth century.

Eleven fragments from a rectangular quarry. Maximum surviving dimensions 75mm × 66mm. Sixteenth–seventeenth century.

One complete small triangular quarry. 33mm × 33mm × 47mm. Sixteenth–seventeenth century.

One complete small triangular quarry. 28mm × 35mm × 45mm. Sixteenth–seventeenth century.

13/9

One miscellaneous quarry fragment, no edges. Sixteenth–seventeenth century.

13/11

One quarry edge. Sixteenth–seventeenth century.

13/12

One complete square quarry. 38mm × 38mm. Sixteenth–seventeenth century.

13/13

One corner from a rectangular or square quarry. Sixteenth–seventeenth century.

13/14

One miscellaneous quarry fragment, no edges. Sixteenth–seventeenth century.

13/15

Two miscellaneous quarry fragments, no edges. Sixteenth–seventeenth century.

Digest 6.16 MEDIEVAL LEATHER FOOTWEAR

CLARE THOMAS

D6.16.1 EARLY MEDIEVAL SHOE, 24/7810 (not illiustrated)

Description

A leather fragment (24/7810) was found in F431, a stone culvert within S7. It was identified as cattlehide and conserved as five separate fragments.

1. Irregularly shaped item, now in at least two separate pieces, with two almost straight edges which meet almost, but not quite, in a right angle. The shorter edge is defined by a flattened line, parallel to outer edge and 4mm from it. This makes it appear as if edge has been folded and hemmed, which is not the case. Item has various irregularly spaced holes, but none of these seem to be traces of either stitching or slots for thongs. Item is very fragile and is extremely delaminated, now consisting of separate grain and flesh layers. Maximum dimensions 231mm × 140mm; thickness not measured because of delamination.
2. Irregularly shaped item with one curved edge, defined by a flattened line, as in item 1. Item 2 has various holes, but none of them appear to be either traces of stitching or slots for thongs. Item is very fragmentary and delaminated. Maximum dimensions 135mm × 145mm; thickness not measured because of delamination.
3. Irregularly shaped item, with 30mm long edge, slightly folded as if for a hem, and with a suggestion of stitching, consisting of two grain-flesh holes, stitch length 5.5mm. Item also has an irregularly cut, slightly curved edge, as well as torn edges. Item also has various other holes but none of them appear to be either traces of stitching or slots for thongs. Item is very fragmentary and delaminated. Maximum dimensions 95mm × 103mm.
4. Irregularly shaped item with all edges torn, no cut edges survive. Item is fragmentary and delaminated. Maximum dimensions 80mm × 125mm.
5. Five small pieces, with no cut edges and no stitching. All fragmentary and delaminated. Maximum dimensions: 42mm × 25mm; 37mm × 30mm; 22 × 15mm; 25mm × 14mm; 26mm × 10mm.

There are no obvious joins, yet the excavation photographs suggest that these fragments originally formed one object.

Discussion

Only one item has even a suggestion of stitching, and that consists only of two possible stitch holes. Three pieces do have cut edges, suggesting that they have been worked, and could be offcuts. However, the photographs from the excavation suggest that these fragments were originally one item. The leather was found adjacent to a leather and vellum-working complex, which included appropriate tools. Thus, leather-working waste would not be unusual.

However, it is worth considering whether the fragments are part of some object, such as a shoe. Shoes from the late seventhth to early ninth centuries are most likely to be of one-piece construction, and are often referred to as 'hide shoes'. In this method, one piece of leather comprises both sole and upper, acting as a bag for the foot. The shoe is tightened by a thong threaded through slots at the top edge of the upper. Seams are usually short, and occur at the front of the shoe, up the middle of the vamp, and at the back of the shoe.

Small, incomplete fragments of such shoes often have few diagnostic features, apart from slots for thongs, as they have no obvious soles, and neither sole seams nor lasting margins. Furthermore, such a shoe is very likely to break up into unrecognisable 'scraps'. An attempt has been made at reconstructing this item as a shoe, based on a tracing from an excavation photograph. The cut edges, which appear to be visible in the photograph, have been assumed to be the top edges of a vamp; two short, possibly stitched, edges have been interpreted as the opposing edges of a central vamp seam. The reconstruction suggests a low slip-on shoe. However, this reconstruction is very tentative, and is only based on the information in the photograph.

Examples of 'hide shoes' survive from Scotland, England, Ireland and the Continent. The Scottish examples include Loch Glashan, Buiston, Dowalton Loch and Dundurn (Thomas 2005, 74–5). However, the closest parallels come from York's Anglo-Scandinavian assemblage. Of particular interest is Style 1. Shoes 15354 and 15357 have a cutting pattern that might be similar to the Tarbat fragment. These shoes came from contexts dating to mid-tenth century and late tenth to mid-eleventh century, respectively. (Mould et al 2003, 3275–79, figs 1598 and 1599).

Accordingly, this piece of leather might be a remnant of such a shoe; on the other hand, it could just be waste from cutting out some other item.

References

Crone, A & Campbell E 2005 *A Crannog of the 1st Millennium AD Excavations by Jack Scott at Loch Glashan, Argyll, 1960.* Edinburgh: Society of Antiquaries Scotland.

Mould, Q, Carlisle I & Cameron, E 2003 *Craft, Industry and Everyday Life: Leather and Leatherworking in Anglo-Scandinavian and Medieval York. The Archaeology of York 17/16.* York: Council for British Archaeology.

Thomas, C 2005 'The Leather Assemblage', *in* Crone & Campbell, 72–81.

D6.16.2 MEDIEVAL SHOES [Illus 7.18]

Introduction

A pair of shoes was found during excavation of a skeleton interred within the nave of Tarbat Old Church (Burial 43, F83, C1228). The shoes were preserved beneath the wooden slats of the collapsed coffin lid, in a dry and oxygen-free environment. The skeleton was that of a mature male of at least 46 years. Textile hose were identified during conservation (see D6.1.17).

Condition of shoes

The shoes are in a fragmentary state and friable condition but with large areas of leather remaining intact. A copper alloy buckle was found during excavation, along with two linked straps. When found, the right shoe was under the left. They were separated during conservation and are now sorted into custom-built protective packaging, with supportive mesh allowing views from both above and below. Unfortunately, the mesh obscures details. They cannot be handled, and thus it is impossible to examine the interior. During burials, as the skeleton's feet rotted, the shoes were squashed flat, leaving mostly grain surfaces visible. The surviving flesh surfaces are degraded; only a few traces of stitching are visible.

Description

Construction

The shoes are of turnshoe construction, with an upper attached to a single sole with an edge-flesh seam. There is no evidence for rands, which would have strengthened the seam and made it more waterproof.

Style

Insufficient remains to indicate sole style. The uppers appear to be of one-piece design, with a butted edge-flesh seam linking quarters and vamp wing on the inside of the foot. These were high shoes or low boots, fastened by two straps and a buckle. The straps are no longer attached, but evidence from elsewhere suggests that they emerged from slits near the vamp throat.

Left shoe

Substantial portions of the upper of this shoe survive and consist of vamp and quarters, as well as the two straps and a buckle. No sole fragments have been identified. The vamp is now folded asymmetrically. A short stretch of lasting margin with grain to flesh stitching channel, stitch length 5.5–6mm, is exposed on the inner vamp wing. This stitch length indicates that the shoe is of turnshoe construction. The front portion of the vamp is extremely degraded, with no further lasting margin visible. However, most of the vamp survives; it appears to have had an oval toe. There is a short tear running forwards from the vamp wing; this is not a seam. The quarters are folded and very fragmentary, and probably distorted. A small triangular portion at the front quarters is now folded backwards, exposing the flesh side. This tiny portion of flesh surface is delaminated and degraded but has very faint suggestion of hemstitch. The fold itself is accidental and of no significance. The top edge of the quarters has possibly been oversewn. The back edge of the quarters is represented by a fold. The quarters end with a vamp/quarters seam on the outside of the foot, indicating that this upper is of one-piece design.

Two straps, linked by a copper alloy buckle, now lie on top of the quarters. One strap is approximately triangular. It has a grain to flesh stitching channel halfway along the strap, and secured by folding the strap through a slit in itself. The other half of this strap is folded underneath the wider portion. The second strap is a long tapering strip, and passes through the buckle. The buckle pin lies under the second strap. No pinholes are discernable.

The copper alloy buckle is round, with a diameter of 18mm, and a thickness of 2mm. The pin, which is partially hidden by the second strap, is at least 13mm long and 2mm wide. No slits through which these straps might have been anchored on the flesh side or interior of the shoe have been identified. Parallels from elsewhere (see below) suggest that these would have been in the vamp throat/vamp wing area, which is now too degraded for any slit to be recognisable.

Right shoe

Parts of both sole and upper of this shoe survive.

Sole

The grain side of seat, waist and rear of forepart of sole are visible from underneath. No stitching channels can be seen. There is no sign of a rand. There is a tear across the waist.

The upper fragments comprise most of the quarters and part of a vamp wing. The lasting margin survives folded under vamp wing and quarters, but only two unrelated stitch holes are visible. Quarters and vamp wing are joined by a butted edge-flesh seam, stitch length 3.5mm.

There is also a short stretch of stitching channel, grain to flesh, but with the grain folded to form an edge, stitch length 3mm. This is on a fragment with grain surface, at present on the quarters; it could imply an insert. It is also possible that the fragment, which is not clearly connected to anything else, is in the wrong place. The rest of the vamp does not survive.

Discussion

The only published parallels for shoes with straps and buckles are from England. The best examples, and closest to the Tarbat shoes, are from London. These are low boots with one-piece wrap-around uppers with a straight opening down the centre of the vamp, and with two straps, one with a buckle. The straps emerge on either side of the foot from slits near the vamp throat. Some straps had been secured to the flesh side with stitching; other straps had spade-like terminals to prevent them being pulled through the slits. These boots are of early fifteenth-century date (Grew & de Neergaard 1988, 37, fig 59; 41, figs 63–5, fig 105). Grew and de Neergaard also illustrate another type of boot with straps and buckles but this had a much higher leg than is possible with the Tarbat examples (Grew & de Neergaard 1988, 37, fig 59; 42, figs 67–8). The other shoes with straps and buckles discussed by Grew and de Neergaard are not relevant to Tarbat. Similar boots were found in Coventry, but unfortunately these are all from unstratified deposits (Thomas 1980, 12–13, Type 1a, fig 4, 78/51/52 and 78/51/57; fig 7, 58/158/7; fig 18, 78/59/29). Other parallels are known from Reading (early fourteenth century – 1539) and Poole (early fifteenth century) (Mould 1997, 111, fig 63, no 17; Mould 1994, 71–3, fig 53, no 14, fig 54, no 20a).

According to Grew and de Neergard, most London shoe buckles of the early fifteenth century were made of lead alloy but with iron pins. Three of the lead/tin alloy buckles illustrated by Grew and de Neergaard resemble that from Tarbat in shape (Grew & de Neergaard 1988, 75–6, fig 110, 1, b, c, I). Mould also illustrates a circular metal buckle from Reading, but does not defined the metal (Mould 1997a, fig 63, no 17 – early fourteenth century to 1539). Shoes from burials are rare. The best examples are from Sandwell Priory, where six pairs of shoes and a pair of leather legcoverings were found in graves that dated from the thirteenth to sixteenth centuries. The shoes were all turnshoes, and included four different sole and upper styles. The shoes were neither badly worn nor new. One pair had two straps but there was no indication of a buckle; also the design of the shoes was quite different to those from Tarbat. The leg coverings reached to about mid-thigh, and had laced slit above knee level. They were of fifteenth to early sixteenth-century date (Thomas 1991, 102–11). A pair of knee-high boots was found in a pilgrim's grave in Worcester Cathedral; these possibly date to the last quarter of the fifteenth century (Thomas 1991, 110–11; J Spriggs pers comm). Similarly, a pair of shoes or boots was excavated at Hulton Abbey (Thomas 1991, 111). A sole and upper, both of approximately twelfth to fourteenth-century date, along with other fragments of leather, were found in a grave at Jedburgh Abbey. However, these were not directly associated with any of the skeleton parts recovered from this grave (Thomas 1995, 114; Grove 1995, 122, 125).

This is probably the only surviving example of shoes and cloth hose. More common, but still rare, are shoes with linings. An unstratified ankle-boot from the Perth High Street excavations, 1975–7, had a felt lining, while a calf-high boot from the same site, of twelfth-century date, had stitching for a lining (Thomas 2012, 224, 221–4).

References

Bogdan, N Q & Thomas, M C 2012 *The Perth High Street Archaeological Excavation: The Leather Fascicule 3.*

Grew, F & de Neergaard, M 1998 *Shoes and pattens, Medieval finds from London.* London: HMSO.

Grove, R 1995 'The Human Burials', *in* Lewis J & Ewart, G *Jedburgh Abbey: the archaeology and architecture of a border abbey*, 117–30.

Edinburgh: Society of Antiquaries of Scotland.

Hawkes, J W & Fasham, P J 1997 'Excavations on Reading Waterfront Sites 1979–88', *Wessex Archaeological Reports* 5: 108–41.

Hodder, M A 1991 'Excavations at Sandwell Priory and Hall 1982–88', *South Staffordshire Archaeological and Historical Society Transactions 31.*

Lewis, J & Ewart, G 1995 *Jedburgh Abbey: the archaeology and architecture of a border abbey*. Edinburgh: Society of Antiquaries of Scotland.

Mould, Q 1994 'The Leather', *in* Watkins: 68–74.

Mould, Q 1997 'Leather', *in* Hawkes & Fasham: 108–41.

Thomas, M C, *in* Bogdan & Thomas.

Thomas, M C 1991 'The Leather Shoes and Leggings', *in* Hodder: 102–11.

Thomas, M C 1995 'Leather', *in* Lewis and Ewart: 114.

Thomas, S 1980 *Medieval Footwear from Coventry*. Coventry: Coventry Museums.

Watkins, D R 1994 *The foundry excavation on Poole Waterfront 1986–7*. Dorchester: Dorset Natural History and Archaeological Society.

Digest 6.17 MEDIEVAL TEXTILE

PENELOPE WALTON ROGERS (The Anglo-Saxon Laboratory) (OLA 7.1.0)

Introduction

Fragments of a yellowish-fawn textile were found in association with the leather shoes in Burial 43 (F83 C1228). The largest fragments were in the ankle region (17/373, 374), but a small area was also noted peeping out of the decayed toe area of the left shoe [the shoe with the buckle] (Illus 7.18). The textile is a heavily felted wool tabby (ie plain weave). The yarn is Z-spun in one direction and S-spun in the other and there are 10/Z × 8/S threads per square cm. Microscopy of the fibres (× 100 and × 400 magnification) shows that they are non-pigmented wool. The fibres are split and abraded and have rounded ends, indicating extensive wear. No dye was detected and, judging from the present colour, it seems likely that the textile was originally white. Some loose, coarse animal fibres were also found in association with the textile from the ankle area (17/373). These were short, lightly pigmented fibres, with intact roots and tips, and may represent light brown hair from the man's legs. This textile is a typical medium-weight clothing fabric of the late fourteenth to sixteenth centuries. In the twelfth to fourteenth centuries, most clothing fabrics were made in twill, but during the course of the fourteenth century there was a shift to tabby weaves, first of all in English urban textile centres (Walton 1991; Crowfoot et al 1992, 434) and then in places with less well developed textile industries, such as Scotland and Norway (Walton Rogers 1999).

The position of the textile suggests that it represents cloth socks or 'foot-hose'. Hose with feet were a common feature of men's dress in medieval north-west Europe. Several pairs have been found on bodies in the late Norse cemetery at Herjolfsnes, Greenland (Nørlund 1924), and there is another pair on the fourteenth-century man from Bocksten bog, Sweden (Nockert 1997, 104–7). There are also discarded single examples from late fourteenth-century London (Crowfoot et al 1992, 185–9) and another of uncertain date from Papa Stour, Shetland (Walton Rogers 1999). The London ones are made from wool tabbies with Z × S spinning and are therefore technically the most like the Tarbat textile. Cloth hose was largely superseded by knitted stockings during the course of the sixteenth century, although there are some later examples in existence (Bennett *in* Walton Rogers 1999). The shoes in the Tarbat burial are of a style which was worn in London in the early fifteenth century and a similar date would be appropriate for the hose. The obvious wear on the textile indicates that they were probably the hose that the man wore in life.

References

Crowfoot, E, Pritchard, F & Staniland, K, 1992, 'Textiles and Clothing *c* 1150–*c* 1450', *in Medieval Finds from Excavations in London 4*. London: Boydell Press.

Nockert M 1997 *Bockstensmannen och hans drakt*. Sweden: Stiftelsen Hallands länsmuseer.

Nørlund P 1924 'Buried Norsemen at Herjolfsnes', *Meddelelser om Grønland* 67: 1–270.

Walton P 1991, 'Textiles', *in* Blair, J, Ramsay, N *English Medieval Industries*, 319–54. London: Hambledon Press.

Walton Rogers P 1999 'Textile, yarn and fibre from the Biggings, *in* Crawford, B E & Ballin Smith, B, *The Biggings, Papa Stour, Shetland: the History and Archaeology of a Royal Norwegian Farm*, Society of Antiquaries of Scotland Monograph Series No 15 (Edinburgh: Society of Antiquaries of Scotland and Det Norske Videnskaps-Akademi), pp 194–202.

Digest 6.18 MEDIEVAL CERAMICS

DEREK HALL (OLA 7.1.4)

6.18.1 POTTERY FROM THE MEDIEVAL TOWNSHIP Sectors 1 to 3

Introduction

The ceramic assemblage [from Sectors 1 to 3] comprises 2,116 sherds from 249 contexts, ranging in date from the twelfth to nineteenth centuries. The entire pottery assemblage has been examined by eye and identified to an accepted fabric name where possible. A selection of fabrics was submitted for ICPS (Chemical Sourcing).

Clay sourcing

The MacAulay Soil Survey Map of Easter Ross indicates the presence of a large deposit of potentially workable clay less than two miles to the south-west of the site, close to Toulvaddie. Field prospection by the author in 2011 identified a deposit of blue-grey lacustrine clay in this vicinity and a sample was submitted to SUERC for ICPS analysis and comparison with the potential locally produced redwares from the excavation.

Pottery fabrics

Scottish Redwares

This assemblage is dominated by sherds in variations of this fabric type, being represented by 1,701 sherds. Recent analysis has indicated that from at least the early thirteenth century, this pottery tradition is prevalent in medieval Scotland where there are riverine red firing clays available – essentially all the main river valleys (Haggarty et al 2011). In recent years, Redware fabrics have been identified from excavations at Dornoch and Hilton of Cadboll and from fieldwalking at Tarradale on the north side of the Beauly Firth (Hall 2009, 9, 10; Hall 2010; E Grant pers comm). Although the Portmahomack assemblage is very fragmented, sufficient evidence is provided by handle, rim and base fragments to attempt to reconstruct the vessel forms. Splash-glazed jugs with strap handles are the most common form represented, with some sherds suggesting that the potters are copying imported vessels from Yorkshire, this is best represented by ribbed rod handles, decorated bridge spouts and a fragment of a decorative arm from a figure jug. Some sherds are smoke blacked and may be from jars used for cooking, although it would appear from other Scottish assemblages that, due to their poor resistance to heat shock, Scottish Redware fabrics were not normally used for producing such vessels. Unusual vessel types in this assemblage include a small skillet/ladle handle and heavily rilled bodysherds (C1318, 24/3234) for example). There is also evidence for bodysherds in this fabric having holes drilled in them and being re-used, possibly as spindle whorls (C1343, 24/2940; C1378, 24/1366). Some of the redware fabrics have a very high quartzite content (visible as white spots) (C1318, 24/3236 for example), something that has previously been noted for the Redwares from Inverness (MacAskill 1982) and some of the north-eastern Scottish redwares that have recently been recorded from excavations by AOC Archaeology at the Bon Accord Centre in Aberdeen (Haggarty & Hall forthcoming). A very distinctive purple heat skin is also visible on some sherds, something that has been identified as a distinctive trait of Scottish Redwares, indicating the leeching of iron from the fabric during firing, interestingly, there are also Redware fabrics present that do not exhibit this effect. There are occasional sherds which appear to be crosses between Organic tempered wares and Redwares (very micaceous) (C1293, 24/1057) for example) also (F137 C1367, 24/1281). There is also an unidentified fabric with large red sandstone inclusions (C1007), which could be a Redware variant, and occasional sherds have very large white quartz inclusions (C1877, 24/5307 for example). Generally, these redwares are quite highly fired. Based on our current knowledge of the Scottish medieval pottery industry, these Redware fabric types and vessel forms would seem to date no earlier than the thirteenth and fourteenth centuries, and no later than the fifteenth/sixteenth centuries (Haggarty et al, 2011).

Organic Tempered Wares

This broad range of handmade fabrics is found on the Scottish west coast and in the Highlands and Islands and represents a pottery tradition that covers at least 2,000 years (Cheape 1993; Lane 2007). This assemblage contains eighty-two sherds in this fabric type. The handmade nature of these vessels makes the reconstruction of complete forms difficult, but perhaps the most distinctive sherd from the assemblage is the 'looped' rod handle from C1366 (24/1363) (ICP sample 3), which seems to be trying to copy an imported vessel form. Such a wide date range for this tradition makes accurately dating sherds of the earlier part of this industry difficult, if not impossible, unless they are found in association with other datable material, or from scientifically dated levels. This small group from Portmahomack is found in association with medieval Redware fabrics and would therefore seem to be of that date.

Whitewares

Recent analysis and study suggests that white firing clays have always been hard to find in Scotland – or may even have not ever been present north of Fife and Strathclyde (Jones et al 2006). This means that any Whitewares from this excavation are likely to be imported rather than locally produced. The small number of such sherds (22) are quite small and difficult to provenance, but included amongst them is a Scottish White Gritty Ware basesherd from a very distinctive flat-bottomed, straight-sided jar of Scottish Borders type (C1366, 11/2422) (ibid 2006). These vessels are thought to be of twelfth-century date, are very well thrown and have now been found from sites at Robert's Haven, Caithness, and Quoygrew, Orkney, indicating that they were being traded up the Scottish east coast (Hall 2011 and forthcoming). This vessel type forms the basis of the as yet unproven argument for a strong monastic involvement in pottery production and trade in twelfth century Scotland (Haggarty 1984). There is also a bodysherd from a splash-glazed Scottish White Gritty Ware jug from the fill of post-hole F260 (C1694, 14/2590), which is liable to date to the thirteenth or fourteenth centuries. Two joining bodysherds from C1078 (14/1896) are from a well-glazed jug, decorated with applied scales, in a fabric which is liable to be of northern English origin and of thirteenth or fourteenth-century date. A further small bodysherd from a vessel that is well-glazed, light green with brown flecks and green streaks resembles Stamford Ware C1264 (24/239), which would date to the eleventh or twelfth centuries (Kilmurray 1980).

Yorkshire Type Wares

Vessels in these distinctively glazed fabrics are the most common imports in the Scottish east coast burghs in the thirteenth and fourteenth centuries (McCarthy & Brooks 1988, 227–52; Jennings 1992). These ornately decorated vessels seem to have had a marked effect on the local redware potters as it is quite plain that they tried very hard to copy them (see Scottish Redwares above). The Portmahomack assemblage continues with a small number of sherds from vessels in this fabric type, largely from C1000 and C1002. Although there are a very small number of sherds (5), they all come from well-glazed, highly decorated vessels of fairly high status, such as jugs with facemasks and tubular spouts (C1002, 25/111; C1000, 11/992), an aquamanile (C1002, 11/191) and a small, narrow-necked vessel (C1000, 24/7669). Excavations within the church at Portmahomack also produced sherds from an aquamanile (Hall 1998).

Paffrath Type Ware

There is also a single small rimsherd from C1426 (F125, 25/1163), which may be a product of the Paffrath (Blue Grey) pottery industry in northern Germany. Ladles in this fabric are known from excavations in Perth and Aberdeen and are dated to the eleventh/twelfth or early thirteenth centuries (Verhaege 1983). A single bodysherd from C1284 (24/1661) is in a similar slightly thicker, hard-fired fabric and may also be a product of the Paffrath kilns.

Rhenish Stonewares (Raeren)

From the mid-fourteenth century, vessels in these very highly fired stoneware fabrics become fairly common imports into Scotland. The three sherds from Portmahomack are all from Raeren Type stoneware vessels and one of them is from a Raeren jug with a splayed frilled footring (C1000, 24/1477) that dates between 1475–1525 (Hurst et al 1986).

Unidentified

The unidentified material (282 sherds) is largely made up of small bodysherds that are difficult to accurately provenance, but does include an everted rimsherd from a small unprovenanced greyware jar used for cooking, with splashes of external lead glaze (C1368, 11/2505) (ICP sample 21).

Tile

There is a single piece of thin (14mm) flat unglazed redware tile from C1368 (11/2035), which is difficult to date but could potentially be medieval.

ICPS sampling of pottery fabrics (chemical sourcing)

Twenty-six samples of Redwares, Organic Tempered Wares, Yorkshire Type Wares, Whitewares and unidentified fabrics were chosen by the author and George Haggarty for submission to SUERC (East Kilbride) for analysis.

Statistical interpretation of chemical sourcing data

Dr Simon Chenery (British Geological Survey)

The Portmahomack samples have been divided into three groups: *redware*, organic tempered ware (*OTW*) and *other* which includes Scottish White Gritty Ware, Yorkshire Type Wares and an unprovenanced greyware.

Simple x–y graphical plots of data are the first and most rapid method of interpreting the chemical relationship between samples. Bi-variate plots of Th versus U and Th versus La, Portmahomack *redware* and *OTW* appear inter-mixed. The *other* ware has a greater spread and in particular Portmahomack samples 19, 20 and 21 separate. All samples except these fall within the main body of north-east Scotland redware, but seem to most closely match Rattray (Aberdeenshire) and Quoygrew (Orkney).

Date and provenance

Generally, the assemblage of pottery from Portmahomack would seem to date consistently to the thirteenth and fourteenth centuries, with a very small element present suggesting activity in the twelfth century, there are no sherds of Scottish Post Medieval Oxidised or Reduced Wares present, suggesting that occupation dates no later than the sixteenth century (Haggarty et al in press). All of the Organic Tempered Wares would seem to be of medieval date and there would seem to be a hiatus in pottery use at Portmahomack as there are no ceramics present from the early monastic horizons. Apart from a few sherds of Tin Glazed Earthenwares and Brown Glazed Earthenwares from the ploughsoil horizons, there are no ceramics any later than early sixteenth century present on the site either. The ceramic evidence would seem to consistently be suggesting that the major medieval phases at Portmahomack date between the thirteenth and early sixteenth centuries. There are no imported wares present from France, the Low Countries or Iberia, trade connections are only suggested between the rest of mainland Scotland, northern England and the Rhineland.

Conclusions

The pottery assemblage from Portmahomack is one of the largest such assemblages from excavations in the Scottish Highlands and is of value in the continuing study of the development of Scotland's medieval pottery industry. The domination of the assemblage by a variety of Redware fabrics is of interest and the interim results of the chemical sourcing suggest that local production may be taking place. The absence of any ceramics from the early monastic phases is of interest and can be paralleled by a similar absence from the early deposits across the firth at Dornoch (Colman & Photos-Jones 2008).

Acknowledgements

The author would like to thank George Haggarty for aiding the selection of the ICP samples, Professor Rob Ellam and Valerie Olive at SUERC for analysing them and Dr Simon Chenery of the British Geological Survey (Keyworth) for statistical interpretation of the data.

References

Cheape, H 1993 'Croggans and Barvas Ware: handmade pottery in the Hebrides', *Scottish Studies* 31: 109–28.

Colman, R & Photos-Jones, E 2008 'Early medieval settlement and ironworking in Dornoch, Sutherland: excavations at the Meadows Business Park' (http://www.sair.org.uk/sair28/): 9, 10.

Haggarty, G 1984 'Observations on the ceramic material from phase 1 pits BY and AQ', *in* Tabraham, C 'Excavations at Kelso Abbey', *Proc Soc Antiq Scot* 114: 395–7.

Haggarty G & Hall D W forthcoming 'The ceramics', *in* Roy, M 'Excavations at Bon Accord, Aberdeen'.

Haggarty, G, Hall, D W & Chenery, S 2011 *Sourcing Scottish Redwares*, MPRG Occasional Paper No 5.

Hall, D W 1998 'Medieval pottery at Portmahomack a preliminary assessment', http://www.york.ac.uk/depts/arch/staff/sites/tarbat/bulletins/bulletin4/pottery.html.

Hall, D W 2008 'The Pottery', *in* James, H, Henderson, I, Foster, S & Jones, S A *Fragmented Masterpiece, recovering the biography of the Hilton of Cadboll Pictish Cross-slab*, 373–5. Edinburgh: Society of Antiquaries of Scotland.

Hall, D W 2009 'The Pottery', *in* Colman, R & Photos-Jones, E 'Early medieval settlement and ironworking in Dornoch, Sutherland: excavations at the Meadows Business Park' (http://www.sair.org.uk/sair28/): 9, 10.

Hall, D W forthcoming 'The Pottery', *in* Barrett, J 'Excavations at Robert's Haven, Caithness'.

Hall, D W 2011 'Interpreting the ceramics and glass', *in* Barrett, J (ed), *Being an islander: production and identity at Quoygrew, Orkney AD900–1600*, 255–75.

Hurst, J G, Neal, D S & van Beuningen, H J E 1986 *Pottery Produced and Traded in North-West Europe 1350–1650*. Rotterdam: Het Nederlandse Gebruiksvoorwerp.

Jennings, S, 1992 *Medieval Pottery in the*

Yorkshire Museum. York: The Yorkshire Museum.

Jones, R, Will, R, Haggarty, G & Hall, D W 2006 'Sourcing Scottish White Gritty ware', *Medieval Ceramics* 25/27 (2003).

Kilmurry, K 1980 *The pottery industry of Stamford, Lincolnshire,* c *850–1250.* Oxford: Archaeopress.

Lane, A 2007 'Ceramics and cultural change in the Hebrides AD 500–1300', *Cardiff Studies in Archaeology Specialist Report No 29.*

MacAskill, N L 1982 'The pottery', *in* Wordsworth, J 'Excavations of the settlement at 13–21 Castle Street, Inverness', *Proc Soc Antiq Scot* 112: 355–68.

McCarthy, M & Brooks, C 1988 *Medieval Pottery in Britain AD 900–1600*, 227–52. Leicester: Leicester University Press.

Verhaege, F 1983 'Low Countries medieval pottery imported into Scotland: notes on a minor trade', *Medieval Ceramics* 7: 3–36.

6.18.2 POTTERY FROM THE CHURCH (Sector 4)

Introduction

Excavation in Sector 4 produced a small assemblage of pottery (forty sherds) (Table D6.18.1), ranging in date from the early medieval period to the nineteenth century. All the material has been examined by eye, and where possible, assigned a recognised fabric name.

Assemblage

Grass-marked Ware

This fabric is commonly recovered from excavations in the Northern Isles and is normally of early medieval date (MacAskill 1978, 405). Handmade pottery very similar to this, known as craggan ware, was being made as late as the nineteenth century in the Hebrides and West Highlands but normally in identifiably modern forms such as cups and teapots (Quail 1979, 39). There is a single sherd from the backfill of a grave (F3 C1006, 20/343), which is from a handmade cooking vessel.

Scottish Redware

Fifteen years of archaeological excavations in the Scottish east coast burghs have identified this fabric type as forming a tradition of native pottery production, apparently dating from the thirteenth to the fifteenth century (Hall 1996, 126). The assemblage from Tarbat Old Church is dominated by this fabric (thirty-one sherds). The fabric from Tarbat is much grittier than other examples of this fabric and is a much redder colour, however it does exhibit the purple wash under the glaze which is such a typical identifier for this fabric type (Hall 1996, 126). The vast percentage of the sherds is from glazed jugs, and it of interest that the glaze is of a

Table D6.18.1
Medieval pottery from the church (Sector 4)

Int No	Context	Find No	Grass	Scot Red	Yorks	China	Tile
17	1004	7	0	0	1	0	0
17	1061	42, 44, 145	0	3	0	0	0
17	1065	43	0	1	0	0	0
17	1112	244, 459, 461	0	3	0	0	0
17	1131	146	0	1	0	0	0
17	1147	164, 229, 245, 246, 275	5	0	0	0	0
17	1150	189, 228, 230	0	4	0	0	0
17	1154	190	0	1	0	0	0
17	1162	186	0	1	0	0	0
17	1189	460	0	1	0	0	0
17	1208	318, 462	0	0	6	0	0
17	1212	288, 299	0	2	0	0	0
20	1001	107	0	1	0	0	0
20	1006	343	1	0	0	0	0
20	1064	281	0	0	0	1	0
20	1075	106	0	1	0	0	0
20	1109	279	0	1	0	0	0
20	1178	341	0	2	0	0	0
20	1181	344	0	1	0	0	0
22	1001	2, 8	0	2	0	0	0
22	1013	10, 11	0	0	0	0	2

Fabric Codes: Grass = grass-marked pottery; Scot Red = Scottish Redwares; Yorks = Yorkshire Ware much higher quality than normal and is very lustrous. Apart from jugs, there are two sherds from cooking pots (C1178 20/341) and one rimsherd that may be from a chafing dish (C1147, Cat 4, 17/164).

Yorkshire Ware

Vessels in these distinctively glazed fabrics are the most common imports in the east coast burghs in the thirteenth and fourteenth centuries (McCarthy & Brooks 1988, 227–52). There are six sherds in this assemblage, one from a glazed water jug and the other five from the front half of a zoomorphic aquamanile (C1004, Cat 7, 17/318) (McCarthy & Brooks 1988, 228, fig 651).

China

There is one rimsherd from a china teacup that has the remains of a stamped 'heart' decoration around its rim (C1064, Cat 8). This dates to the eithteenth or nineteenth century.

Tile

There are two pieces of green glazed floor tile from Int 22, C1013.

Discussion

Recent work on Scottish ceramics has concentrated on trying to locate the sources of the Scottish redwares. A combination of thin section and ICPMS (Inductively Coupled Mass Spectroscopy) analysis has proved to be very successful in suggesting where the kiln sites for these wares may be (Chenery & Phillips forthcoming). What is most striking about this small assemblage from Portmahomack is that it contains yet another variant of the Scottish Redwares, which must be a local product, it is much grittier than the usual sandy matrix of this fabric. Although the clay source for this fabric is not known, it would seem very likely that the alluvial deposits along both the Dornoch and Moray Firths may be the most likely location.

It is of great interest that the excavations at Portmahomack are producing what appears to be a local redware that belongs with the fabric type that has been found in Inverness (McAskill 1982, 355–68) and more recently in Dornoch (Hall 1998).

All the pottery from the old church, except the china, would seem to date no later than the fifteenth century, the contexts containing Yorkshire ware are liable to date to the thirteenth or fourteenth centuries. The presence of at least two high status vessel types, a chafing dish and an aquamanile, is also worthy of note.

References

Chenery, S & Phillips, E & Haggarty, G 2001 'An evaluation of the geochemical fingerprinting for the provenancing of Scottish Redware pottery', *Medieval Ceramics* 25: 45–53.

Hall, D W 1996 'Blind Date – Scottish medieval pottery industries', *Tayside and Fife Archaeological Journal* 2: 126–8.

Hall, D W 1998 'The Scottish Medieval Pottery Industry – A Pilot Study', *Tayside and Fife Archaeological Journal* 4: 170–8.

Hall, D W 1998 'The pottery', *in* Colman, R *A watching brief at Meadows business park, Dornoch*. Report for Highland Archaeology Service.

MacAskill, N L 1982 'The Pottery', *in* MacGavin, N 'Excavations in Kirkwall, 1978', *Proc Soc Antiq Scot* 112: 405–13.

MacAskill, N L 1982 'The pottery', *in* Wordsworth, J 'Excavations of the settlement at 13–21 Castle Street, Inverness', *Proc Soc Antiq Scot* 112: 355–68.

McCarthy, M & Brooks, C M 1988 *Medieval pottery in Britain AD 900–1600*. Leicester: Leicester University Press.

Quail, G 1979 'Craggan ware', *Scot Pottery Society Archive News* 4: 39–46.

Catalogue

Scottish Redware

1. Rimsherd and rod handle junction from jug, glazed lustrous brown on a purple wash (C1150; 17/189)
2. Rod handle fragment from jug, glazed lustrous green on a purple wash (C1112; 17/461)
3. Unglazed basesherd from jug (C1001; 22/8)
4. Rimsherd from chafing dish(?) with traces of internal lustrous brown glaze and slight external smoke blackening (C1147; 17/164)
5. Rimsherd from open vessel form(?) internal glazed lustrous green brown on a purple wash (C1075; 20/106)

Yorkshire Ware

6. Fragment of small strap handle glazed lustrous green (C1004; 17/7)
7. Front end of zoomorphic aquamanile glazed lustrous green and decorated with scales. Junctions for spout and two legs are visible (C1208; 17/318)

China

8. Rimsherd from teacup(?) decorated with stamped pattern around rim (C1064; 20/281)

Digest 6.19 COFFIN WOOD IDENTIFICATION

STEVE ALLEN (York Archaeological Trust) (OLA 7.1.5)

Objectives

This report is the summary of the species identifications of a number of fragments of wood.

Procedures

The objects were delivered to the Wet Wood Laboratory. Each was double bagged in self-seal plastic bags, with the inner bag containing jiffy foam to support the contents, and all self-seal bags were contained in the same Stewart box. Each object was in turn removed from its packaging, sampled and returned to its packaging. The samples were studied under various magnifications to identify the wood species.

Condition

The wood was generally in a poor state of preservation. The material was dry and degraded and in consequence, some identifications were not possible.

Listing

The material is listed in burial number order. All species identifications follow Schweingruber (1982).

Reference

Schweingruber, F 1982 *Microscopic Wood Anatomy*. Teufen: F Flücke-Wurth.

Table D6.19.1
Catalogue of coffin wood

Burial No	Feature No	Context No	Find No	Species identification
9	45	1134	17/192	Not identifiable
17	7	1100	17/71	*Pinus sylvestris L*
21	75	1195	17/263	Not identifiable
26	55	1161	17/180	Not identifiable
26	55	1161	17/181	Not identifiable
30/36	76	1215	17/289	*Quercus* sp
43	83	1228	17/375	?*Fraxinus excelsior L*
43	83	1230	17/490	*Quercus* sp
93	28	1114	17/152	*Pinus* sp
101	47	1104	17/153	Not identifiable
112	69	1174	20/136	*Quercus* sp
112	69	1174	20/136	*Quercus* sp

Digest 7.1 SUMMARY REPORT ON ANIMAL BONES

KRISH SEETAH (OLA 7.3.1)

Method

The zooarchaeological investigation followed the system implemented by Bournemouth University, with all identifiable elements recorded (NISP: Number of Identifiable Specimens) and diagnostic zoning (amended from Dobney & Reilly 1988) used to calculate MNE (Minimum Number of Elements) from which MNI (Minimum Number of Individuals) was derived. Ageing of the assemblage employed a combination of Grant's (1982) tooth wear stages and fusion of proximal and distal epiphyses (Silver 1969). Metrical analysis followed von den Driesch (1976). Elements from sheep and goats were distinguished, where possible, based on criteria established for the post-cranial skeleton by Boessneck (1969) and teeth by Payne (1985) and Halstead et al (2002).

Identification of the domestic and wild component of the assemblage was undertaken with the aid of Schmid (1972) and Cohen & Serjeantsen (1996). The marine mammal component of the assemblage was identified with the help of Ericson & Storå (1999). Dr Chris Stimpson (Department of Archaeology, University of Cambridge) generously identified the avian bones. Zooarchaeological reference material from collections of the Grahame Clark, Zooarchaeology Lab, Department of Archaeology, University of Cambridge; the Zoology Museum, Cambridge and the specialist avian collection of the Natural History Museum housed at Thring, Hertfordshire, were also used in the analysis of this assemblage. Taphonomic criteria, including indications of butchery, pathology, gnawing activity and surface modifications as a result of weathering, were also recorded when evident.

The range of wild and domesticated species identified is summarised in Tables 3.6–3.8 in Chapter 3, pp 62–5.

Size and condition of assemblage

Following an initial assessment of the material, bones from 850 contexts were scanned, producing a total of 32,479 recorded fragments. Having identified the key components of the global assemblage that merited full analysis, a comprehensive zooarchaeological investigation was undertaken of material from both Sector 1 and 2. This resulted in a recorded sample of some 16,731 fragments from 855 [850] contexts, of which 11,763 (70%) were identifiable to element level, and a further 7,035 (42%) were identified to species. Some 8,862 bones were classed as having moderate to good preservation, whereas 3,445 were considered poor. Of the bones that underwent full analysis, 15,629 (93%) fragments were recorded from Sector 2.

Species represented

The assemblage as a whole was dominated by domestic species (Table D7.1.1).

Cattle were the most numerous species, accounting for 73% of the identifiable portion of the assemblage. They were also the most numerous in terms of MNI, with some 305 individual animals calculated from the MNE. Pig and sheep/goat were also recovered in representative numbers; however, their economic significance was apparently less important than cattle. The MNI count for the horse component of the whole assemblage was calculated to be nine individuals; six of these derive from Period 4. A large proportion of loose horse teeth recovered from Period 4 levels accounts for much of this, with sixty-four teeth recorded. Dog bones were recovered in greater numbers than horse; however, this is predominantly as a result of a near complete juvenile canid skeleton recovered from C1319 (Int 24).

The most abundant non-domesticates are red and roe deer; figures for red deer are inflated due to the presence of a relatively large number of antler fragments. The number of wolf finds (four individuals) is unusual, wolf finds being notoriously rare. The avian assemblage is markedly diverse. Sea birds are present in significant numbers. Geese were recorded in greater numbers than domestic chicken; however, this component included individuals from a range of species as opposed to domestic geese only. From the materials present it was not possible to refine the identification of the geese component to species level. One 'wader' was recorded and this was likely a grey heron (*Ardea cinerea*).

The marine mammal cohort showed a noteworthy level of diversity. Unfortunately, fragmentation – particularly of the largest whale species – and state of preservation made firm identification problematic. However, it was clear that large (minke whale sized), medium (porpoise sized) and small (dolphin sized) cetaceans, along with seals (common/harbour seal, *Phoca vitulina* and possibly grey seal, *Halichoerus grypus*, identified) were recovered.

Cattle: ageing, sexing and metrical data

Age

Both tooth wear and fusion data were used to establish an age range for cattle from this sub-assemblage. In total, it was possible to determine tooth wear stages from 100 individual mandibles; a significantly great number of fusion counts, 617 in total, were recorded. In combination, these data provide a reasonable estimate of the overall age profile of this sub-set. The tooth wear data strongly favours individuals classed as 'Adult' or 'Old Adult', with just three examples of sub-adult animals (estimated to be between 18 to 30 months old). Mandibular wear stages are calculated on the basis of permanent molars, this method is thus not ideal for identifying juvenile specimens. To deal with this, Grant's system includes the recording of deciduous and pre-molar teeth. At least ten juvenile cattle still retained the deciduous dentition, approximately 10% of the overall 'adult' component. This figure calls for caution in assuming that the cattle cohort is comprised principally of old adults. While this is in fact the case from the evidence we have, it must be noted that calves were also present, and in noteworthy numbers. The fusion data, which given that the greater sample size is likely to be providing a more complete age profile for the site, still shows 'Adult' and 'Old Adult' individuals in the majority. However, at least sixteen individuals died as sub-adults, under the age of 12 months, as evidence from the unfused distal radii count.

Sex

Unfortunately, due to the fragmentary nature of both the recovered horn cores and innominate bones it was not possible to determine the sex of any of the individual animals. The portion of horn core still attached to the cranium suggests that the horns themselves were not particularly large and could have potentially derived from either males or females. However, from the corpus of metrical data it was possible to extract two sub-sets denoting the size variation at the proximal joint of metacarpals (forty-seven individuals) and metatarsals (forty-four individuals). The results would seem to indicate two relatively clearly defined groups,

Table D7.1.1
NISP and MNI counts all species

Species	NISP	%NISP	MNI
Cow	5,124	72.8	305
Pig	721	10.2	71
Ovicaprid	355	5.0	28
Horse	199	2.8	9
Dog	270	3.8	9
Cat	11	0.15	2
Fox	33	0.47	4
Wolf	4	0.05	4
Hare	2	0.02	1
Cervid – no species assigned	2	0.02	2
Red deer	97	1.4	3
Roe deer	35	0.49	4
Otter	5	0.07	2
Birds	83	1.2	16
Chicken	20	0.3	3
Anser sp	34	0.5	8
Raven (*Corvus corax*)	2	0.03	1
Razorbill (*Alca torda*)	7	0.09	1
Lesser black-backed gull (*Larius cf fuscus*)	1	0.01	1
Cygnus sp	1	0.01	1
European shag (*Phalacrocorax aristotelis*)	11	0.2	2
Gannet (*Morus bassanus*)	1	0.01	1
Common redshank (*Tringa totanus*)	1	0.01	1
Eurasian curlew (*Numenius arquata*)	2	0.03	1
Western capercaillie (*Tetrao urogallus*)	2	0.03	1
'Wader'	1	0.01	1
Marine mammal (one unid'd)	94	1.3	9
Whale sized	15	0.2	2
Porpoise/dolphin sized	9	0.1	1
Seal	70	0.99	5
ULM	3,431	29.1 (Σ = 11763)	–
UMM	1,191	10.1 (Σ = 11763)	–
USM	1	0.008(Σ = 11763)	–
UUB	91	0.07 (Σ = 11763)	–
UUF	3	0.02 (Σ = 11763)	–
UUM	4,968	29.7 (Σ = 16731)	–

Key: USM, UMM & ULM = Unidentified Small, Medium and Large Mammal/UUB & UUF = Unidentified Bird and fish/UUM = Unidentified Fragment. NB: Species percentages are out of 7,035. These differ from the unidentified counts as these were calculated on the basis of element identification (for UMM & ULM) and total fragments (for UUM) (corresponding to Σ in brackets)

based on size of the proximal joint. From the metacarpal plot, it would appear that some 35 individuals, probably representing female animals, are distinguishable from a smaller, approximately 10 individuals, sample of male animals (two individuals fall between the main groupings). In contrast, the metatarsal evidence suggests the reverse, with a larger cohort of bigger, perhaps male, animals.

Stature

By using the greatest length measurement from the metacarpals and metatarsals (fifty-one in total) and Matolcsi's (1970) correction factor it was possible to estimate the average withers height of the sampled cattle, calculated as follows (after Matolcsi 1970):

Females: Metacarpal GL × 6.03/Metatarsal GL × 5.33

Males: Metacarpal GL × 6.33/Metatarsal GL × 5.62

As the sex of the individual animals was not known, each measurement was first calculated using the equation for estimating female stature, then male, then averaged. Overall, the withers height for individuals from the pooled data elicited an average stature of 1.1m for cattle at Portmahomack in Periods 2 and 3.

Body parts

Body part representation for cow suggest that all parts of the carcass are present. There is a bias towards cranial elements, but this might not be representative since there is a greater probability of these parts becoming fragmented.

Pig

Ageing of pig was again based on tooth wear and fusion data. Some fifty-five tooth wear stage records were taken, alongside 138 fusion counts. The majority of individuals were killed at between 18 to 30 months of age, indicating their use as meat animals. The pig cohort exhibits a classic cull-profile for this species, with a high number of young animals and a small number of older animals retained for regeneration of the population. Unfortunately, sexing was not possible for pigs as the majority of skull and pelvic elements were fragmented. Culling would have focused on sub-adult animals that are less likely to have developed sexually distinctive characteristics. No large canines were recovered that may have indicated large male animals. Because of the large number of unfused elements overall and the fact that bones such as the metacarpal and metatarsal are considered 'Middle' fusing (and therefore unlikely to have fused by the time the animals were slaughtered), metrical analysis was not assistive in determining sex. As with cattle, body part representation for pig indicates that all elements are present on site. Once again, there is an over emphasis of cranial bones and loose teeth, which is likely result taphonomic fragmentation.

Sheep/Goat

Tooth wear scores from twenty individuals were recorded, with a further 109 fusion records noted in order to estimate age at death for sheep/goat specimens. The cull patterns for S/G is in line with that observed for cattle, suggesting similar pressures on these species ie secondary products. This said, the S/G component reflects a preference towards goats. Where it was possible to identify that the specimen was clearly a sheep or a goat, in all instances – six in total – the individual artefact was noted as being derived from goat. Body part representation mimics the pattern observed for the other domesticates ie all body parts present, with an emphasis on cranial portions.

Butchery

Some 679 separate butchery records were noted on 224 individual bones from this assemblage, and good evidence was forthcoming on the sequence of tasks involved in the butchering process. One skull points to the mode of slaughter: pole-axing. This practice was common up to and including the modern period and is noted in the Tarbat assemblage from a skull demonstrating a slightly off-centred 'puncture' with associated circular and spiralling fracture marks. The fractured (but still attached) bone just above the circular indentation indicates that a punch point, with blunt force, was used rather than an actual cut.

The majority of cutting took place with smaller blades *at* joints rather than chopping *through* the joints with cleavers or axes. This suggests a more refined approach to the butchery, as well as the likelihood that while regular and repetitive, it was not an 'everyday' task. The carcass was portioned into the main units ie shoulder and upper forelimb, leg and upper hind limbs, with the central rib cage and vertebrae left as one unit. Cleavers were used for bone breaking and sectioning of specific parts of carcass only, once it had been broken down into these main units. This subsequent activity took place on large tables or 'blocks'. Evidence for the above derives from a very clear sequence noted on the rib heads and vertebrae. Chop marks were recorded that demonstrated that rib heads and vertebrae were separated, whilst they were still joined, by using a cleaver. This took place on a block as the cut marks were delivered from above, straight down, travelling from the internal surface of the animal (ventral) to the back (dorsal). Thus, the person performing the butchery was standing over the carcass and chopping straight down. An alternative method to achieve the same separation of ribs and vertebrae would be to chop down along the spine. However, this would have resulted in cut marks travelling from the posterior of the animal to the anterior (tail to head); this was not the case.

Considering the overwhelming predominance of cattle on this site, it comes as no surprise that the majority of cut marks were recorded on this species. The butchery data were highly informative, indicating that a variety of implements were in use, ranging from fine blades to cleavers. The evidence from detailed microscopic analysis of the surface of the marks themselves would suggest that some of these blades potentially included steel technology.

Cut marks were also noted on both fur-bearing (otter) and game (red and roe deer) species. The highest occurrence of butchery relative to the number of specimens was recorded on marine mammals from all size categories.

Pathologies and non-metric anomalies

Pathological changes were noted on some seventeen individual elements. These were predominately associated with traction use on cattle distal limb bones, with five examples of eburnation (hardening) noted. A pig mandible showed evidence of an abscess. This was likely the cause of death as no healing of the abscess had occurred. Another infectious pathology was noted on the ulna of a pig, marked by the presence of a festule (tubular bone tract) to release pus. A non-metric anomaly was noted on a lower third molar that demonstrated a missing third cusp; this was not pathological.

Variations over time

Domesticates (see Chapter 3, Table 3.6, p 62)

Variations over time are subject to distortions due to the different sample sizes from Periods 1–4. Using the raw data of NISP, cattle dominate throughout, but there is a slight increase from Period 1–3, and subsequent decrease in Period 4. This is matched by a reduction in numbers of pig, and an increase in the numbers of ovicaprids in later periods. The raw data of the MNI count show a greater level of variability by period, with a pronounced dip in cattle from Period 2 to 3, and subsequent rise in Period 4. However, when these raw data are represented as a proportion of the overall MNI, ie as percentages, these fluctuations are generally evened out, although the main trend of an overall increase in cattle and sheep, at the expense of pig, remains consistent and would appear to corroborate the fragment count data (OLA 7.3.1.1, Graph 11, p 25).

The horse component of the overall assemblage shows a marked increase in Period 4, then accounting for nearly 10% of the assemblage.

Age variation in cattle by period

Some 103 MWS (Mandible Wear Stage) stages were calculated from mandibles recovered

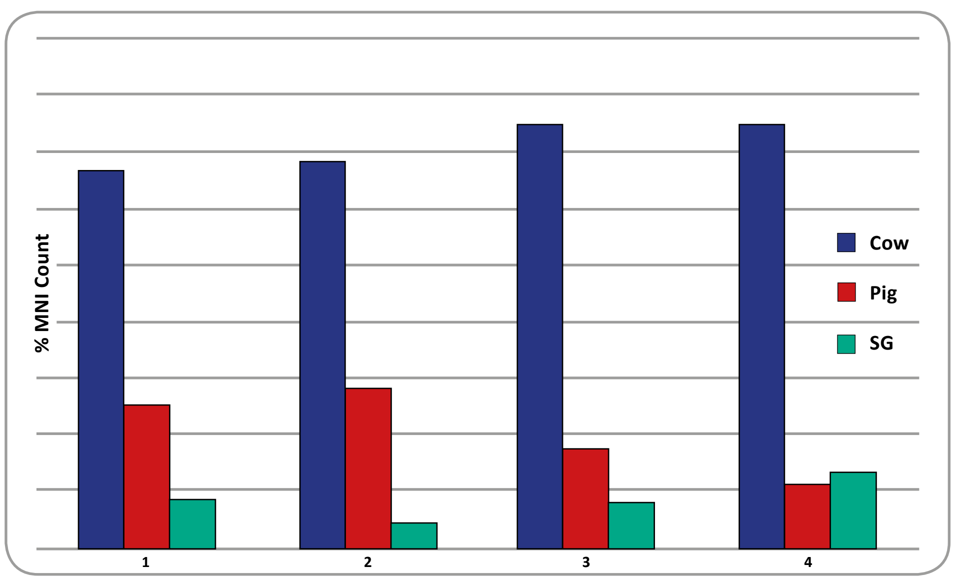


Illustration D7.1.1
Proportions of main domestic species by period (%MNI)

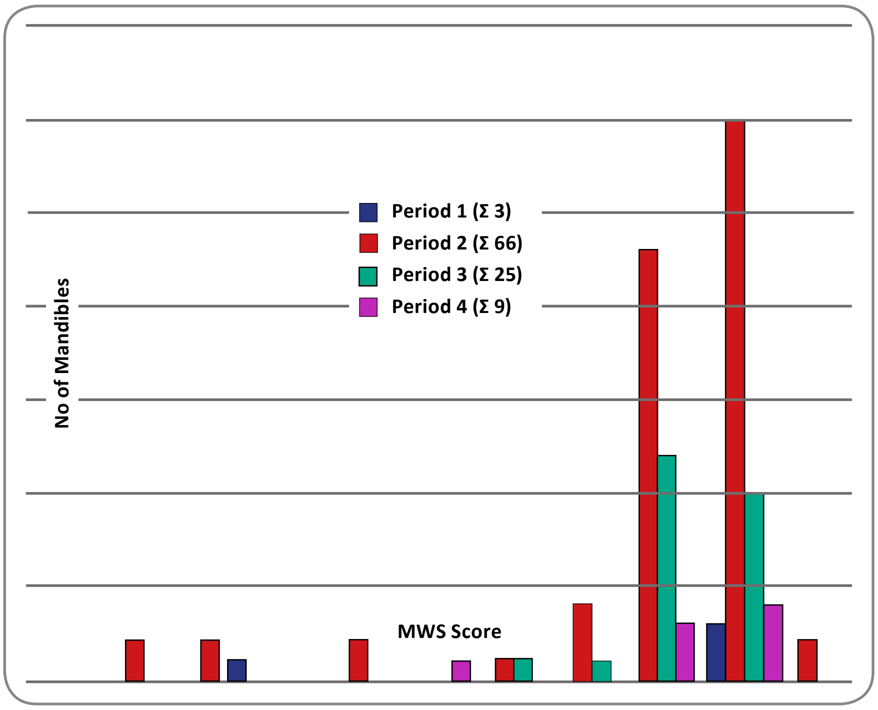


Illustration D7.1.2
MWS calculation by Period

from the four periods. In addition, a further 608 fusion data points were also assessed to investigate cull patterns over time. The overall trend of a predominance of animals falling into the 'Adult' and 'Old Adult' category, is maintained through the four periods (OLA 7.3.1.1, graph 12, p 26). However, there are some fluctuations. It would appear that there is greater proportion of younger animals being culled in Periods 2 and 3. Period 2 evidences a trend towards the culling of animals in the 'Old Adult' class, Period 3 shows a decline in this category and a greater number of 'Adult' animals. Of the eleven juvenile mandibles that were noted as having the deciduous premolar present, none were recovered from Period 1, six derived from Period 2, with a further three from Period 3, and two noted from Period 4. Although these figures are small, they would seem to suggest a greater representation of calves in Period 2 and a decline in Period 3. However, this may also be a reflection of the sample size.

The fusion data (OLA 7.3.1.1, Graph 14, p 29) would seem to indicate a general increase in the culling of younger animals in later periods. The variation is subtle but does represent a noticeable pattern. By presenting the percentages of the collated data, rather than raw counts, graphs 12 and 13 take variations in sample size into account. Thus, the fluctuations observed from one period to the next are not merely a consequence of sample size bias, although this will no doubt have had an impact.

Conclusions

The clear and overwhelming bias towards domestic species indicates focused management resulting in reliable meat stocks as well as, and perhaps more importantly, consistent exploitation of secondary products. There can be little doubt of the economic significance of cattle. Both the fragment count and MNI calculation reinforce this point. It is generally considered that sheep supersede cattle as the most significant economic species during the medieval period, sheep (but not goat) becoming important as providers of wool. Tarbat apparently bucks this trend. The cohort of sheep/goat finds supports this: all examples from the 'S/G' category that could be definitively identified were goat.

The mortality profile of cattle provides a clear indication that animals were generally raised to old age (with evidence for 'senile' animals also indicated by the tooth wear profile). The sexual data is somewhat contradictory – the metacarpals seem to indicate a predominance of female animals and the metatarsals favour male, but the overall pattern points towards adult individuals. This firmly points towards secondary product exploitation, and while cattle would no doubt have provided significant quantities of meat, it would appear that they were slaughtered after a long working life. Linking the metrical data with the incidences of pathology, it may be suggested that traction was an important aspect of animal management. The metacarpal data is indicative of dairying; this is further reinforced by the presence of a sizeable component of juvenile animals, accounting for a NISP of 49 and MNI of seven individuals.

The presence of all elements, including head and distal foot bones, would indicate that the animals were either brought in on-the-hoof and/or raised locally. The fact that this pattern

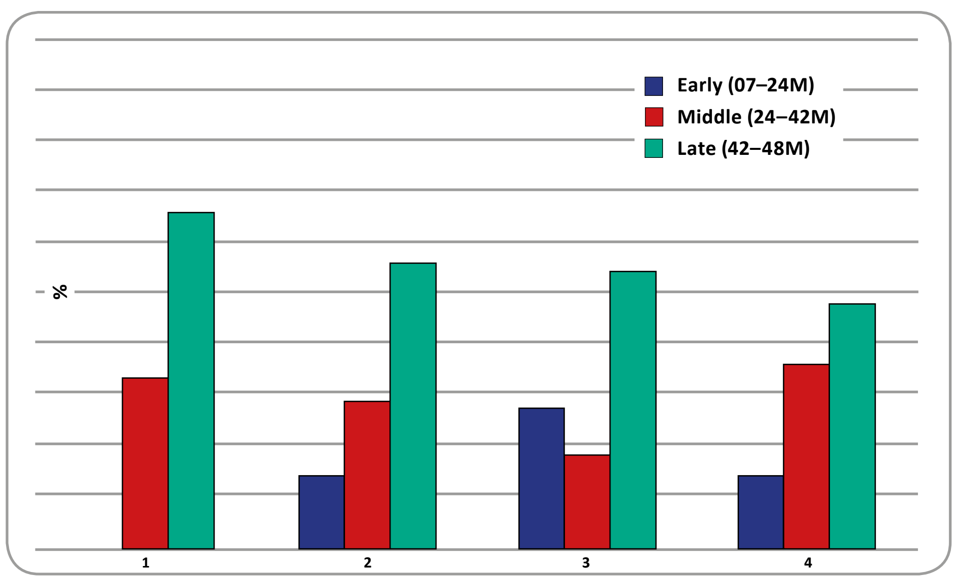


Illustration D7.1.3
Fusion data (% unfused) for cattle by Period

is repeated for all species would reinforce the notion of husbandry and management in situ. Furthermore, as the metrical data shows very little variation between individual animals, this could indicate that the animals themselves were drawn from a relatively restricted geographic region, a factor that isotopic analysis could certainly shed light on.

With cattle kept in significant numbers, but apparently for secondary products, and sheep/goat mimicking the pattern for cattle, it would appear that pig was the main meat provider. While this is not in itself a surprise, what is interesting is that despite the wealth of primary animal resources clearly evident from this site, meat does not appear to be the main concern. The fact that pig bones are more common than sheep/goat serves to reduce the importance of the latter; traction, diary products, meat and leather were derived from cattle; pigs were kept in relatively small numbers, and this actually serves to deemphasise the key resource that pigs provide: meat. This is further supported by the fact that pig numbers fall slightly through time. The fact that sheep/goat were apparently kept in smaller numbers than pig perhaps suggests that they were of marginal importance, or were ecologically unsuitable.

Of the wild species present, the finds are likely indicating species either trapped or actively hunted for specific products. The finds of capercaillie would almost certainly have made their way into the assemblage via hunting, given the type of woodland – dense coniferous – that it favours. This is also likely to have been the case for the other wild species, especially otter and wolf, given their habitats and habits, which are unlikely to bring them into contact with man. However, the significance of environment is most clearly contextualised from the perspective of marine mammals. The presence of such a diverse range of marine mammals gives some indication of the extent of resource exploitation, and specifically, the fact that this was evidently tied closely to available local resources.

There is clear evidence of a range of specialist implements in use for butchering, along with refined and systematic cutting practices. The tools used were predominantly knives – potentially with steel cutting edges – cleavers appear to have been reserved for chopping against a block. The repetitive, and consistent, manner in which the skulls of cattle were processed suggests both a high degree of skill and clear ‘guidelines’ for the types of butchery required. Thus, in this instance there is lucid evidence for the *outcome* of carcass processing (size of portion per body part) to have been clearly defined from the outset of butchering.

The diverse range of species, including food and (traditionally) non-food domesticates, that had occurrences of butchery is revealing. Skinning marks noted on otter, as well as antler removal ‘chops’ noted on red deer, indicate a diverse range of practices associated with activities not directly related to meat exploitation. Particularly revealing in this regard was the relatively high frequency of cut marks registered from marine mammals. Although the level of fragmentation, which, incidentally, was as a result of processing, was too great to construct detailed sequences, it was clear that heavy, repetitive and systematic exploitation of a range of marine species was undertaken. This exploitation was for meat as well as blubber.

The confusing matter with regard to craft specialisation is the fact that, whilst present in the assemblage, the numbers of elements with marks indicative of skinning, horn working and antler processing are relatively small. This suggests that the skills for these tasks were present within the monastic community, but employed on an ad hoc basis. Alternatively, and more likely, is that, as yet, the excavations have not revealed the main dumpsites. One would not, for example, expect to find skinning waste close to a tanner.

The assemblage had a relatively large number of ‘neonatal’ animals. Only two were recorded from Period 1, although this is likely a result of small sample size. Periods 2, 3 and 4 elicited thrity (nineteen neonates), twenty-five (twelve neonates) and twenty (nine neonates) juveniles respectively. These values, and those for the juveniles that could be categorised on the basis of MWS and Fusion, show a decline through time. Though small, the trend is an important one. It may indicate a change in husbandry or indeed, a transition in craft exploitation. The finds of juvenile bones certainly support the presence of vellum processing. In fact, the majority of juvenile cattle bones are neonatal, falling into an age range between 185 and 255 days (Prummel 1987). A few examples are older, based on tooth eruption, but overwhelmingly, the cattle are very young individuals. These numbers do not of themselves equate with book production. Gameson (1992) suggests that at least thirty individual animals would need to be slaughtered to produce one 246mm × 170mm volume with 200 folios. This figure is dwarfed when one considers the number of animals, 1,545, required to produce the three volumes of the *Codex Amiatinus* (see Chapter 5.6, p 210). It is likely that the assemblage recovered to date represents predominantly food waste, and only to a lesser extent waste from craft.

References

Boessneck, J 1969 ‘Osteological differences between sheep (*Ovis aries*) and goat (*Capra hircus*)’, *in* Brothwell D & Higgs E S (eds) *Science in Archaeology*, 2nd edn, 331–58. London: Thames & Hudson.

Cohen, A & Serjeantson, D 1996 *A manual for the identification of bird bones from archaeological sites, revised edition*. London: Archetype Publications Ltd.

Dobney, K & Reilly, K 1988 ‘A method for recording archaeological animal bones: the use of diagnostic zones’, *Circaea* 5(2): 79–96.

Ervynck, A 1997 ‘Following the rule? Fish and meat consumption in Monastic Communities in Flanders (Belgium)’, *in* De Boe, G & Verhaeghe, F *Environment and Subsistence in Medieval Europe. Papers of the Medieval Europe Brugge 1997 conference*. Vol 9. Zellik: IAP Rapporten 9.

Gameson, R 1992 ‘The cost of the Codex Amiatinus’, *Notes and Queries* 39(1): 2–9.

Grant, A, 1982 ‘The use of tooth wear as a guide to the age of domestic animals’, *in* Wilson, B, Grigson, C & Payne, S (eds) *Ageing and sexing animal bones from archaeological* sites, 91–108. Oxford: Archaeopress.

Halstead, P, Collins, P & Isaakidou, V 2002 ‘Sorting the sheep from the goats: morphological distinctions between the mandibles and mandibular teeth of adult *ovis* and *capra*’, *Journal of Archaeological Science* 29: 545–53.

Langdon, J 1984 ‘Horse hauling: a revolution in vehicle transport in the Twelfth- and Thirteenth-Century England?’, *Past and Present* 103: 37–66.

Matolcsi, J 1970 ‘Historische Erforschung der Körpergrösse des Rindes auf Grund von ungarischem Knochenmaterial’, *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 87: 89–137.

Mettler, J 1986 *Basic butchering of livestock and game*. Vermont: Storey Books.

Payne, S 1985 ‘Morphological distinction between the mandibular teeth of young sheep *Ovis* and goats *Capra*’, *Journal of Archaeological Science* 12: 139–47.

Prummel, W 1987 ‘Atlas for the identification of foetal skeletal elements of cattle, horse, sheep and pig. Part 2’, *Archaeozoologia* 1(2): 11–42.

Schmid, E 1972 *Atlas of animal bones*. Amsterdam: Elsevier.

Silver I A 1969 ‘The ageing of domestic animals’, *in* Brothwell D R & Higgs E (eds) *Science in Archaeology*, 2nd edn, 283–301. London: Thames & Hudson.

von den Driesch, A 1976 ‘A guide to the measurement of animal bones from archaeological sites’, *Peabody Museum Bulletin* 1. Cambridge Massachusetts: Harvard University.

Digest 7.2 FISH BONE

MATILDA HOLMES

Introduction

The fish bone assemblage comprises a few small samples from Period 1 to 3 features and a considerable assemblage from the midden and other Period 4 features (Table D7.2.1). Although the earlier sample is small, its contrast with that of the later phase makes it worthy of consideration.

Method

Bones were identified using the author's reference collection and other resources as required, they were recorded using the York system (Harland et al 2003), where only the most diagnostic elements are identified. Condition of the assemblage was recorded (following Lyman 1994, 355), as was evidence for other taphonomic factors such as butchery, gnawing, burning and working. Measurements were taken where the bone was complete enough (Morales & Rosenlund 1979). Information on the ecology of species was taken from Fishbase (Froese & Pauly 2000).

Both hand-collected and sieved samples (sieved to 1mm) were recorded.

Taphonomy and condition

The bones were generally in good condition (Table D7.2.2), with a small number able to be refitted from smaller fragments. A high proportion of Period 1 to 3 bones were burnt (63%), suggesting they were subject to different processing than those of the later phase, of which only a few fragments (2%) were burnt. Five bones from Period 4 had been gnawed.

Butchery and fragmentation

Butchery marks were only observed on Period 4 bones. Very few vertebrae included the lateral or dorsal spines, even in the sieved samples there were very few spinous processes (25% of the total number of ribs, rays and spinous processes and vertebrae), which suggests that these were removed at an earlier stage in processing. While this could be a matter of taphonomy, occasional butchery marks were observed on cod vertebrae, largely in the axial direction on the lateral aspect of vertebrae (Illus D7.2.1), but also, more rarely, as transverse chops and cuts. A similar cut mark was observed on a haddock caudal vertebra, in a transverse direction. Although not obvious from the bagged assemblage, the site record notes a number of articulated vertebrae that would have been deposited intact, as part of a butchery process.

Other butchery included a cod vomer that had a knife cut to the dorsal aspect and an articular from a gadidae spp with holes pierced in it (Illus D7.2.2), possibly resulting from hanging the fish or removing a fishing

Table D7.2.1
Number of fish bones identified to species and/or anatomy by feature type

Feature	1 or 2	2	2 or 3	3	4
Culvert		1	3	3	
Gulley					34
Hollow					278
Layer					5
Pit					31
Post-hole					27
Road				1	
Scoop					9
Shell Midden					1,125
Spread	2	1			297
Well		1			
Total	2	3	3	4	1,806

Illustration D7.2.1
Two illustrations of butchery occurring on cod vertebrae

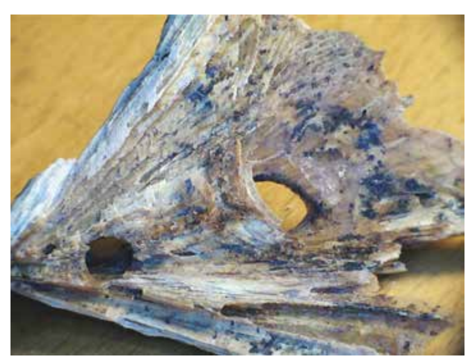


Illustration D7.2.2
Holes pierced in a gadidae articular fragment

Table D7.2.2
Condition and taphonomic factors affecting the fishbone assemblage

Condition	1 or 2	2	2 or 3	3	4
Fresh					1
Good	1	1	1	1	1102
Fair	1	1	2	3	680
Poor		1			23
Very poor					
Total	2	3	3	4	1806
Burnt	2	1	2		32
Gnawed					5
Refit			1 = 2		14 = 33

hook – the size of the hole is consistent with hooks recovered on site (C Spall pers comm).

When the skull elements present were compared with those from sites of known function (Barrett et al 1999, 372, fig 378), they are consistent with the results from sites where fish were being cured and exported (Illus D7.2.3; Table D7.2.3). And this, combined with the location of butchery marks and presence of filleted vertebrae, suggests that the cod assemblage from Period 4 was consistent with the waste left following preservation previously recorded at Robert's Haven, Caithness, and St Boniface, Orkney (Barrett et al 1999, 371; Barrett et al 2008, 852). The haddock assemblage included greater numbers of cleithra, which are more commonly recorded on sites where whole fish were consumed. However, this is also a phenomenon that has been observed on other sites and related to the unusually robust cleithrum of the haddock, creating a bias in favour of preservation of this element (Barrett et al 1999, 373). Haddock, too, may be the result of preservation or curing waste, particularly given the low numbers of supracleithra.

Period 1 to 3 (sixth–eleventh century)

This assemblage, although small, included freshwater or marine char, oceanic cod and horse mackerel (Table D7.2.4). Char are present in deep glacial lochs in Scotland, and could have been caught in the highland lochs Morie or Glass *c* 26 miles away by land, or Loch Ness, *c* 30 miles away by sea (National Library of Scotland 2012). However, all three species are available in coastal waters or further out at sea. The increase of cod in the eighth to ninth century is consistent with the increase in cod fishing in the Viking Age period (ninth to eleventh centuries) (Barrett et al 2000, 151; Barrett et al 2004, 624).

Period 4 (thirteenth–fifteenth century)

The increase in fish bone evidence from this phase comes exclusively from marine fish (Table D7.2.4). The majority of the assemblage derives from large numbers of cod and haddock, but includes various demersal species living on or near the ocean floor ie flatfish (plaice, halibut and, possibly, dab), conger eel, halibut, haddock and saithe, all of which could be caught from close to the shoreline. Other species are benthopelagic and can be caught at all depths, such as herring, cod and pollack. All these fish occupy littoral zones and can be found within the range of the continental shelf, so could be caught from the shore or with a small boat keeping close to the coast. Herring, cod, conger eel, halibut, haddock and saithe may be caught further out to sea.

The increase in gadid family species (ie cod, saithe, pollack and haddock) has been observed in assemblages from northern Scotland in the medieval period (Barrett et al 1999, 356), which is consistent with the findings from Portmahomack. This reflects the intensification of the fish trade in both Scotland and Europe at that time (Barrett et al 1999; Barrett 2008).

A small number of measurements were available for cod and haddock bones, which were used to estimate the total length of fish (using equations in Jones 1991). The results for cod (Illus D7.2.4) were compared with those given for a number of medieval northern Scottish sites (Barrett et al 1999, 361, fig 364), those from Portmahomack lying within the range for larger fish. No such comparanda were available for haddock, but they were similarly in the larger range of samples given

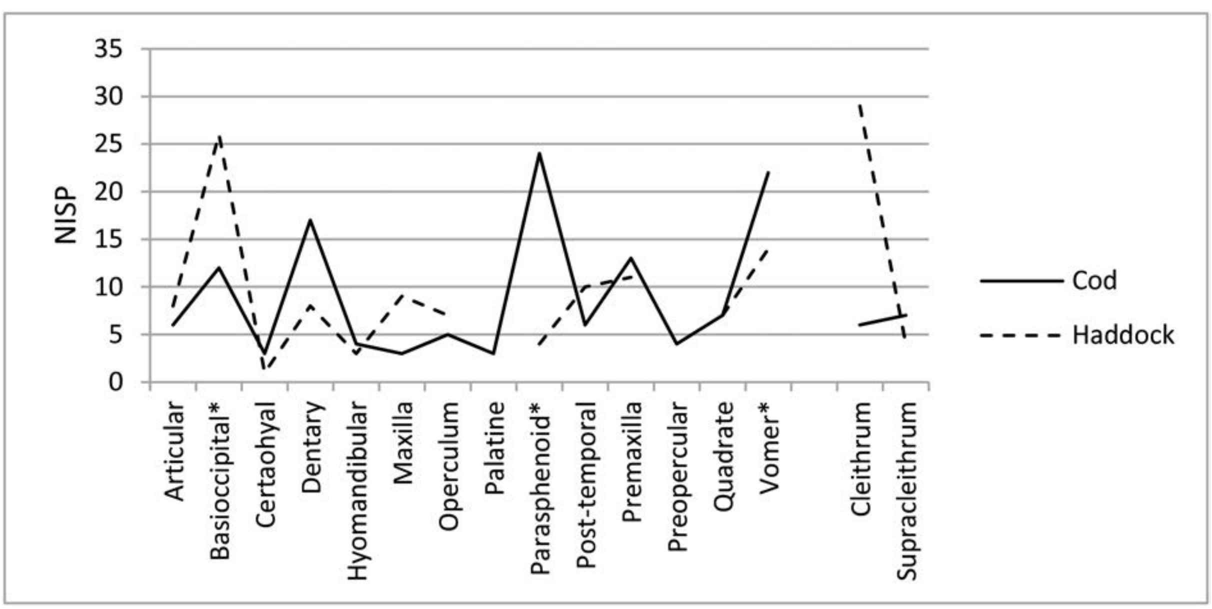


Illustration D7.2.3
Proportion of elements recorded for the cod and haddock assemblages in Period 4 (number of mid-line fragments doubled). Based on the greater likelihood of cleithrum and supracleithrum to be kept with the fish following preservation (after Barrett et al 1999).

Table D7.2.3
Anatomical elements recorded for the Period 4 fishbone assemblage (NISP)

Element/species	Cod	Pollack	Saithe	Haddock	Herring	Gurnard	Conger	Halibut	Flatfish	?Dab	Plaice
Articular	6			8							
Basioccipital	6			13							
Certaohyal	3			1							
Cleithrum	6			29							
Dentary	17	1		8			1				
Hyomandibular	4			3							
Maxilla	3			9							
Operculum	5			7							
Otolith	1			8							
Palatine	3										
Parasphenoid	12		1	2		1					
Posttemporal	6			10							
Premaxilla	13			11							
Preoperculum	4									1	1
Quadrate	7			7							
Supracleithrum	7			4							
Vomer	11			7							
Abdominal vertebrae	323	2		164			42				
Caudal vertebrae	403	17		434	2		91		1		7
Vertebrae	12						4				
Ultimate vertebrae				5							
1st Anal Pterygiophore								1			
Total	**853**	**20**	**1**	**730**	**2**	**1**	**138**	**1**	**1**	**1**	**8**

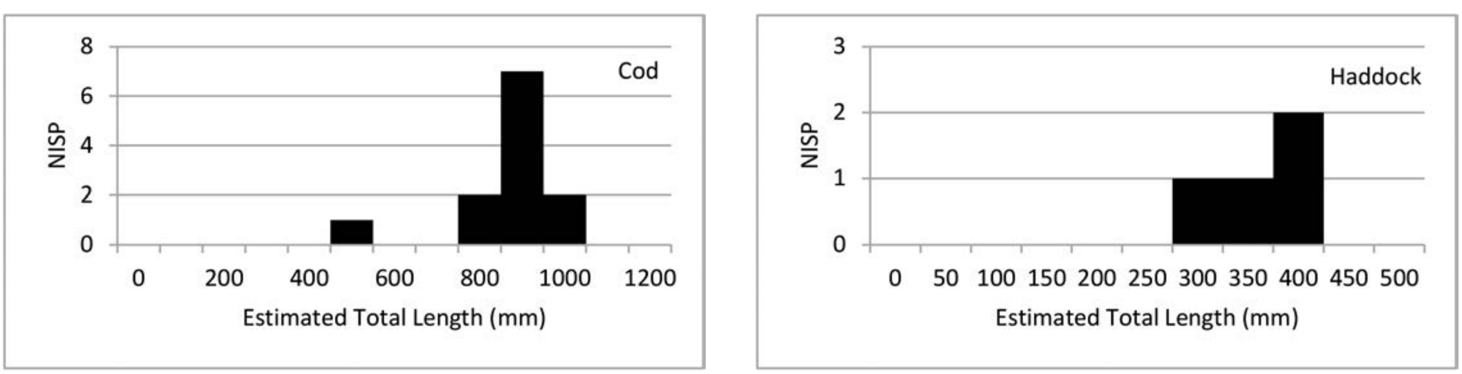


Illustration D7.2.4
Estimated total length of cod and haddock from the Period 4 assemblage. Based on dentary measurements, following equations by Jones 1991

by Jones (1991, 155, fig 157). The life cycle of cod suggest that larger fish are more likely to live in deeper waters, and the size of cod from Portmahomack are consistent with those suggested by Barrett et al (1999, 363) to be large enough to have required deep sea fishing.

Summary

Although not a vast sample size, the fish bone assemblage from Portmahomack has allowed some comments to be made regarding the nature of fish exploitation from the sixth to fifteenth centuries, of which relatively little is known in this area of the British Isles. The earliest phases were typified by a very small number of fish bones, suggesting that nearby lochs may have been fished, or, more likely, that the closer, more easily accessible marine resources were taken advantage of. The evidence from isotope studies on the human bone at the site suggest that only negligible amounts of marine resources were eaten by the inhabitants of the site in this phase. This is consistent with the low numbers of fish bones recovered on the site, the members of the monastery possibly focusing their attentions towards more land-based food sources.

Following a hiatus between the eleventh and thirteenth centuries, there was evidence for an intensification of the utilisation of marine stocks to have taken place in the intervening period. This is not surprising, as the phenomenon has been recognised on English sites from *c* AD 1000, and those from further north in both Scotland and Europe as occurring on Viking Age sites from *c* AD 900. The diversity of species suggests that both coastal and deep-sea waters were exploited, requiring some considerable expenditure of time and skill. Furthermore, the implications from metrical analysis suggest that larger fish were targeted, requiring the use of deep-sea fishing methods.

The combination of butchery marks and anatomical representation further implies that the deposits of cod and haddock resulted from a preservation process, where fish were beheaded and vertebrae removed on site, and then smoked or salted with the cleithra and/or supracleithra intact, to be traded further afield or supplied to another location.

Table D7.2.4
Species representation (NISP) of hand-collected material and that from samples

Species	1 or 2	2	2 or 3	3	4
Char	2	1	2	1	
Horse Mackerel	1				
Gadidae	1				46
Small Gadidae					1
Cod			1	3	853
Herring					2
Conger					138
Gurnard					1
Haddock					730
Pollack					20
Saithe					1
?Dab					1
Halibut					1
Plaice					8
Flatfish					1
Total	**4**	**1**	**3**	**4**	**1803**

References

Barrett, J, Beukens, R & Nicholson, R 2000 'Diet and ethnicity during the Viking colonization of northern Scotland: evidence from fish bones and stable carbon isotopes', *Antiquity* 75: 145–54.

Barrett, J, Nicholson, R & Ceron-Carrasco, R 1999 'Archaeo-icthyological evidence for longterm socioeconomic trends in northern Scotland: 3500 BC to AD 1500', *Journal of Archaeological Science* 26: 353–88.

Barrett, J H 2008 'Cod bones and commerce: the medieval fishing revolution', *Current Archaeology* 221: 20–5.

Barrett, J H, Johnstone, C, Harland, J, Van Neer, W, Ervynck, A, Makowiecki, D, Heinrich, D, Hufthammer, A, Enghoff, I, Amundson, C, Christiansen, J, Jones, A, Locker, A, Hamilton-Dyer, S, Jonsson, L, Lougas, L, Roberts, C & Richards, M 2008 'Detecting the medieval cod trade: a new method and first results', *Journal of Archaeological Science* 35: 850–61.

Barrett, J H, Locker, A & Roberts, C 2004 'Dark Age Economics' revisited: the English fish bone evidence AD 600–1600', *Antiquity* 78: 618–36.

Froese, R & Pauly, D 2000 *Fish Base 2000: Concepts, Design and Data Sources*. Penang: The World Fish Center.

Harland, J, Barrett, J H, Carrott, J, Dobney, K & Jaques, D 2003 'The York System: An integrated zooarchaeological database for research and teaching', *Internet Archaeology* 13.

Jones, A 1991 *The fish remains from Freswick Links, Caithness*. Unpublished thesis, University of York.

Lyman, L 1994 *Vertebrate Taphonomy.* Cambridge: Cambridge University Press.

Morales, A & Rosenlund, K 1979 *Fish Bone Measurements. An Attempt to Standardize the Measuring of Fish Bones from Archaeological Sites.* Copenhagen: Steenstrupia.

National Library of Scotland 2012 'Bathymetrical Survey of the Fresh-Water Lochs of Scotland, 1897–1909', *http://maps.nls.uk/bathymetric/index.html* [Accessed March 2012].

Digest 7.3 SHELLFISH

MATILDA HOLMES

Introduction

Shellfish were abundant in the middens of Period 4 associated with the lay settlement, and because of this, a sampling programme was undertaken whereby a few shells were kept for identification, but the majority were weighed and discarded. Shells from earlier deposits (Periods 1 and 2) relating to the early Christian monastery were all kept, and originated from a variety of features (Table D7.3.1). Because of the Period 4 sampling strategy, and bias introduced by the likelihood that only the biggest or most representative shells were kept back for identification, no measurements were taken on the Period 4 material.

Method

Shells were weighed and identified to family or species where possible (following Crothers 2003). Condition of the shells was recorded, as well as their completeness. Taphonomic processes affecting the assemblage were also noted, including burning, butchery, gnawing, perforations, encrustations and abrasion (Claassen 1998, 54–9). Measurements were taken following guidelines by Claassen (1998, 109–10) and bivalves were sided where possible.

Both hand-collected and sieved samples were recorded.

Taphonomy and condition

Shells were in fair condition, although highly fragmentary. Encrustations and perforations caused by parasites were common on whelk shells, oysters and, less often, winkles (Table D7.3.2). A large number of shells (crab and winkle) from Period 4 deposits showed signs of burning, and one winkle shell, also from this period, bore numerous cut marks.

Periods 1 to 2 (sixth–ninth century)

Shellfish from these periods came from discrete features, with a concentration of whelks in and around pit F325 in Int 14. Winkles were recorded further to the south, from features within Int 24 associated with the vellum yard. Limpets, oysters and cockles were less commonly recorded (Table D7.3.3).

With the exception of two flat winkles (*Littorina obtusata* or *Littorina fabalis*), the rest were identified as the common or edible winkle (*Littorina littorea*), both of these species inhabit the middle and lower shore areas. Although it has been suggested that winkles were roasted to be used as lime in the vellum production process, there was no evidence of burning on the shells in this assemblage. However, this may not be

Table D7.3.2
Condition and taphonomic factors affecting the shellfish assemblage

Condition	1 or 2	2	2 or 3
Excellent			
Good	3	6	16
Fair	31	87	
Poor		16	
Very Poor			
Total	34	109	16
Burnt		6%	81%
Butchery			6%
Encrustation	3%	11%	
Perforation	3%	11%	6%
Refit		1 = 4	

Table D7.3.1
Number of shells identified to species by feature type

Feature	1 or 2	2	2 or 3
Culvert		13	
Ditch		3	
Dump		8	
Floor		1	
Hollow			1
Layer	11		
Pit		23	1
Shell Midden			13
Spread	23	61	1
Total Number	34	109	16
Total Weight (g)	4.2	22.5	36 860.6*

* Period 4 weight includes discarded sample from the midden

Table D7.3.3
Shellfish recorded to species from hand collected and sampled deposits

Phase Species	1 or 2 Number	 Weight	2 Number	 Weight	4* Number	 Weight
Winkle	21		72	2.2	1	23817
Flat Winkle			2			
Whelk			30	18.2		
Common Whelk			1			
Cockle	1	0.1				
Limpet	3	0.1	3	0.5	1	7097
Oyster	9	4	1	1.6	1	1.6
Crab					13	–
Mussel						5945
Total	34	4.2	109	22.5	16	36890.6

* Number of fragments from Period 4 comes from a sample kept back from the middens. Weights include all midden shells including those later discarded

surprising, as those winkles that had been roasted and crushed would not survive well in the archaeological record.

Although the use of dog whelks (*Nucella lapillus*) for the production of purple pigment has been documented as occurring in Anglo-Saxon Britain, little direct evidence has been forthcoming (Biggam 2006, 2). Unfortunately, despite their association with manuscript production at this site, the only whelk shell complete enough to be identified to species was that of the common whelk (*Buccinum undatum*), which are distinct from the dog whelk. Common whelks are found on the lower shore and could be easily exploited.

Native British oysters (*Ostrea edulis*) were present and could have been picked from freshwater, estuarine or marine beds. Cockles and limpets are also common finds on the middle and lower shoreline.

Period 4 (thirteenth–fifteenth century)

As with the earlier period, winkles dominated the Period 4 assemblage by weight (Table D7.3.3), and given their small size compared to the other common shellfish, suggests the intensive exploitation of this species. Mussels and limpets were also recorded in significant numbers from the middens, along with a small number of crab claws and oyster shells. It is likely that these species formed part of the diet and they could have been easily gathered from the shore.

Summary

The sheer quantity of shellfish remains in the Period 4 middens suggests intensive exploitation. Although it is possible that shellfish were exported from the site, it is most likely that the accumulations of shells derive from animals eaten by the inhabitants of the settlement.

Despite the results of isotope analysis on the human remains of the earlier Periods 1 and 2 indicating that there was no intensive exploitation of shellfish for food, it is possible some were occasionally eaten, resulting in the significant deposit of winkles. There was no direct evidence for the use of shells for craft purposes – the winkles were not burnt or otherwise processed, and the whelks were not of the correct species to produce pigment.

References

Biggam, C 2006 'Whelks and purple dye in Anglo-Saxon England', *The Archaeomalacology Group Newsletter* 9: 1–2.

Claassen, C 1998 *Shells*. Cambridge: Cambridge University Press.

Crothers, J 2003 'Rocky shore snails as material for projects (with a key for their identification)', *Field Studies* 10: 601–34.

Digest 7.4 SUMMARY REPORT ON PLANT AND INSECT REMAINS

ALLAN HALL and HARRY KENWARD (formerly University of York) (OLA 7.4.1)

A wide variety of samples was collected during excavations at Portmahomack over the period 2004–11, including spot finds of charcoal and uncharred wood, and other charred and waterlogged plant material. Some samples were processed by wet-sieving by FAS for recovery of charred remains; and some further samples of whole sediment containing material preserved primarily by anoxic waterlogging were processed by the author and by others. In some cases, the material offers insight into fuel use at and importation and use of materials from the hinterland to the site, whilst in others, aspects of the past environment of the inhabitants of the site at Portmahomack have been addressed through studies of plant and insect remains.

For samples of charcoal and other charred remains treated as spot finds or residues/flots from sieving, the quantity of material submitted was weighed to the nearest gram as a rough guide to the quantity present. In some cases, material was sieved to remove fine debris before being examined under the low-power binocular microscope. Charcoal was identified by examining transverse sections, either from the original surface or by creating freshly broken surfaces. where necessary. For waterlogged wood, thin sections in one or more of three planes were taken with a razor blade and examined using a transmission microscope.

Some samples in which the bulk of the preservation was by anoxic waterlogging had been disaggregated by staff at Headland Archaeology during an early phase of assessment and the authors received 'flots' from paraffin flotation. Some other material had been examined at this stage by Headland Archaeology and their comments are, where relevant, subsumed into this account (OLA 7.4.2).

Lastly, a group of samples from the channel/'millpond' in Sector 2 was processed (by ARH) using one of the two series of column samples obtained by FAS. These were in the form of cling-film wrapped slices, each of about 200–330g in weight. They were disaggregated and sieved following the general procedures of Kenward et al (1980) (with the use of sodium carbonate and boiling for some of the early processed samples, though this was not found very effective in facilitating disaggregation). The wet residues were then checked (by ARH) for macroscopic plant remains, which were recorded semi-quantitatively on a four-point scale of abundance (from 1 – one or a few items per kg of original sediment to 4 – very abundant or a major component of the deposit), along with all other components of the samples. Representative insect remains observed during this stage were picked out for examination (by HKK) with paraffin flotation (again following the methodology of Kenward et al (1980)) used in one case.

Detailed comments on the material examined are presented in OLA 7.4.1 Table 1, where the order and grouping of samples follows the narrative below. Note that the deposits from the stream channel/'millpond' are treated separately (OLA 7.4.1 Table 2) since their dating stretches from Period 0 to 2.2+.

Period 0 Fill of charcoal pit/kiln F573

C3536

The material in the two samples examined was primarily charred birch roundwood (up to about 35mm in diameter). The observation that much of the material in Sample 24/8538 comprised bark with tarry deposits on outside surfaces is perhaps consistent with the idea that this material was deliberately made charcoal, since tars would tend to be concentrated in the enclosed environment of a charcoal clamp. But this also raises the possibility that pitch was being produced by this kiln as a primary product or a by-product to the charcoal.

Period 1 Fill of ditch F129

C1325, C1337 and C1345

The series of samples from this feature were notable for their content of charred cereal remains, with both grains and chaff fragments represented, evidently discarded into the ditch rather than being burnt there. The presence of grains and rachis (ear stalk) fragments of rye, barley and free-threshing wheat might be considered to imply bulk processing of cereals nearby: charring having occurred either during the crop drying phase of processing or during a conflagration of a storage context, whilst an origin in waste from threshing is perhaps unlikely, given the paucity of weed seeds. The presence of charred debris which may have arrived in turves is perhaps the key to this material – it may have been burnt debris from a straw and turf roof (though the absence of cereal culm material might argue against that, in which case one might invoke a crop within a turf-roofed and/or walled building, both of which were destroyed by fire).

Period 1 Fills of hearth F535

C3305, C3406, C3467, C3473, C3499, C3500, C3502 and C3528

Plant material surviving in charred form in the deposits associated with this hearth primarily comprised the coarse woody material from the basal parts of heather plants, sometimes with twig fragments from the upper parts, identified with certainty in most of the samples. There were also some charred rhizome fragments, presumably from surface-cut turves – perhaps from the organic litter layer from which the heather had been pulled. Likewise, the record of fragments of burnt peat in three samples also points to peat turves, or to the same kind of surface-deposited organic matter from an area of heathland or moorland. The traces of barley grains in four samples might represent material from straw, or accidental burning of grain intended for food, in the hearth. Charred hazel nutshell was present in two samples in this group.

Two samples from a deposit identified as a dump of spent fuel, adjacent to the hearth (C3467 and C3528), yielded a very similar range of remains. Charred hazel nutshell and traces of barley grains were noted in one sample within this group.

Period 1 Samples from gulley F436, well F527 and cistern F530

C2224, C3227 and C3570

Three samples fell outside of these Phase 1 context groups. Two consisted of willow stems (details in OLA 7.4.1 Table 1), whilst the organic content of a sample from C3227, the fill of a stone-lined cistern, appeared to be mainly burnt peat, or perhaps surface-cut heathland/moorland turves.

Period 2 Building material from buildings/structures

C1030, C1866, C1872, C1916 and C2704

Sixteen samples from five contexts from layers of 'primary burning' relating to the destruction of Period 2 Phase 2 buildings by fire were examined and were, not surprisingly, dominated by wood charcoal (principally of oak, present in thirteen samples). There were also numerous records of hazel charcoal, mostly from roundwood, typically from stems about 15mm in diameter and therefore, presumably, most likely to be from wattle (they would be rather slender for roof purlins, for example) though a less formal brushwood layer within a roof is possible). There were remains of heather in many samples, sometimes in the form of small leafy shoot or twig fragments, in other cases as coarser root/basal twig material.

This is consistent with the excavators' record of C2704, for example, as having 'contained burnt wattle and heather rope' and woven wattle, though none of this could be discerned directly from the samples as supplied. Some small charred peg-like structures in Sample 24/6773 may have been from roofing material – pegs might be used in the fixing of turves or other thatching material. The thatch seems most likely to have been of heather (perhaps with some cut turves as an underlay), since the grass or straw debris likely to represent cut reed or cereal stems do not seem to be present in the assemblages.

Period 2 Hearth fills associated with S9

C2468, C2777, C2786, C3196, C3198 and C3252

This group comprised material from hearths F445, F495 and F529, within the 'vellum-makers' yard' adjacent to S9. The two small samples from focal hearth F445 included charred (?)heather root/twig and some barley grains, whilst much the same material was recovered from refurbished focal hearth F495 (noted during excavation as 'containing frequent lenses of pure turf charcoal and occasional pockets of unburnt turf present as decayed brown silt'). Sample 24/3196, in particular, contained what appeared to be burnt peat/mor humus (the latter more likely from surface-cut turves than deeper-lying peat), with root/rhizome and sedge nutlets as further probable indicators of an origin in turves. From a sample from focal hearth F529, further burnt amorphous peat was recovered, along with heather twig and (?)heather basal twig/root fragments, as well as a single burnt spirorbid shell and charred and uncharred snails (spirorbids are discussed further in the next section). A second sample from another layer within the same hearth produced what might have been a tiny fragment of charred seaweed, as well as further (?)heather charcoal, but the bulk of the sample seemed to be unburnt mor humus, again consistent with the excavators' observations.

Period 2 Other deposits associated with S9

C1917, C2109, C2889, C3140 and C3171

The sample from C1917, a layer of ash and burnt shell, gave the strongest evidence in this group for material from the marine littoral. There were burnt marine shells, including periwinkle, as well as charred seaweed with frequent burnt spirorbid shells. The latter live mainly as epibionts on seaweed and are unavoidably imported with their substrate. They can serve as a proxy for seaweed, even when none is recorded in its own right. Closer identification of spirorbids is difficult, if not impossible, but their interpretation does not depend on knowing the species concerned. Similarly, a sample from C3140, recorded as a shell-rich sand, forming part of an earth and stone bank (F476), included further charred seaweed material along with marine shell, spirorbids, traces of foraminiferans (marine micro-fauna) and a few burnt snails, which included two *Hydrobia* cf *ulvae*, a species likely to have arrived with seaweed. The assemblage as a whole points to imported seaweed and shells, presumably burnt to produce a form of lime for processing skins (which process is also inferred from other evidence). A third sample rich in spirorbid shells was from C3171, an ashy dump; again, there were traces of burnt seaweed and some charred herbaceous material that may have originated in turves.

Quite different, yet still charred material was recovered from C2889, recorded as burnt structural material. Here, there was a sample comprising a mixture of what may have been burnt peat with charcoal, the latter including oak and (?)heather, with some fine charred herbaceous stems and fine charred moss stems, perhaps from burnt surface-cut turves. Another sample was of coarser charred herbaceous stems, perhaps from some large sedge-like plant such as bulrush or sea club-rush (*Scirpus lacustris/maritimus*) and most likely, material from a thatched roof.

The sample from C2109 was a chisel handle on which mineral-replaced wood was present; the wood may have been alder but was not conclusively identified (24/4716).

Period 2 Deposits associated with S7

C2295 and C3509

The sample from C2295 was material from a wooden structure, from which a willow twig provided a radiocarbon date. From C3509, the final backfill of a stone-lined culvert, F431, there was a single sample of very humic sand. Not surprisingly, as a final fill it probably bears no relation to the life and use of the culvert; the assemblage of plant remains was dominated by wood fragments and elder (*Sambucus nigra*) seeds, the former perhaps largely also from elder bushes. On the whole, the material gave the impression of inwashed terrestrial material, though fragments of caddis larval cases stood out as the exception to this. It is perhaps significant that the only beetles recorded were of terrestrial species, one of which, *Grynobius planus*, is a wood-borer and the only beetle associated with trees to have been found in any of the assemblages which yielded insect remains.

Period 2 Deposits associated with monastic boundary walls

C2584, C2677 and C2697

Four samples from C2584 were from charred remains of a hurdle and were from a variety of tree species: alder, birch, hazel, oak and an unidentified conifer, together, in one case, with traces of (?)heather root/basal twig. Generally, the charcoal seemed to have come from well-grown plants which perhaps – not surprisingly – implies management of woodland for poles suitable for hurdles (providing long straight specimens) rather than casual collection from unmanaged local woods. Charcoal from C2677, adjacent to F483 (collapsed burnt hurdle), included birch, hazel and oak, along with willow/poplar/aspen and, again, some fragment which were probably heather root/basal twig. The hurdle elements were again from well-grown stools. Lastly, a further selection of charcoal samples from a hurdle from C2697 contained alder, hazel, oak and willow/poplar/aspen as well as (?)heather. The quality of growth of the rods, as marked by their ring-widths, was not noted as especially good or bad, except in the case of material from one sample (Sample 24/2697), which was hazel, perhaps from a stem perhaps 100mm in diameter, and therefore perhaps a sail (upright) rather than a rod; here there were some tens of annual rings across the section, suggesting rather slow growth. It may be significant that a sample of this charcoal returned a radiocarbon date rather earlier than others for this phase.

Period 2 Enclosure ditch S16

C1401, C1404, C1405 and C1407

These deposits were the waterlogged fills from the basal sequence in the monastic enclosure ditch and had been examined previously by Mhairi Hastie at Headland Archaeology. Only 0.5l samples had been processed and the material examined by the present authors consisted of glass jars of 'residue' and some sorted remains. HKK makes the point that much larger samples (3–5kg) would undoubtedly have furnished rather more valuable information. The interpretative potential of these insect assemblages was very much limited by the small numbers of remains: few taxa were recovered, and it was not possible to make a reasonable judgment as to the relative importance of the various habitats suggested. The site is, of course, located in an area where many species common in more southerly locations might not be able to exist, restricting the potential range that might be recovered in any case (though this would not necessarily prevent the recovery of useful data from the insects, as it has proved possible in areas such as Iceland and Greenland, with extremely limited local faunas).

Those caveats notwithstanding, the ditch clearly contained water, at least intermittently, at the time the lowermost deposits (C1407) formed, for there were both plant and insect taxa requiring a body of standing water. The bulk of the biota, though, was of terrestrial origin, with the abundance of elder seeds (and with wood and twig fragments of this species, too), perhaps suggesting scrub overhanging the ditch. Consistent with such scrubby vegetation were the moderate numbers of fruits of rough chervil (*Chaerophyllum temulentum*), docks (*Rumex*) and stinging nettle (*Urtica dioica*). Amongst the insects there were some dung beetles, pointing to the presence of nearby livestock, or of extensive grazing land more generally. Perhaps the ditch formed the boundary to a field, with the elder scrub part of a hedge line. The presence of rough chervil so far north in the seventh–eighth centuries may be of some significance in terms of climatic change; this area is very much the northern limit for the species at the present time (Preston et al 2002, 456, as *C temulum*).

Much the same kind of assemblage of plant remains was seen in C1405, with very abundant elder seeds and many elder twig fragments. There were again some ‘hedgerow’ taxa, but also present here were traces of uncharred heather (twigs, shoots and flowers), the bog moss *Sphagnum* (leaves) and bog myrtle (*Myrica gale*). They must have originated in an area of heathland or bog, perhaps, for example, via imported materials for roofing. The presence of traces of arable weed seeds points to a further component from a quite different source. By contrast, the insect remains offered no evidence for human occupation in the vicinity, though as pointed out in the detailed narrative (OLA 7.4.1 Table 1), such taxa may be rare in deposits forming even quite close to occupation.

The theme of an elder twig/seed-rich assemblage continued into C1404, though with twigs of alder and willow also present. There was clearly a return to more permanently standing water at this time, evidenced by the insect remains – which included several aquatic taxa – and by the plants, amongst which were abundant water crowfoot (*Ranunculus* Subgenus *Batrachium*) achenes. Hedge/scrub communities were again indicated by the insects, as well as cultivated land, grazing land and waste places, but with none of the presumed occupation materials seen in the sample from C1405.

Finally, the uppermost fill in this sequence, C1401, was largely twiggy debris, including a substantial chunk of elder trunk wood and many elder seeds, along with abundant water crowfoot achenes (some of them finding their way onto the larval cases of caddis flies that lived in the ditch at the same time). Much the same kinds of habitats were represented, but there was a decline in overall numbers of taxa – and here the observation that some of the wood looked as though it had become somewhat decayed before burial may be of relevance. Perhaps the ditch was drying out more frequently, leading to some decay between phases of standing water (during which material was much better preserved).

Two other samples from this sequence were timber and twigs; not surprisingly, perhaps, they, too, were elder.

Period 2/3 Hearth fills in S1

C1082, C1086, C1141, C1142, C1527, C1615, and C1621

Material from focal hearth F65, S1, was represented by samples from six contexts (all those listed, apart from C1527). Wood ending up as fuel – whatever its original function – comprised alder, birch, hazel, Pomoideae (perhaps rowan or hawthorn, for example), oak, and willow/poplar/aspen, with hazel, oak, and willow/poplar/aspen being the most frequently recorded. Heather root/basal twig fragments were recorded in six samples, with other parts of heather plants noted in several of them: buds, flowers, twigs – presumably from cut or pulled heather brought as fuel or from recycled heather thatch, for example. There were occasional fragments of charred root/rhizome and herbaceous material which may have arrived with surface-cut turves (especially in Sample 11/4171, C1615, the principal surviving fill of the hearth). Oat and barley grains (but no wheat) were occasionally recorded too, and five samples (from three contexts) furnished charred hazel nutshell.

The single sample from C1527 (the fill of a stone-lined ‘flue’ serving the interior of S1), comprised remains of three charred barley grains from which a radiocarbon date in the ninth and tenth centuries was obtained.

Period 3 Fills from metal-workers’ hearths

Material from hearth F148: C1412

The three small samples yielded remains of charcoal of oak and hazel, with, in one case, some heather root/basal twig and a little charred straw. Another sample produced a single oat grain.

Material from hearth F353: C1545 and C1815

The small sample was mainly oak charcoal.

From a deposit interpreted as a metalworkers’ dump by hearths F148 and F353, an iron hook (24/4804) was recovered and mineral-replaced wood from its handle was examined, but could not be identified.

The last sample in this group was from C1724, a fill from a further hearth or firepit, F299. It comprised burnt (?)peat (or perhaps organic soil) and heather root/basal twig fragments.

Period 3 Fills of S5 ditch F3

C1009, C1010, C1018, C1126, C1127, C1128, C1130, C1132, C1135, C1136, C1137, C1140, C1141, C1147, C1148, C1149, C1150, C1151, C1153, C1154 and C1156

The earliest silting onto the basal sands was represented by a single sample from C1156 in which the ancient (charred) remains comprised traces of barley grains and (?)heather root/basal twig fragments.

This was followed by a slumping episode (C1150, C1151, C1153 and C1154) from which the thirteen mostly minuscule samples produced only scraps of charcoal (most of which was not identified any further, though there was some heather from two samples from C1150), traces of barley grains, and a few uncharred and presumably recent weed seeds.

A phase of burning came next. Here, the four samples from two contexts (C1148 and C1141) yielded three records of oak charcoal, one of hazel, and two examples of charred heather twigs, with two of (?)heather root/basal twigs. The presence of charred root/rhizome in the two samples from C1141, and of sedge nutlets in one of them, perhaps points to an origin in burnt surface-cut turves.

Deposits interpreted as originating from the erosion of the bank are next in the sequence. The fourteen samples (from C1132, C1135, C1136, C1140, C1147 and C1149) perhaps included material originally deposited in Period 2, since there were traces of (?)burnt peat and (?)charred seaweed across two of the contexts and (?)heather root/basal twig in five of the samples (representing four contexts). Some lesser clubmoss megaspores in a sample from C1140 might indicate material from unburnt turves if they are not inwashed from local damp short turf. Traces of barley grains were recorded from two samples from two contexts and tentatively from a third.

From a sand deposit laid prior to levelling, four samples (from C1127, C1128, C1130 and C1137, all equivalent layers) yielded between them no more than a few barley grains. And a little oak charcoal

The latest layers in the infill of the ditch were interpreted as relating to its final levelling (C1009, C1010, C1018 and C1126). Perhaps not surprisingly, there were few ancient remains (but quite a few records of uncharred – presumably recent – weed seeds) in the six small samples available: the remains were much the same as in deposits below, with three records of oak charcoal, two of (?) heather root/basal twig fragments and a single record of tentatively identified barley (two grains).

Period 3 Other deposits

The fill of a central pit in S5 (C1027) provided two samples. In one, the sediment was most likely burnt peat, with a little charcoal and charred (?)heather root/basal twig, charred heather flowers, some small barley and oat grains and a few wild radish (*Raphanus raphanistrum*) pod segments, the last a cornfield weed contaminant not easily winnowed or sieved from the crop. The other sample was a spot find of charcoal including a few oat and barley grains.

Channel/pool section (OLA 7.4.1 Table 2)

The sequence of more or less sandy detritus peat had been divided in the field into three contexts, a basal layer sandy gravel (C2332) grading into the lower half of the section, with a sharp change in colour between the lower context (C2310) and the upper (C2296) (though there was little to distinguish the two upper contexts lithologically when examined in the laboratory some years after excavation). Though labelled C2332, the lowermost sample has been assigned to C2310 here since it was indistinguishable in composition from the material immediately above it, other than having a higher sand content. Since the nature of the plant and invertebrate remains in the peat was not known from the outset, the division of samples into a series of thin slices collected in the field was respected during the present analyses, and they were not aggregated into larger units. In any case, the sediment proved rather intractable: even prolonged soaking or the use of mild alkaline chemicals did not readily assist in disaggregation, the peat remaining very coherent and requiring considerable manual intervention to reduce clast size and free the contained fossils. It is likely (especially given the sandy substrates across the site) that the peat had undergone a degree of natural drying and shrinkage during the centuries after deposition, which made it difficult to tease apart.

The commentary which follows is based on the more detailed sample-by-sample account in OLA 7.4.1 Table 2, and drawing on information in OLA 7.4.1 Table 6.

Period 0–1 C2310

The assemblages from the lowermost samples were dominated by plants of marsh and fen, primarily – in terms of identifiable matrix components – the hypnoid mosses *Drepanocladus* (whose identification to species is extremely challenging for fossil material where characters such as habit and colour are lacking), *Cratoneuron commutatum* (in Sample 24/49102, taken from the second, adjacent column, and examined to provide material for radiocarbon dating), and *Scorpidium scorpioides*. The other plant taxa persistently present or recorded in significant numbers, such as lesser spearwort (*Ranunculus flammula*), toad rush (*Juncus bufonius*) and spike-rush (*Eleocharis palustris*), augmented by the records for waterside insects, such as *Chaetarthria seminulum*, were also consistent with deposition in a shallow wet feature, with enough standing water to provide habitats for caddis flies and water beetles such as *Coelostoma orbiculare*, though with remains coming from organisms living in terrestrial habitats nearby. Indeed, in this latter category, beetles such as *Aphodius* (but also several other taxa) pointed to the presence of herbivore dung in the vicinity. Intriguingly, the records for charred and uncharred remains of heather, even in these lower deposits, suggests a very small component of occupation material may have been reaching the site of deposition, probably by wind-blow.

Period 2 C2296

Human influence is more markedly obvious in the upper context, where records for plants of disturbed places and weeds of cultivation, such as annual nettle (*Urtica urens*), docks (*Rumex*), fat hen (*Chenopodium album*), chickweed (*Stellaria media*), corn spurrey (*Spergula arvensis*) and wild radish (*Raphanus raphanistrum*) become established. Further records of heather, especially as charred fragments, together with scattered charred grains and chaff fragments of barley (*Hordeum*) point to material from occupation. Likewise, as low in the sequence as Sample 24/4872, there are indications in the beetle fauna for the presence of artificial habitats associated with human occupation (via *Falagria* or *Cordalia* sp and *Gyrohypnus ?angustatus*). At least four kinds of fly puparium were present in this assemblage, too, perhaps adding to the evidence that detritus from human occupation was present. It should be noted, though, that the only *strongly* synanthropic insect (from Sample 24/4868 from this context) was the spider beetle *Tipnus unicolor*, a species generally found in (by modern standards) damp old buildings. Though some of the wetland plant taxa from the earlier phase persist, and there are occasional records of waterside beetles, the moss flora is very depleted in the upper part of the peat and the taxa present are not those fen/marsh plants seen in Period 0–1. The insect fauna is increasingly dominated by terrestrial taxa, especially grazing land forms, though at the top of the sequence (Sample 24/4862) there are hints of a return to more marshy conditions (which also fostered better preservation and a large assemblage of both plants and insects).

Concluding remarks

Overall, the studies of plant remains have enabled us to confirm many of the field interpretations of the excavators: deposits thought to comprise or contain structural building material have generally yielded materials likely to have come from roofs and perhaps also walls, with imported heather persistently present in the assemblages. Whilst this may sometimes have arrived as cut material in its own right, the abundance of what are thought to be the coarser basal parts of the plant warn us that surface-cut turves from heather-dominated vegetation are a rich source of such material, and would also be likely to furnish the charred remains of roots/ rhizomes and small clasts of burnt peat seen in so many of the samples.

Evidence for plant foods at Portmahomack is very limited. Although cereal grains were quite frequently encountered, in some cases in moderately high concentrations, the grains were more usually scattered in ones or twos through many of the samples. Rachis fragments from samples from the Period 1 ditch (F129) have allowed us to show that free-threshing hexaploid wheat, barley and rye were all being exploited.

The records for wheat, with a single exception, and for rye, are all from Period 1 deposits, the later cereals being barley, with (occasionally) oats. Rye is perhaps the more likely crop to have been grown successfully so far north, so perhaps the wheat was imported, as suggested for the contemporaneous material from Hoddom, Dumfries and Galloway (Holden 2006, 152), though the presence of the rachis would perhaps be unexpected in a crop cleaned prior to shipping. Comparison with the Hoddom assemblages – which can only be tentative, given the very different nature of the depositional contexts between the sites – also reveals the very limited representation of oats at Portmahomack compared with the Dumfriesshire site, where 'tens of thousands of oats' (ibid 151) were recovered.

The insect assemblages reported here, though for the most part limited by sample size and/or quality of preservation, offer evidence (primarily through records of dung beetles and the chafer *Phyllopertha horticola*) for grazing land at various stages through the period of occupation of the site. Notable also are some elder-rich assemblages, which presumably reflect patches of scrub; these must have been close to the site of deposition in the case of the Period 2 monastic enclosure ditch (S16), and were perhaps boundary hedges, though elder seems unlikely to have been stockproof enough to serve to contain the livestock whose dung was apparently providing a substrate for *Aphodius* and *Geotrupes* dung beetles at the same time. That the elder represents phases of neglect or abandonment of certain areas might also need to be considered.

Acknowledgments

The authors are grateful to Cecily Spall for her untiring responses to tedious and complicated questions about the samples during the phases of practical work and report compilation. The work of Drs Tim Holden and Mhairi Hastie at Headland Archaeology in some analyses undertaken at assessment stage are gratefully acknowledged. The generous support of the Department of Archaeology, University of York, in providing facilities for the work reported here was a *sine qua non*.

References

Holden, T 2006 'The botanical evidence', *in* Lowe, C *Excavation at Hoddom, Dumfriesshire. An Early Ecclesiastical Site in South-West Scotland*, 150–5. Edinburgh: Society of Antiquaries of Scotland.

Kenward, H 2009 'Invertebrates in archaeology in the north of England', *English Heritage Research Department Report Series* 12/2009, 785 pp (http://services.english-heritage.org.uk/ResearchReportsPdfs/012_2009WEB.pdf).

Kenward, H K Hall, A R & Jones, A K G 1980 'A tested set of techniques for the extraction of plant and animal macro-fossils from waterlogged archaeologicaldeposits', *Science and Archaeology* 22: 3–15.

Kenward, H & Large, F 1998 'Recording the preservational condition of archaeological insect fossils', *Environmental Archaeology* 2: 49–60.

Kloet, G S & Hincks, W D 1964–77 *A Check List of British Insects*, 2nd edn. London: Royal Entomological Society.

Philp, E G 2006 'Vascular plants and the beetles associated with them', *in* Cooter, J & Barclay, M V L (eds) *A Coleopterist's Handbook*, 270–310. Orpington, Kent: The Amateur Entomologists' Society.

Preston, C D, Pearman, D A & Dines, T D (eds) 2002 *New Atlas of the British & Irish Flora*. Oxford: University Press.

Smith, A J E 1978 *The Moss Flora of Britain and Ireland*. Cambridge: Cambridge University Press.

Tutin, T G, Heywood, V H, Burges, N A, Moore, D M, Valentine, D H, Walters, S M & Webb, D A (eds) 1964–80 *Flora Europaea* 1–5. Cambridge: Cambridge University Press.

Digest 7.5 SUMMARY REPORT ON SOIL MICROMORPHOLOGY

CLAIRE ELLIS (for full report see OLA 7.5.1)

Method

Nine kubiena samples were taken from four selected locations in Sector 2. Each sample was prepared for thin section analysis by G McLeod at the Department of Environmental Science, University of Stirling, using the methods of Murphy (1986). Water was removed and replaced by acetone exchange and then impregnated under vacuum using polyester crystic resin and a catalyst. The blocks were cured for up to four weeks, sliced and bonded to glass and precision lapped to 30μm with a cover slip.

Samples were assessed using a MEIJI ML9200 polarizing microscope, following the principals of Bullock et al (1985), Courty et al (1989), Fitzpatrick (1993) and Stoops (2003). A range of magnifications (×40–×400) and constant light sources (plane polarized light – PPL, cross-polars – XPL, circular polarized light and oblique incident light – OIL) were used in the analysis. The summary results are given below and full descriptions in OLA 7.5.1.

Locations and objectives

The main objective of analysis was to characterise the nature of the sampled deposits and address specific questions as follows:

Location 1. Sample 24/8030. Taken from the layers stratified beneath the stones F577 assigned to the bridge (S7) and representing Period 0 to 1.

- Did the sediment accumulate in situ or was it imported?

Location 2. Samples 24/8033 and 8034. Taken from C3587, C3584, C3560 stratified beneath the Period 2 road (S13) and representing Period 0 to 1.

- Did the sediments accumulate naturally and in situ, or were they imported?
- What was the environment of accumulation?
- Was vegetation supported on the soils?

Location 3. Samples 24/6899 and 6898. Taken from C2294, C2292, clay silts in Module D2 accumulating in Period 2.

- What was the mode and environment of sediment accumulation and/or deposition?
- What was the type and source of fuel(s) being utilized?

Location 4. Samples 24/8031 and 8032. Taken from C2353, C3633, the ultimate sand floor of the yard of S9 (the vellum workshop) immediately beneath the primary burning, representing the Period 2 to Period 3 interface. Samples 14/4291 and 4292 were also taken from the floor of S9 yard, but sampled in baulk.

- What was the mode and environment of sediment accumulation and/or deposition?

Results

Location 1 (under bridge) Sample 24/8030 Period 0–1

This sample comprises a coarse, quartz dune sand with very little organic or fine organo-mineral. The organic content is dominated by amorphous charred organic matter that occurs between and forms thin coats on some mineral grains. Organic coatings to mineral grains often occur in peats (FitzPatrick 1993) and it seems probable that some of the sand is derived from peat ash. The presence of a very few fungal spores/pollen grains replaced by goethite is also indicative of peat as the original source deposit.

Summary interpretation: Sample 24/8030 comprises a wind-blown sand that appears to have accumulated in situ with the addition of some sand grains from peat ash.

Location 2 (under road) Samples 24/8034 and 8033 (Illus D7.5.1) Period 0–1

All three contexts within Sample 24/8034 comprise natural coarse dune sand, which is peppered with thin, often irregular bands of ash. The majority of the ash laminations are less than 1mm thick, but the boundary between (C3584) and (C3583) is marked by a thicker wavy band up to 5mm thick. The ash is characterised by fragmented biogenic silica, mainly phytoliths but with very few diatoms, a few small woody charcoal fragments and charred contorted organic matter and a few mineral grains, mainly silt-sized but some coarse sand-sized. In places, the burnt organic matter retains a linear preferred orientation. The ash is derived from either a grass-rich damp turf, or more likely, a thin peat that had developed upon a silt/sand rich substrate. The environment of deposition of the contexts was dynamic with overall net accumulation of dune sand interspersed by very frequent and short lived phases of ash accumulation, all occurring as the result of aeolian processes (wind). There is no micromorphological evidence of the in situ growth of vegetation on these dune sands. The diffuse nature of the boundary (Sample 24/8033) from (C3583) into the overlying (C3560) indicates that there was no hiatus in sediment accumulation.

C3560 contains significantly more and larger clasts of charcoal and charred, contorted organic material than the

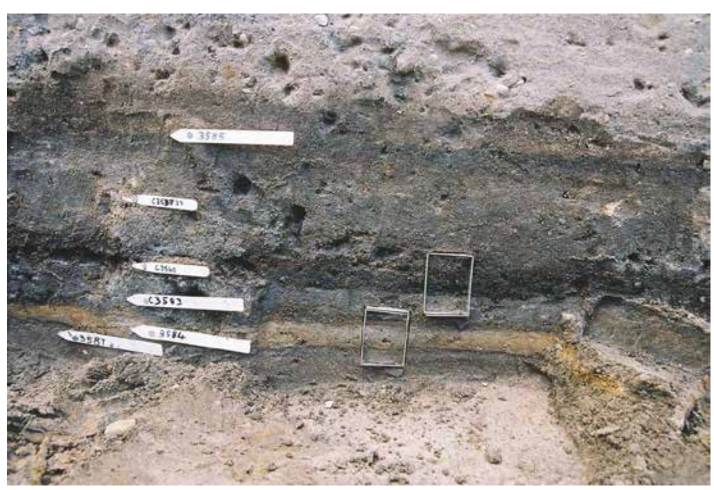


Illustration D7.5.1
Sequence beneath the road (S13) with kubiena boxes in place

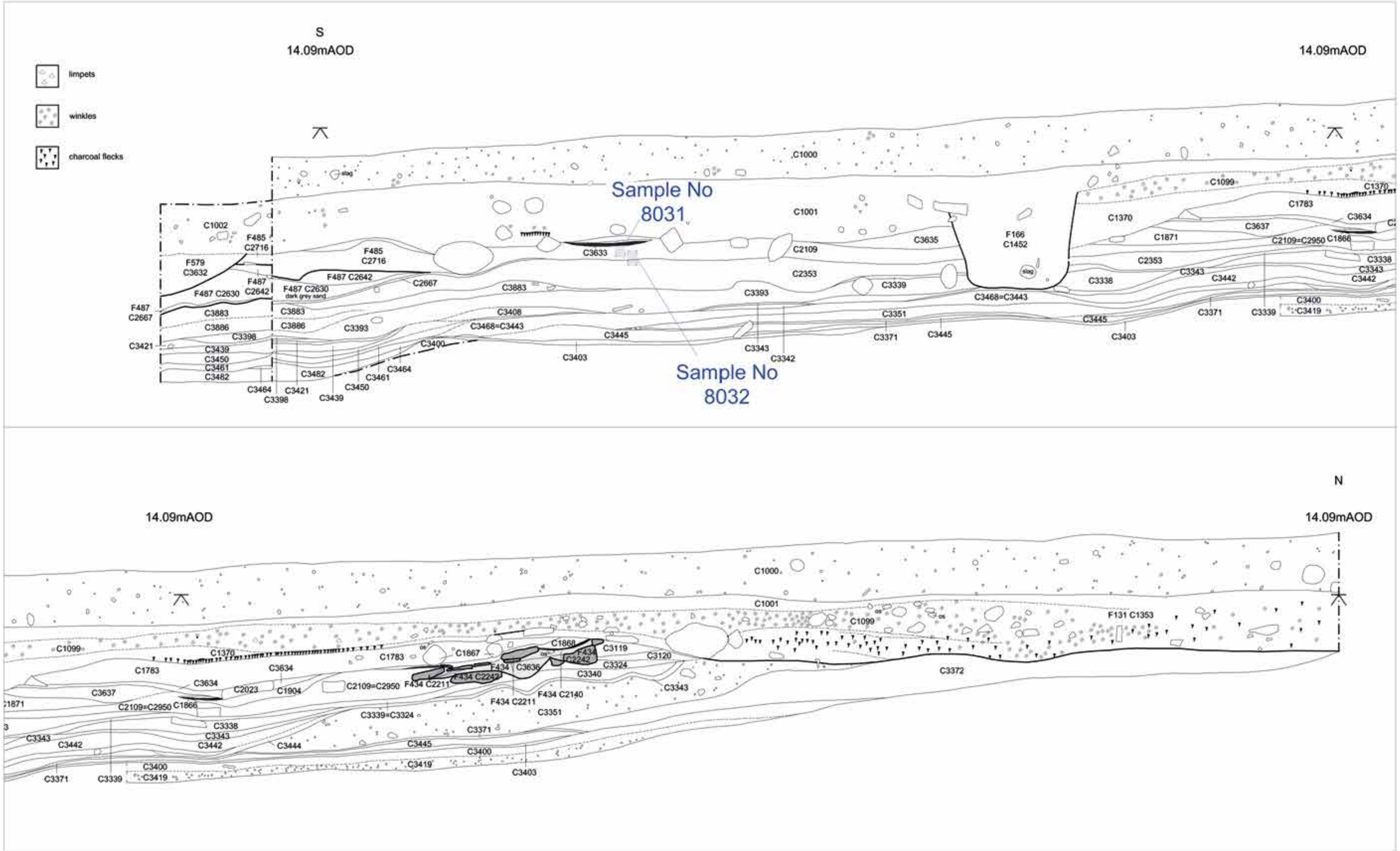


Illustration D7.5.2
Sequence through and under the vellum workshop floor, showing locations of kubiena boxes

underlying (C3583). The source of the fuel of the ash present in the upper portion of (C3583) and (C3560) is also peat, and clearly a fire in which combustion was incomplete. However, the relative scarcity of ash rich in biogenic silica may also to be a function of the carrying capacity of the wind, ie it was too strong to deposit the finer ash. There are two fragments of slag, one within (C3583) and one within (C3560), hinting at the possibility that peat was being utilized to fuel a smelting furnace. The presence of very small fragments of bone, possible coprolite and a rounded clast of pottery suggests that the source of the ashy components of the deposits may have been a midden heap onto which domestic and industrial waste was being dumped.

Summary interpretation: Sample 24/8034, the lower deposit, comprises wind-blown sands that appear to have accumulated in situ, with the occasional influx of wind-blown ash from a nearby midden; the ash content increases up the profile. There is no evidence that vegetation was supported on the dune sands of Sample 24/8034 (C3584).

Location 3 (ashy silts associated with the vellum-working area) Samples 24/6899 and 6898 Period 2

Sample 24/6899 comprises two units, Unit 1 is a coarse sand with abundant ash, rich in charcoal and Unit 2 is a peat ash, rich in silt with some sand. Unit 2 is contained within Unit 1, although there are clasts of Unit 1, like material within Unit 2. The fabric of Unit 1 has been disturbed by the post-depositional activities of soil biota. It is likely that the lower portion of Unit 1 represents the accumulation of wind-blown sand and locally eroded coarse components of peat ash into a shallow hollow within the confines of an active settlement. Further erosion of a nearby midden is demonstrated by the presence of relatively large clasts of fine peat ash (Unit 2) and domestic waste, as indicated in the existence of rounded coprolite clasts (no bone is observed, so this coprolite is possible human), pottery [burnt clay] fragments and burnt and unburnt bone. The sediment within Sample 24/6898 is similar, but much richer in fine peat ash, with a relatively low sand content; it is essentially an ashy midden. The sediment has been subject to extensive post-depositional bioturbation, which has largely destroyed the original fabric. However, some of the largely mixed ash clasts are clearly rounded, indicating rolling across a surface, propelled by the wind.

Summary interpretation: see below.

Location 4 (floor of vellum workshop yard) Samples 24/8032 and 8031 (Illus D7.5.2) Period 2–3

The lowermost context (C2353) comprises a wind-blown sand with a small wind-blown ashy midden content. The sharp boundary into (C2109) reflects a sudden increase in the amount of ash incorporated into the sediment. The ash in Sample 24/8032 is dominated by clasts of charred amorphous organic material (partially combusted clasts of peat) while that in Sample 24/8031 is dominated by fine, well-combusted peat ash. As with many of the other deposits, (C2109) contains anthropic derived inclusions that indicate an ashy midden was being actively eroded and re-deposited as a band of dirty dune sand. Much of the bioturbation appears to be post-depositional in origin and reflects the high organic and nutrient rich nature of the midden material. The dark lens (C3633) within (C2109) comprises a mixture of fine, well combusted peat ash clasts and partially combusted peat ash clasts, mixed with the occasional fragment of bone (burnt and not burnt).

Samples 14/4292 and 4291

The deposit sampled in Sample 4292 is very similar to (C3633), comprising a mixture of fine, well-combusted peat ash and poorly combusted peat ash. This deposit contains the largest concentration of bone fragments of all the sampled contexts. The deposit has been extensively re-worked by soil biota. The basal portion of the deposit also contains more goethite pseudomorphs and goethite impregnations than any of the other sampled contexts, a probable consequence of the nature of this particular batch of peat. Sample 14/4291 comprises three irregular bands, the lower and upper band made up from a mixture of wind-blown dune sand, well-combusted and partially combusted peat ash and the central band is dominated by well-combusted peat ash. In this central band, there are very few clasts of sandstone cemented by iron (one oxidized and one metallic in OIL), which may have been the source rock of iron ore and used for the extraction of smelted iron. The central band appears to be a dump of mixed peat ash residue and midden material to which some sand has been incorporated, probably by aeolian processes.

The fuel

The dominant fuel utilized was a silty, moderately humified peat. Some of the ash clasts are dominated by biogenic silica, mainly phytoliths derived from grasses (in the broadest sense) with a few diatoms, the latter clearly indicating that the organic matter accumulated under damp conditions. The degree of humification of the organic matter within the peat was poor to moderate, as woody charcoal derived from small shrubs is clearly visible within some of the ash deposits. The clasts rich in biogenic silica and yellow in colour when observed in OIL are remnants of peat that has been subject to relatively high temperatures (>600°C), resulting in the combustion of nearly all of the organic matter (Simpson et al 2003). Within these clasts are occasional zones of vesicular biogenic silica, where the temperature has attained such a high level as to melt the silica. In contrast, the clasts dominated by charred and burnt organic matter have not been subject to such high temperatures and combustion is incomplete. One explanation of the micromophological evidence for contrasting burning temperatures of the peat is that the fuel was utilized for two purposes. Peat would have been burnt at a high temperature for 'industrial' use, such as the smelting of iron, whereas a lower temperature was necessary for domestic use.

In addition to the micromorphological evidence for high temperature burning of peat, such as that required in a smelting furnace, other evidence for metal working includes a couple fragments of slag (Sample 24/8033), clasts of possible native ore (Samples 24/4292, 4291 and 8032) and shards of magnetite (Sample 24/8031).

The peat generally appears to have developed on a substrate rich in silt-sized quartz. However, in Sample 24/8031 a few clasts of silt ash contain muscovite, indicating that at least some of the peat was removed directly from bedrock. The juxtaposition of clasts of peat ash derived from different temperature fires, along with the incorporation of bone fragments and rounded pottery fragments, suggests that many of the contexts originated as either wind-blown detritus from midden heaps or were spread as thin dumps of midden material and to which wind-blown sand was then naturally incorporated.

Summary interpretation, locations 3 and 4: The earlier contexts in both workshop locations comprise wind-blown sand mixed with peat ash. Generally, the ash midden material appears to have been incorporated into naturally accumulating dune sand by aeolian processes. Some deliberate spreading of ash midden may have occurred; wind-blown sand was then incorporated by natural aeolian processes.

The ash midden is derived from eroding midden heap(s), composed of the waste of domestic and 'industrial' activities. The dominant fuel type utilized was a poor to moderately humified peat. The peat ash occurs in two forms: a charcoal rich ash, dark brown to black in colour, derived from low temperature fires where combustion is often incomplete and a fine grey-brown granular-looking ash, dominated by phytoliths and diatoms derived from high temperature fires where the majority of the organic matter has been burnt off. The partially combusted ash is most probably derived from the domestic hearth. The fully combusted ash is likely to be derived from 'industrial' furnaces, probably associated with the smelting of ore.

References

Bullock, P, Fedoroff, N, Jongerius, A, Stoops, G, Tursina, T & Babel, U 1985 *Handbook for soil thin section description*. Wolverhampton: Waine Research Publications.

Courty, M A Goldberg, P & Macphail, R 1989 *Soils and Micromorphology in Archaeology*. Cambridge: Cambridge University Press.

FitzPatrick, E A 1993 *Soil microscopy and micro-morphology*. Chichester: John Wiley & Sons.

Murphy, C P 1986 *Thin section preparation of soils and sediments*. Berkhamsted: AB Academic Press.

Simpson, I A, Vésteinsson, O, Adderley, P & McGovern, T H 2003 'Fuel resource utilization in landscape settlement', *Journal of Archaeological Science* 30: 1401–20.

Stoops, G 2003 *Guidelines for analysis and description of soil and regolith thin sections*. Madison: Soil Science of America, Inc.

Digest 8 MONUMENTS AND PLACENAMES ON THE TARBAT PENINSULA

Legend

% possible Pictish, pre-ninth-century existence [6]

+ Norse, ninth–eleventh century [6]

* Gaelic, probably medieval, eleventh–sixteenth century [36]

The site nos are from RCAHMS 1979.

Placenames

% * Allan: medieval name cited 1479. Watson (1904: 275) sees Allan as Pictish, meaning a swampy place.

% Annat: see Castlecraig.

+ Arboll: Norse *ork-bol*; 'farm of the ark? Seal?'. Nearby is *Lòn tigh nan cat* 'Cats' house meadow'.

* Balachladich: 'village on the shore'.

* Balaldie: 'village of the stream'.

* Balintore: was G. *Bail' an todhair* ['village of bleaching' – ie flax]. It was also Abbot's Port, Abbot's haven.

* Balloan Castle: 'Town of the meadow'. Two causeways led to it. *Cabh-sair an righ* 'King's causeway'. *An cabhsar mor* 'big causeway'. Late sixteenth-century tower house. (RCAHMS no 250; MacGibbon & Ross 1887–92, ii: 248–51)

Balone Mill: Stone and brick-built mill and mill pond visible in 1977 (RCAHMS no 332; NH 930 839).

* Balnabruach: 'Town on the banks'. Site of a cemetery of the early Bronze Age (see *cemeteries*).

Balnapaling: Shell middens exposed west of Dunskeath Castle (RCAHMS no 337, 338; NH C 801 692, 804 689).

* Balnuig: G. *bail' an aoig* 'village of death'.

* Bayfield, Ankerville: names changed in the eighteenth century for what was formerly Kindeace, G. *Cinn-déis*.

+ Bindal: Norse *bind-dalr* 'sheaf dale'. Traditional site of a hermitage (see *chapels*).

* Binn Nigg: hill of Nigg.

* Broomtown G. *bail' a' bhealaidh* [not glossed]. Between this and Balintore was the 'pass of the cattle'.

% * + Cadboll (Cathabul 1529): Norse *kattar-ból*, 'cat-stead'. (From 'cat' rather than battle). There was a sixteenth-century castle (RCAHMS no 252, NH 878 776) and two chapels of St Mary, one north near Cadboll Mount and one south on the sea shore (see Chapels). Enclosures have been recorded inland from the castle (RCAHMS no 194, NH 871 778) and on the coast (RCAHMS no 284, NH 889 782).

Cadboll Mount: A pyramid with a base 29m square and 6m high, built before 1760 by a Laird of Cadboll to look down on his lands (RCAHMS no 339, NH 889 790).

* Castle Corbet: G. *an Caisteal dearg*, Red Castle. Site of cist burial found in 1845 (RCAHMS no 94, NH 900 832). Shell middens exposed in 1977 (RCAHMS no 341, NH 902 833). Possible site of a broch, see Cnoc Tigh.

* Castlecraig: now the name of a farm on which may yet be traced the lines of the castle built by William the Lion in 1179. Was Dùn Sgàth fort of dread (Eng. Dunskaith). Also contained %Annat (a church that contains the relics of the founder); Rhidorach, dark slope; Culbinn (back of the hill). (RCAHMS no 247, NH 807 689).

Castlehaven (Port a' Chasteil): A river accessible to a boat at high water at the northernmost point of Tarbat with a tradition of a fort. The fort had a rampart and three ditches with a D-shaped enclosure within. Numerous shell middens were reported in 1872 (*FSA*, 643; RCAHMS no 180, NH 929 872; no 342, NH 931 893).

Chapel Hill: (see chapels, below).

* Cillean Helpak: a fishing bank in the Moray Firth.

* Cnoc Tigh: the remains of what may have been a broch stand on a tongue of raised beach 650m SW of Lower Seafields. It measures 22m in diameter over a wall 5.5m thick (RCAHMS no 184, NH 902 832; Macfarlane 1906–8, i, 215).

* Culinald: 'Burn-nook' now part of Nigg Farm. The stream flows through the gulley at Nigg Church.

* Culliss: G. *Cùl an lios* ('behind a fort with earthen bank [a *lios*]').

* Dallachie: G. *loch an dàilich* 'loch of the meetings (?)'.

Dunskeath Castle: see Castlecraig.

* Fearn: from Lat. *Nova Farina* (New Flour). Parish is G. *Sgìr na Manachainn* (Parish of the monastery) (Watson 1904, 40). Said to be 'several druidical temples in this parish' (*FSA*, 387).

* Gallow Hill: G. *cnoc na croiche*. About a mile from Ballone Castle.

* + Geanies: G. *Gàan* probably from Norse *gja* a chasm, from the rocky coast. Traditional site of Geanies Castle is at NH 894 798 (RCAHMS no 257).

* Hilton [Eng]: was G. *Bail' 'a chnuic* [settlement on the hill]. Chapel dedicated to St Mary. Thus *Craeg na baintighearna* (Lady's Rock); see cemeteries and ports.

Milton. Milntown Castle, built in *c* 1500, No visible remains in 1977 (RCAHMS no 261, NH 772 737)

Milton: Crop mark of an oval enclosure *c* 18m in diameter noted 400m south-east of Tarbat House (RCAHMS no 202, NH 773 733).

Milton, Polnicol: G. *Poll Neacail* 'Nicol's pool'. Crop marks of six ring ditches *c* 5m in diameter recorded about 100m north-west of Polnicol (RCAHMS no 199, NH 752 731).

Milton, Rhives: Cropmarks about 400m north-west of Rhives show parts of three sides of a rectilinear enclosure measuring about 40m north–south by at least 45m within a ditch about 3m wide (RCAHMS no 197, NH 742 735).

* Morangie: G. *Mòr(a)istidh* 'big haugh' (meadow). Site of a dun measuring *c* 13m in diameter (RCAHMS no 188; NH 761 839).

* Nig 1227: G. *'n eig* at the notch. Probably the V-shaped gulley on which the church stands. 'on the analogy of other parish names it is perhaps safer to regard this gulley as the notch which gave its name first to the church and then to the parish' (Watson 1904, 50).

% Pitcalnie: G. *Baile-chailnidh*, perhaps from Gaulish root (Watson 1904, 276).

% Pitcalzean: G. *Bail' a' choillean*, 'village of the little wood'. A circular enclosure *c* 16m in diameter was noted 1.4m east of Pitcalzean House (south of Nigg) in 1977 (RCAHMS no 196, NH 816 703).

% Pitkerrie: G. *Baile-chéiridh*, '?Dark place'.

* Poulfock: G. *poll a' phoca*, 'pool of the bag'.

% Rarichie: G. *Rath-riachaidh shios agus R shuas*, Fort of the scratches [as of brambles]; but the local derivation is 'The Picts lived at Cadha 'n ruigh and in springtime they would say: '*tiugamaid 'bhàn 'dheanamh rotha riachagan*' 'let us go down to make rows of scratches' (to sow seed in)' (Watson 1904, 51). This implies an association between the duns and ard cultivation. Rarichie was a seat of the Ross family (see Chapter 7, p 288). Easter Rarichie is a 'complex multiperiod fort on a prominent knoll on the lower slopes of the Hill of Nigg. The defences comprise three ramparts, two walls and an inner enclosure which may be a dun' (RCAHMS no 182; NH 843 736). Wester Rarichie is a dun 10.5m across on a prominent knoll 250m west of Easter Rarichie (RCAHMS no 190; NH 840 736).

Red Castle: A castle, ruinous and removed before 1872 (RCAHMS no 264, NH 892 825).

* Rockfield: was G *a' Chreag* ('rocks').

* Rhynie: G ràthan. 'Little fort'.

* Tarrel: G *Tarail* 'over rock'. A dun survives as an enclosure *c* 9.5 × 6.7m on the summit of a rocky knoll overlooking the seashore. An entrance is visible on the east side (RCAHMS no 189; NH 904 803). Shell middens exposed in 1977 (RCAHMS no 348, NH 904 804). Remains of a mill visible in 1977 (RCAHMS no 335, NH 900 799).

+ Shandwick: Norse *sand-vik*, 'sandy bay'.

* Skinnertown G. *baile nan Scinnearach*. Skinner was a very common surname in the coastal villages of Easter Ross (Watson 1904, 48).

* Tarbat: G. *tairbeart* (for tairm-bert, 'an over-bringing'). Portage, also isthmus (Watson 1986, 505).

* Teampall Earach: site of a cave on the south coast, east of Bindal, opposite a moor (now cultivated) between Bindal and Wilkhaven called *Blàr-Earach*. There is a tradition that the cave was once used for purposes of worship. See Chapels.

*Toll Raoiridh: cave on north-east side of the Ness.

Names of paths leading to the shore beneath the rocks (at Shandwick)

Cadha nan caorach 'sheep's path'.
Cadha sgriodaidh 'shingly path'.
Cadha nan suibhean 'raspberry path'.
Cadh a' bhodaich 'the old man's path'.
Cadha a' bhreacaich 'speckled place path'.
Cadha Neachdain 'Nectans' path'.
Cadha 'n ruigh 'sloping path'.
Cadha togail toinn 'the path where you need a push from behind'.
Cahda port an druidh 'path of the druid's port' (west of Shandwick).

Portage

* TARBAT: (*Arterbert* in 1227) is probably from Gaelic *Tairbeart* meaning an isthmus or peninsula, but may be from an older P-Celtic (British) word meaning headland.

* Dallachie: G *loch an dàilich* ?'Loch of the meetings'.

* Loch Clais na cré: Loch of the clay hollow.

* Lochslin: G. from *slinn*, a weaver's sley. 'Lochslin, as a loch, has disappeared, and survives only in the names Lochslin Farm and the ancient ruin of Lochslin Castle' (Watson 1904, 42). 'The lower courses of the north-east corner of this tower-house are visible in a clearance heap' (RCAHMS no 260, NH 849 806, seen 1977.)

* Locheye: G *loch na h-iudhe*. *Uidh* from Norse *eith*, isthmus. Might refer to slow running water between lochs.

* Mounteagle: G *cnoc na h-iolaire*. Also *an eith*. [So also perhaps slow running water.]

Battlefield

* Blàr 'a chath: The battlefield. Adjacent to Port Mòr (great port) at NH 925 870.

Ports and havens

* PORTMAHOMACK: is from the Gaelic meaning the Port of Colm, Colman or Cholmag.

* Port a' chait: 'Cat's port', cf Cadboll NH 947 876. Cairns near the lighthouse are named Bodach an rudha, (the old man of the point), an Cailleach (the old wife), a' Bhean-mhuinntir (the servant lass).

* Wilkhaven: translates from *Port nam faochag* [= wilk; = ?whelk]. It was Allan-sallach [ford] and had a chapel dedicated to St Bride.

* Port a' Chaisteil: Castlehaven (qv). Also called Port Buckie on OS map.

* Balintore: was also Abbot's Port, Abbot's haven.

* Port na baintighearna: Lady's haven (Hilton of Cadboll beach). Medieval: Cadboll Fisher.

* Port an Druidh: (Druid's port) is west of Shandwick. Shandwick had a Ballnamorich Fisher town in 1786.

* Port Mòr: (great port) at NH 925 870.

* Port Uilleim: 'William's port'. NH 921 859.

Wells G Tobar

* Tobar ma Chalmag: 'Colman's well' is 'behind the library' in Portmahomack.

* Tobar na baintighearna: 'Lady's haven well' at Hilton beach.

* Tobar na slainte: 'healthy well' at Shandwick.

* Tobar Cormaig: 'Cormac's well' (at Shandwick farmhouse).

Nigg had twenty wells, including a Tobar a' bhaistidh baptismal well (just above the old UP church).

Twenty chapels recorded on the Tarbat peninsula

1. Portmahomack, St Colman's Church (extant) (RCAHMS no 241, 242; NH 914 840; see Chapter 2, p 15).
2. Portmahomack, Chapel Hill (placename extant). 'The discovery before 1845 of human bones "deposited within rough flags of freestone" may be linked with the chapel that is alleged to have stood on this site. The rough flooring of flat stones in a roughly oblong setting, approximately east and west' recorded in 1947 may be associated with the chapel or with later buildings, which were still standing on the site in 1907 (RCAHMS no 235, NH 916 845).
3. Portmahomack, Dunbar Chapel, still visible in 1791 (*FSA*, 648).
4. Portmahomack, Teampall Earach, *Easter Temple*, near the old castle of Tarbat (Balone). 'Near it is a plentiful spring of water which continues to bear the name of Tobair Mhuir or Mary's Well. A small cave or grotto is shown as the abode of the priest' (*FSA*, 648). A single gravestone dated 1682 was all that remained in 1977 (RCAHMS no 245, NH 926 834).
5. Portmahomack *St Brigit's Chapel* site recorded at *Allansallach* 'A short mile' east of Portmahomack church by Macfarlane (1906–8, I, 215). Presumably near Wilkhaven (Watson 1904, 45).
6. Portmahomack St John's Chapel. Stood a 'large mile' from Tarbat parish church (Macfarlane 1906–8, I, 215; RCAHMS, no 244).
7. Bindal Hermitage. The site of an old hermitage situated on the shore of the Moray Firth *c* 1.5 miles north-east of Bindal. A wall *c* 7 ft high and 4 ft broad is supposed to have provided the east, north and south sides, while the W side was the cliff (*ONB* 1872). RCAHMS describes the boundary wall as drystone built and averaging 1.3m wide and 1.7m high with

an entrance gap *c* 2.0m wide towards the south end of the east wall (visited 14 September 1972). Appears to have been an early rectangular building, with an enclosure and clearance heaps (heaps of stones removed from the surface before the land was ploughed for the first time) (RCAHMS, Site 280; NH 9387 8502). Bindal is Norse meaning 'sheaf-steading'. Nearby is *Stiana Bleadar* (Norse = Stone spot).

8. Balnabruach: a chapel recorded by Davidson (1946, 27; RCAHMS no 206, NH C 908 840).
9. Wester Arboll: a chapel. 'John Baptist's Chappel' (Macfarlane 1906–8, I, 215).
10. Cadboll Mount: A chapel of St Mary (1) was recorded west of Geanies in 1529 and still visible in 1855, but occupied by a rubbish dump by 1977 (RCAHMS no 210, NH 883 791; *OPS* II, 2, 434).
11. Cadboll, Hilton of: a chapel of St Mary (2) on the sea shore (RCAHMS no 224. NH 873 768). The foundations are still visible. The large and small parts of the Hilton of Cadboll cross-slab were found at the west end of the chapel. The chapel appears to have served the medieval village of Cadboll Fisher. See Chapter 5.10, p 252.
12. Old Shandwick chapel (fifteenth century). Exposed at the edge of a quarry. The chapel stood in a burial ground until the end of the eighteenth century (*FSA*, 592). By 1977 only two dressed stones and a length of walling survived (RCAHMS no 233, NH 8582 7453).
13. Castlecraig in Nigg parish: formerly contained *an Annaid* 'The Annat', which refers to a chapel with relics of the founder (Watson 1904, 52–3). Castle built by William the Lion at Dunskeath in 1179 (at Castlecraig) (*NSA*, 25) (RCAHMS no 211, NH C 822 707).
14. Nigg: parish church dedicated to St Fiacre dating from 1626. Earliest reference to a church is 1255–6 (cf Portmahomack). Site of the Nigg Pictish cross slab (RCAHMS no 231, NH 804 717). A 'rude undressed stone' is said to have stood in the churchyard in 1835 (RCAHMS no 120, NH 804 717). A cropmark of a large house visible on an air photograph was associated with the Bishop of Ross (RCAHMS no 268, NH 804 717).
15. Midd Genie. Traditional site of a Chapel dedicated to St Barr, on the coast at Geanies (RCAHMS, no 227, NH 897 792; Alston 1999, 181).
16. Culiss (Nigg): where there is small enclosure that goes by the name of Chapel Park. 'Scarce a vestige of the building remains' (*FSA*, 592; RCAHMS no 216, NH C 828 752).
17. Newton. Chapel said to date from sixteenth century. Used as a burial ground until 1832, lower walls remained in 1978 (RCAHMS no 230, NH 845 814).
18. Fearn Abbey. Founded at New Fearn in *c* 1238. Still in use as a parish church in 1977 (RCAHMS no 229, NH 837 772).
19. Delny. Former existence of a chapel dedicated to St Mary (RCAHMS no 217, NH C 734 723).
20. Wilkhaven [*Port nam faochag* ?whelk] had a chapel dedicated to St Bride.

Early cemeteries

Balintore. Many sightings of cist burials in nineteenth and twentieth centuries (RCAHMS nos 88–92).

Balnabruach (NH 908 840). Site of a cemetery of the early Bronze Age and later. In the 1992 watching brief on the course of a pipeline, GUARD found a shell midden, a Bronze Age short stone cist. Body probably male 17–25; a long cist with an extended skeleton north–south; another east–west above it [Report by D Low, Highland Council].

Balnabruaich. A cist found in 1922 and two 'vases' in 1945 (RCAHMS no 93, NH 794 698).

Castle Corbet. Site of a cist burial found in 1865, about 160m west of Castle Corbet. It contained a cremation and a small urn (RCAHMS no 94, NH 900 832).

Cnoc Dubh, near Ballone Castle. Stone coffin recorded here in 1904 (Watson 1904, 48).

Nigg: 'At Nigg Rocks, below Cadgha Neachdain, there is a graveyard, now covered in shingle. Here the Danish princes were buried. Their gravestones came from Denmark and had iron rings in them to facilitate their landing. So local tradition. This most unlikely spot for a graveyard was not selected without some good reason, the most probable being that hermits once lived in the caves, whence the place was reckoned holy ground' (Watson 1904, 56).

North Sutor. Two urns found close to North Sutor in 1820–3. One contained what was probably a cremation, the other what appears to have been a jet necklace (RCAHMS no 109, NH C 800 691). Many animal bones were found in associated layers (SSA, 30).

Portmahomack (see Chapter 4, p 77).

Shandwick burial ground and cross slab (*Clach' Charaidh*). 'At [the Shandwick stone] all unbaptized infants of the parish were buried up till fairly recent times. It is now cultivated' (Watson in 1904: 56). 'Near Shandwick Farm-house, to the south-west, between the sea and the rock was a graveyard … some of the stones are still visible' (ibid 57). [At Easter Rarichie] 'the curate of Nigg lived and the field behind his house is called "raon a chlaidh" the graveyard field. The plough goes over it now and formerly used to strike the gravestones, but these are now removed (ibid 57). The burial ground is reported to have been levelled in about 1885 (RCAHMS no 236, NH 855 747). A cist containing a crouched inhumation was found and left in situ in about 1954 (RCHAMS no 111, NH 855 746). There was a chapel in the vicinity (see chapels) and a castle built in 1460 was ruinous by 1780 and removed in 1942 (RCAHMS no 263, NH 858 745).

References

References to RCAHMS are to their archaeological field survey of Easter Ross, Ross and Cromarty District, Highland Region, issued in February 1979.

References to Watson are to his 1904 *Placenames of Ross and Cromarty* [repr. Evanton 1996] unless otherwise indicated.

Bibliography

RCAHMS 1979 *The Royal Commission on the Ancient and Historical Monuments of Scotland. The archaeological sites and monuments of Easter Ross, Ross and Cromarty District, Highland Region, The archaeological sites and monuments of Scotland series no 6*. Edinburgh.

Digest 9 TABLE OF CONTENTS OF ONLINE ARCHIVE

The online archive is curated by ADS, http://dx.doi.org/10.5284/1031216

7. SPECIALIST STUDIES
- 7.1 Artefacts
  - 7.1.1 Coins
    - 7.1.1.1 Sceat by Mark Blackburn
    - 7.1.1.2 Medieval Coins by Nick Holmes
  - 7.1.2 Glass
    - 7.1.2.1 Early Medieval Glass by Ewan Campbell
    - 7.1.2.2 Technical Report on Glass by James Peake and Ian Freestone
    - 7.1.2.3 Medieval Glass by Hugh Willmott
  - 7.1.3 Stone Objects
    - 7.1.3.1 Lithics by Peter Rowe
    - 7.1.3.2 Catalogue of Medieval Stone Objects by Cecily Spall
    - 7.1.3.3 Petrology of Medieval Stone Objects
    - 7.1.3.4 Gaming Board from Sector 2 (Int 14/C1660) by Mark Hall
  - 7.1.4 Medieval Pottery by Derek Hall
  - 7.1.5 Medieval Coffin Wood Wood by Steve Allen
  - 7.1.6 Objects associated with Metal-working
    - 7.1.6.1 Catalogue of Metal-working Objects by Cecily Spall
    - 7.1.6.2 Catalogue of Crucibles by Cecily Spall with Catherine Mortimer
    - 7.1.6.3 Catalogue of Moulds by Cecily Spall
    - 7.1.6.4 Catalogue of Slag by Cecily Spall with Catherine Mortimer
    - 7.1.6.5 Investigation of Touchstone and Assay Tray by Lore Troalen and Jim Tate
  - 7.1.7 Objects associated with Vellum-working by Cecily Spall
  - 7.1.8 Carved stone
    - 7.1.8.1 Catalogue of Early Medieval Sculpture by Nicola Toop
    - 7.1.8.2 Descriptive Inventory of TR1-40 by Kellie Meyer
    - 7.1.8.3 Medieval Grave Slabs by Lawrence Butler
  - 7.1.9 Leather by Clare Thomas
    - 7.1.9.1 Early Medieval Shoe
    - 7.1.9.1 Late Medieval Shoe
  - 7.1.10 Textiles by Penelope Walton Rogers
  - 7.1.11 Bone Objects by Steve Ashby
- 7.2 Human Remains
  - 7.2.1 Osteology
    - 7.2.1.1 Human Bone Report by Sarah King
    - 7.2.1.2 Human Bone Catalogue by Sarah King and Shirley Curtis-Summers
    - 7.2.1.3 Medieval Charnel by Don Brothwell
    - 7.2.1.4 Report on Possible Detection of Syphilis by Shirley Curtis-Summers
    - 7.2.1.5 Pathology Report by Sarah King, revised Shirley Curtis-Summers
  - 7.2.2 Diet
    - 7.2.2.1 Stable Isotopes of Carbon and Nitrogen by Shirley Curtis-Summers
    - 7.2.2.2 Starch from Teeth by Becca Walters
  - 7.2.3 Stable Isotopes of Oxygen and Strontium by Lauren Walther
- 7.3 Animal Remains
  - 7.3.1 Mammals
    - 7.3.1.1 Mammals by Krish Seetah (edited by Martin Carver)
    - 7.3.1.2 Catalogue of Mammal Bone by Krish Seetah
    - 7.3.1.3 Discussion by Finbar McCormick/Martin Carver
  - 7.3.2 Fish and Shellfish by Matilda Holmes
- 7.4 Plant and Insect Remains
  - 7.4.1 Report on Plant and Insect Remains by Allan Hall and Harry Kenward
  - 7.4.2 Plants from the Crypt by Tim Holden
  - 7.4.3 Assessment of Samples from the Enclosure Ditch S16 by Mhairi Hastie

Index

Index

Note: major topics are signalled in **bold**; page numbers in *italics* indicate an illustration. Page numbers in the form D1, D2 refer to the Digest of Evidence.