THE

SCOTTISH NATURALIST:

A MAGAZINE OF SCOTTISH NATURAL HISTORY.

EDITED BY

FRANCIS BUCHANAN WHITE WHITE,

M.D.; L.R.C.P.E.; L.R.C.S.E.; F.L.S.;

MEMBER OF THE ENTOMOLOGICAL SOCIETIES OF LONDON AND OF FRANCE; FELLOW AND LOCAL SECRETARY OF THE BOTANICAL SOCIETY OF EDINBURGH; EDITOR AND LATE PRESIDENT OF THE PERTHSHIRE SOCIETY OF NATURAL SCIENCE; HONORARY MEMBER OF THE ROSS-SHIRE NATURALISTS' CLUB; CORRESPONDING MEMBER OF THE ABERDEEN NATURAL HISTORY SOCIETY, OF THE NEW ORLEANS ACADEMY OF SCIENCE, ETC., ETC., ETC.

VOLUME II.

"Hæc studia adolescentiam alunt, senectutem oblectant; secundas res ornant, adversis perfugium ac solatium præbent; delectant domi, non impediunt foris, pernoctant nobiscum, peregrinantur, rusticantur."—CICERO.

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PREFACE.

In returning thanks to all our kind friends for the support that *The Scottish Naturalist* has received during the third and fourth years of its existence, there is one subject that the Editor must reluctantly allude to.

In the preface to the first volume, more frequent illustrations, and even perhaps an increase of size in the Magazine, without a corresponding increase of price, were promised—if the subscribers would help by paying their subscriptions when due, *i.e.*, in advance.

The annual subscription is small, and consequently the payment thereof easily—as we know from experience in other matters—forgotten. The expenses of the Magazine are so calculated, however, that a neglect on the part of our friends to pay in advance, is the cause, to us who manage the Magazine on their behalf, of considerable increase in the expense and labour. If the subscribers, therefore, will only kindly consider this, we hope yet to be able to carry out the promises made two years ago.

There is another matter that we may be pardoned for mentioning. If contributors who desire copies of their papers will communicate with the printer, they can obtain separate copies (of their papers) at a cheap rate, and by doing so will much oblige us, as by purchasing single numbers of the Magazine they break up the sets, and consequently increase the price of the volume when completed.

December, 1874.

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THE SCOTTISH NATURALIST.

VOLUME THE SECOND.

ZOOLOGY.

ON THE OCCURRENCE OF THE HOODED SEAL (*CYSTOPHORA CRISTATA*) AT ST. ANDREWS.

By ROBERT WALKER, F.G.S.E.

THIS species of seal is rarely met with in the British or Irish seas; and although one that is not difficult to identify when found, still from the few opportunities that present themselves to competent persons of examining living or recently killed specimens, it is apparently by no means so well known as it deserves to be. Besides, from the general resemblance in shape and external aspect that all seals bear to each other, it could, in its immature state, be readily enough passed over as the young of the Common, or more especially the Grey Seal, as it not unlikely has been, and even by those, perhaps, who consider themselves not unfamiliar with the general appearance of these animals. I therefore propose to describe this individual at greater length than would have been at all necessary in the case of an animal of more frequent occurrence.

This seal was found opposite St. Andrews, on the 22d July, 1872. When discovered, it was reposing, near low-water mark, on the top of one of the ledges of rock that stretch out

into the sea. It presented a somewhat fierce and threatening-looking demeanour to the man who first saw it, sufficiently warning him that an attempt on his part to approach near too rashly would not be quietly tolerated, and might, if persisted in, be attended with rather unpleasant consequences to himself. It seems to have made no effort to escape, and was ultimately struck repeatedly on the head with stones until dead. It is said to have exhibited great tenacity of life.

On dissection it proved to be a young male, very fat; the stomach was about half full of what appeared to be estuary sand and mud, with a few small entozoa here and there through it. It measured forty-seven inches in length. The body stout, roundish, and gradually diminishing from a little behind the shoulders to the tail. The head short, round, and broad over the muzzle. The septum between the nostrils hairy. The upper part of the head, the back and half-way down the sides, of a bluish black colour when wet; of a dark grey when dry; the lower parts and half way up the sides, of a yellowish white; on the sides of the neck this colour extends up to within about an inch of the eyes, and thence along the upper lip under the nostrils. The anterior limbs are the same colour on the upper sides as the back, the lower whitish with a streak of grey extending obliquely across them. The upper surfaces of the posterior limbs and the tail are of a darker colour than the back, their lower sides whitish grey. The webs between the toes hairy. The hair is longish on the back, and somewhat erect; there is a finer and darker fur next the skin. The whiskers are longish, and directed downwards; the hairs are waved and gradually taper to fine points, the upper ones dark grey, the lower yellowish white. Eyes, three and one-fourth inches behind the extremity of the nose, black, iris dark brown; they are large, round, two inches in diameter, when removed from the sockets. The orifices of the ears—there are no external auricles—are small and situated about one and three-fourths of an inch behind and below the eyes. The fore limbs are short, with five fingers each, the outside one longest, the others gradually becoming shorter, but so regularly graduated, that the points of the claws are in a straight line or thereby with each other. The hind limbs have five toes each, the inner one longest, the outer one about half-an-inch shorter, the second and fourth about the

same length, and an inch shorter than the first, the third about half-an-inch shorter than the second and fourth—the membrane in all projecting beyond the claws. All the latter are pretty long and strong, dark coloured at the bases, and light coloured towards the points.

The skull is short and broad, rounded at the sides, and flattened above, more especially over the frontal bones, and interorbital space. Its greatest breadth is over the zygoma, at the articulations of the malars and zygomatic processes. There is no sagittal nor occipital crest. The interorbital space is broad and flat for a seal. The ascending process of the superior maxilla form on each side a narrow margin of bone not exceeding one-fourth of an inch in breadth, between the anterior edge of the orbital cavities and the nasal apertures. The premaxillæ are small, narrow in front, and do not reach within about three-fourths of an inch of the nasals; the latter are rather short bones, and project in front considerably beyond their junction with the maxillæ, they have no external process, the internal is small but distinct. The olfactory chambers are somewhat large, arched out at the sides, and filled with very complex maxilloturbinals. The malars are long thin bones, bent outward and downward, bifurcated at the posterior extremity, and joined to the maxillæ by long sutures. The united breadth of the palatal portion of the palatine bones is about equal to their length; the posterior outer edge of each is angled inward and forward about half its breadth, they then jointly form a nearly straight transverse margin at the middle of the posterior edge of the palate. The foramen magnum is larger and wider transversely; and the occipital condyles seem to me to approach nearer each other on the basi-occipital than is the case in the Common, the Floerat, or Grey Seals. The anterior palatine foramina are also much smaller than in either of these animals. The posterior palatine foramina are rather behind the palato-maxillary suture, and there is an oval aperture in the basioccipital in advance of the foramen magnum.

The dental formula is—incisors, $\frac{2\cdot2}{1\cdot1}$; canines, $\frac{1\cdot1}{1\cdot1}$; molars, $\frac{5\cdot5}{5\cdot5}$, = 30. Of these, the first four molars on each side are generally reckoned premolars. The incisors of the lower jaw, and the two middle of the upper, are small, compressed,

and somewhat incurved. The two upper external incisor teeth are nearly half as large as the canines, which they closely resemble in shape; the latter are pretty large, not much compressed, and curved inward. The molars are close together, small, compressed, the crowns short, trenchant, and somewhat elliptical; the enamel distinctly wrinkled or plicated vertically. The last of the upper, and the two last of the lower series, are slightly tubercular at the edges; the first and last above are the smallest. All the molars have short roots implanted into shallow sockets on the alveolar margin of the jaws; the fourth and fifth of the upper side, and the fifth of the lower, have each two short, roundish, diverging fangs or roots; the third and fourth below, and the third above, have a slight groove down the middle on the outside.

Of the seven skulls of this species of seal from Greenland, described by Dr. Gray,* it would appear, on the whole, that our specimen comes nearest—so far as the roots of the molar teeth are concerned, to those of the skull No. 4 of his last. As observed by him, however, the root of the grinders is very liable to variation in this genus. He also states that he has not observed any similar variation in the teeth of any other seal, and still believes that the form of the roots affords a good character in most of the genera.

The mandible is narrow at the symphysis, from which each ramus diverges, when looked at from below, in a nearly straight line to the condyle. The horizontal rami have fairly developed thickish round lower edges, not thin and inflected. There is, strictly speaking, no notch at the posterior margin, the lower edge of the bone at this point is slightly protuberant, and bent inward into a not very prominent lobe, situated considerably in advance of the condyle. The hinder ramus ascends to an oblique angle. The coronoid is a slender, narrow process, its front edge follows that of the ramus, it is not recurved at the extremity, and approaches closely to the condyle.

The other bones of the skeleton do not appear to differ so materially in form from those of the other seals likely to be met with on our coasts as to call for any special remarks, at least on the present occasion. It may, how-

* Proceedings, Zool. Soc., 1849; and Cat. Seals and Whales, 1866.

ever, be observed that the scapula is less concave on the posterior border, and the anterior is rather more convex than is the case in the same bone of a half-grown common seal; the coracoid is much smaller than in that animal, while the suprascapular epiphysis seemed to be broader cartilaginous plates. Both the prescapular and postscapular fossa are moderately developed. The os innominatum differs from that of the half-grown common seal in being much shorter, its posterior margin more circular, the pubic spine broader, and the thyroid foramen wider in proportion to its length. The femur is also shorter and slenderer than the corresponding bone of that individual. The pelvic bones are more throughly ankylosed than these bones are in the specimen above referred to. On the other hand the supracondyloid foramen of the left humerus is not quite perfect, while it is completely ossified on both arm bones of that seal. It would seem, however, that in some seals this canal is either never entirely closed by bone, or its walls are afterwards absorbed during life—at any rate in oldish animals it becomes much elongated. In two humeri of the Grey Seal *(Halichærus grypus)* in my possession, and pertaining to different animals, this structure is represented by two spiculated fragments of bone, having their points directed towards each other, but without nearly meeting together. The imperfect condition of this foramen on the bones of these seals seems to me to be pretty near the state in which it is generally met with on the humeri of man. Those acquainted with the literature of the Descent * and Antiquity of Man question † will be aware of the interest and importance which have somewhat recently been attached to the occasional survival to our own day in the human race, of the rudiment of a structure which finds its normal development in the bones of the carnivora. It has been estimated that it occurs in a more or less perfect condition, in about one per cent. of recent European human skeletons. In ancient skeletons it is more frequently met with. "Dupont † found thirty per cent. of perforated bones in the caves of the Valley of the Lesse, belonging to the reindeer period, and Lequay,‡ in a dolmen, at Argenteuil, observed twenty-five per

*Darwin, Descent of Man, vol. I. †Lyell, Principles of Geology, vol. II. 1872.
‡Busk, International Congress of Prehist. Archæology, 1868.

cent. perforated." From these and other instances that could be mentioned, it seems pretty evident that it will be ultimately found that Palæolithic man, as well as the seals and others, had each alike a canal through which the great nerve, and sometimes the great artery, of the fore-limb passed.

The above is the first record, so far as I can learn, of the occurrence of *C. cristata* anywhere on the coasts or seas around Scotland, and I can find no notice of its appearance in Ireland. It has been obtained, apparently, once only, on the coast of England, a specimen having been captured in Orwell River, on the 29th June, 1847.* This was a young animal, and measured fifty-two inches in length; it was described and figured by Mr. W. B. Clark, and presented to the Museum of Ipswich. There was another example of this Seal taken at l'Ile d'Oléron in 1843, and both the animal and skull were figured and described by Professor Gervais,† who states that it was the only one obtained on their coast; it was also a young individual, about forty inches long, and was placed in the Museum in Paris. Gervais' description and figures, more especially of the skull, agree closely in the main with the seal and skull above described, with the exception of the neck, which appears to be represented much shorter in his specimen than this part was in mine. Dr. De Kay ‡ gives a good description of an individual of this species that was killed in 1824 about fifteen miles from New York. He states that this was the first time so far as he knew that this seal had been met with within the limits of the United States. It was ninety and one-half inches long, and apparently an oldish animal, marked on the back with irregular patches of grey and dark brown, and had the hood on the front of the head prominently displayed. This appendage, whatever may be its real use in the œconomy of the animal, as to which there has been various theories, is not developed until it arrives towards maturity. There was no indication of it on the heads of the young seals above noticed. Drs. Ludlow and King give some interesting anatomical details of the New York specimen in the same volume. De Kay§ described the same individual

* Zoologist, 1847. † Zoologie et Paléontologie Françaises.
‡ Annals, Lyceum Nat. Hist. New York, Vol. 1, 1824.
§ Nat. Hist. of New York, Vol. 1, 1842.

eighteen years afterwards, and again states that it was the only one that had been found within their territorial limits. It would thus appear that this species is rarely met with within the temperate regions of both sides of the Atlantic. Nilsson includes it in his Scandinavian fauna, where, from its habitat, it is probably not uncommon on the more frigid parts of that coast. Lammont,|| however, does not seem to have recognized it during his expedition to the Spitzbergen seas. According to Lloyd * "this seal is an occasional visitor to the more northern of the Scandinavian coasts, and that on the coast of Norway its singular look has given rise, amongst the fishermen and others, to many superstitious and fabulous stories. Klakkekallan, the name by which he is there known, appears, according to these men, in the form of a large and hairy black man, with fingers so grown together as to resemble fins, and having a cap on his head. He is rarely seen, they say, but affirm that during tempests he is sometimes driven on the rocks and perishes." This has apparently somewhat of the old mermaid superstition still hanging about it; and the following animal, the account of which is given by Lloyd, from Holberg's History of Denmark, was considered at the time of its capture—although he does not say so—to be a genuine specimen of that fabulous creature, which had so long haunted the fears and imaginations of the ancients. "In December, 1549, there was captured in the sound, near the town of Malmö, a fish of unheard-of size and most remarkable shape. It had a head like unto that of a man, and on the top of it a crown resembling a monk's cowl. The King, Christian III, caused this fish to be preserved, and sent a drawing of it to the Emperor Charles in Spain." It would appear that this was the same animal as that noticed by Hvitfeld.† He says it was caught in Oresund, and brought to Copenhagen, and there buried by his majesty's order, because the head resembled that of a human creature, with cropped hair, and covered with a monk's hood. Rondeletus ‡ describes and figures this animal as a veritable specimen of a merman. The figure was given to him by Margaret, Queen of Navarre, and certainly had the animal been anything like the

|| Seasons with the Sea Horses. * Game Birds, &c., Sweden and Norway.
† Pontoppidan, Nat. Hist., Norway, 1755. ‡ Gesnerus, Hist. Anim., 1604.

figure, it would have been a most wonderful object, very unlike a hooded seal, however, or any other denizen of land and water. What most concerns us here is, that from the preceding it may be inferred that the Hooded Seal was then, as now, rarely met with on the coasts of temperate Europe; otherwise the appearance of the animal would have been better known, and there would have been less room for so many fictitious representations. Brown* describes the Hooded Seal from observations made by himself while in Greenland, where, amongst other names, it is called the Bladder-nose by the sealers. According to him, it is one of the largest and fiercest of the northern seals, and that although it is found all over the Greenland Seas, from Iceland to Greenland and Spitzbergen, it is not a common animal anywhere. He seems to question the truth of the statement made by Fabricius†—it is the *Phoca leonina* of this author—that during the second year the Hooded Seals are snow-white, with a straight line of brown on their backs, as neither he nor any other seal-hunter with whom he had conversed ever saw such a seal in the Greenland Sea.

St. Andrews, Nov., 1872.

Late breeding of the Hedgehog in Scotland.—Both Bell and Macgillivray, in their articles on the common hedgehog *(Erinaceus europæus)*, state that the young are produced early in summer. This does not, however, seem always to be the case, as several instances have of late come under my notice of their breeding in autumn. The two following occurred this year:—At Girvan, in Ayrshire, a gentleman found a brood of young ones in his garden in the end of August, and on the 28th September I found a young one which could not have been more than a day or two old, as its eyes were not open, and the spines were very soft. Can it be that the breeding season is later in the north than in England? If this is the case the fact has not hitherto been noticed.—JAS. LUMSDEN, jun., Arden House, Alexandria, 6th November, 1872.

Birds of Balquhidder.—Lists of birds have been printed in the "*Scottish Naturalist*," one for a north, and another for a south lowland district. The following list is for a south highland district, being the birds of Balquhidder, Perthshire, all of which named are known to breed there, with the exception of those marked with an asterisk:—

Golden Eagle* *(Aquilla chrysäetos)*, seen rarely of recent years; Peregrine Falcon *(Falco peregrinus)*, breeds at the head of the valley, and is scarce; Merlin *(F. æsalon)*, nearly, if not quite, exterminated; Kestral *(F. tinnunculus)*,

*Proc., Zool. Soc., 1868. † Fauna Grænlandica.

the commonest of the Falconidæ in the parish; Sparrow-hawk (*Accipitur nisus*), sadly persecuted, and almost extinct; Kite or Gled (*Milvus vulgaris*), very scarce, being ruthlessly destroyed by the gamekeepers whenever met with; Barn Owl (*Strix flammea*), and Tawny Owl (*Syrnium stridula*), both not unfrequent. Before the present Lagopomania set in several others of this tribe, including the Swallow-tailed Kite, were denizens of the parish. Great Grey Shrike* (*Lanius excubitor*), a rare visitor; Spotted Fly-catcher (*Muscicapa grisola*), a regular summer resident; Water Ouzel (*Cinclus aquaticus*), pretty common; Missel Thrush (*Turdus viscivorus*), not uncommon; Fieldfare* (*T. pilaris*), a winter visitant; Mavis (*T. muscicus*), common; Redwing* (*T. iliacus*), a winter visitor; Blackbird (*T. merula*), not very common; Ring-ouzel (*T. torquatus*), frequent on the hillsides during summer, nesting high up; Hedge-sparrow (*Accentor modularis*), common; Redbreast (*Erythaca rubecula*), common; Redstart (*Phœnicura ruticilla*), a regular summer visitant; Whinchat (*Saxicola rubetra*), not uncommon during summer; Wheatear (*S. œnanthe*), also a common summer resident; (the Stonechat, the name by which the Wheatear often goes, does not visit the district.) Sedge Warbler (*Salicaria phragmitis*), not common, but frequently heard during the summer nights; Blackcap* (*Curruca atricapilla*), a pair male and female—observed in the summer of 1869; Garden Warbler (*C. hortensis*), scarce; Wood Wren (*Sylvia sylvicola*), not common; Willow Wren (*S. trochilus*), common; Gold-crested Wren (*Regulus cristatus*), not scarce; Great Titmouse (*Parus major*), not uncommon; Blue Titmouse (*P. cæruleus*), frequent; Cole Titmouse (*P. ater*), the least common of the Tits; Long-tailed Titmouse (*P. caudatus*), not scarce; Pied Wagtail (*Motacilla Yarellii*), common; Grey Wagtail (*M. boarula*), a regular summer resident, not common; Tree Pipit (*Anthus arboreus*), a summer visitor, not common; Meadow Pipit (*A. pratensis*), very common. The Sky-lark does not appear to pass the mountain barriers at Callander and Comrie. The Wood-lark ought perhaps to be included in this list. Snow Bunting* (*Plectrophanes nivalis*), a winter visitor, on the hill tops till May; Black-headed Bunting (*Emberiza schœniclus*), a regular summer resident, not common; Yellow Hammer (*E. citronella*), very common. Chaffinch (*Fringilla cælebs*), common; House Sparrow (*Passer domesticus*), common; Greenfinch (*Coccothraustes chloris*), frequent; Siskin (*Carduelis spinus*), resides throughout the year, not common; Lesser Redpole (*Linota linaria*), rather scarce; Mountain Linnet (*L. montium*), common; Bullfinch (*Pyrrhula vulgaris*), not unfrequent; Crossbill* (*Loxia curvirostra*), frequents the firs in autumn, very regularly of recent years; Common Starling (*Sturnus vulgaris*), very common; Raven (*Corvus corax*), a victim of the gameherds, and therefore scarce; Hooded Crow (*C. cornix*), ditto, ditto; Rook (*C. frugilegus*), not too common; Jackdaw (*C. monedula*), abundant; Magpie (*Pica caudata*), nearly exterminated; Jay (*Garrulus glandarius*), in the Strathyre woods only—elsewhere extirpated; Great Spotted Wood-pecker* (*Picus major*), a single bird seen in 1869; Creeper (*Certhia familiaris*), common; Common Wren (*Troglodites vulgaris*), frequent; Cuckoo (*Cuculus canorus*), a regular visitor; Common Swallow (*Hirundo rustica*), common; House Martin (*H. urbica*), abundant; Sand Martin (*H. riparia*), common; Swift* (*Cypselus apus*), an occasional caller, is said to build at Callander; Night-jar (*Caprimulgus europæus*), a summer visitant, and probably breeds. Ring-dove (*Columba palumbus*), common; Pheasant (*Phasiamus colchicus*), protected; Capercaillie* (*Tetrao urogallus*), an occasional visitor of late years; Black Grouse (*T. tetrix*), not scarce; Red Grouse (*Lagopus scoticus*), abundant; Ptarmigan (*L.*

vulgaris), not common; Common Partridge (*Perdix cinerea*), not uncommon. Golden Plover (*Charadrius pluvialis*), frequent; Dotterel (*C. morinellus*), said to breed on Binean and Benmore; Lapwing (*Vanellus cristatus*), abundant; Heron (*Ardea cinerea*) frequent; Curlew (*Numenius arquata*), common; Redshank (*Totanus calidris*), not common; Common Sandpiper (*T. hypoleuca*), common; Woodcock* (*Scolopax rusticola*), frequent in winter—may not improbably breed here as at Loch Lomond-side; Common Snipe (*S. gallinago*), frequent; Jacksnipe (*S. gallinula*), have good authority for the fact of its being native to the district; Corncrake (*Crex pratensis*), common; Water-hen (*Gallinula chloropus*), common; Coot (*Fulica atra*), on Loch Lubnaig and Loch Voil. Wild Swan* (*Cygnus ferus*), an occasional winter caller; Wild Duck (*Anas boschas*), common; Teal Duck (*A. crecca*), not common; Wigeon* (*A. penelope*), frequent in winter; Goosander* (*Mergus Merganser*), an occasional winter visitant; Little Grebe (*Podiceps minor*), common; Black-headed Gull* (*Larus ridibundus*), an occasional caller.—W. CAMERON, Carstairs Junction, August, 1872.

Occurrence of the Golden Oriole (*Oriolus galbula*).—A specimen of this bird, obtained in the parish of Kirkconnel, Dumfries-shire, was exhibited at a recent meeting of the Thornhill "Society of Enquiry." Specimens have three times previously been met with in Scotland.—F. BUCHANAN WHITE.

Purple Heron (*Ardea purpurea L.*)—About the 28th of September last a specimen of this very rare bird was shot on the links at Aberdeen by an individual who was gull-shooting, and on its being brought to the Natural History Museum of the University, I had an opportunity of examining it. It is a young male, and is a very fine specimen. This is the second recorded occurrence in Scotland as far as known to me; the only other instance is recorded by Dr. Macgilivray, from Monquhilter, Aberdeenshire, on 18th June, 1847. It seems to be more common in England, as notices of it are recorded from several counties, several having been found in Norfolk.—H. O. FORBES, Aberdeen, November, 1872.

[Another young Purple Heron (in first year's plumage) was recently shot in Haddingtonshire.—EDITOR.]

Wood Sandpiper (*Totanus glareola*).—At the October Meeting of the Glasgow Natural History Society, a specimen of this rare Scottish species was exhibited, which was shot on the banks of Loch Lomond by Sir George Leith, Bart., on the 8th of August last. This is the second record of the Wood Sandpiper's occurrence in the west of Scotland, one having been shot in the autumn of 1853, on the Clyde, near Port Glasgow. It has, however, been met with on three or four occasions in the east.—JAMES LUMSDEN, Jun., Arden House, Alexandria, Nov. 6, 1872.

Turtle Dove.—There was an adult female of the Turtle Dove (*Columba Turtur*) sent to me for preservation lately. It was shot on the 21st October, 1872, three miles from Berwick. This is unusually late for a migratory bird, and it could not be from weakness that it remained so late, as it was very fat when shot. I observe Morris, in his "British Birds," records one, almost as late, which was shot in Perthshire, October 20th, 1834.

Another instance of migration occurred to me about the same time—a Blackcap (*Sylvia atricapilla*) which I saw at Edenmouth, 20th October, three miles

east from here ; but the black-cap appears to be an exception amongst our migratory birds in remaining late, as I once shot a male at Ednam on the 25th December, 1865.—ANDREW BROTHERSTON, Kelso

Note on the presence of five toes on each leg of a Black-headed Gull *(Larus ridibundus)*.—Some weeks ago I was shown the newly removed skin of a young black-headed gull shot on the Links of Old Aberdeen on 24th August, by Mr. Angus, on each leg of which there was a supernumerary toe. The toes were situated on the inner side of the normal tarsal bone, being attached to the lower surface of a process of bone on the inner side of the lower end of the tibia. In each leg there is an additional tarsal bone developed. The toe on the right leg is thicker and longer than that on the left ; its claw reaches nearly to the point of the inner of the true toes ; it consists of a tarsal bone occupying about half its length, and bent and twisted backwards, and four phalanges. It is loosely connected by skin to the leg as far as the lower end of its tarsus ; the phalanges are free, and there is a narrow web running to the base of its claw on the outer side, and a broad one on the inner. The toe on the left leg reaches only as far as the lower end of the normal tarsus, with which it is parallel, and with which it is connected by skin as far as the end of its tarsal bone. It has three phalanges, which are free and unwebbed, To my regret I did not get an opportunity of dissecting the legs of the bird to ascertain if there were any peculiarity among the muscles corresponding with the abnormal development of toes.—J. W. H. TRAILL, Old Aberdeen.

MEMOIRS ON SCOTTISH TENTHREDINIDÆ.

BY P. CAMERON, JUN.

No. I.—NEMATUS GALLICOLA.

NEMATUS GALLICOLA Westwood and Stephens ; *Illust. Brit. Ent., Mandibulata*, Vol. vii. 36 (1835).

NEMATUS VALLISNIERI Hartig ; *die Familien der Blattwespen und Holzwespen*, 205 (1837).

NEMATUS GALLICOLA is the commonest species of gall-making *Tenthredinidæ* in this country, and may be found in almost any locality where the larger willows abound, on the leaves of which its bright red galls must have been noticed by every observer of natural objects.

The galls have been found on the following willows :—

Salix fragilis L. The galls are bean-shaped, the skin covered with small irregular projections, and hairless. They vary from ¼ to ½-inch in length, ⅛ to ¼-inch in breadth, and about the same in depth. They project, in about equal proportions, through both sides of the leaves, and are always placed on the

blades. When very young, they are of a very light green colour, but as they reach maturity this gives place to a deep red above, and a paler red or light green beneath. The number on a single leaf varies from one to thirteen, which is the most I have found. A single larva resides in each gall. (Pl. I., fig. 2).

Salix alba L. The galls only differ from the former in being whitish-green or light red, and in the underside being hairy. (Pl. I., fig. 3.)

Salix caprea L. They are somewhat oval, dark shining green above, and very hairy underneath. This gall is not very common.

Salix cinerea L. These galls I have only found on the banks of Loch Lomond. They are oblong, dark green, like those on *S. caprea*, but much smaller, and slightly hairy.

Although the galls are so extremely common, yet they are local to a remarkable degree, and the insects show a strange preference for particular trees. Thus one tree will be completely covered with galls, while another some yards distant will not have a single specimen on it. According to my experience they are commonest on the willows at a distance from water, and when they do appear on trees growing on river banks, it is on the land-side they are found. This appears to be also the case with its coleopterous inquiline *Balaninus brassicæ*. The galls, containing larvæ in all stages of growth, may be found on the trees from the end of May to the end of October.

The perfect insects make their appearance about the 20th of May (kept inside the house, they come out in March), and the females shortly afterwards proceed to deposit their eggs. This they do in the undeveloped leaf-buds, laying the eggs in several leaves by one operation. In due time the young leaves reach their proper size and the galls grow out along with them. The eggs are also deposited in young but fully developed leaves, and later on in the season on old and rather dry ones. The majority, if not the whole, of these latter always produce small and irregular galls, which very rarely or never contain larvæ. It may therefore be concluded that for the proper growth of the galls, and the well-being of the larvæ, it is necessary that the ova should be deposited in young and growing leaves.

The *egg*, after being laid, swells to about double its first size. It is a minute, oblong, transparent white object, about 1-50th-inch in length, frequently with a slight curve in one of its sides.

J. Allen Harker del. ad nat. Cooke & Fotheringham, lith. Westminster.

At first it is pure white, and as it gets older the form of the larva may be observed through the shell. As a general rule the egg is placed in the centre of the gall, but I have also found it at one end.

After escaping from the egg the *larva* is very minute, and is transparent white, with the exception of the head, which is shining brownish-black. After some time this white colour gives place to a beautiful shining green by the dorsal vessel getting filled with food and its contents shining through the transparent skin. Immediately after moulting the larvæ are perfectly white, but in a short time they regain their former colour. Three larvæ that I watched were unable to slip the old skin off the head, and perished. By the time the larva has reached its third moult, it has, by eating, made a considerable hollow in the gall, but the round brownish pellets of frass have also accumulated, and in order to get rid of them it wisely eats a round hole in one end of the gall on the underside of the leaf, and through it ejects the frass. The larvæ may be often observed with their heads projecting out of this hole as if taking a view of the outer world, and occasionally quit the galls entirely to take a short walk on the leaf, at least this is the case in the breeding jar. The full fed larvæ vary from ¼ to ⅜-inch in length; this variation being caused by the size of the galls which they inhabited. The head is shining brownish black, slightly narrower than the first segment of the body; a dark greenish-white stripe forms a semi-circle across the face. The mouth is light-brown, the mandibles being darker at the tips. The six feet are white, the claws brown; the fourteen claspers are also white, but not quite so pure as in the feet. The body throughout is of a dull whitish-green, without any marks whatever. A few short microscopic hairs are scattered over the head and body. The larvæ are very sluggish creatures; when touched or alarmed in any way they beat the air with the anal segment. Like most of the larvæ of *Nematus*, they carry the anus curled up under the preceding segments. When ejected from the galls they, as might be expected from having lived in a small round confined space, walk about in short semi-circles, but full-fed larvæ, who are about to spin, walk much better than younger specimens. When they reach full maturity they quit the galls and descend to the ground, in

order to spin under the earth. But if they have been living on a large tree with rough bark, full of crevices, a goodly number enter these instead, and spin their cocoons in company. By removing the bark of a tree upon which the galls have been abundant, the cocoons of numberless generations may be discovered in hundreds, joined end to end, or packed one above the other.

The cocoons are rarely spun inside the galls. They are oblong, about ⅛-inch in length, and of a coffee-brown colour. The larvæ of the last broods remain unchanged in the cocoons until the spring, when they enter the pupal state. After the larvæ have spun their cocoons, their bodies become considerably reduced in length, but on the other hand they become much stouter. The colour also assumes a yellowish tinge, and the claspers become almost invisible.

The *pupa* is much thinner than the larva, and displays all the parts of the future saw-fly; the limbs are laid along the breast. At first it is about the same colour as the larva, but in a short time the thorax, the head, then the back of the abdomen, and finally all parts show the colours of the perfect insect; the wings gather consistency, the insect then gnaws with its mandibles a round lid of one end of the cocoon, leaves it, and after giving some preliminary shakes to its wings, and briskly agitating its antennæ, flies away to follow the example of its parent.

The head of the *perfect insect* is narrow, a good deal broader than long, shining black, mouth light reddish brown, eyes large and prominent. Thorax broad and well developed, black. Some specimens have the head and thorax slightly pubescent. Antennæ, filiform, a little longer than the abdomen, black. Abdomen, black. The feet are light reddish-brown, the posterior tarsi blackish. Wing scales testaceous; the wings themselves are hyaline, iridescent. The outer half of the stigmal spot is dark testaceous, inner portion pale. The nervures are light testaceous at the base, darker at the tip. Some insects have the wings darker or paler than others, and the submarginal cells are frequently obliterated. Long corp. 1½-2 lin.; exp. alar. 3½-4½ lin.

A variable species, but the varieties run so much into one another that they are not worth describing.

The *saw* is light brown, shaped somewhat like a scythe,

its teeth minute, placed wider apart towards the base. The mandibles of the perfect insect are very sharply pointed, the point has its edge very minutely dentate; the mandibles of the larva are very blunt. Probably the sole use of the mandibles in the imago is to cut the lid of the cocoon; I never observed the imagos eat anything, nor could I find traces of food in their stomachs. The perfect insects may be discovered congregating in numbers on the willow leaves towards the end of May and beginning of June.

The male is quite unknown to me, and this appears to have been also the case with Hartig. In all probability they, like *Cynips lignicola* and other *Cynipidæ*, propagate without the aid of the male sex.

Further information regarding this interesting species may be found in Swammerdam's Book of Nature (where it is figured in all stages), p. 286, pl. 44; Réaumur, Memoires, Tome 3, p. 435, pl. 37; Rösel, Inst. Belust. Vol. 2, Bomb. et Vesp., pl. 10; Ratzeburg, die Forstinsecten, p. 128, Tab. III.; Thomson, Hymenoptera Scandinaviæ, 1, 162; Müller, Ent. Mo. Mag. 6, 29 (under *Nematus saliceti* Fallen).

In a future paper I shall give an account of the numerous inquilines and parasites of *Nematus gallicola*.

EXPLANATION OF PLATE I.

1.—*Nematus gallicola*. 2.—Galls on *Salix fragilis*. 3.—Galls on *S. alba*. 4.—Larva. 5.—Cocoon. 6.—Saw. 7—Fore-wing.

Figures 1, 4, 6, *and* 7 *are magnified.*

Occurrence of three species of Tenthredinidæ new to Britain.—While at Rannoch, in 1871, I beat from the Scotch fir examples (females) of *Lophyrus pallipes* Fall., and of *Lophyrus virens* Klug., two saw-flies not previously met with in this country. I also captured there *Strongylogaster eborina* Klug., a saw-fly which is likewise new to Britain. This year, in June, I took eight specimens of the latter insect by beating sallow bushes in the Glenelg Valley, Inverness-shire.—P. CAMERON, Jr., 136 West Graham Street, Glasgow.

Occurrence in Scotland of Trigonaspis megaptera Panz.—About the end of May, I found the galls of *Trigonaspis megaptera* Panz., in Cadder and Kenmuir Woods, near Glasgow. All the galls were, as Hartig states, placed on very young shoots. The perfect insects emerged on the 8th of June. I never could find the galls after that date; it is probably single brooded.—*Id.*

VANESSA ANTIOPA.

By THE EDITOR.

IT seems advisable that the recent so-called invasion of Britain by this butterfly should not pass unnoticed in the pages of the *Scottish Naturalist.* At pp. 266, 267 of Vol. I. several captures of *Vanessa Antiopa* are recorded. I have since received notices of several others.

The following is a list of all that (as far as I have been able to ascertain) have been noticed in Scotland during the past year:—

Tweed	Berwickshire,	6	specimens.
	Selkirkshire,	1	,,
Forth	— Fife,	2	,,
Tay	Perthshire,	5	,,
	Forfarshire,	5	,,
Dee	— Aberdeenshire,	8	,,
Moray	Banffshire,	1	,,
	Morayshire,	3	,,
Solway	— Dumfries-shire,	3	,,
Argyle	— Inverness-shire,	1	,,

In all 35 specimens, or, as in one or two instances, the same specimen may have been twice recorded, at least upwards of 30 specimens have been captured or seen in Scotland in 1872.

The dates vary. The first of which there is any record, was seen in early spring in Perthshire. The next is one recorded in the *Field* newspaper, as having been taken in Inverness-shire, near Loch Lochy, on August 3rd. The majority occurred about August 22nd, and the remainder on various dates from then till October 24th.

The condition of the specimens seems to have been variable, but many were fine. One (taken near Methven, in Perthshire, in September, by Mr. Wilson), was exhibited at the November meeting of the Perthshire Society of Natural Science, and was in most perfect condition.

Finally, all the specimens appear to have belonged to the white-bordered form.

There has been a considerable amount of discussion as to the birthplace of the "Camberwell Beauties," of 1872—whether they are immigrants from continental Europe, or whether they are British-born.

Mr. Stainton (Ent. Monthly Mag., Oct. 1872, p. 105) shows that central European specimens are yellow-bordered (at least before hibernation), but north European ones are white-bordered, and for this reason he inclines "to the opinion that the recent invaders have come to us from Scandinavia." Mr. Stainton, in support of this belief, alludes to the various recorded instances of migrations of butterflies, and to the fact that in the parts of Belgium nearest Britain, from which country, as being so much nearer Britain than Scandinavia, the butterflies might have been supposed to have come, *Vanessa Antiopa* is said to be scarce, and to be yellow-bordered.

Mr. Doubleday, in the same magazine, (Nov. 1872, p. 138), takes a directly opposite view to Mr. Stainton's. He believes that every one of the butterflies was bred in this country, and cites Moses Harris as implying that *Vanessa Antiopa* was not uncommon in this country a century ago. He also states that there is a peculiarity in the appearance of British specimens which at once distinguishes them from continental ones.

In "*Science Gossip*" for November, Mr. C. G. Barrett reviews the recent records of the capture of this butterfly, and points out that both yellow and white-bordered specimens have occurred in several English counties. Mr. Barrett then considers the question of origin, and though apparently desirous to believe that it is British, yet confesses himself unable to decide. In favour of British origin, he brings forward the fact of the simultaneous appearance of specimens on the coast and inland, the fineness of many of the specimens &c.

Writing in the *Ent. Mo. Mag.*, for November, I expressed my inclination to more than half accept Mr. Stainton's view of invasion from Scandinavia, but now with the light obtained from further records, I have no hesitation in saying that I believe the majority of, if not all, the specimens are British-born. Against Mr. Stainton's theory, the simultaneous appearance of the majority of specimens throughout the country about August 22nd, the fine condition, and the fact that a friend, who was travelling in the Scandinavian peninsula

about the time that the butterfly should have been common there, did not observe a single specimen, greatly militates.

Let us now see what can be said in support of the theory of British origin. In the first place, we have the specimen seen in Perthshire in the spring. Now entomologists are comparatively few in numbers, and not many lepidopterologists go in pursuit of butterflies early in spring. It follows therefore then, if one was observed, there may have been others that did not come under notice. By these eggs would be laid, and as 1872, though a bad year in most places for perfect insects, yet appears to have been the reverse for larvæ, the abundance of specimens seen in autumn is accounted for. That is, if we adopt Mr. Barrett's theory, that eggs are laid every year in this country, but that the young larvæ are usually killed off by the dampness of the climate, the hot weather of the first three weeks of last July saving them in this case from their usual fate. For my own part, taking into consideration the great tendency to irregular appearances in abundance shown by many of the *Vanessidæ*, I think that the old idea of these insects remaining in a dormant state in some period of their existence (possibly that of the egg) has not been entirely explained away.

Secondly, 1872, with its peculiar weather, has, strange to say, been characterised by the appearance in various parts of Scotland of insects rarely or never before seen in these parts. Thus we have *Vanessa polychloros* in Aberdeenshire, *Colias Edusa* at Perth (both species subject to irregularity in the periods of their appearance in abundance), and *Gonepteryx rhamni* in Fife. The two first can find their food-plants anywhere, but buckthorn, the food-plant of *G. rhamni*, is a rare plant in Scotland, and I do not know what plant would do for a substitute—sea-buckthorn, *Hippophäe rhamnoides*, which is naturalized on some parts of the Fifeshire coast, would scarcely, I imagine, serve as such. Putting aside, therefore, *Colias Edusa* and *Gonepteryx rhamni* as stragglers from elsewhere (which rather tend to support the theory of immigration), we have *Vanessa polychloros*, a species subject, like *V. antiopa*, to irregularity, and like it a feeder on trees, occurring simultaneously with *Vanessa Antiopa* in Aberdeenshire, and possibly also in Perthshire. This fact may of course be adduced as an argu-

ment in favour of imigration. I think, however, that taken in connection with the next point, it may equally serve to show that 1872, through some obscure meteorological cause, has been a favourable year for the development of these species, as it certainly has for many larvæ.

Thirdly, the simultaneous appearance of specimens throughout the country, preceeded here and there by a few stragglers. This is (as Mr. Barrett remarks) just what occurs with insects emerging from the pupæ. If there had been an emigration from Scandinavia, there would probably have been more specimens noticed on the east coast, or at anyrate specimens seen there a few days earlier than inland, but instead of that we find specimens recorded as taken in far inland localities on the same days (or even a day or two earlier) as those on the coast. The earlier date of inland specimens may be accounted for by the fact of, that, at that season, there is a greater amount of heat inland than on the coast, where the influence of the sea lowers the temperature.

Fourthly, the (already alluded to) fine condition of many specimens seems almost sufficient proof of a British origin. It is, one would think, impossible that a butterfly could cross 300 miles of sea, even under the most favourable circumstances, without showing some signs of wear and tear, and yet if we accept the immigration theory, we have examples utterly unworn by the long journey.

A word or two in conclusion regarding the two forms of *Vanessa Antiopa*. The white-bordered one is the alpine and northern race, and is what should and does occur in Scotland, and generally in England. The yellow-bordered form is the southern one, and it we find occurring occasionally in England, showing the junction of the districts inhabited by the two forms. Holland appears to be another country where the two districts meet. In England *V. Antiopa* has not occurred most commonly in the south, but rather towards the north. If it occurred more commonly in the south, I should expect the yellow-bordered form to be the more common one there. Its scarcity implies, I think, an absence of emigration tendencies

in the race of *Antiopa* inhabiting the parts of the continent nearest Britain,* and possibly the same absence in the whole race.

Gonepteryx rhamni in Fifeshire.—On the 19th August Dr. J. A. Power and I were driving from Balmuto to Kinghorn, and when a little to the east of Kilrie Lodge, the Doctor said to me "There goes *rhamni*." I said he was mistaken, as there were no *rhamni* in Fife, but he was positive he was right, so we got out of the dog-cart and went back to the place where he said he saw the butterfly; we had no net except the Doctor's water-net (fortunately not yet put to its proper use) and with it we captured the insect,—a fine male *G. rhamni*.—J. Boswell Syme, Balmuto, Nov., 1872.

Vanessa Antiopa in Fife.—A friend (Mr. G. Davidson, of Banchory, Kinghorn), told me that in the latter part of August he had seen a butterfly he had never seen before, on the old north road, between South Balmuto and Dunearn hill, not far from this. From his description I supposed it to be *Vanessa Antiopa*, so I shewed him a French specimen, and he said his butterfly was very like it, but had a white margin to the wings.—*Id.*

Vanessa Antiopa in Banffshire.—Mr. Bannerman informs me that in August of this year he saw a fine specimen of *Vanessa Antiopa* near Banff, adding another to the list of Scottish counties in which it has been seen this year.—J. W. H. Traill, Old Aberdeen, Nov., 1872.

Additions to the Aberdeenshire Fauna.—On looking over a collection of Lepidoptera lately, which had been made during the summer about Aberdeen, I found some species new to the lists of the district, viz.—*Argynnis Paphia*, one specimen of which had been taken at Muchalls; *Zygæna trifolii*, of which one specimen was taken at the same place; and several specimens of *Botys verticalis*, taken a few miles inland from Aberdeen, This last species has been obtained in several localities near Aberdeen this year. *Eupithecia linariata* has been taken abundantly at Inverury by Mr. Tait. Of species not new to the district, the following are among the more interesting: *Erebia æthiops* (*E. Blandina*), on the coast a mile or two south of Aberdeen; *Lithosia complanula*, the larvæ common near Stonehaven; *Orthosia suspecta*, once in Strathdon; *F. pinetaria*, in Corgarff on the Don; and a specimen of *Vanessa Antiopa* near Aberdeen in September.

Among some beetles picked up by me during the summer, Dr. Sharp, to whom I sent them for examination, has detected two specimens of *Omalium rugulipenne*, and three of *Corticaria cylindrica*, both, he informs me, very rare, and both new to Scotland. To the best of my knowledge, I took both species among the rocks, about two miles south of Aberdeen, along with the littoral species *Cercyon littorale*, and *Aleochara grisea*, both of which Dr. Sharp found among those sent.—*Id.*

* I only remember one recorded instance of *Vanessa Antiopa* having been seen crossing the Channel.

MEMOIRS ON SCOTTISH DIPTERA.

By JAMES HARDY.

No. V.—TRYPETA ALTERNATA Fallen.

(The Rose-hip Fly).

BOUCHÉ, as we are informed by Mr. Westwood ("Intro. to Ent.," ii. 573), reared, *Trypeta continua* Meig. *(T. alternata*, Fall.*)*, from the berries of *Rosa villosa*. I am able to confirm this account of the habits of the insect, having during the autumn detected the maggot devouring the ripe hips of *Rosa tomentosa*, var. *scabriuscula*, and *Rosa canina;* the former, at best, but a doubtful variety of *R. villosa*. The hips get black and corrupted on the sides, and shew the openings by which the maggots have gained access. They appear not to confine themselves to single fruits, and readily enter a fresh one when presented to them. I obtained them in a pupa state shortly after collecting the hips, which they deserted previous to entering into that condition. The puparia were mostly cemented to the object on which they lay, by a moisture that had exuded from the vent. The hips of *Rosa spinosissima* are similarly damaged, but I was too late in ascertaining whether this was attributable to the same cause. The maggots were found on the 1st of November, and the fly was not disclosed till the 23d of June, in the subsequent spring. The maggots first appear about the end of September.

The *maggot* is yellowish, shining, smoothish, thickish, convex, a little tapering in front and less behind, the breadth at the middle being nearly uniform; the segments distinct, the division lines crenated; the upper part of the second anterior segment is roughish above; and near its base, on each side the stigmata come out in a bilobed white furcate scale; hinder end a little rounded and narrower, with a pair of approximated, not raised, stigmata, which are composed of three divisions, and have a narrow depression between them; the tip behind rounded; the anus a cleft; the middle part of the ventral segments slightly wrinkled; length 2½ lines. The specimens from the dog-rose *(R. canina)* were whiter, the divisions of the segments scarcely crenate; the hinder stigmata more elevated, a minute tubercle on the outer edge of the area beneath them,

and a light brown stripe on the hinder part of the back. The differences may be attributed to the latter not being so near to their change as those from *R. tomentosa.*

The *pupa-case* is yellowish or straw-tinted, shining, somewhat oval or cylindrical, the fore extremity conic, with two small white scales, one at each end, the sides behind with an indistinct interrupted keel; segments flattish, not very distinct, more so beneath; transversary striated or furrowed with several waved wideish ridgelets, which are most distinct on the underside, and are connected on the sides by retiform meshes; hinder end rough, roundish or sub-conic, the stigmata not far apart, scarcely raised; the anus cleft elliptical, bounded by a rim; length 1¾-2 lines. The fly is the *Tiphritis alternata*, Fallen, *Ortal.* 5, 3, which Loew. has shown (vide *Ray. Soc. Reports on Zool.* 1844, 391,) to be the same as the *Trypeta continua, Meig. Europ. Zweif. Ins.* V., 312, 1. It is a very pretty insect.

The specific character given by Meigen is "*Mellea, metathorace nigro; alis fasciis quatuor fuscis; secunda minima; basi puncto fusco.*" The *male* is honey yellow; face pale yellow with a white reflection, a slight ridge on each side, sloping out from the antennæ, a long and a few short bristles about the mouth; front nearly level with the eyes, with three black stiff hairs on each side lying across it, and two lying backwards; a minute eyelet spot, which has four stiff hairs directed backwards; two very long ones on the hinder margin of the head. Third joint of the antennæ sub-oblong, straight above, arched beneath, with a short point at the tip turned upwards; seta longish, black, short, pubescent. Eyes light green with an olivaceous cast; brown after death. Thorax slightly oblong, but moderately convex, the back honey-yellow, and bearing a short appressed pubescence; the sides, the region before the wings, and the scutellum, somewhat sulphur yellow, (but this distinction is scarcely visible in dried specimens), with several long black stiff hairs, and four on the scutellum; metathorax with two shining quadrate black patches, divided by a yellow line. Abdomen not so wide as the thorax, sub-oblong, the tip conic, lighter tinted than the back of the thorax, hinder edges of the segments paler; a shining black blotch at the tip, intersected by a yellow spot; with scattered appressed pubescence and a row of longish black bristles near the hinder edges of the seg-

ments; the underside uniform pale yellowish, as are the legs; tibiæ and tarsi rather more tawny; breast and coxæ rather bristly; poisers yellow. The wings ample, clear, fringed, the tip conic, the nervures at the base yellow, the remainder brown or subtestaceous; the cross nervures darker where the bands cross; the bands black or inky; a diagonal band widest on the underside rises near the outgoing of the second longitudinal nervure, and crosses the second transverse one; this is followed by a short one, which is narrowest at its tip, proceeding from the upper margin, and going no farther than the third cell; a third band sloped in an opposite direction to the first, widest and darkest at its origin, which is behind the coming out of the mediastine nervure, and narrowing towards the tip, crosses the first transverse nervure, and runs somewhat towards the tip of the first; and there is also a small spot near the base towards the hinder margin where the fifth nervure is emitted, and a minute pale one after the transverse nervure of the costal cell. Length 1½ line; expansion of the wings 5 lines. The *female* is larger, and has the abdomen more ovate; the sheath of the ovipositor is short, with its edges and tip brown; length 3 lines; breadth 5¾ lines.

It may be remarked that in both this and *T. artemisiæ*, which deposit their eggs in substances easily reached, the ovipositor is of moderate length.

Note on Bibio clavipes Mg. and B. lepidus Loew.—*Bibio lepidus* Loew. is the species that for a long time was considered by British entomologists to be *clavipes* Mg. In fact, *lepidus* was only distinguished from *clavipes* and described a year or two ago. The true *clavipes* appears to be very rare in England, the only specimens extant being some collected by the late Mr. Dale, the localities of which are doubtful. In Scotland, however, it seems more common, as I have examples from several localities. I therefore take this opportunity of recording it as a British species beyond doubt. *B. lepidus* (only recorded hitherto from England and Ireland) is also a Scottish species. Regarding these species I will say more in a paper on the Scottish species of *Bibio*, which I have in contemplation, and in aid of which I will be glad of information from anyone who has studied Scottish Diptera.—F. BUCHANAN WHITE.

CAPTURES OF SPIDERS IN SCOTLAND DURING 1872

DURING the past year I have collected Spiders in various Scottish localities, most of which have been kindly verified by the Rev. O. P. Cambridge,

and as my captures include a good many of some interest, and as, besides, to my knowledge, very little is known about the distribution of spiders north of the Forth, I am induced to give a complete list of the species taken. They include four new to science; several new to Britain, or of very rare occurrence, some of them having been met with on the Cheviots, for the first time, by Mr. Hardy, last winter; while a number of them are new to Scotland. The localities in which I have collected have been Deeside and Donside in Aberdeenshire (especially about Aberdeen and in Braemar), Lintrathen in Forfarshire, and about Dunkeld and at Stanley in Perthshire. For some species I am indebted to friends, especially to Dr. Buchanan White, for some from Braemar, and others from Dunkeld.

Lycosa agretica, Dunkeld; *L. campestris*, Perth, and Keith in Banffshire; *L. andrenivora*, Perth, Keith, and about Aberdeen; *L. rapax*, near Aberdeen; *L. allodroma*, Dunkeld, Stanley, and Banchory on Deeside, but everywhere scarce; *L. picta*, common on the Aberdeenshire coast, and at Stanley; *L. saccata*, Aberdeenshire; *L. obscura*, Strathdon; *L. biunguiculata* (Cambr.), and *L. Traillii* (Cambr.), both new to science, both from Braemar; *L. fluviatilis*, near Old Aberdeen; *L. cambrica*, Aberdeenshire; *L. piratica*, Strathdon; *L. monticola* (Westr.), near Old Aberdeen, Lintrathen, and Dunkeld; *L. nigriceps* (Thorell.)=*L. congener* (Cambr.), Muchalls, on the coast, ten miles south of Aberdeen, and Parkhill, six miles north-west of Aberdeen; *Dolomedes mirabilis*, Keith, Ballater on Deeside, and Blairgowrie; *Hecaërge spinimana*, common about Aberdeen; *Salticus scenicus*, Strathdon, Banchory, and Dunkeld; *S. coronatus*, Dunkeld, common; *S. frontalis*, local near Aberdeen; *S. cupreus*, Muchalls and Dunkeld; *Thomisus cristatus*, from all localities; *Th. viaticus* (Koch.), near Aberdeen; *Th. erraticus*, Banchory, scarce; *Th. versutus*, local near Aberdeen; *Th. trux*, Parkhill and Dunkeld; *Th. lanio* (Koch.), Dunkeld; *Philodromus elegans*, Donside, Dunkeld, and Lintrathen; *P. cæspiticolis*, Dunkeld; *P. aureolus*, scarce, Strathdon; *Drassus troglodytes* (Koch.)=*D. clavator* (Cambr.), Parkhill; *D. cupreus*, about Aberdeen; *D. lapidicolens*, Ballater, and about Aberdeen; *D. nitens*, near Aberdeen, and Dunkeld; *Clubiona holosericea*, Ballater; *C. amarantha*, Aberdeenshire and Keith; *C. epimelas*, Muchalls; *C. phragmitis* (Koch)=*C. deinognatha* (Cambr.), near Old Aberdeen; *C. brevipes*, generally distributed; *C. compta*, Inverury and Dunkeld, scarce; *C. diversa* (Cambr.)=*C. pallens* (Koch.), Dunkeld; *C. accentuata*, Dunkeld, scarce; *Cheiracanthium nutrix* (Westr.)—not *Clubiana nutrix* of Leach—Muchalls, and near Aberdeen; *C. carnifex* (Westr.)=*Clubiona erratica* (Bl.), Dunkeld—both of these are exceedingly rare as British; *Ciniflo atrox*, common everywhere; *Ergatis benigna*, common on all moors; *Agelena montana*, Dunkeld; *Tegenaria civilis*, common everywhere; *T. sylvicola*, near Aberdeen, Lintrathen, and Dunkeld; *Textrix lycosina*, common in Aberdeenshire and at Dunkeld; *Theridion lineatum*, all the varieties common everywhere; *Th. projectum* (Cambr.), near Old Aberdeen, and at Inverury; *Th. nervosum*, common everywhere; *Th. pictum*, Dunkeld; *Th. denticulatum*, Inverury and Dunkeld; *Th. varians*, Dunkeld; *Th. pallens*, Dunkeld; *Th. variegatum*, near Aberdeen. Banchory, and Dunkeld; *Linyphia montana*, abundant everywhere; *L. cauta*, Dunkeld; *L. fuliginea*, Aberdeenshire and Dunkeld; *L. luteola* (Bl.)=*L. alticeps* (Bl.), Strathdon, and near Old Aberdeen; *L. tenuis*, near Old Aberdeen, and at Dunkeld; *L. insignis*, Dunkeld; *L. circumspecta*, near old Aberdeen; *L. rubra*, Parkhill; *L. alacria*, Parkhill, Inverury, and Lintrathen, *L. ericæa*, near Old Aberdeen; *L. socialis*, near

Aberdeen, and at Lintrathen ; *L. minuta*, Dunkeld ; *L. pulla*, near Aberdeen, scarce ; *L. obscura*, near Aberdeen ; *L. pratensis*, Aberdeenshire and Dunkeld ; *L. rufa*, (Westr.), near Old Aberdeen ; *L. leprosa*, (Westr.) = *L. confusa* (Cambr.), near Aberdeen ; *L. reticulata* (Cambr), top of Cairn-na-Glaisha, on the bonndary between Aberdeenshire and Forfarshire, at 3,300 feet above the sea ; discovered as new to science, on the Cheviots, by Mr. Hardy last winter. *Neriene bicolor*, near Aberdeen, and Dunkeld ; *N. cornigera*, Parkhill ; *N. livida*, Parkhill and Lintrathen ; *N. viaria*, Parkhill ; *N. vagans*, near Old Aberdeen ; *N. bituberculata*, as last ; *N. graminicola*, Banchory ; *N. agrestis*, near Aberdeen ; *N. gracilis*, as last, and at Dunkeld ; *N. dentata*, near Old Aberdeen ; *N. nigra*, as last, and at Inverury ; *N. longipalpis*, Parkhill and Inverury ; *N. dentipalpis*, near Aberdeen ; *N. atra* (Bl.) = *N. vagabunda* (Westr.), near Old Aberdeen, and at Stanley ; *N. promiscua* (Cambr.), Braemar, near Aberdeen, at Inverury, and at Dunkeld, discovered by Mr. Hardy last winter ; *N. uncana* (Cambr.), same remarks apply to this as to *Linpyhia reticulata* Cambr. ; *N. rubens*, abundant everywhere, at Banchory I took a specimen with only one left lateral eye replacing the normal pair, and the left posterior eye larger than usual, and oval in form ; *N. trilineata*, common in Aberdeenshire, and at Stanley ; *N. variegata*, Dunkeld ; *N. marginata* Parkhill ; *Neriene (sp. nov.)* Dunkeld, scarce ; *Walckenaëra acuminata*, near Aberdeen ; *W. punctata*, near Old Aberdeen, and at Inverury ; *W. scabricula* (Westr.) = *W. aggeris* (Cambr.), Dunkeld ; *W. brevipes* (Westr.), near Aberdeen, and at Inverury ; *W. similis*, (Westr.), near Old Aberdeen, first record as British ; *W. cristata*, Dunkeld ; *W. antica*, near Old Aberdeen ; *W. bifrons*, Inverury ; *W. frontata*, near Aberdeen, Inverury, and Dunkeld ; *W. Beckii* (Cambr.), Dunkeld ; *W. minima*, Inverury ; *W. permixta*, near Old Aberdeen ; *Walckenaëra (sp. nov.)*, very small, but male well marked, near Old Aberdeen ; *W. nemoralis*, Dunkeld ; *Pachygnatha Clerckii*, Aberdeenshire, and Dunkeld ; *P. Degeerii*, abundant everywhere ; *Epeira quadrata*, and *E. apoclisa*, abundant everywhere, up to 2000 feet ; *E. cucurbitina*, Aberdeenshire, and Dunkeld ; *E. scalaris*, Braemar and Dunkeld ; *E. umbratica*, Dunkeld, scarce ; *E. diadema*, abundant everywhere, and like *E. quadrata*, very variable ; *E. calva*, near Aberdeen, Braemar, and at Inverury : *E. callophylla*, abundant everywhere ; *E. fusca*, Parkhill ; *E. antriada*, common under banks and in holes, everywhere ; *E. inclinata*, swarms everywhere, and is very variable ; *E. anthracina*, Dunkeld, scarce ; *E. conica*, Inverury and Rothiemay, one specimen from each locality ; *Tetragnatha extensa*, common everywhere ; *Dysdera Hombergii*, Muchalls and Dunkeld ; *Segestra senoculata*, common among stones everywhere ; *Oonops pulcher*, near Aberdeen, and at Dunkeld.

I have followed Blackwall's classification chiefly in this list. The whole number of species given in this list is 130, of which I have taken 109 in Aberdeenshire and the north of Kincardineshire, 14 in Banffshire, 34 in Forfarshire, and 70 in Perthshire. I shall feel much obliged for any assistance in obtaining spiders from any district north of the Forth. They may be readily preserved for a time in small bottles, in any kind of spirits ; and it greatly enhances the value of the contents of each bottle to have a label with the date and place of collection. I should be happy to make any return in my power for such assistance.

J. W. H. Traill, Old Aberdeen.

PHYTOLOGY.

THE PLEASURES AND ADVANTAGES OF THE STUDY OF BOTANY.*

By JAMES ALLAN.

SEVERAL generations ago one of the pleasures of being a botanist was, that if you were a woman you might probably be burnt for a witch, and if a man, would be constantly requested to concoct love potions or cosmetics. But now these unfortunate adjuncts do not exist, and one meets ladies armed with vasculum and spud, who run no risk of hurt; and though botanists know the ingredients of love-philtres well enough, they are never asked for them, the belief in such things having probably passed away.

Those who have felt an interest in, and have studied, Natural History, have always met with ridicule at the hands of the superficial or vulgar, which, although getting rarer every day, adds a certain piquancy to the study. Peter Pindar, the poet laureate of scurrility, delighted in nothing better than in ridiculing the President of the Royal Society, Sir Joseph Banks. Here is one instance,—

> "A president in butterflies profound,
> Of whom all insect-mongers sing the praises,
> Went on a day to catch his game renowned,
> On violets, dunghills, nettletops, and daisies."

And even the genial authors of the "Nugæ Canoræ" have poked their fun at us—

> "Some folk 'll tak' a heap o' fash
> For unco little end man,
> An' muckle time an' muckle cash
> For nocht ava' they'll spend man;

*An abstract of an address by the Vice-President of the Glasgow Field-Naturalists' Society.

Thae chaps had come a hun'er mile
For what was hardly worth the while ;
'Twas a' tae pu'
Some gerse that grew
On Ben Muic Dhu
That ne'er a coo
Wad care tae pit her moo' till."

The favourite joke of the rabble now is, "What's the price of candles ?" mistaking the vasculum for a candle box.

It is a trite saying that things change ; and a change has come over men's thoughts in regard to science. When men cannot open their eyes without seeing what science has done for the world, they cease to sneer at students.

But it is not from an utilitarian point of view that I wish to consider this subject now. I wish chiefly to dwell on the intensely interesting nature of the pursuit, and its reflex effect on ourselves. And here I would advert to the beneficial effect that any hobby of this kind must have on people engaged in daily monotonous toil, giving them something to think of besides pounds shillings and pence, and educating the spirit of poetry in every one's heart, save the most debased. This applies with great force to botany. Then it has this advantage as a hobby—that it is a cheap one. Many other sciences require expensive apparatus, but this one, after you have spent a few preliminary shillings, need not cost you anything more for years.

The science of botany brings one in contact with the most beautiful objects in existence, and men (save in cities,—for there, as Arthur Helps says, they will rather rush to see a representation of beauty than beauty itself), have always admired and loved the graceful objects which add such a charm to scenery, and without which scenery would be nothing.

"The young read nature like the manuscript of heaven,
And call the flowers its poetry."

Our old songs and poems are full of this love of nature, which was perhaps more intense in days gone by. Over and over again the old ballad-makers tell us,—

"Oh it was *so* merry under the greenwood tree."

Our poetic literature is full of the names of columbine and celandine, asphodel, anemone, pimpernel, and rue ; and one

immediate pleasure the botanist enjoys, is the full appreciation of such passages. Who can walk through a lime-tree avenue on a July evening without recalling the passage of Milton,

"The lime of dewy eve dropping odour sweet."

This science is the study of beautiful forms; but you will soon see that it is a beauty according to law, and without irregularity, so much so, that after Chevieul and others had wrought out the laws of colour by prismatic experiment, the resulting laws of complimentary colours might equally have been deduced from the arrangement of colour in flowers.

As a lever of education botany is invaluable. You are taught to observe. It is in its practical details a science of observation. You are taught to generalise and to classify. If shown a room full of books, and you were asked to arrange them, before you touched a single book you would sit down and determine on some principle to guide you, whether by size, by dates, by authors, or by subjects. It is true in botany you find the principal already determined, but the practical result is the same. You go forth to nature and investigate its truth. This power or faculty of arrangement is at once the most useful and the rarest of human endowments.

I need not touch on the pleasures of botanical excursions, the curious beings brought to notice, or the incidents that occur on almost every occasion.

There is again to be considered the poetry of flowers. By this I mean that analogy that poets have seen in flowers to some virtue or vice, or other human character, or that personal history many of them have. Ophelia says, "There is rosemary, that's for remembrance." There is often a poetry in their very names, especially those named by Linnæus. A strongly narcotic plant he names after the mother of the furies. He names plants indiscriminately, from the Fates, the Gods, or the Graces of ancient mythology. It is much to be regretted (from a poetical point of view) that modern botanists differ widely from him in this, and will call them by such sesquipedalian names as *Pleuroschysmatypus*, *Boenninghauseniana*. Even the common Scotch names of Blinks, Branks, Taur, or Skellochs are better.

A most interesting subject is the folk lore of plants still

current in many places. One cannot look at the rare and beautiful fairy rings without half believing the superstition that soon they will be filled with merry groups of the "good folks" in green, dancing under the harvest moon. Fern seed is one of the substances which universally enters into folk lore, and is supposed to be of great power. The common belief is that it renders one invisible. It ought to be gathered on the night of 22nd June, in a wood, a plate or white piece of paper being put below the fern, and the fern seed, which drops while the would-be-invisible repeats an incantation three times with his back to the fern, is said to have peculiar power. One of the prettiest of these fables is that attaching to the pellucid St. John's Wort. This plant, called in Germany the "plant of power," is very delicate and readily fades. Its power culminates on the night of St. John, and at midnight the German girls are wont to go out to gather it. If it keeps fresh till morning they believe they will be married before twelve months are over.

There are many theories in connection with the study of Botany, as to which the student must form an opinion for himself, and take one side or other. One cannot go far into the study of botany without having to face somehow the question of the origin of species, so long debated and so well stated by Mr. Darwin. This question is more troublesome in botany than anywhere else, and from botany will yet come, I think, the answer to the question, "What are the conditions of a species?"

The geographical distribution of plants is perhaps the most interesting part of the study, and opens to us some curious relations between far distant countries.

Botany is a science closely related to many others. We are brought in contact with chemistry, medicine, geology, geography, and mechanics. Perhaps the young student may find the mechanical part the most interesting, when he observes the number of elastic lids, springs, boxes, syphons, and tubes, which go to make up the most insignificant flower. The spores of the fern are the most curious mechanical contrivances in the vegetable world. As a study of the beautiful, this science has a most beneficial effect in correcting and improving our taste, or sense of the beautiful. Ladies will dress more in accordance with the laws of beauty when they get acquainted with them.

There are hundreds of things done in the worst taste, which people would be ashamed to do if they were botanists.

And botany is intimately connected with Theology. As Shelley says,—

> "Nothing in this world is single,
> All things by a law divine,
> In one another's being mingle."

So even the grass of the field or the moss on the wall speak not only of themselves, but of the God who made them, and declare His power and goodness in words easily read. From nature we cannot help turning to nature's God. Well did the great German poet make the spirit of nature say—

> "Still at the roaring loom of time I ply,
> And weave for God the garment that thou seest Him by."

Glasgow, November, 1872.

SCOTTISH GALLS.

By J. W. H. TRAILL, M.A.

DURING the past summer I have obtained numerous additions to my collection of Scottish Galls, for a good many of which I have to thank friends; and I now lay the result of my summer's work before the readers of this magazine in the hope that they may be of some use to fellow-workers. My observations have extended over a somewhat wider sphere than was included in the former list, ranging over the greater part of Aberdeenshire and Kincardineshire, and part of Perthshire and Forfarshire. Any species of interest of those previously described which I have met with in the two latter counties is included in its proper place in this list, as are also those of which I have been able to ascertain the makers. Some of the additions are on plants on which I had previously found other kinds of galls, but the majority are on plants on which I had not previously found any.

BRASSICA SINAPISTRUM Boiss. *(Sinapis arvensis L.)*

RAPHANUS RAPHANISTRUM L. — On these plants I have found galls so similar in every way that one description will serve for both. The galls are situated on the root,

usually near the surface of the ground; they are apt to be united, forming masses, but usually each gall, when distinct, is about ¼′ diameter. Each is monothalamous; the walls are thick and fleshy, the part projecting from the root forms an irregular hemisphere, the surface of which is smooth and whitish, Those on *B. sinapistrum* are very common about Aberdeen, and also occur in Strathdon; those on *R. raphanistrum* are less common, and are less apt than the former to form large masses. Probably both are formed by *Ceuthorhynchus*, but I have not yet reared the insects.

Helianthemum vulgare Gærtn.—The galls occur at the tips of the leaf-shoots, and consist of modified buds, the leaves of which are thickly covered with whitish hairs. They are sessile, ovate, and rather more than ¼′ in length. Between the leaves live one or more larvæ of *Diplosis helianthemi*, Hardy? The galls are common at Muchalls, Glen Gairn, Strathdon, &c., in the district of 'Dee,' and at Lintrathen in Forfarshire.

Cerastium glomeratum Thuill.—The terminal bud becomes affected, either the whole or the basal half of each leaf in it becoming swollen, hard, and fleshy; in the centre is a small cavity. In form the gall is somewhat ovate, the average breadth being about ¼′, the length rather more. In colour it is light yellowish-red, the surface smooth, save at the margins of the leaves, where there is a fringe of long hairs. Each contains several Cecidomyious larvæ, each of which spins a small white cocoon in the gall in autumn. These galls are not uncommon around Aberdeen, from August to October. I also found one in September, near Dunkeld.

Hypericum pulchrum L.—The galls on this are similar in origin and structure to the last, the basal two-thirds of the leaflet of the terminal bud of the leaf-shoot becoming inflated, red and fleshy; the leaves diverge slightly above; average size ¼′ by ⅛′. The surface is smooth and naked. Between the leaflets live several small reddish-orange larvæ of *Cecidomyia serotina* Winnertz?. Shown me by Dr. Buchanan White, near Dunkeld, in September.

GERANIUM SANGUINEUM L.—About the middle of August I found on two plants of this species at Muchalls large conspicuous masses at the end of the shoots, consisting of leaflets which had become thickened and distorted, their margins being revolute, and the external surface being nearly naked and smooth. Each leaflet forms an irregular tube lengthwise (the lower surface of the leaf internal), which is loosely filled with whitish hairs, among which live multitudes of a long-bodied four-footed pale-green mite, *Phytoptus geranii*. The large mass formed by the leaflets is not very compact, and varies from $\frac{1}{4}'$ to 1′ in diameter. Each leaflet is green or yellowish, with the tip deep red.

CYTISUS SCOPARIUS Link.—(*a*) From the galled pods (Sc. Nat. I., p. 195), I have reared *Asphondylia sarothamni* Loew., and also one of the *Chalcididæ*. I have this year found these galls abundant in Aberdeenshire, also at Dunkeld and Lintrathen. (*b*) These galls occur on the young twigs in the axils of the leaves, forming bud-like bodies, about $\frac{1}{3}'$ by $1\frac{1}{2}'$. Externally they are green and smooth, with two or three ribs lengthwise; they are open above and two-lipped. Internally, at the bottom there is a smooth cell, and above this the sides are thickly lined with hairs, decreasing in quantity upwards. The cell is occupied by one larva of *Asphondylia sarothamni* Loew. ?. Usually a number of galls occur on a twig. Common at Muchalls, at Inverury, and near Aberdeen.

Poa sudetica possibly a British plant.—In June, 1872, I found a few large tufts of a *Poa* here, which I could find no description of, so I sent a specimen of it to Professor Babington, who kindly, and at once, named it *Poa sudetica*. He says,—"It is found in Norway and Holstein, as well as more to the south." It was in a rather "doubtful locality" where I found it, being within private grounds; but being neither useful nor ornamental, it would not be sown or planted there, except accidentally. According to its geographical distribution on the continent it may be found in other parts of Scotland, in suitable places, viz.—shady woods where *Bromus asper*, *Milium effusum*, *Poa nemoralis*, and other shade-loving plants delight to grow. It is a very distinct-looking grass, about three feet high, growing in tufts, of a peculiar deep green colour (somewhat like *Luzula sylvatica*), with strongly *two-edged sheaths*, a mark it may be known by, as no other British grass I am acquainted with has the same distinctive mark As there are many botanists who never try to get anything named which they have not a description of, and others, who, on account of the imaginary difficulty of the *Gramineæ*, never go into them, it may happen that the *Poa sudetica* may have been found by others in less doubtful localities.—ANDREW BROTHERSTON, Kelso.

Note on Altitudes.—I have recently found *Nymphæa alba* at an altitude of 1400 feet, and *Pilularia globulifera* at 960 feet. Mr. H. C. Watson gives for the first "Lake Province to 350 yards," and for the second "Wales to 300 yards." Regarding *Betula nana*, Mr. Roy writes, "I have specimens from Ross shire as low as 1000 feet. The lowest altitude given by Mr. Watson is 600 yards."—F. BUCHANAN WHITE.

Monstrous form of Teucrium scorodonia.—Last August, Colonel Drummond Hay and I found at Craig Tronach, near Dunkeld, about a square yard full of a very curious form of *Teucrium scorodonia* in a large bed of the common form. The monstrosity may be thus described :—The racemes in length, and their branches in length and number are not different from the usual form ; but the pedicel of each flower is increased to about ten times the usual length, and the lower ones of each branch bear several pairs of branches, thus making the raceme tripinnate. The pedicels thus altered (to secondary and tertiary branches) bear altered flowers at the extremity of each branch. The usual bract is present at the base of the original pedicel, and each supplementary pedicel has also a bract at its base ; then follow on the pedicel numerous bracts, gradually increasing in size till at the summit they form a rosette. In the centre of the rosette is first a whorl of narrow leaves (imperfect carpels) with long subulate points (modified styles)—these leaves are glandular at the back. Then a cluster of less imperfect carpels—four or five in number—also glandular, and furnished with long styles, often bi- or trifurcate. Each carpel contained ovules. The colour of the inflorescence is green, except the styles, which are greenish ochreous.—*Id.*

Acclimatisation of Exotic Trees in Scotland.—For the last ten years an experiment has been in operation in the Green-house and grounds of the Murray Royal Institution, Perth, regarding the growth in this country of one of the handsomest New Zealand Trees—the "Goai" or "Kowhai" (*Sophora tetraptera* Aiton : var. *microphylla* Jacq.). It is one of the many New Zealand trees or shrubs which, apparently hardy and suited for out-door growth in the climate of Scotland, have, nevertheless, so far baffled the attempts made to cultivate them as to have gained for them the reputation of being only *half*-hardy, requiring glass for their due protection in winter. Eminent arboriculturists, such as Messrs. Gorrie & Macnab, of Edinburgh, have attained the most opposite results, and consequently hold the most opposite opinions. The Perth experiment, made by Mr. Gowenlock, bade fair for some years to succeed in its proof of the hardiness of the "Goai," and its suitability for out-door cultivation in Scotland. But the tree on which these hopes were founded gradually failed in its vitality, and at length succumbed to the cold of the winter of 1870-1. A comparative experiment under glass has on the other hand succeeded admirably : and Mr. Gowenlock is able at present to display a very handsome seedling "Goai," so tall and vigorous as to threaten speedily to acquire unsuitable dimensions for the roomy Greenhouse, part of whose space it occupies and adorns. Though ten years old, it has never yet shown signs of flowering. Should it flower or fruit in Perth, it will be an exception to the general rule that the "Goai" has never—even though fifty years old—flowered so far north in Great Britain as Scotland, though it is said both to be hardy and to seed abundantly in Guernsey. The history of the Perth and other experiments on the acclimatisation of the "Goai" in Scotland is to be found in Dr. Lindsay's "Contributions to New Zealand Botany," 1868, p. 75).

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from vol. 1, p. 276.)

EDITED BY F. BUCHANAN WHITE, M.D.

COSSIDÆ H.S.

COSSUS Fab.

COSSUS L.; *ligniperda* F. Scarce. Nemoral.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway ♂ ♂ ♂ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. Feeds for two or more years. FOOD-PLANT. Wood of birch and oak.

PSYCHIDÆ Boisd.

PSYCHE Schrk.

OPACELLA H.S. Scarce. Nemoral.

DISTRIBUTION—EAST. o o Tay ♂ [Moray] o o o
WEST. o o ♂ ♂ o

LAT. 56°30″-[57°30″]. RANGE IN EUROPE. Germany, Finland, &c. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. August-June. FOOD-PLANT. Low shrubs and plants.

HIRSUTELLA H. (1793); *fusca* Hw. (1810). Scarce. Nemoral. [Ascends to upwards of 1000 feet.]

DISTRIBUTION—EAST. o o Tay [Dee] ♂ o o o
WEST. o o ♂ ♂ o

LAT. 56°30″-[57°] RANGE IN EUROPE. Germany, Belgium, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. August-June. FOOD-PLANT. Sallow, &c.

EPICHNOPTERYX Hub.

ROBORICOLELLA Br.; *nitidella* St. Very local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay o o o o o
WEST. Solway ♀ o o o

LAT. 54°50″-56°40″. RANGE IN EUROPE. Throughout (except extreme north and south). TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. July-June. FOOD-PLANT. Various trees.

ZYGÆNIDÆ Boisd.

INO Leach.

STATICES L. Local. Pascual.

DISTRIBUTION—EAST. Tweed o o o Moray o o o
WEST. Solway ♀ Argyle o o

LAT. 55″-57°30″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional and -meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-June FOOD-PLANT. Sorrel.

ZYGÆNA Fab.

PILOSELLÆ Esp. (1781); *minos* Fuessl. (1782).

Var. *nubigena* Ld. Local. Pascual. Maritime.

DISTRIBUTION—EAST. o o Tay ♀ o o o o
WEST. o ♀ Argyle ♀ o

LAT. 56°20″-56°30″. RANGE IN EUROPE. High Alps, Scotland, Ireland. TYPE. Occidento-central. TYPE IN BRITAIN. Scoto-Hibernian.

TIME OF APPEARANCE– IMAGO. June, July. LARVA. August-May. FOOD-PLANT. *Leguminosæ*. On the coasts of Forfarshire (A. Guthrie), and Argyleshire.

The typical *pilosellæ* differs from the var. *nubigena* by its less diaphanous wings, less hairy and more metallic-shining hind-body, and by the red costal streak *not* meeting or overlapping the discal streak. *Pilosellæ* is widely distributed in Europe, and should occur in Scotland. *Z. scabiosæ* Scheven, should be looked for in July.

EXULANS Hchwh.

Var. *subochracea* B.W. Local. Pascual. Alpine. From 2400-2800 feet.

DISTRIBUTION—EAST. o o ♀ Dee o o o o
WEST. o o ♀ o o

LAT. 57°-57°10″. RANGE IN EUROPE. Scotland. TYPE. Scottish. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July. LARVA. August-June. FOOD-PLANT. *Erica, Vaccinium*, and other low plants.

The typical *exulans* is tinged and marked with ochreous in both sexes, and inhabits the Alps and Pyrenees. The var. *subochracea* has the female only marked with ochreous; the var. *Vanadis* has no ochreous markings, and occurs in the north of Europe.

TRIFOLII Esp. Local. Pascual. Maritime.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. ♀ ♀ ♀ o o

LAT. 56°40″-58°. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-May. FOOD-PLANT. Bird's-foot Trefoil, and other *Leguminosæ*.

From the specimens I have seen (from Forfarshire and Ross-shire), I should refer this to the *Z. trifolii* (the "early *trifolii*") of Mr. T. H. Briggs' paper in Trans. Ent. Soc., iv., 1871. The Forfarshire examples were taken on the coast near Arbroath, in company with *filipendulæ* and *nubigena*, at various dates (the captor, Mr. A. Guthrie, informs me), from the last week of June to August 26th, at which date they were much worn. The date of appearance of Mr. Briggs' "early *trifolii*" is from the second week in May to the second week in June. The other localities where *trifolii* has occurred in Scotland are the coasts of Kincardineshire (J. W. H. Traill) and Ross-shire (A. Davidson). *Z. loniceræ* should occur.

FILIPENDULÆ L. Local. Pascual. Maritime.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°10″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-June. FOOD-PLANT. *Leguminosæ.*

SESIIDÆ H.S.

SESIA Fab.

MUSCÆFORMIS View.; *philanthiformis* Lasp. Local. Maritime.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

LAT. 54°50″-57°10″ RANGE IN EUROPE. Britain, Germany (northern and central), and ———? TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. Feeds for two years? FOOD-PLANT. Thrift (*Statice armeria*). This species does not, as might have been expected, appear to be co-extensive in its range with its food-plant.

CULICIFORMIS L. Scarce. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. o o Tay Dee ♀ o o o
WEST. o Clyde ♀ ♀ o

LAT. 55°50″-57°10″ RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central and -oriental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. June. LARVA. July-April. FOOD-PLANT. Birch (and alder).

TIPULIFORMIS Cl. Local. Hortensal.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

LAT. 55°-56°30″ RANGE IN EUROPE. Northern and central. TYPE. Centro-septentrional and -oriental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. July-April. FOOD-PLANT. Currant.

SCOLIÆFORMIS Bkh. Rare. Nemoral.

DISTRIBUTION—EAST. o o Tay ♀ ♀ o o o
WEST. o o Argyle ♀ o

LAT. 56°30″-56°50″. RANGE IN EUROPE. Central and northern (except the boreal regions). TYPE. Centro-septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. Birch.

TROCHILIUM Scop.

CRABRONIFORME Lewin. (1797); *bembeciforme* H. (1803.) Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-56°40″. RANGE IN EUROPE. Britain, Batavia, Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE--IMAGO. July. Larva. August-May. FOOD-PLANT. Sallow *(Salix caprea &c.)*.

APIFORME Cl. Not common. Nemoral.

DISTRIBUTION--EAST. o o o o o o o o

WEST. Solway Clyde o o o

LAT. 54°40″-55°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. Poplar.

SPHINGIDÆ Boisd.

MACROGLOSSA Ochsr.

FUCIFORMIS L. ; *bombyliformis* Esp. *(et auct. Anglorum)*. Not common. Nemoral and ericetal. Ascends to upwards of 1000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray [Sutherland] o o

WEST. Solway Clyde Argyle o o

LAT. 54°40″-58° RANGE IN EUROPE. Nearly throughout (except the polar regions and the extreme south). TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July, August. FOOD-PLANT. Scabious *(Scabiosa succisa)*.

This species is usually called in Britain *bombyliformis*—the "narrow bordered bee hawk-moth." *Bombyliformis* O. is the following species,—the "broad bordered bee hawk-moth."

[**BOMBYLIFORMIS** O. ; *fuciformis* Esp. *(et auct. Anglorum)*. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed o o o o o o o

WEST. Solway Clyde o o o

LAT. 54°40″-55°50″. RANGE IN EUROPE. Nearly throughout (except the boreal regions and ? the extreme south). TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May. LARVA. June-August. FOOD-PLANT. Honeysuckle, Bedstraw, Lychnis, and other low plants.

STELLATARUM L. Not uncommon. Agrestal and pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o Orkney o

WEST. Solway Clyde o West-Ross o

LAT. 54°40″-59°10″. RANGE IN EUROPE. Nearly throughout

(except the boreal regions). TYPE. Territorial. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. April-October (sometimes all the year). LARVA. July-September. FOOD-PLANT. Bed-straw *(Galium verum)*.

CHŒROCAMPA Dup.

PORCELLUS L. Not uncommon. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♂ o o o
WEST. Solway Clyde ♂ o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Nearly throughout (except the polar regions and extreme south). TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July-September. FOOD-PLANT. Bedstraw *(Galium verum)*.

ELPENOR L. Not common. Pascual.

DISTRITUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Nearly throughout (except the polar regions and extreme south). TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. July-September. FOOD-PLANT. Bedstraw, Hairy Willow-herb *(Epilobium hirsutum)* and Fuschia.

CELERIO L. Very rare.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. ♂ Clyde o o o

LAT. 55°20″-57°40″. RANGE IN EUROPE. South-western and south-central. TYPE. Meridiono-occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-October. LARVA. September (June?). FOOD-PLANT. Vine (and bedstraw?).

DEILEPHILA Ochsr.

LIVORNICA Esp. Very rare.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o Clyde o o o

LAT. 55°20″-56°10″. RANGE IN EUROPE. Southern. TYPE. Meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. June, July. FOOD-PLANT. Bedstraw and vine.

GALLII Rott. (correctly *galii*). Not common. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde o o o

LAT. 54°50″-57°10″. RANGE IN EUROPE. Central, northern (except the polar regions), and south-eastern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August, September. FOOD-PLANT. Bedstraw (and fuschia).

SPHINX Ochsr.

LIGUSTRI L. Rare.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o [Clyde] o o o

LAT. 54°40″-55°30″. RANGE IN EUROPE. Central (to South Sweden and Finland), and south-eastern. TYPE. Centro-oriental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Ash, privet, and lilac.

CONVOLVULI L. Occasional. Hortensal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-59°10″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. July FOOD-PLANT. *Convolvulus*, &c.

S. pinastri L. (which is *said* to have occurred near Edinburgh), ought to occur as it is a species of northern Europe. The imago flies in June and July, and the larva feeds on various kinds of fir trees in August and September. The perfect insect is said to frequent the flowers of the honeysuckle.

ACHERONTIA Ochsr.

ATROPOS L. Occasional. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney Zetland.
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40″-60°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July; August-October. LARVA. July-October. FOOD-PLANT. Potato, &c.

This species affords a good instance of the effect that cultivation has in altering the fauna of a country. The native food-plants (unless perchance the insect had once some other and now forsaken food-plant), are so few, and so comparatively rare, that it is probably entirely owing to the introduction and cultivation of the potato that *Acherontia atropos* now inhabits Scotland and some other countries.

SMERINTHUS Ochsr.

POPULI L. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Nearly throughout.
TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July-September. FOOD-PLANT. Sallow, poplar, aspen (and birch).

OCELLATA L. Rare. Nemoral.

DISTRIBUTION—EAST. Tweed o o [Dee] o o o o
WEST. Solway ♂ o o o

LAT. 55°-[57°10″.] RANGE IN EUROPE. Nearly throughout.
TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July-September. FOOD-PLANT. Sallow, poplar, apple, &c.

TILIÆ L. Very rare. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde o o o

LAT. 55°50″-56°. RANGE IN EUROPE. Nearly throughout.
TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July-September. FOOD-PLANT. Elm and lime.

SATURNIIDÆ.

(*Saturnidæ* Boisd.)

SATURNIA Schrk.

PAVONIA L. Common. Ericetal. Ascends to 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂
Orkney o
WEST. Solway Clyde Argyle ♂ ♂

LAT. 54°40″-59°10″. RANGE IN EUROPE. Throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVÆ. July, September. FOOD-PLANT. Heather, blaeberry, and (more rarely) sallow, alder, &c.

ENDROMIDIDÆ.

(*Endromidæ* Boisd.)

ENDROMIS Ochsr.

VERSICOLORA L. Local. Nemoral. Ascends to nearly 1000 ft.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. [Solway] o Argyle ♂ o

LAT. 56°30″-58°. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. April. LARVA. July, August. FOOD-PLANT. Birch and alder.

BOMBYCIDÆ Boisd.

LASCIOCAMPA Latr.

POTATORIA L. Not common. Pascual and ericetal. Ascends to upwards of 1000 feet.

DISTRIBUTION—EAST. Tweed ♂ Tay Dee Moray ♂ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-58°. RANGE IN EUROPE. Central; South Sweden, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, July, August. LARVA. September-May. FOOD-PLANT. Grasses.

Dr. Boswell Syme calls attention (*Sc. Nat.* 1. 176) to the fact that in Mull and Bute, the larva hibernates full fed, and the moth appears two months earlier than it does in the south of England.

BOMBYX Boisd.

CRATÆGI L. Not common. Ericetal and nemoral.

DISTRIBUTION—EAST. Tweed o Tay ♂ ♂ o o o
WEST. o Clyde Argyle West-Ross o

LAT. 55°-57°50″. RANGE IN EUROPE. Northern (except the polar regions) and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September. LARVA. May, June. FOOD-PLANT. Sallow, hawthorn, sloe, &c.

POPULI L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde Argyle ♂ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern (except the boreal regions) and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. October-December. LARVA. June, July. FOOD-PLANT. Alder, birch, oak, &c.

B. neustria L. has occurred once at Aberdeen ; but, though it is a species that should occur, we can scarcely yet include it in the Scottish list.

RUBI L. Common. Ericetal (and maritime-pascual). Ascends (larvæ) to 2200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40″-58°. RANGE IN EUROPE. Throughout, except extreme north and south. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July-April. FOOD-PLANT. Heather and other low plants.

QUERCUS L. Common. Ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ Orkney ♀
WEST. Solway Clyde Argyle West-Ross Hebrides.

LAT. 54°40″-59°10″. RANGE IN EUROPE. Throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. July-September of the following year. FOOD-PLANT. Heather, &c.

All the Scottish specimens, I imagine, belong to the variety *callunæ* Palmer (=*quercus* L., *Fauna suecica*), which differs only from the typical *quercus* by its darker colour (especially in the female), and by its different time of appearance. *Quercus*, as distinguished from *callunæ*, appears in Mr. A. Davidson's Ross-shire list, but I have not seen specimens.

LANESTRIS L. Not common.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway [Clyde] [Argyle] o o

LAT. 55°. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. February. LARVA. May, June. FOOD-PLANT. Hawthorn, sloe, &c.

Weaver records, in the "Zoologist," the capture of this species [larva?] on Ben Nevis ; I do not think the evidence is sufficient.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from vol. 1, p. 280.)

EDITED BY D. SHARP, M.B.

TRECHUS Schaum.

MICROS Herbst. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde Argyle o o

LONGICORNIS Sturm. Very rare. Riparial.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

Near Kelso.—R. Hislop. On the banks of the Nith, at Thornhill and Dumfries.—D.S.

LAPIDOSUS Daws. Very local. Lowland.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o Clyde o o o

RUBENS Fab. Not common. Lowland, highland.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o Zetland.
WEST. Solway Clyde o o o

MINUTUS Fab. Abundant. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ o o
WEST. Solway Clyde o o o

OBTUSUS Er. Common. Lowland, highland.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. ♀ ♀ o o o

SECALIS Payk. Rare. Lowland.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o. o

AËPUS Curtis.

MARINUS Strom. Local. Marine.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o Clyde o o o

ROBINI Lab. Local. Marine.

DISTRIBUTION—EAST. Tweed Forth o o o o o o

WEST. o o o o o

PERILEPTUS Schaum.

AREOLATUS Creutz. Very local. Riparial.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

CILLENUS Schaum.

LATERALIS Sam. Local. Maritime.

DISTRIBUTION—EAST. ♂ Forth o o o o o o

WEST. Solway Clyde o o o

BEMBIDIUM Schaum.

RUFESCENS Guer. Local. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. Solway Clyde o o o

QUINQUESTRIATUM Gyll. Local. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o Clyde o o o

OBTUSUM Sturm. Not uncommon. Lowland.

DISTRIBUTION—EAST. ♂ Forth Tay o o o o o

WEST. Solway ♂ o o o

BIGUTTATUM Fab. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o

WEST. ♂ Clyde o o o

ÆNEUM Germ. Local. Riparial, maritime.

DISTRIBUTION—EAST. ♂ Forth o o o o o o

WEST. Solway Clyde o o o

GUTTULA Fab. Abundant. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ♂ Moray o o o

WEST. Solway Clyde o o o

MANNERHEIMI Sahl. Common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

CLARKI Daws. Rare. Lowland.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

QUADRIGUTTATUM Fab. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

[**ARTICULATUM** Panz.

"Ben Lomond, Dr. Leach," Steph. Illust.

I am not aware of any other record of this pretty species for Scotland, and think the above probably erroneous.

DORIS Panz. Local. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o Moray o o o
WEST. Solway Clyde o o o

MINIMUM Fab. Local. Maritime.

DISTRIBUTION—EAST. ∞ Forth o o o o o o
WEST. Solway o o o o

SCHUPPELI Dej. Local. Riparial.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

[**GILVIPES** Dej.

"Raehills, Rev. W. Little," Murray.

LAMPROS Herbst. Abandant. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ∞ ∞ ∞
WEST. Solway Clyde ∞ ∞ ∞

Var. *Velox* Er. Common.

BIPUNCTATUM L. Common. Riparial.

DISTRIBUTION—EAST. ∞ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

DECORUM Panz. Abundant. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ∞ ∞ o o
WEST. Solway Clyde o o o

MONTICOLA Sturm. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay ○ ○ ○ ○ ○
WEST. Solway ⚷ ○ ○ ○

BRUNNIPES Sturm. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth ○ ○ ○ ○ ○ ○
WEST. ⚷ Clyde ○ ○ ○

TIBIALE Duft. Abundant. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay ⚷ Moray ⚷ ⚷ ⚷
WEST. Solway Clyde ⚷ ⚷ ⚷

ATROCŒRULEUM Steph. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay ⚷ Moray ○ ○ ○
WEST. Solway ⚷ ○ ○ ○

TESTACEUM Duft. Very local. Riparial.

DISTRIBUTION—EAST. ○ ○ ○ ○ ○ ○ ○ ○
WEST. Solway ○ ○ ○ ○

Common in one or two places on the banks of the Nith.—D.S.

SAXATILE Gyll. Very local. Riparial, maritime.

DISTRIBUTION—EAST. Tweed ⚷ Tay ○ ○ ○ ○ ○
WEST. Solway ⚷ ○ ○

FEMORATUM Sturm. Local. Lowland.

DISTRIBUTION—EAST. ⚷ ⚷ Tay ⚷ Moray ○ ○ ○
WEST. Solway Clyde ○ ○ ○

ANGLICANUM Sharp. Local. Riparial.

DISTRIBUTION—EAST. Tweed Forth ⚷ ⚷ Moray ○ ○ ○
WEST. Solway ⚷ ○ ○ ○

BRUXELLENSE Wesm. Common. Lowland.

DISTRIBUTION—EAST. ⚷ ⚷ ⚷ Dee Moray ○ ○ ○
WEST. Solway Clyde ○ ○ ○

CONCINNUM Steph. Local. Maritime.

DISTRIBUTION—EAST. ⚷ ⚷ Tay ⚷ Moray ○ ○ ○
WEST. Solway Clyde ○ ○ ○

LITTORALE Ol. Abundant. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ⚷ Moray ⚷ ⚷ ⚷
WEST. Solway Clyde ⚷ ⚷ ⚷

LUNATUM Duft. Rare. Riparial.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway Clyde o o o

STOMOIDES Dej. Very rare. Riparial.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

This species occurs very rarely, on the banks of the Nith, at Thornhill and Dumfries.—D.S.

PALLIDIPENNE Ill. Local. Maritime, riparial.

DISTRIBUTION—EAST. ⚷ Forth ⚷ ⚷ Moray o o o
WEST. ⚷ Clyde Argyle o o

FLAMMULATUM Clair. Very rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

PRASINUM Duft. Local. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay ⚷ Moray o o o
WEST. Solway ⚷ o o o

PUNCTULATUM Drap. Common. Riparial.

DISTRIBUTION—EAST. ⚷ Forth Tay ⚷ Moray o o o
WEST. Solway Clyde o o o

PALUDOSUM Panz. Very local. Riparial.

DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. ⚷ Clyde o o o

TACHYPUS Schaum.

PALLIPES Duft. Rare. Riparial.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway Clyde o o o

FLAVIPES L. Not common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

(To be continued.)

ZOOLOGY.

ON KING DUCKS (*SOMATERIA SPECTABILIS*) IN ST. ANDREWS BAY, &c.

By ROBERT WALKER.

THE King Duck has occupied a place in all the lists of British Birds published since the days of Pennent and Bullock. The latter stated to Colonel Montague that he found the bird breeding in Papa Westra, one of the Orkney Islands. Since his time, it has not been known to nest there, and the records of its occurrence in that quarter, or at any other part of the British coast, are far from numerous, and it is to be feared that some of them may not be perhaps altogether reliable. However this may be, I am not aware that any specimens of this duck have been obtained anywhere around the mainland of Scotland. The following note, therefore, on a small flock of King Ducks, in St. Andrews Bay and the mouth of the Tay, last spring, may be of some interest to zoologists.

On the morning of the sixth of March 1872, I saw a number of ducks swimming about, opposite the old castle of St. Andrews. At first I took them for Eiders, as this is a rather favourite place for that bird, and although somewhat surprised at their early appearance, I was inclined to ascribe this to the mildness of the past winter. They were a considerable way out at sea, and seemed to me to consist of five females and two males. After watching closely for some time, it struck me forcibly that there was something or other in their appearance and attitudes that I could not quite reconcile with my previous acquaintance with the manner of the Eider. Still, at the time, and even yet, I could not define precisely what the difference really was; further, and this is to some extent supplemented from what I after-

wards saw of them, they seemed to be quicker in their movements, and exhibited a more restless unstable-like behaviour than is the custom of the "Dunter." I could not be positively certain of seeing these ducks again for some days. One morning, however, about a week afterwards, I had a good sight of them, as they were apparently busy feeding on the young mussels that occur in some abundance outside the rocks on the north of St. Andrews. I could only count six birds at this time, but as they were diving and remaining a considerable time under the water, there may have been more of them. From their general appearance, and the view I then had of the dark colour of the backs of the males, I felt absolutely certain that they were King Ducks.

Although I continued to see these ducks occasionally—or, at any rate, what, from the distance, I took for them—until the end of the first week of April, they were, with one exception, always so far out at sea that it was impossible to make any thing of them. This was at the mouth of the Eden, where I came upon them, somewhat unexpectedly, as they were quietly swimming about amongst a number of Eiders, with which they were evidently associating in the most friendly manner. I could only, of course, be sure of the identity of the males. The females of the Eider and King Duck seem to me to resemble each other so closely, that I should say it would be next to impossible to distinguish the one from the other when seen at a distance.

About the middle of April I heard that one or two King Ducks had been shot in the Tay, but beyond that I could neither see nor learn anything of these birds or their whereabouts, and ultimately concluded that they had gone off. In this, however, I was mistaken, for on the 29th of April a fine male, in splendid adult plumage, was killed in the estuary of the Tay. The bird is in my possession, and was examined by me while in the flesh. Mr. Patrick Henderson, Dundee, who also saw these ducks in the Tay last spring, has kindly informed me that other three specimens were killed in the estuary of that river in March last. All these birds were seen and examined by himself. He states that they were all females, but that he was once within thirty yards of a fine male, but could not procure it. One of the above mentioned ducks was shot by Mr.

Ross ; another by Captain Campbell ; and the third by Mr John Nelson, Dundee, to whose kindness I am indebted, not only for sending the particulars of the case, but, for forwarding the bird itself for my inspection. He says that, on the 16th of March last, he was in a boat on the river, about three miles below Tayport, and shot it while it was flying past him, at a distance of about seventy yards, going up the water. It is a fine female, in capital plumage, and although exceedingly like the female of the Eider, it may be known from that species by its somewhat smaller size ; the head and neck are of a lighter brown shade, the bill is shorter, and its base rises higher behind the nostril.

In my specimen of the male, all the variety and shades of colour in the plumage with which this beautiful species is decorated, and the whole general appearance of the bird, agree closely in the main with Mr. Gould's* splendid figure of a male of the King Duck, which, he says, was made for him by the celebrated Dr. Rae, while travelling in the Arctic regions in search of Sir J. Franklin. The chief difference observable between the two, when compared together, is, that in the figure, both the bill and the sides of the vertical protuberance on the upper part of its base are represented the same in colour, a darkish red. In my specimen the bill is of a deep red, and the sides of the basal protuberance are of a darkish orange yellow. In this it seems to accord with the example described by Dr. De Kay.† He states that the bill is reddish ; the ascending portion verging to orange. The colour of these parts may be ultimately found to vary according to the season of the year in which the bird is obtained, and, not unlikely, the uniformity in colour represented in Mr Gould's figure may be an ornamental feature assumed during the breeding season.

The stomach of my specimen was empty, with the exception of small angular fragments of pebble. The intestine was five feet eleven inches in length. I could only see one cæcum, situated about two feet from the posterior extremity. The trachea, was in shape as represented in Sabine's figure in the Linnean Transactions.‡

The above is the second record, so far as I know, of an adult male of this species having been obtained in Britain

* Birds of Great Britain. † Zoology of N. York, Birds. ‡ Vol. 12.

or Ireland. Specimens of the bird have been got two or three times in England, but it would appear that they were chiefly females. One was shot at Breydon, Norfolk, July, 1813; § another at Aldborough, Suffolk, 1827;|| and a third is recorded at Bedlington, Northumberland, 1846.* According to Mr. Gould,† it is reported to have occurred twice at Lowestoft, somewhat recently. Mr. Stevenson, an excellent authority, is not disposed to consider these cases trustworthy. A female was procured in Leadenhall market, Nov., 1870. Mr. Thomson‡ records four examples of the King Duck shot in Ireland from 1837 to 1850. They seem to have been all either females or immature males. In Orkney, it would appear that this bird has been taken twice only. A specimen killed there was exhibited by Mr. Gould in Nov,. 1832, at a meeting of the Zoological Society of London;§ and Mr. Gray|| stated that a female was shot amongst these islands, May, 1868, by Mr. Hargitt, London. Mr. Dunn* says he shot a King Drake out of a pair at Wensdale Vol, Shetland, 20th April, 1846. Besides the above summary of examples obtained, there are several records stating that the King Duck had been seen on our coasts.

The King Duck apparently congregates in considerable numbers in some parts of Greenland, and other places in the Arctic regions during the breeding season†; and when we bear in mind Holbœll's statement that it can dive to the depth of two hundred yards, using its wings for that purpose, and thus having facilities of procuring food at depths beyond the reach of most species, it might have been expected to frequent Iceland, and some other of the more northern parts, at least, of Europe for breeding purposes. Although it is stated by some authors that this duck nests in the above-mentioned places, recent researches, however, throughout a considerable extent of these countries, have not as yet shown this to be the case. On the contrary, they have made it pretty evident that the bird is rather rarely met with anywhere in northern Europe. Mr. Wheelwright,‡ who spent ten years in Sweden, says he never heard of the King Duck visiting the coast of that country, except in an accidental

§ Yarrell, Brit. Birds. || Mag. Nat. Hist., Vol. 4, 1831. * Zoologist, 1851.
† Birds of G. Britain. ‡ Nat. Hist. Ireland, Birds. § P. Z. S., 1832.
|| Birds of West of Scotland. * Zoologist, 1848. † Sir James C. Ross, Appendix, &c. ‡ Ten years in Sweden.

manner, nor did he believe that it nested on any Scandinavian coast. It is not included in his own list of the birds he observed in Lapland, § and in the list given by him of the ornithology around Vardol in East Finland, by the Rev. C. Sommerfeldt, it is said to be only occasionally seen in autumn. Mr. Dresser, || who also translates Sommerfeldt's list, gives similar testimony in his notes, relative to the scarcity of the bird in that district.

In the Færoe Islands this duck has been procured several times; but, according to Capt. H. W. Fieldin, there is no instance known of its having been found breeding there. ‡ In Mr. Newton's * notes on the Ornithology of Iceland, he says the King Duck is rarely met with in that island, and can only be regarded as a straggler from Greenland or elsewhere. From Mr. Newton's † notes on the birds of Spitzbergen, which he visited in 1864, this duck would seem to be equally rare in that quarter, and although the species has been several times got, it is certainly not of common occurrence, neither does it appear to breed thereabout. He mentions two or three examples of the bird that were shot in the island, a number of years before his arrival, and Dr. Malmagren showed him a specimen that he had succeeded in shooting some little time before, in Safe Haven. The latter naturalist went to Spitzbergen, with the Swedish expedition, in 1862. He states that a considerable portion of the island was explored by the expedition, and not a King Duck seen, and he fancies it is rare everywhere in the country. Von Baer ‡ includes this duck in his article on the birds of Nova Zembla, published in 1838. Mr. G. Gillett has given a more recent account of the birds of that quarter in the *Ibis*, 1870, but, as I have not been able to see this paper, I do not know whether or not it contains the bird in question. The King Duck is included in Reinhardt's list of the birds of Greenland, as well as in most of the prior works on the natural history of the arctic regions, where the species has no doubt its metropolis, and from whence the examples that occasionally visit the coasts of Europe and America evidently proceed. In North America, amongst other

§ Spring and Summer in Lapland. || Zoologist, 1867. ‡ Zoologist, 1872.
* Baring-Gould, Iceland, and Zoologist. † Ibis. ‡ Bulletin l'Acad., St. Pétersbourgh, III. 1838.

places, it is stated to be not uncommon about Hudson's Bay and Labrador. According to Mr. Reeks, § it is tolerably common in Newfoundland during its migrations, and has been frequently shot in company with the Eider.

After this brief sketch of the geographical distribution of the King Duck, other questions of some interest are apt to suggest themselves, in connection with the irregular migrations of these, as well as of other birds, fishes, &c., hundreds of miles away from their recognised head-quarters, to places where some of them are not known to have occurred before, whilst others have only been observed occasionally at long intervals. Although these wanderings are performed by different classes of animals, it would appear to be mainly those who inhabit the same regions, who take to moving off at or about the same time. Do these migrations take place in obedience to an unknown —or in its operations, unrecognized—force or law acting on the animals themselves? If so, is it dynamical, mechanical, psychical in its nature, or what? And if related to one or either, does it act at regular or irregular periods? Observations from different parts of the world may by and bye—after we have got over the "straggler" theory—throw considerable light on the latter question. The former, however, may long remain somewhat inscrutable.

St. Andrews, February, 1873.

NOTES ON THE BIRDS OF THE BASS ROCK.

By JAMES LUMSDEN, Jr.

A VISIT to the Bass Rock, at any season, well repays the tourist. Its many associations give it a varied interest. There the antiquary, as well as the student of geology and ornithology, may find abundance to speculate on and interest them. But, however much the antiquary may be charmed with the remains of bye-gone days, or the geologist find subject for speculation in the formation of the rock, to the ornithologist it is of the greatest interest, as one of the chief breeding stations of the sea birds of our coast.

§ Zoologist, 1869.

The bird best known in connection with the Bass is the Gannet or Solan Goose *(Sula alba)*. The number of these birds which yearly frequent the rock has been estimated at 20,000. They remain only during the breeding season, and leave as soon as the young ones are able to fly, which is not till the end of September or October,—often, however, returning to inspect their home during winter. The young of the Gannet, when first hatched, are quite black and are more like frogs than birds. In the course of a week, however, they are covered with a thick white down. When they get their feathers they again change their colour, and for the first year are of a dark grey, with light spots. The second year the grey is mixed with white, which increases yearly until they reach their mature plumage, at the fourth year. The nests, which are built on ledges on the steepest sides of the rock, are formed of seaweed and grass, and so thickly are they placed, that, when the birds are sitting, the rock at a little distance looks quite white.

The Herring Gull *(Larus argentatus)* breeds in limited numbers on the Bass. When visiting the rock in August last (1872), we observed 8 or 10 old birds seated on a point of rock above the landing place. By that time the young had all left, and the return of those we saw was looked upon with satisfaction by the boatmen who accompanied us, as a sign that herring were plentiful in the Firth.

The Kittiewake *(Larus tridactylus)* is very common; its peculiar cry mingling not unpleasantly with the deeper note of the Gannets as they fly overhead, when frightened from their nests at the approach of an intruder.

The Common Gull *(Larus canus)*. Common, not only on the Bass, but on the east coast in general this bird is found in much greater numbers than on the west.

The Great Black-Backed Gull *(Larus marinus)* frequents the rock in limited numbers, but its smaller connection,

The Lesser Black-Backed Gull *(Larus fuscus)* is far from uncommon, attracted no doubt by the numbers of Razorbill and Gulliemot eggs, for which it has a decided liking.

The Common Gulliemot *(Uria troile)* is very abundant and equals, if not excels, the numbers even of the Solan Geese.

They breed along the foot of the rock, but leave in July, as soon as the young are able to go with them.

The RINGED GULLIEMOT *(Uria lachrymans)* has been observed on the rock, but is rather a scarce species.

The BLACK GULLIEMOT *(Uria grylle)* has been obtained on several occasions in the neighbourhood, but we have no authority for stating that it breeds on the Bass.

The RAZOR-BILL *(Alca torda)* is very common, arriving and departing along with the Gulliemots.

The LITTLE AUK *(Mergulus melanaleucos)* has been several times observed, at various seasons of the year, and we have seen specimens taken on the coast in the neighbourhood of the Bass after severe storms.

The PUFFIN *(Fratercula arctica)* is common, breeding in holes in the rock. They swim about in small flocks, but are easily frightened by the approach of a boat.

The COMMON CORMORANT *(Phalacrocorax carbo)* and the SHAG *(Phalacrocorax graculus)* are found roosting on the rock in large numbers in the autumn evenings, coming, no doubt, from considerable distances to the shelter of the cave.

The PEREGRINE FALCON *(Falco peregrinus)*. The Bass has for many years been frequented by Peregrines, which find suitable nesting places on the steep ledges of the rock, and abundance of prey in the Gulliemots and other sea birds. In the breeding season of 1872, we observed a male Falcon seated on a sharp point of rock, unconcerned and undisturbed, amid the din of thousands of Gannets and Gulls flying around him.

The above is by no means a complete catalogue of the birds of the Bass, but only notes of those observed or heard of from authentic sources, while visiting this interesting spot. On the top, the Blackbird and Wheatear are often to be met with, while the cave or tunnel which runs through the rock is the retreat of Rock Doves.

Those ornithologists who have not yet been on the Bass, have for themselves a pleasure in store, and we know of no way of spending a holiday better than in visiting the rock during the breeding season.

Arden House, Alexandria, December, 1872.

Tengmalm's Owl *(Strix Tengmalmi).*—There was a specimen of this rare British bird, caught by a fisherman, on the sea coast, at Greenses Harbour, Berwick, on the 4th February, 1873; it was kept alive till the 8th, when it died. Naturalists differ as to which is the longest feather in the wing of this species; the following are the relative lengths of the primaries in this specimen, which is a young female,—the third is the longest, the fourth one-tenth of an inch shorter, the second one-fourth, the fifth three-eighths, the sixth three-fourths, the first and the eighth are equal, being one inch and three-eighths shorter than the third. Length from head to tail, ten inches; expanse of wings one foot nine and a-half inches.

This is the third *rare* bird got in the vicinity of Berwick, in little over three months, viz., a Turtle Dove, (see "*Scottish Naturalist*," page 10); a young Night Heron, on 5th December, 1872, which cannot be claimed as a Scottish specimen, as it was shot south of the Tweed; and the present instance. All three are preserved for the Natural History Collection of the Berwick Museum.

Hobby *(Falco subbuteo).*—There was an adult male found dead (it had been shot), in Bowmont Forest, on the 4th of June, 1870. By being found there at that date, may they not have been breeding there? Morris says, "It does not appear to be known in Scotland."

Honey Buzzard *(Pernis apivorus).*—The under-keeper at Newtondon shot a very fine specimen there, on the 22d of May, 1865.—*Id.*

Hen Harrier *(Circus cyaneus).*—There was a fine female of this, now very rare, British bird, shot by Mr. Henderson, East Gordon, at Rumbleton Law, 25th December, 1871.

Great Spotted Woodpecker *(Picus major).*—Several specimens of this bird were shot in this district during the autumn and winter of 1868, and spring of 1869.

Spotted Crake *(Crex porzana).*—One shot at Graden Moss, 19th October, 1868.

Canada Goose *(Anser Canadensis).*—There was a large flock of these birds in this district, during the winter and spring of 1866-7, but the only specimens I am aware of having been obtained, were shot by Mr. Cowe of Dowlaw, who shot five of them on the 14th May, 1867.

Smew *(Mergus albellus).*—A pair of these birds, of which the male only was shot, were observed on a pond near Kelso, 26th January, 1869. It was an adult in fine plumage.—ANDREW BROTHERSTON, Kelso.

Hybrid between a Black-cock and a Capercailzie.—A specimen of this rare hybrid having been sent to Mr. Robb, stuffer to the Museum of the University, here, I had the pleasure of examining it. It was shot by the game-keeper to Mr. Duff, M.P., Fetteresso, on his property on the 26th October last. These birds are very rare in this country, although they seem to be rather common in Sweden; according to Yarrell, they were common at one time in Scotland, along with the cock of the woods. This hybrid receives various names, *Tetrao medius, Tetrao hybridus, Urogallus hybridus,* and in Sweden it is known as Rackbhauen.—H. O. FORBES, Aberdeen, November, 1872.

Nesting of the Hedge Accentor *(Accentor modularis)* **in the Outer Hebrides.**—This species has not hitherto, I believe, been recorded as nesting in the Outer Hebrides. At all events Mr. A. G. More, in his paper on the Distri-

bution of Birds in Britain during the nesting-season, does not include it among those breeding in sub-province 36 ; I was therefore much pleased at finding a nest near Loch Maddy in North Uist. on May 14, 1872. The old birds were hoppiug about close by and repeatedly carried food to the nest, which was placed about 3 feet from the gr und, in a wall built of turfs. and contained three young ones I watched the parent birds for some time, and on several occasions, through a powerful glass, so as to make quite sure of the species. This was the only nest found, but several birds were seen singly and in pairs, both at Loch Maddy and at Tarbert in Harris.—H. JENNER FUST, Jun., Hill Court, Falfield.

Eagle Owl in Perthshire.—At a recent meeting of the Glasgow Natural History Society, Mr. Robert Gray communicated a note from Mr. M'Leay, Inverness, regarding the occurrence of an Eagle Owl *(Bubo maximus)* in Perthshire. It was shot near Pitlochry last January.

ON CERTAIN PROBABLE SCOTTISH TORTRICES.

By CHARLES G. BARRETT.

A SUGGESTION has been made to me that a notice of some of the species of Tortrices which might reasonably be expected to occur in Scotland, but which have not yet been found in the British Islands, may be useful as a hint to Scottish entomologists what to look for. A few remarks upon the rarer northern species which have already been discovered, may also be acceptable.

HALONOTA SUBLIMANA H.S. A pretty species, but sufficiently near to *H. cirsiana* and *trigeminana* to be readily overlooked. Taken on the Continent on high mountains among juniper, in July.

SERICORIS TURFOSANA H.S. About the size of *lacunana*, but with narrower wings ; silvery grey with dark fasciæ. Found on peat swamps, among young firs.

STIGMONOTA SCOPARIANA H.S. A pretty, dark species, with bright silvery streaks beyond the middle of the fore-wings, about the size of *Stig. internana*. Found among *Spartium* (broom), in April and May, the larva feeding in the seeds.

STIGMONOTA DUPLICANA Zett. A handsome species allied to *coniferana*, but much larger. "Taken in June and July, especially in mountainous districts ; the larva from autumn to May, in the bark of spruce fir."—Heinemann.

RETINIA POSTICANA Zett. Found in Northern Europe, in June and July ; probably a fir-feeding species.

STEGANOPTYCHA ERICETANA H.S. (Not *Orthotænia ericetana* West.) Also found generally in Northern Europe. "End of May, and in June, among birches."—Heinemann.

Of species already recorded as British the following are well worthy of special attention :—

HYPERMECIA AUGUSTANA Hub. Very few specimens have yet been taken here, and these all in the north. It seems to occur among sallow, like its congener *cruciana*, and it is desirable that *both* species should, if possible, be collected freely in Scotland, in order to settle the still existing doubt whether they are, or are not, distinct.

PENTHINA GREVILLANA Curt. This species is apparently excessively rare. Dr. Buchanan White has taken one or two specimens on the mountains, and Curtis's came from Sutherlandshire. Its *long* fore-wings *black* for *three-fourths of their length*, and with pointed apex, make it a striking and noticeable species.

PENTHINA STAINTONIANA *mihi.* Also a rare species, occurring among *Arctostaphylos uva-ursi* on the mountains. Allied to *sauciana* and *Grevillana.* The apical pale portion of the fore-wings is suffused with creamy or pink, and the apex truncate.

DICRORAMPHA HERBOSANA *mihi.* I think this will prove to be common in the north, and to have been generally mistaken for *plumbagana.* It flies among grass and low plants.

LEPTOGRAMMA SCOTANA Gn. (*Treveriana* W.V.) A fine and handsome species, formerly taken in September and October in Perthshire, when it was beaten out of birch. Probably its habit is to sit on the trunk or branches.*

PERONEA LIPSIANA Schiff. Among *Vaccinium myrtillus* and *Vitis-idæa*, probably best collected in the larva state.

MIXODIA BOUCHARDANA Dbld. Among fir, apparently rare, and the larva unknown.

STIGMONOTA COSMOPHORANA Treit. Among young firs ; a small species, easily overlooked.

*I have taken a few specimens in Perthshire and Ross-shire, and suspect that it may be attached to aspen.—EDITOR.

STIGMONOTA PYGMÆANA Hub. There are only two specimens of this species recorded as British, and without locality. As it is a fir-feeding species, they may have been obtained from Scotland. It flies in April among spruce fir.

RETINIA RETINELLA. } These two species seem confined to
„ DUPLANA. } the north, the latter being as yet very rare, but most probably the larvæ or pupæ of both might be found more commonly in the shoots of young fir trees in the spring. When the young shoots are growing, those which are stunted or distorted should be examined. *Duplana*, however, flies in April and May, so that its larva must feed up early like that of *Turionana*.

SERICORIS DALEANA. } Further information respecting these
„ IRRIGUANA. } two species, and long series of both, are most desirable, since they belong to a most difficult group of closely allied species, and are not yet satisfactorily determined. The latter species seems to frequent high mountain districts.

It may be well to say a word respecting the best method of collecting Tortrices, so that time may not be wasted in finding out their habits.

Many species fly in the bright sunshine, and for these a sheltered spot and the bright sun is all that is wanted, but the great majority love to fly in the latter part of the afternoon, and are very partial to warm still weather. It can hardly have escaped notice that, after a steady breeze, or even a strong wind, all day, it is not uncommon for the wind to fall towards 5 or 6 o'clock in the afternoon, till there is an almost total calm. *This* is the time to collect Tortrices. It is the very opportunity for which they have been waiting, and they seize it to fly abroad; and, as different groups of species choose different hours of flight, there is in such an evening plenty of employment until dusk. In the case of fir-feeders, however, this weather is rather tantalizing, as it induces them to fly high. They should be beaten out of the sheltered side of the trees, or collected when flying low, in warm windy weather.

As there are so many hard working and energetic entomologists in Scotland, I sincerely hope that they may be induced to turn a little more attention to the Tortrices, and that they may

be rewarded by making the acquaintance of many of the interesting species which I have enumerated. Any information respecting their habits, larvæ, or food-plants, will be most acceptable to me.

5, Heigham Road, Norwich.

Tenthredinidæ in the Glenelg Valley, Inverness-shire.—In June, 1872, I spent twelve days in the little village of Glenelg, which is situated at the mouth of the beautiful valley of that name, and directly opposite the Island of Skye. My principal object was the investigation of its Hymenopterous Fauna, but the extraordinarily wet weather that prevailed during my stay rendered my efforts almost fruitless in this respect. I had only one entire dry day, and on the other days the rain poured down in torrents, making collecting nearly impossible. This will account for the following meagre list of species, most of which were captured by beating the bushes under the rain. The district seems to all appearance to be an excellent one, and well worthy of being visited by an entomologist. The neighbourhood of Loch Hourn would probably be the most productive hunting-ground, as the vegetation is of a more varied nature, besides being much more densely wooded. Unfortunately, when I was there the rain came down with extra violence, and quite prevented me exploring its—at present unknown—Insect Fauna. All the species mentioned below are commonly distributed, but as nothing has been written upon the Scotch *Tenthredinidæ*, the list may not be without interest to the few who study that family.

Trichiosoma lucorum Lin.—A very small variety was caught ovipositing in a sallow bush, on the hills above Loch Duich, at an elevation of 1,100 feet. *Abia nitens* Lin.—Common on sallow bushes. *Athalia rosæ* Lin.—Common on the rose. *Blennocampa fuscipennis* Fallen.—Common. *Selandria stamincipes* Kl.—Got commonly by sweeping herbage. *Poecilosoma impressa* Kl.—Not common. *Strongylogaster eborinus* Kl.—Common on sallow bushes. This species was recorded as "new to Britain" in the last number of the "*Scottish Naturalist*," which is not correct, as it had been previously reported in the British Museum Catalogue. *S. cingulatus* Fab.—Taken not rarely by sweeping ferns; no males were seen. *Pachyprotasis rapæ* Lin.—Abundant everywhere. *P. antennata* Kl.—Common. *P. simulans* Kl.—Not so common as the last. *P. variegata* Kl.—A single specimen. *Taxonus* ——?—A small black species, probably *sp. nov.*—one specimen. *Allantus nothus* Kl.—Abundant everywhere. *Perineura (Tenthredo) brevispina* Thoms.—Very common and variable. *P. (T.) excisa* Thoms.—Rare. *P. (T.) nassata* Lin., Thoms.—Very rare. These three species are included by Klug and Hartig in their *T. instabilis* which has been separated as above by the learned Swede. Our species require verification. *P. (T.) punctulata* Kl.—One example. *Tenthredo olivacea* Kl.—Abundant. *T. scalaris* Kl.—Very common, and as usual variable.

According to Thomson this is the true *viridis* of Linné. *T. mesomela* Thoms.—Not common. This is the *viridis* of authors. *T. livida* Lin.—Common on the flower of the raspberry. *T. velox* Fab.—One specimen. *T. balteata* Kl.—Common through the valley. *T. rufiventris* Fab.—One specimen. *Nematus gallicola* West.—Common in one locality. In addition to the above, sundry species were captured belonging to the genera *Nematus* and *Dolerus*, which stand over for further examination.

Among other Hymenoptera, were, besides some other Bees, two examples of the rare *Nomada xanthosticta*. The "Currant Galls" of *Spathegaster baccarum* were extremely abundant on some oaks at Glenshiel, as well as at Loch Hourn, and the insects themselves were equally numerous. The galls of *Teras terminalis* were likewise observed. *Formica rufa* inhabited the woods at Loch Hourn, and constructed its nests principally of ferns and heather leaves.

The "Burnet" Moth *(Ino statices)* appeared in hundreds on the only day the sun was visible, and was found throughout all the valley, either flying very slowly, or oftener at rest on shrubs. All the specimens were remarkable for their size, and for the brilliancy of their colours.

Two beetles, *Dascillus cervinus* and *Phyllopertha horticola*, were so abundant as to be a perfect pest. The former insect had, when handled alive, a very bad odour.

A short visit to Skye yielded nothing new; the rain preventing anything being done. The leaf galls of *Spath. baccarum* were very numerous on some stunted oaks, scarcely two feet high. The only Saw-fly noticed was *T. olivacea*. And thus ended my far from pleasant holiday.—P. CAMERON Jr., 136 W. Graham Street, Glasgow.

Capture of Lyda erythrocephala at Rannoch.—Among some *Tenthredinidæ* given me by Mr J. J. King, and taken by him at Rannoch, was a single example of the rare and beautiful Saw-fly, *Lyda erythrocephala*.—*Id.*

Note on the Larva of Synergus.—I have on various occasions opened the galls of *Cynips divisa* and found them tenanted not by that fly or its larvæ, but by two larvæ of a *Synergus*. The two nearly filled the gall, one being placed at each end, and what was to me rather strange, they were separated from each other by a thin semi-transparent white partition of silk, stretched across it from side to side, and dividing it into two distinct portions. Generally, the silk is stretched exactly across the centre, in other cases it divides it into two unequal parts, one large the other small; and in one instance I found three larvæ in one gall, one of them being at one end, enclosed in a space of its own size; but as a rule, the creatures have enough room to move about. I have also noticed that the galls inhabited by these larvæ have the hole slightly smaller, and its sides inside not so regular and smooth as those inhabited by the larva of the legitimate owner, which exactly fills it. How the silk partition was constructed, whether it was spun by one larva, or if it was the joint work of both, I have no evidence, but the subject is certainly worth the attention of the enquiring naturalist. It is a common occurrence to find one, two, three, or even four parasites in one of these galls, but, with the exception of the species mentioned above, in all the cases observed by me they lay in a heap together without any separation. The *Synergus* is supposed to feed, not on the constructor of the

gall, but on the gall itself, but the two never, so far as I am aware, come to maturity together. From observations I have made during the past season I have no doubt whatever but that the *Cynips* is destroyed either in the egg or as a very young larva, and that the "guest" gall-fly lives on the juices of the gall, but in what manner the host is killed I could not discover. May it not be destroyed by the female *Synergus* when she is depositing her eggs in the gall.—*Id.*

Biorhiza renum H., near Glasgow—The galls of *Biorhiza renum*, H. are abundant in the woods near Glasgow. *Cynips radicis*, Fab. also occurs.—*Id.*

Two New British Hemiptera.—I captured in Braemar, in 1871, two bugs which I suspected were additions to the British list, as they did not agree with the descriptions of any recorded British species. I have lately taken Mr. J. W. Douglass (our great British authority on these insects) opinion, and he informs me that they may *probably* be referred to *Salda marginella* H.S. and *Phytocoris pini* Kirschb.—F. BUCHANAN WHITE.

Hemiptera in Harris.—During a visit to Tarbert in Harris, in the spring of 1872, I took on 25th April, *Corixa Scotti* (abundantly), *Gerris costæ*, and *Velia currens*.—H. JENNER FUST, Junr., Hill Court Gloucestershire.

Dicrorampha herbosana Barrett, an additio to the Scotti h List.—I captured this insect in considerable numbers during the month of July, 1872, on the Glenniffer Braes near Paisley. It has also been taken on the hills above Port Glasgow by Mr Peebles, and in the neighbourhood of Glasgow by Mr. King. I might also mention that I have taken a second specimen of *Mixodia Bouchardana* in a pine wood near Paisley.—JOHN DUNSMORE, Castlehead, Paisley.

Sericomyia superbiens Miller—This insect is not indicated as occurring in Scotland by Mr Walker in his work on British Diptera. I captured one in the month of August seven or eight years ago, at Woodhouselea in the Pentlands. The only other place I have caught it was in the English Lake district.—R. C. R. JORDAN, Edgbaston, Birmingham, 26th Feb.

MEMOIRS ON SCOTTISH DIPTERA.

BY JAMES HARDY.

No. VI.—ANTHOMYIA MITIS Meigen ?

(The Dock-leaf Miner.)

DURING the summer, large blanched or withered spaces are conspicuous everywhere on the upper surface of the leaves of the common dock *(Rumex obtusifolius)*, which when closely inspected are perceived to arise from the detachment of the cuticle, and the destruction of the subjacent layer of green matter; while the inferior portion of the leaf remains unaltered. In these blotches the loose skin is slightly puffed up by the

air that has obtained admittance within, into irregular elevations ; which, taken along with their seared tint and irregular outline, might induce one unaware of the mode in which they were produced, to infer that the leaves had been injured by the application of some hot or acrid substance. But this is not the origin of these striking appearances ; for it is, in reality, owing to the operations of a company of maggots of a Dipterous fly, about the size of the smallest of the common house flies, and not very unlike to it in general aspect. The parent fly deposits her ova at short distances from each other on the upper surface of the leaves ; and the maggots, when hatched, immediately proceed to scoop out and devour the green substance amidst which they find themselves placed ; where, working forwards in drifts, that gradually enlarge with their growth and capabilities of eating, these at length become connected in one wide area, round whose borders the busy occupants continue to ply their vocation, apparently unaware of each other's proximity, and acting without concert in the common field whose limits are only determined by the outline of the foliage. These excavated spaces vary in dimensions. The indwellers sometimes after raising a small blister desert it for another habitation ; or, after entirely consuming the contents of the upper surface of one leaf, proceed, to attack in a similar manner another conveniently accessible. Where the attacks have been only partial, but frequently repeated, the leaves are much disfigured, and the blotches appear like foul eruptions breaking forth from every part. In some instances we meet with only a solitary occupant, and this is generally the case with the sorrel *(Rumex acetosa)*, which is mined by the same sort of maggot. In the long leaf of the curled dock *(Rumex crispus)*, the central portion is the most liable to be eaten out. When this happens, the thin filmy skin is left nearly unbroken, stretched between the oblique sides of the leaf, and looks like a large scald, extending from the base to the tip. When fresh, the detached cuticle is white, particularly in the sorrel, variously defiled with green stains, and the ejecta of the miner, but at length it becomes of a pale brown. Its thinness sometimes enables one to trace the outline of the inmates beneath ; in other instances we can only detect their situation, by passing the finger over the surface.

The anterior end of the miner is tapered to a fine point, like that of the maggot of the flesh-fly, and is provided with two hard black hooks, bent downwards, which supply the weapon by which it separates the cuticle, and triturates the parenchyma into a pulp suitable for deglutition. These appear to be put into exercise by the repeated movements to and fro of the head; and the leaf by their means is literally flayed, in the same manner as the hide of an animal is detached by the knife of the butcher. If the body is watched while the maggot is at work, there is observable a continued equal moving backwards and forwards, like a reiterated pulsation, which may facilitate the transmission of the food through the simple alimentary passages. One, taken out of its chamber, felt little difficulty in selecting a new residence, and soon again put itself under cover. With little restraint upon their voracity, from the ample scope afforded, these maggots when in large assemblages of from eight to a dozen (from four to six is a common number) will consume the substance of about one fourth of the upper layer of a leaf during a day; and although I have not attended to their proceedings from the commencement, they unquestionably, from their almost unintermitted exertions, attain a rapid development. In the fields I find the fly about the end of May, and in some seasons I observe that the docks are affected with the young maggots about the 2nd or 3rd of June. Those I had under my observation were obtained on the 6th of July; and were placed in a tumbler inserted over a flower-pot containing soil. Most of them had buried themselves in the earth before the 17th, having been pretty well full-fed previous to my confining them. The first fly appeared on the 6th of August; two came out on the 7th; and others in succession. This brood gives rise to a second race of maggots, which continue to feed till winter closes in when they betake themselves to their brumal retreat, are converted into pupæ, and eventually in spring, when the season admits, become the progenitors of an issue as numerous as the first. Several of the flies, however, were not so speedy in making their exit, but remained in the pupa state, till the time of their vernal revivescence. This was about the 7th of May in the ensuing season. Those that came forth in August, and in the early part of next season, were chiefly males; the females were later in arriving at the perfect

state. It may be easily understood, how, as is generally the case with insects, the male thus anticipate the females; being of less bulk, they will be more quickly fed, and will on this account precede the other sex in arriving at a state of quiescence, whereas the females, being more robust, will require a longer period for being satiated.

The *maggot* is yellowish-white, sometimes slightly dusky in the middle anteriorly, owing to the food shining through, and occasionally reddish-brown posteriorly; elongate fusiform, rather attenuated towards the fore end; the posterior apical segment less broad than the preceding, truncate; the segments very distinctly separated, slightly ventricose; with a longitudinal series of shallow depressions along each side; two fibre-like white tracheæ distinctly visible, somewhat converging posteriorly, where they terminate in two closely approximated tubercles, each capped by a chestnut plate (stigmata) situated a little below the tumid superior margin of the apical truncation; widening out anteriorly, and then again drawing near to each other behind the head, and descending to the sides, where their opening is indicated by two ovate chestnut scales, one on each side, near the base of the second segment; mouth provided with two black corneous hooks, contractile within the next segment; truncate end descending rather abruptly, triangulate-conic, a transverse wrinkle beneath the stigmata, followed by a ridge, which offers from four to six minute elevations, beneath this it contracts into a double tubercle, the substitute for a proleg, behind which there are two slight tubercula on each side of a slit; the middle of the ventral rings closely striolate across. Length from 2 to 3 lines.

The *pupa-case* is formed of the indurated skin of the maggot, and may be considered as a self-constructed cast of the body, several of whose distinguishing features it still exhibits. It is of a brown colour, and is oblong oval, the posterior end being rather narrowest, crossed with rather close fine ridges, somewhat roughish or granulated on the inferior surface; a row of slight hollows along the sides, below and above; the anterior end with a lamella at each angle, with the interval between them rugose; the first three segments keeled at the sides, with a depression along their superior edges; the posterior apical segment smallest, roundish at the apex and rugose, bearing a pair of sub-conical

divergent rough processes, each of which is surmounted by a plate which is separated into three divisions; a depression behind these, succeeded by a rugulose ridge, posterior to which there is a longitudinal depression, that intersects four slight elevations, of which the two uppermost are placed apart. Length 2 lines.

The *fly* is the *Anthomyia mitis* of Meigen, *Europ. Zweif. Ins.* v. 183, 173. *Pegomyia mitis*, Macquart, *Hist. Ins. Dipt. (Suites à Buffon)* ii. 351, 2. The *male* has the face of a shining silky white, viewed in front, but ferruginous when looked at laterally; the frontal band ferruginous, two shining white spots above the antennæ; margins of the eyes narrowly silken white, eyelet triangle, black with grey reflections, bearing a few black hairs, as do the sides of the frontal band, the borders of the mouth, and the hinder rim of the head; eyes nearly meeting above, reddish-brown, or brown, naked; antennæ, with the two basal joints ferruginous, the third oblong, black; the seta naked, black; trunk ferruginous, darker along the middle; palpi narrow, scarcely spathulate, with the apices black, the remainder ferruginous. Thorax light grey, scarcely bluish grey, with very obsolete longitudinal duskier lines, and several rows of black spots, giving rise to a longish pubescence; scutellum and metathorax concolorous, the former with a few long stiff hairs. Abdomen narrow, cylindric, with the tip blunt and rounded, shining ferruginous, with a white reflection, with scattered black hairs, and others in rows at the tips of the segments; a very obscure dorsal line; the upper part of the penultimate segment sometimes of greyish black; apex beneath with pubescent not very prominent appendages; belly with a few radiating hairs on the centre of each segment. Legs ferruginous with black pubescence; the fore coxæ very fine whitish cæsious, and the fore femora slaty in front and on the sides; tarsi black; claws dirty whitish. Poisers ferruginous at the base, their tips white; yellow after death; wing-scales small, white; wings clear, the base of the nervures near it somewhat rusty or yellowish, the costa bristled, without a costal spine; the small cross nervure slanted; the second upright, not quite straight. Length 2¼ lines. In the *female* the frontal space is wide, the band orange or ferruginous, with a white linear margin next the eyes; eyelet triangle grey, darker in the centre; thorax fine cæsious grey, without traces

of lines, prettily marked with rows of hair-bearing points; abdomen narrowish ovate, the tip finely tapered, shining testaceous, with some duskier tints, and the base sub-cinereous; legs as in the male; wings more ample than in the male; the second cross nervure slighly crooked; length 2¼; expanse of the wings 5¾—6 lines.

A small variety of the male, which came out during the spring, differs in having the antennæ and palpi entirely black; the thorax darker, the abdomen shorter, of a faint testaceous hue and less shining; the fore thighs dusky, not so bright slaty; the wings shorter, the second cross nervure straight, and not so far apart from the first; length 1¼; expanse of the wings 4 lines. This dwarf condition may have arisen from a deficiency of nourishment during the maggot state.

Meigen ascribes to *A. mitis* a black frontal band, ferruginous palpi and black antennæ; but out of the large number that I have reared, not one corresponds to this character, excepting the last variety in one particular. An English specimen, however, taken in the open air, agrees with Meigen's characters. the reared specimens appear thus to constitute a distinct variety, which may be named *A. mitis*, var. *rumicis*.

Mr Walker in his "*List of specimens of Dipterous Insects in the British Museum*," (1849) p. 922, has doubtingly united *A. mitis* with *A. bicolor*, but having reared both species from different plants, and with evident tokens of dissimilarity, I cannot subscribe to his opinion.

A. mitis is infested with an Ichneumonideous parasite, while in the pupa state; and the same species attacks *A. bicolor*.

This species also, at least judging from the maggot and pupa case, occasionally mines in the leaves of the Coltsfoot (*Tussilago farfara*). I have also found the maggot of a *Trypeta* feeding upon them, but did not succeed in rearing the fly of either.

POLARITY IN THE GEOLOGICAL DISTRIBUTION OF GENERA AND ITS CAUSE.

By the Rev. J. WARDROP.

ACCORDING to this generalisation, the greatest numbers of organic forms generically different are found at the

two extremes of the geological series. The energy of the genus-producing power, whatever that was, manifested itself, not with an altogether irregular intensity throughout the geological formations, nor with an intensity ever regularly increasing or decreasing from the beginning onwards, but with such a sort of regulated variation that there is a maximum intensity at the epochs farthest removed from each other, the Silurian and the Tertiary, whilst from these two poles of time it diminishes towards the Permian and Triassic formations in which at last it dwindles to a minimum. Such is the simple sense of the somewhat abstruse looking formula, Polarity in the Geological distribution of Genera.

That some very observable variation in the numbers of types produced at different times should occur, would be, on Darwinian principles for instance, not surprising, but rather matter of anticipation. If diversification of structure and of type at all depend on natural causes originating anyhow in the conditions of life, it clearly follows that, unless the conditions of life have throughout the successive ages operated with a rigid uniformity of preponderance, there must have been some amount and order of difference in the comparative numbers of generically different organisms produced in the periods. The facts might furnish an argument in either of two directions. If physical geology should establish that the conditions operating to the transmutation of type had a varying preponderance of influence throughout the different periods, the consequence would be inferrible that there would be a corresponding difference in the production of generic forms. Similarly, in the reverse order of inference, if an inequality were observed in the proportionate numbers of genera, such as for instance a maximum production at one time, and a minimum at another, we would be entitled to seek the cause of this in a corresponding variation in the influencing conditions. Now this theory of Polarity, so called, affirms that an augmented production of generically different types has marked the origin and the close of the history of organic life. The questions that arise are of course these two, —First, Is the fact so? And, second, Can it be accounted for on Darwinian or any other principles?

The designation employed is borrowed from the physical sciences. It is used here in a sense only analogous to that which it bears there.

There are other manifestations of a polar arrangement of phenomena in organic nature. The force that developes the two organic kingdoms as a whole, operates, after a sort in a polar manner. Thus the vegetable kingdom does not pass over at the point of its highest development into the animal, so as to present continuity of rise from the lowest vegetable to the highest animal. Quite the reverse. Both the vegetable and the animal series setting out from a point at which development is at a minimum, and where the two are all but, or altogether, confounded, graduate therefrom in opposite directions, diverging as they ascend each in the scale of organisation in its own sphere, till they reach their respective goals of perfection at the farthest possible remove from each other. The highest plants, not the lowest, are the farthest separated from the highest animals. The two kingdoms culminate at opposite poles. It was Fries, the Swedish botanist that introduced the idea and the term "polarity" into biological science. And this, I believe, was one of his instances. It was Ed. Forbes who first, and I may say, last, suggested the same relation as a generalisation of palæontological facts. Arranging the geological formations into two great groups, the Palæozoic and the Neozoic, he found the following contrast between the two,—"The maximum development of genuine types during the Palæozoic period was during its earlier epochs; that during the Neozoic periods, towards its later epochs." Such are his words. If in this he has hit on a true reading of the facts, that supreme two-fold division of the formations, Palæozoic and Neozoic, would be established on the ground of numerical as well as structural relations between the respective organic types of the two series, that is to say, on variation in the intensity of the force diversifying organic forms, as well as on the variety of its products.

Before proceeding to inquire into the truth of such a theory as this, one is almost tempted to put the question, is it proposed in sober earnest? Or, taking it to have been held seriously (and of that there was never a doubt,) is it not, especially when looked at in view of the author's well known scientific proclivities, of a character to suggest that there may be more of theorising enthusiasm to be expected in it, than either of sober investigation or of inductive truth? "Forbes," says his biographer; "had a love for broad and often poetic generalisa-

tions," and of this feature of his scientific character the present theory is instanced as a signal example. Yet Forbes himself says, "in issuing it, I do so keeping in view a vast number of individual facts, and base it on the results of investigations of no small extent." To lay these before the scientific world in detailed or tabulated shape will be the work," he added, "of more leisure than can at present be given to the task." That leisure never came. We may say of him, adopting the language of Geikie in reference to Jukes, who left behind him similarly a newly originated but unproven view of the Devonian rocks, that he was removed from among us before he had time adequately to work out the views which he had sketched. He was a trained and most skilful adept in Palæontology, and though his suggestion has not been adopted by the general body of geologists, there must still linger in many minds the conviction that a view which had recommended itself to so earnest and experienced a palæontologist is well worthy of serious consideration. It is true that Forbes in his theorising soared high; but, though it may be that he had to struggle with a tendency to indulge "the use," rather than to observe "the limit of the imagination in science," it is also true that he had the keenest sense for facts and unrivalled powers of observation, and that he seldom soared on a foolish or a fruitless flight. It would be strange indeed if this polar arrangement should to his practised eye have seemed a true reading of nature, whilst it had no actual standing in fact at all.

At all events, stand or fall it must, according as the facts shall be found to determine. It is the facts on which it professes to build that can alone be made the means of its removal. It must be accurately apprehended in its own terms in the first place, and then in those terms shown to be an inaccurate interpretation of nature. Now the only criticisims, or at least the principal ones that I have seen, those of Pictet and Wallace, both follow close on Forbes's proposal, and the latter, repeated afresh last year, are certainly chargeable, so far, with an inexact apprehension of the doctrine they deal with; and curiously, with that kind of misapprehension, against which its author gave a special caution. It is to be observed that the theory makes no affirmation about the amount of life, in individuals or in species, at any epoch on the earth. The number

of genera, at any time, is no test of the numbers of either specific or individual life at that time extant. And the generalisation is relative solely to generic numbers. "The number of species in a group at any given epoch," says Forbes, "is to be excluded, not being an element in the discussion, though apt to be introduced through mistake of the generalisation attempted to be attained." The criticisms of Pictet and Wallace, for one thing, do not keep generic diversity exclusively in view, and are therefore thus far irrelevant.

From the grounds recently proposed and widely accepted as to the origination of the forms of living beings, it might be thought that this theory would have very unsafe footing, or indeed be an impossible one, inasmuch as its author held to the independent creation and permanent distinction of species. Doubtless such was his view. A species was to him a group of individual beings not only morphologically identical, but connected genealogically, being of one blood, and that blood such as had never run, and never should run, in the veins of another species. A genus correspondingly was a group of species allied by certain structural affinities. It was an idea which the Creator realised or expressed and embodied variously in the various species which are classed under it. Whether those views would have held their ground with Forbes in the revolutionary times to which a longer life would have introduced him is hard to say. But polarity does not stand or fall with them. They are not essential to it, though they formed with it part of the scientific furniture of the same mind, and were therefore readily wrought up with it, whether necessary or not. It can be expressed equally well in terms of the Darwinian hypothesis,—in which hypothesis moreover we shall bye-and-bye try to find its physical explanation. Either Forbes or Darwin could use the following language, and it describes the law of polarity perfectly, the force that operates to the production of organic types differing to the degree of generic distinctness (be that force natural selection with the the one theorist, or the Creator's immediate power with the other) manifested itself in maximum energy in the earliest and latest ages of geological time. What may be the genus-producing power is plainly indifferent to this generalisation, which deals solely with the results of its work. And this leads to

another remark in caveat of mistaken criticism. Polarity broaches no physical theory. It is simply an empirical law, or law of observation, declaring *that* the facts are so-and-so, but saying nothing as to *why* they are. Therefore, when Mr. Wallace speaks of it as "a hypothesis put forward to *account for* the abundance of generic forms at an early period and at present," and as "a *cause* so obscure and hypothetical," and so on, he is in a second point wide of the mark. Polarity is no "occult cause" suggested for any phenomena. It is no cause at all. It only affirms a certain arrangement of the phenomena concerned. It is the *mode of the operation of some cause.* It is an effect needing itself by some cause to be accounted for. Nay, as we shall bye-and-bye find, we may turn on Mr. Wallace and ask, Is not the *vera causa*, called Natural Selection, of which part paternity is due to you, the very cause that will account for it?

But before bringing polarity and natural selection further into line with each other, there is another objection alleged by Mr. Wallace, that would effectually save any trouble about a physical cause of the arrangement which Forbes thought he had observed. "I would, also," says Mr. Wallace, "suggest some reasons against the very nature of the theory of Professor Forbes." These reasons are tantamount to the well-known objection often drawn against other positions, from the incompleteness of the palæontological record. Polarity, he says, assumes the completeness of our knowledge of the life that has existed on the earth, an assumption fatal to it, for that knowledge is infinitesimally small. Now, as the theory professes to rest on the facts that are known—to be a reading of the data actually in hand—it would have been relevant and effective criticism to have shown that these known facts do not countenance the theory, or that they are misinterpreted by it. But Mr. Wallace does not proceed in that manner. He appeals against the theory to the vast body of the facts that are unknown—of the data not yet come to hand, but only possible; which is, in the first place, a very positive way of using negative evidence; and, in the second place, would put an arrest on all generalised conclusions from the only geological premises now or ever to be within our reach.

(To be continued.)

PHYTOLOGY.

CONTRIBUTIONS TO A FLORA OF ROSS-SHIRE.

By A. DAVIDSON.

RANUNCULACEÆ.

Thalictrum alpinum L.—Tor-Achilty and the west coast. *T. minus* L.—Tarbat-Ness. *Anemone nemorosa* Sibth.—Common. *Ranunculus circinatus* L.—Near Dingwall. *R. aquatilis* L.—Common. *R. hederaceus* L.—Common. *R. lingua* L.—Not uncommon; Kintail, Gairloch, and near Dingwall. *R. flammula* L., var. *a.* and *b.*—Common. *R. auricomus* L.—Brahan, &c. *R. ficaria* L.—Common. *R. sceleratus* L.—Rare; near Dingwall. *R. acris* L.—Common. *R. repens* L.—Common. *R. bulbosus* L.—Common. *R. arvensis* L.—Not common; near Brahan. *Caltha palustris* L.—Common. *Trollius europæus* L.—Not common, but found both in the east and west.

BERBERIDACEÆ.

Berberis vulgaris L.—Wood near Dingwall.

NYMPHÆACEÆ.

Nymphæa alba L.—Common.

PAPAVERACEÆ.

Papaver argemone L.—Not common. *P. dubium* L.—Common. *Chelidonum majus* L—Rare; Rockfield, and near Dingwall.

FUMARIACEÆ.

Fumaria capreolata L.—Common. *F. officinalis* L.—Common. *Corydalis claviculata* D.C.—Not common; Melvaig, by Gairloch.

CRUCIFERÆ.

Barbarea vulgaris Br.—Not common. *Arabis petræa* D.C.—Gairloch. *A. hirsuta* Br.—Common. *Cardamine amara* L.—Common. *C. pratensis* L.—Common. *C. hirsuta* L.—Common. *Nasturtium officinale* Br.—Common. *Cochlearia officinalis* L.—Common; vars. *a.*.*b.* and *c.* **Alyssum calycinum* Wild.—Rare; Seafield. *Draba verna* L.—Common. *D. incana* L.—Not common; Nigg. *D. rupestris* Br.—Rare; Ben Sleugach, Loch Maree. *Teesdalia nudicaulis* Br.—Not common. *Cakile maritima* Wild.—Rare; Tarbat Ness. *Sisymbrium officinale* L.—Common. *S. thalianum* Hook.—Common. *Capsella bursa-pastoris* D.C.—Common. *Lepidium Smithii* Hook.—Not common; Gairloch. *Sinapis arvensis* L.—Common.

Plants marked * are naturalised.

RESEDACEÆ.

Reseda luteola L.—Rare; near Dingwall. **R. lutea* L.—Rare; Geanies.

CISTACEÆ.

Helianthemum vulgare Gær.—Common.

VIOLACEÆ.

Viola palustris L.—Common. *V. canina* L.—Common. *V. tricolor* L., vars. *a.* and *b.*—Common. *V. lutea* Huds., vars. *a.* and *b.*—Not common.

DROSERACEÆ.

Drosera rotundifolia L.—Common. *D. longifolia* L.—Frequent. *D. anglica* Huds.—Gairloch.

POLYGALACEÆ.

Polygala vulgaris L.—Common.

CARYOPHYLLACEÆ.

Dianthus deltoides L.—Not common. *Silene acaulis* L.—Frequent on the hills. *S. inflata* Sm.—Not common. *S. maritima* L.—Common. *Lychnis flos-cuculi* L.—Common. *L. viscaria* L.—Not common; above Evanton, and near Moybridge. *L. vespertina* Sibth.—Common. *Agrostemma githago* L.—Too common. *Sagina procumbens* L.—Very common. *S. saxatilis* Winm.—Not common; Wyvis. *S. nodosa* L.—Rare; Craig, near Dingwall. *Cherleria sedoides* L.—Rare; Wyvis. *Arenaria serpyllifolia* L.—Common. *Stellaria media* With.—Common. *S. holostea* L.—Frequent. *S. graminea* L.—Common. *S. uliginosa* Murr.—Not common. *Cerastium vulgatum* L.—Common. *C. triviale* Link.—Frequent. *C. semidecandrum* L.—Not common. *C. alpinum* L.—Wyvis and other mountains. *C. trigynum* Fries.—Same situation as *alpinum*.

LINACEÆ.

Linum catharticum L.—Common. *Radiola millegrana* Sm.—Rare; near Wyvis; Achilty, (F.B.W.)

MALVACEÆ.

**Malva rotundifolia* L.—Rare; Balnabruach, Tarbat.

TILIACEÆ.

* *Tilia europæa* L.—Woods, Tulloch.

HYPERICACEÆ.

**Hypericum calycinum* L.—Rare; Balmacarra. *H. androsæmum* L.—Rare; Glenshiel. *H. perforatum* L.—Common. *H. humifusum* L.—Rare; near Strathpeffer; Achilty, (F.B.W.) *H. pulchrum* L.—Common.

ACERACEÆ.

**Acer pseudo-platanus* L.—Tulloch.

GERANIACEÆ.

Geranium sanguineum L.—Rare; Tarbat Ness; thence to Fortrose. *G. Robertianum* L.—Common. *G. molle* L.—Common. *G. sylvaticum* L.—Ach-

ilty, (F.B.W.) *G. dissectum* L.—Achilty, (F.B.W.) *Erodium cicutarium* Sm.—Not common.

OXALIDACEÆ

Oxalis acetosella L.—Common.

RHAMNACEÆ.

Rhamnus frangula L.—Rare; Achilty, (F.B.W.)

LEGUMINOSÆ.

Ulex europæus L.—Common. *Genista tinctoria* L.—Rare; near Auchterneed, Strathpeffer. *G. anglica* L.—Not common. *Sarothamnus scoparius* Winn.—Common. *Ononis arvensis* L.—Not common. *Anthyllis vulneraria* L.—Common. *Medicago lupulina* L.—Common. * *Melilotus officinalis* L.—Not common; Balnabruach, Tarbat. *Trifolium repens* L.—Common. *T. pratense* L.—Common. *T. medium* L.—Common. *T. arvense* L.—Not common; near Brahan. *T. procumbens* L.—Frequent. *T. filiforme* L.—Not common. *Lotus corniculatus* L.—Common. *Oxytropis uralensis* D.C.—Not common; Tarbat. *Ornithopus perpusillus* L.—Rare; Balintore. *Vicia lathyroides* L.—Not rare. *V. sativa* L. vars. *a.* and *b.*—Common. *V. sepium* L.—Common. *V. cracca* L.—Frequent. *V. orobus* L.—Common. *V. sylvatica* L.—Rare; near Fortrose. *V. tetrasperma* Lois.—Rare; corn field, Dingwall. *V. hirsuta* Koch.—Achilty, (F.B.W.) *Lathyrus pratensis* L.—Not common. *Orobus tuberosus* L.—Frequent.

ROSACEÆ.

Prunus communis, var. *spinosa* Hud.—Common. *P. padus* L.—Common. *P. avium* L.—In many places. *Spiræa ulmaria* L.—Common. *Geum urbanum* L.—Frequent. *G. rivale* L.—Not common; Craig near Dingwall. *Rubus idæus* L.—Common. *R. suberectus* L.—Common. *R. carpinifolius* W. & N.—Not common. *R. corylifolus* Sm.—Not common; Glenshiel, &c. *R. glandulosus* Bell.—Not common. *R. saxatilis* L.—Frequent. *R. chamæmorus* L.—Frequent on the mountains. *Fragaria vesca.*—Common. *Comarum palustre* L.—Frequent. *Potentilla anserina* L.—Common. *P. tormentilla* Sibth.—Common. *P. fragariastrum* Ehrh.—Frequent. *Alchemilla vulgaris* L.—Common. *A. alpina* L.—Frequent on the mountains and near the sea on the west coast, as at Poolewe. *A. arvensis* Sm.—Common. *Agrimonia eupatorium* L.—Not common. *Rosa spinosissima* L.—Not common; Tarbat Ness. *R. involuta* Sm.—Gairloch. *R. Sabini.*—Woods; not common. *R. villosa* L.—Frequent. *R. rubiginosa* L.—Rare; in a hedge near Dingwall; Achilty. *R canina* L.—Common. *Cratægus oxyacantha.*—Common. *Pyrus aucuparia* Gaertn.—Common. *P. aria* Sm.—Rare; Lochcarron. *P. malus* L.—Achilty, (F.B.W.)

ONAGRACEÆ.

Epilobium angustifolium L.—Rare; Kiach-more, Wyvis. *E. hirsutum* L.—Rare; near Dingwall. *E. parviflorum* Schreb.—Not common; Craig near Dingwall. *E. montana* L.—Common. *E. tetragonum* L.—Not common. *E. palustre* L.—Not common. *E. alpinum* L.—Wyvis; not common. *E. alsinifolium* Vill.—Not common. *Circæa lutetiana* L.—Near Dingwall and Strathpeffer. *C. alpina* L.—Frequent; Var. *intermedia* Ehrh.—Achilty, (F.B.W.)

HALORAGACEÆ.

Hippuris vulgaris L.—Rare; Coul; Achilty, (F.B.W.) *Myriophyllum spicatum* L.—Common.

LYTHRACEÆ.

Lythrum salicaria L.—Rare; Brahan. *Peplis portula* L.—Not common.

SPERGULACEÆ

Spergularia rubra St. Hil.—Rare; roadside to Strathpeffer; Achilty, (F.B.W.) *S. marina* Camb.—Common on the sea coast. *Spergula arvensis* L.—Too common.

CRASSULACEÆ.

Sempervivum tectorum L.—Not common. *Sedum rhodiola* D.C.—Baois, Bhein, Gairloch. *S. telephium* L.—Not common; Gairloch. *S. anglicum* L.—Rare; Gairloch. *S. villosum* L.—Frequent. *S. acre* L.—Common.

RIBESIACEÆ.

Ribes grossularia L.—Rare; Woods at Tulloch. *R. petræum.*—Very rare; Kincardine.

SAXIFRAGACEÆ.

Saxifraga stellaris L.—Frequent. *S. nivalis* L.—Rare; Wyvis. *S. aiziodes* L.—Common on the hills. *S. granulata* L.—Plentiful on Tarbat Ness. *S. tridactylites* L.—Not common; Inver and Morrich-mhor, Tain. *S. hypnoides* L.—In many places. *Chrysosplenium alternifolium* L.—Common. *C. oppositifolium* L.—Common. *Parnassia palustris* L.—Frequent.

UMBELLIFERÆ.

Hydrocotyle vulgaris L.—Frequent. *Sanicula europæa* L.—Not common; Craig near Dingwall. *Cicuta virosa* L.—Glenshiel. *Helosciadium nodiflorum* Koch.—Not common; Gairloch. *H. inundatum* Koch.—Achilty, (F.B.W.) *Ægopodium podograria* L.—Common. *Bunium flexuosum* With.—Common. *Pimpinella saxifraga* L.—Frequent. *Œnanthe Lachenali?* Gmel.—Rare; Gairloch. *Œ. crocata* L.—Not common. *Ligusticum scoticum* L.—Common on the coast. *Meum athamanticum* Jacq.—Frequent. *Angelica sylvestris* L.—Not common. *Conium maculatum.*—Common. *Scandix pecten* L.—Not common. *Anthriscus sylvestris* Hoffm.—Common. *A. vulgaris* Pers.—Frequent. *Myrrhis odorata* Scop.—Not common; Brahan and Easter Ross. *Daucus carota* L.—Frequent. *Torilis anthriscus* Gaertn.—Not common.

CORNACEÆ.

Cornus suecica L.—Wyvis and Gairloch.

HEDERACEÆ.

Hedera helix L.—Common.

CAPRIFOLIACEÆ.

Sambucus nigra L.—Frequent. *Adoxa moschatellina* L.—Frequent. *Lonicera periclymenum.*—Not common. *Linnæa borealis* Gronov.—Not common; Brahan; one of the islands in Loch Maree, &c. *Viburnum opulus L*—Coul, (F.B.W.)

RUBIACEÆ.

Galium verum L.—Frequent. *G. saxatile* L.—Plentiful. *G. uliginosum* L.—Frequent. *G. palustre* L.—Frequent. *G. aparine* L.—Common. *Sherardia arvensis* L.—Common. *Asperula odorata* L.—Woods, common.

VALERIANACEÆ.

Valeriana officinalis L.—Plentiful. *Fedia olitoria* Vahl.—Rare; near Dingwall and Tarbet Ness.

DIPSACACEÆ.

Scabiosa succisa L.—Common. *Knautia arvensis* Coult.—Not common; Cornfields, Munlochy.

(To be continued.)

SCOTTISH GALLS.

(Continued from p. 32.)

By J. W. H. TRAILL, M.A.

Astragalus hypoglottis L.—The galls consist of leaflets which become conduplicate, hard, and fleshy. Usually when a leaf is affected almost every leaflet on it suffers, and the whole form a mass so compact at times that the individual leaflets are hardly distinguishable, though readily so in general. The masses formed may be terminal or axillary, and seem to consist at times of all the leaflets of a bud. They are very light yellowish-green, and are covered with whitish hairs. Each leaflet contains one or more *Cecidomyious* larvæ. Very common on the coast a few miles south of Aberdeen.

Vicia cracca L.—On this plant there occur galls very like those on *A. hypoglottis* in every point, but of larger size, the leaflets being larger. Each leaflet is tenanted by one or more larvæ of *Cec. onobrychidis* Bremi. At Muchalls, near Aberdeen, at Dunkeld, and at Lintrathen.

Vicia sylvatica L.— In this also the galls consist of leaflets which are conduplicate, but the leaflets remain quite distinct, not forming masses, and are less hard and fleshy, and less inflated. Externally they are smooth, and are reddish-brown tinged with green. Usually only a few leaflets on some of the side leaves are affected. Each contains several white larvæ of a *Cecidomyia.* Not very common at Muchalls in August.

Lathyrus pratensis L. Each gall is a leaflet, treated as in the *Viciæ*, but of larger size and more inflated. They occur in groups of three to eight in the axils of the leaves, but remain distinct; their colour is reddish-brown or green. Each contains two or three orange *Cecidomyious* larvæ. Common at Muchalls in August.

Rubus idæus L. The galls consist of woody swellings on the stem or leaf-stalk of a rounded or oblong form, ½′ to ¾′

by ¼′ to ¾′; the surface is naked, or with small prickles; and is wrinkled or cracked; the colour is yellowish green. The swelling is chiefly medullary, and in the heart of it live several small reddish-orange *Cecidomyious* larvæ. I have found it (scarce) at Dunkeld in September.

Potentilla tormentilla Sibthorp. Of this gall I got one specimen from Mr. W. Vice, which was found by him in August near Loch Etive in Argyleshire. It consists of a swelling just above a node, and contains three somewhat rounded cells, each about $\frac{1}{16}'$ diameter. Externally it is irregularly rounded, showing traces of the cells. Surface slightly pubescent and (in the dry state) wrinkled and purplish. Cells thin-walled, walls compact. Each cell contains one white larva.

Rosa canina L. Gall *(b)*, *Sc. Nat.* vol. i. 124, formed of conduplicate leaflet, is formed by *Cecidomyia rosæ* Bremi. This gall, as also those of *Rhodites Eglanteriæ* and of *Rh. rosæ* and gall *(c)*, are common throughout Aberdeenshire, and at Dunkeld and Lintrathen.

Rosa villosa L. On this species I have found galls of *Rhodites rosæ* L., of *Rh. Eglanteriæ* H., and of *Cecidomyia rosæ* Bremi, and also like gall *(c)* of *R. canina*, all in various parts of "Dee," at Dunkeld, and at Lintrathen.

Pyrus aucuparia Gærtn. The leaves become covered with blisters of various sizes projecting chiefly from the lower surface. Above, they form at first small yellow spots which spread, and eventually become brown and dead. In the interior of each blister there is an irregular cavity almost filled with interlacing hairs, among which live four-footed mites *(Phytoptus)*. Common in August, near Aberdeen, also sent me from Glasgow, by Mr. P. Cameron, jun.

Cratægus oxyacantha L. About Dunkeld I observed that on the hawthorn hedges the branches were frequently tipped with a rounded mass of deformed sessile leaves, usually covered with prickly hairs. These masses are sometimes as much as 1½′ diameter, but the colour is not changed. Between the leaves live several larvæ of *Cecidomyia cratægi* Winnertz. Though common in Perthshire I have never seen it in Forfar or in counties north of the Esk.

GALIUM VERUM L. *(a) Sc. Nat.* vol. i. 156, formed by *Cecidomyia galii* Winnertz. I have found on *G. verum* what I took to be a distinct kind of gall, but which Mr. Müller informs me is also formed by *C. galii.* It occurs along with the form described, from which, however, it differs considerably; it is not glossy; its colour is different, being dull green or dull reddish; it is usually of smaller size, and is much more compact in structure, and frequently bears a few stunted leaves at the apex; like the form described they split open when matured to allow the escape of the larva. This form is more local than the other.

(b) Sc. Nat. vol. i. 156, during July and August this gall is inhabited by several larvæ of *Cecidomyia*———? Rather local.

(c) The gall-like body described on the same page is formed by mites (*Phytoptus*?) Very common everywhere.

(d) This gall consists of a projection from the stem, usually a little above a node, flattened laterally, somewhat conical in form, and ending in a beak curved downwards. Length from above downwards about $\frac{1}{6}'$, projects from stem $\frac{1}{8}'$. It is green, naked, and slightly wrinkled; it is monothalamous, and the side farthest from the stem is very thin. Each contains one whitish *Ceeidomyious* larva. Common in "Dee" in June and July.

Carex punctata in Scotland.—The Rev. J. Farquharson announced, at the February Meeting of the Botanical Society of Edinburgh, his discovery of *Carex punctata*, in the parish of Colvend, Kirkcudbrightshire. He noticed at the same time some of the rarer plants of the parish which had been pointed out to him by the Rev. J. Fraser of Colvend. These are all tolerably well known and include *Cladium mariscus, Scutellaria minor, Lychnis viscaria, &c.* He seems, however, to have overlooked *Spergularia rupestris* which is common on the rocky shore of Colvend—the only Scottish habitat at present known for it.

Mosses.—Botanists will welcome the appearance of "A Synopsis of the British Mosses" by C. P. Hopkirk. It was quite time for a new work on this interesting group of plants, for since the publication of the "Bryologia Britannica," eighteen years ago, the number of species recorded as British has considerably increased, hence in the Synopsis we find descriptions of 562 species, or 116 more than in the Bryologia. In the Synopsis, in addition to a lucid description of each species—in which the chief distinctive characters are pointed out, and no unnecessary plethora of words used—the habitat of each species is noticed, and a *few* localities given for the rarer ones. With Leighton's "Lichen Flora," Cooke's "British Fungi," and Hopkirk's "Mosses," the British Cryptogamic Botanist ought to be thankful at having so many works *up to date.*

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 43,

EDITED BY F. BUCHANAN WHITE, M.D.

[Note on *Bombyx quercus* (Sc. Nat. II. 43). Mr Doubleday has kindly favoured me with the following remarks on this species :—

"I suppose you have copied your statement about *callunæ* from Dr Staudinger's Catalogue, and I presume that his *quercus* and *callunæ* are the same form, which is unquestionably the true *quercus* of Linnæus.

"It is very difficult to know what modern naturalists mean by *a species*, but I consider that Dr Staudinger has united three distinct species under the name of *quercus*; he takes no notice of *the form* of the fasciæ on the wings, or of the larvæ. I will give you my views about these insects, which I think ought to stand thus :—

1. *Quercus* Linn.; Hüb. 172 ?—not a good figure.
   callunæ Palmer.
   quercus, female, Hüb. Gey. 350.—very good.
2. *Spartii* Hüb. 173, male.
   var. *Catalaunica* Staud.
3. *Roboris* Schrk.
   var. = *quercus* var. Hüb. 270.
   var. *sicula* Staud.

"In *quercus*—No. 1.—the yellow fascia on the upper wing turns *outwards* on the inner margin, and the fascia on the under wing turns down to the anal angle. (Fig. 1.) This species is found in wild uncultivated places throughout Northern Europe,

and occurs in abundance in Scotland, Ireland, the North of England, and on Dartmoor and throughout Cornwall, on open heaths. The white spot on the upper wing is distincly visible on the under side of all the specimens which I have examined.

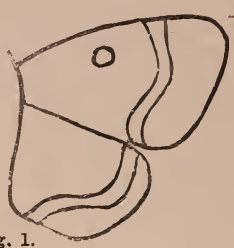


Fig. 1.

No. 2.—*Spartii.* This species appears to be confined to a few localities in the south of Europe—it is abundant at Cannes. The direction of the fascia on the upper wing is different from what it is in *quercus* or *roboris.*

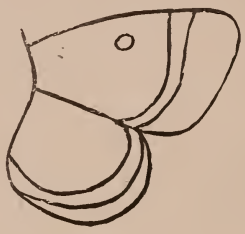


Fig. 2.

No. 3.—*Roboris.* This insect inhabits central and southern Europe, and appears to be rather local. The yellow band on the upper wing turns *inwards* on the inner margin, and the fascia on the under wing is semicircular and does not turn down to the anal angle. (Fig. 2.) I have never seen a specimen in which the white spot on the upper wing is visible on the under side. This is the one which we find here (south of England). The larva will not eat heather, but feeds principally on white-thorn or black-thorn growing in cultivated ground. I have often seen them in the garden, on apricot trees which are trained to the wall. The moth appears in August after remaining about a month in the chrysalis."

The notice of *Bombyx quercus* at p. 43 (lines 17—30) must therefore be altered to the following :—

QUERCUS L.; *callunæ* Palmer. Common. Ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ Orkney ♀♀

WEST. Solway Clyde Argyle West-Ross Hebrides.

LAT. 54°40″-59°10″. RANGE IN EUROPE. North and north-central. TYPE. Septentriono-central. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June. LARVA. July-September of the following year. FOOD-PLANT. Heather, &c.

ROBORIS Schrk. ; (*quercus* auct. Angl.) Rare. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. ♀ o o West-Ross o

LAT. 57°40″. RANGE IN EUROPE. Central and southern. TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August-June. FOOD-PLANT. Sloe, hawthorn, &c.

I have not seen Scottish examples, but from what Mr. A. Davidson tells me I have no hesitation in including *roboris* in this list. Mr. Davidson writes as follows :—"I found the larvæ of *quercus* in a plantation consisting principally of larch, near Kerrisdale, Gairloch. They were feeding upon the sloe. I fed them with it and had the satisfaction of seeing the moths emerge from their cocoons in the latter end of July."]

DREPANULIDÆ Boisd.

CILIX Leach.

GLAUCATA Sc. (1763) ; *spinula* Schiff. (1776). Local. Nemoral.

DISTRIBUTION—EAST. Tweed Forth ♀ o o o o o
WEST. Solway Clyde o o o

LAT. 54°50″-56°. RANGE IN EUROPE. Central (not in Sweden) &c. TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June ; August. LARVA. July, September. FOOD-PLANT. Sloe and hawthorn.

DREPANA Schrk.

FALCATARIA L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54° 40″—58° RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. June. LARVA. August, September. FOOD-PLANT. Birch and alder.

There appears to be only one brood in Scotland. Scottish examples are much paler than English, and have the streak that runs from the tip to the inner margin of the wing more strongly marked and much clouded.

LACERTINARIA L. Not uncommon. Nemoral. Ascends to 1000 feet or upwards.

DISTRIBUTION—EAST. ♂ ♂ Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°40″-58°. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Birch.

Also apparently single-brooded in Scotland. *D. hamula* may occur in the south of Scotland ; *D. unguicula* is exclusively a beech-feeder, and cannot be expected except as an introduction ; *D. curvatula* (not known as British) has nearly as wide a European range as *falcataria* and feeds on alder.

NOTODONTIDÆ Boisd.

HARPYIA Ochs.

FURCULA L. Not uncommon. Nemoral and ericetal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Sallow and poplar.

VINULA L. Common. Nemoral. Ascends to 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-58°. RANGE IN EUROPE. Throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. June-September. FOOD-PLANT. Willow, aspen, &c.

A Lapland variety is nearly black. *H. bicuspis* and *bifida* may perhaps be found, and so may *erminea*, a species of central Europe closely allied to *vinula*.

LEIOCAMPA Steph.

TREMULA Cl. (1759); *dictæa* Esp. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, July. LARVA. August, September. FOOD-PLANT. Aspen, poplar, and willow.

DICTÆOIDES Esp. Not common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Birch.

NOTODONTA Steph.

ZICZAC L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central.. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Sallow, poplar, alder. Only single-brooded?

TRITOPHUS F. Very rare. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde o o o

LAT. 55°50″. RANGE IN EUROPE. Central; South Sweden. &c. TYPE. Central. TYPE IN BRITIAN. British.

TIME OF APPEARANCE—IMAGO. "May and August." LARVA. "July and September." FOOD-PLANT. Aspen, poplar, birch. Once taken near Paisley by Mr. Morris Young.

DROMEDARIUS L. Not uncommon. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″.-57°40″. RANGE IN EUROPE. Central. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Birch, alder.

PERIDEA Steph.

TREPIDA Esp. Rare. Nemoral.

DISTRIBUTION—EAST. Tweed ♀♀ Tay o o o o o
WEST. Solway ♀♀ o o o

LAT. 54°50″-56°30″. RANGE IN EUROPE. Central (to South Sweden.) TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July-September. FOOD-PLANT. Oak.

DRYMONIA H.S.

CHAONIA H. Rare. Nemoral.

DISTRIBUTION—EAST. Tweed Forth ♀♀ o o o o o
WEST. Solway ♀♀ o o o

LAT. 54°40″-56°20″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May. LARVA. July. FOOD-PLANT. Oak.

[**TRIMACULA** Esp. (1785); *dodonæa* Frr. Rare. Nemoral.

DISTRIBUTION—East. o o o o o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-56°10″. RANGE IN EUROPE. West-central. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Oak and birch. A doubtful native of Scotland.

ODONTOSIA Hub.

CARMELITA Esp. Rare. Nemoral.

DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. o Clyde Argyle o o

LAT. 56°20″-57°40″. RANGE IN EUROPE. Central; (once in Sweden). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. April, May. LARVA. June. FOOD-PLANT. Birch.

LOPHOPHTERYX Lederer.

CAMELINA L. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-centro-oriental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. August-October. FOOD-PLANT. Birch, hazel, beech, alder, &c.

PTEROSTOMA Germ.

PALPINA L. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay ♀ Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Aspen and sallow.

PHALERA Hub.

BUCEPHALA L. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Oak, birch, &c.

PYGÆRA Ochs.

PIGRA Hufn. (1766); *reclusa* F. (1787.) Not uncommon. Nemoral and ericetal.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May. LARVA. August, September. FOOD-PLANT. Sallow and aspen. Mr E. C. Buxton reports *P. curtula* (larvæ) from Argyle. It is desirable that specimens should be bred before we include it in the Scottish list. It ought to occur.

LIPARIDIDÆ.

(*Liparidæ* Boisd.)

ORGYIA Ochs.

ANTIQUA L. Common. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o
LAT. 54°40″-57°40″. RANGE IN EUROPE. Throughout.
TYPE. European. TYPE IN BRITAIN. British.
TIME OF APPEARANCE—IMAGO. July-October. LARVA. June-September. FOOD-PLANT. Various trees.

DASYCHIRA Steph.

FASCELINA L. Common. Ericetal. Ascends to 1500 feet.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀
LAT. 54°40″-58°. RANGE IN EUROPE. Central and northern.
TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Heather, sallow, &c. A darker, nearly unicolorous, var. (*obscura* Zett.) occurs in Lapland, and though I have not seen specimens of it, I imagine that our Scottish form is intermediate between this and the southern form. *D. pudibunda* and *Psilura monacha* should occur.

LEUCOMA Steph.

SALICIS L. Rare. Nemoral.
DISTRIBUTION—EAST. o o o Dee Moray o o o
WEST. ♀ Clyde o West-Ross.
LAT. 55°20″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August. LARVA. May, June. FOOD-PLANT. Willow. A few specimens have been taken in Ayrshire (Duncan), Aberdeenshire (Yuill *teste* Traill), and Ross-shire (Davidson). Mr. A. Davidson reports the capture, in Ross-shire, of a larva supposed to belong to *Ocneria dispar*. Specimens must, however, be bred before *dispar* can obtain a place in the Scottish list.

PORTHESIA Steph.

SIMILIS Fuessl. (1775); *auriflua* F. (1787.) Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o
LAT. 54°50″. RANGE IN EUROPE. Central and south-eastern.
TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Hawthorn, oak, &c. I took a single specimen, apparently just emerged from the puparium, on the coast of Colvend, Kirkcudbrightshire, in 1870.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 48.)

EDITED BY D. SHARP, M.B.

DYTISCIDÆ.

CNEMIDOTUS Schaum.

IMPRESSUS Fab. Very rare. In stagnant waters. Lowland.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde o o o

"Ayrshire." R. Hislop.

HALIPLUS Thomson.

OBLIQUUS Fab. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o

WEST. o o o o o o

CONFINIS Steph. Scarce. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o

WEST. o o o o o

[**VARIEGATUS** Sturm. Doubtful as Scottish.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o o o o o

"Dollar. J. T. Syme." Murray's Cat.

FULVUS Fab. Not common. Stagnant waters. Lowland.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o

WEST. ♀ Clyde o o o

FLAVICOLLIS Sturm. Very local. Lowland.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

Abundant in some pools by the side of the Nith below Thornhill.—D.S.

FLUVIATILIS Aubé. Very rare. In clear slowly moving water. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o o o o o

Muttonhole, Edinburgh.—D.S.

RUFICOLLIS De Geer. Abundant in stagnant waters. Lowland.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o

WEST. Solway ♀ o o o

STRIATUS Sharp. Very local. Maritime?

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

Abundant in a pond occasionally filled by the tides on the banks of the Nith, about three miles below Dumfries.—D.S.

LINEATOCOLLIS Marsh. Abundant in clear waters. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay § Moray o o o

WEST. Solway § o o o

BRYCHIUS Thomson.

ELEVATUS Panz. Common in rapid streams. Lowland.

DISTRIBUTION—EAST. Tweed Forth § § Moray o o o

WEST. Solway Clyde o o o o

HYPHYDRUS Schaum.

OVATUS Lin. Very local. In still waters. Local.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

"Barean Loch, Colvend."—Buchanan White.

HYDROPORUS Schaum.

QUINQUELINEATUS Zett. Very rare. Lowland.

DISTRIBUTION—EAST. Tweed o o o o o o o

WEST. Solway o o o o

INEQUALIS Fab. Common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay § Moray o o o

WEST. Solway Clyde o o o

CONFLUENS Fab. Rare. Lowland.

DISTRIBUTION—EAST. § Forth o o o o o o

WEST. Solway Clyde o o o

NOVEMLINEATUS Steph. Local. In lakes. Lowland.

DISTRIBUTION—EAST. o Forth o Dee Moray o o o

WEST. Solway Clyde o o o

PICIPES Fab. Rare. Lowland.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

PICTUS Fab. Local. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o Moray o o o

WEST. § Clyde o o o

LEPIDUS Ol. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee ○ ○ ○ ○
WEST. ♀ Clyde ○ ○ ○

RIVALIS Gyll. Common in streams. Lowland.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray ○ ○ ○
WEST. ♀ ♀ ○ ○ ○

SEPTENTRIONALIS Fab. Common in streams. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ○ ○ ○
WEST. Solway ♀ ○ ○ ○

DAVISI Curt. Common in streams. Lowland, highland.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray ○ ○ ○
WEST. ♀ ♀ ○ ○ ○

LATUS Steph. Rare. In rapid waters. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

DUODECIMPUSTULATUS Ol. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray ○ ○ ○
WEST. Solway Clyde ○ ○ ○

DEPRESSUS Fab. Common. Lowland.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

ASSIMILIS Payk. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray ○ ○ ○
WEST. ♀ ♀ ○ ○ ○

GRISEOSTRIATUS De Geer. Local. In highland lakes.
DISTRIBUTION—EAST. ○ Forth ○ Dee Moray ○ ○ ○
WEST. ○ ○ Argyle ○ ○

[**DORSALIS** Fab. Doubtful as Scottish.
"Raehills, Rev. W. Little." Murray's Cat.

MEMNONIUS Nic. Rather common. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray ○ ○ ○
WEST. Solway ♀ ○ ○ ○

OBSOLETUS Aubé. Rare. Lowland.
DISTRIBUTION—EAST. ○ ○ ♀ ○ ○ ○ ○ ○
WEST. Solway ○ ○ ○ ○

FERRUGINEUS Steph. Local. Lowland, highland.
DISTIBUTION—EAST. o Forth Tay ♂ Moray o o o
WEST. o o o o o

GYLLENHALLI Schiod. Local.
DISTRIBUTION—EAST. ♂ Forth Tay o Moray o o o
WEST. ♂ ♂ o o o

RUFIFRONS Duft. Rare.
DISTRIBUTION—EAST. Tweed o o Dee o o o o
WEST. o Clyde o o o

ERYTHROCEPHALUS Linn. Common. Highland, lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♂ Moray ♂ o o
WEST. Solway Clyde o o o

LITURATUS Fab. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

PLANUS Fab. Abundant.
DISTRIBUTION—EAST. Tweed Forth ♂ ♂ Moray o o o
WEST. Solway ♂ o o o

MELANOCEPHALUS Steph. Common. Lowland.
DISTRIBUTION—EAST. ♂ Forth Tay ♂ Moray o o o
WEST. ♂ ♂ o o o

DISCRETUS Fair. Local. Lowland.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

NIGRITA Fab. Common. Lowland, highland.
DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

CELATUS Clark. Rare. Highland. In tricklingwater.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. o o o o o

MONTICOLA Sharp. Rare. Highland.
DISTRIBUTION—EAST. o o Tay ♂ Moray o o o
WEST. Solway o o o o

LONGICORNIS Sharp. Very rare. Highland.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

ATRICEPS Crotch. Local. Highland.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway o o o o

TRISTIS Payk. Common.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

UMBROSUS Gyll. Local.
DISTRIBUTION—EAST. ♂ Forth Tay o Moray o o o
WEST. ♂ Clyde o o o

OBSCURUS Sturm. Not rare.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway Clyde o o o

VITTULA Er. Scarce. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway Clyde o o o

PALUSTRIS Linn. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ o o

INCOGNITUS Sharp. Rare.
DISTRIBUTION—EAST. o Forth Tay o Moray o o o
WEST. Solway o o o o

ANGUSTATUS Sturm. Scarce. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway ♂ o o o

LINEATUS Fab. Local. Lowland.
DISTRIBUTION—EAST. Tweed ♂ Tay o o o o o
WEST. Solway o o o o

LACCOPHILUS Schaum.

MINUTUS Linn. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway o o o o

HYALINUS De Geer. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

COLYMBETES Schaum.

FUSCUS Linn. Not common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. ♀ Clyde o o o

[**PULVEROSUS** Steph. Doubtful as Scottish.

"Forfarshire, Rev. W. Little."—Murray's Cat.

NOTATUS Berg. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o Dee o o o o
WEST. o o o o o

BISTRIATUS Berg. Common. Lowland, highland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

EXOLETUS Forst. Local. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. ♀ Clyde o o o

ILYBIUS Erichson.

FULIGINOSUS Fab. Common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

ATER De Geer. Not common. In marshes. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

OBSCURUS Marsh. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o [Dee] o o o o
WEST. ♀ Clyde o o o

[**GUTTIGER** Gyll. Rare. Lowland.

DISTRIBUTION—EAST. o o o o o o o o
WEST. ♀ Clyde o o o

"Frequent near Paisley, Mr. M. Young."—Murray's Cat.

ANGUSTIOR Gyll. Scarce. In mossy pools. Lowland, highland

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway ♀ o o o

LIOPTERUS Schaum.

[**RUFICOLLIS** Schal. Doubtful as Scottish.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

"Raehills, Dumfriesshire, Rev. Mr. Little."—Murray's Cat.

AGABUS Schaum.

BIPUSTULATUS Linn. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ ♀ ♀

WEST. Solway Clyde ♀ ♀ ♀

A Solieri Aubé. (*sexualis* Reiche.) is a small highland form of this species, and has occurred in Strathglass, Braemar, and Criffel. Ordinary Scottish individuals of this species are smaller and less developed than South of England or South European individuals.

TARSATUS Zett. Very rare. Highland?

DISTRIBUTION—EAST. o o o o o o Orkney o

WEST. o o o o o

CHALCONOTUS Panz. Rather common. Lowland.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o

WEST. Solway ♀ o o o

CONGENER Thunb. Abundant. In mossy pools. Highland.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee ♀ o o o

WEST. Solway ♀ o o o

ARCTICUS Payk. Local. Highland.

DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o

WEST. Solway Clyde Argyle o o o

STURMI Schon. Common. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o

WEST. Solway Clyde o o o

[**ULIGINOSUS** Linn. Doubtful as Scottish.

DISTRIBUTION—EAST. o Forth o Dee o o o o

WEST. o o o o o

"Rare, near Edinburgh; Aberdeenshire."—Murray's Cat. I think it probable that individuals of *A. congener* were mistaken for this species. *A. uliginosus*, however, has been found in Northumberland, so that it may ultimately prove to be a Scottish species.

PALUDOSUS Fab. Rather scarce. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o

WEST. o o o o o

NITIDUS Fab. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o Moray o o o
WEST. o o o o o

GATTATUS Payk. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed forth Tay Dee Moray o o o
WEST. Solway ∞ o o o

NEBULOSUS Forst. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway ∞ o o o

CONSPERSUS Marsh. Local. Maritime.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

AFFINIS Payk. Very rare. Lowland (?)
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o
Specimens of *A. unguicularis* have usually been mistaken for this species.

UNGUICULARIS Thoms. Not common. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde o o o

FEMORALIS Payk. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ∞ Moray o o o
WEST. Solway Clyde o o o

MACULATUS Linn. Common. In running water. Lowland.
DISTRIBUTION—EAST. Tweed Forth ∞ Dee Moray o o o
WEST. Solway Clyde o o o

A small dark variety, *A pulchellus* Heer., occurs in some of the Highland lochs.

DYTISCUS Schaum.

MARGINALIS Lin. Common. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

PUNCTULATUS Fab. Not common. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ∞ Moray o o o
WEST. Solway ∞ o o o

LAPPONICUS Gyll. Very local. In highland lakes.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o Clyde Argyle o o

(To be continued.)

ZOOLOGY.

POLARITY IN THE GEOLOGICAL DISTRIBUTION OF GENERA AND ITS CAUSE.

(Continued from p. 73.)

BY THE REV. J. WARDROP.

THE objection moves the question from its proper point of view. Polarity professes to start from actually ascertained facts. The objection abandoning this, the only ground on which the theory can be either established or controverted, meets the inference, which it affirms, with an obstruction drawn from the contingencies of future discovery. Now, polarity does not assume a knowledge of palæontological facts complete in extent. It assumes only a representative completeness—a completeness in kind. And who is entitled to say that the facts known give not a specimen of the true relations of the whole? Since, too, the generalisation deals with the amount, not of individual life, but of generic life, is there not something in that that gives the facts a higher chance of being truly representative? Then again it is not the part of inductive reasoning to be either solicited to a conclusion or deterred from it by any surmised testimony of the unknown, or any anticipated revelation of the future. It only seeks, what with a true instinct polarity seeks, to give to the facts which are actually submitted to its treatment, their full interpretation. In any path of investigation, the facts known, however few they may be, are not scientifically exhausted till all the general views they can suggest, all the laws and theories they can, as they stand, legitimately warrant, are brought to their interpretation. As we must not too readily or too far presume on the unknown, so neither must we at all ignore the known. And if polarity or aught else be a competent rendering of the facts already

gathered and registered, science has not discharged her functions with respect to them till it be acknowledged. She has no alternative but to discover, accept, and proclaim whatever is a law of present experience. Is a polar arrangement in the production of genera part of the evidence of the facts ascertained? That is the whole question in the first instance. If that were settled affirmatively there would then of course arise a second, as to the cause that might be supposed to determine such a state of things. A question which Forbes did not contemplate, and which would now emerge with an interest and a hopefulness that nothing before the day of Darwin could have given it.

As to the question, then, of the reality of a polar arrangement of genera in geological distribution, what is the evidence at command? It is not entirely to seek. At the very moment when Forbes first broached his theory, there was passing through its second edition the standard work of "Piclet on Palæozoology." If you had undertaken the simply mechanical task of counting up the genera with the production of which each geological formation was in that work credited, you would have found your figures, somewhat to your surprise in view of this theory, assume an arrangement something like this. *(See Table.)* This Table, even discounting, as it does, the advantage which the admission of recently originated genera would have given, offers about as polar an arrangement as could well be. There, of a truth, the force that diversifies organic structures to the extent of generic distinctness, as it works along the axis of geological time, begins with maximum intensity of action; then lowers towards a minimum in Permian and Triassic times; from that minimum again gathers strength gradually till with a second maximum it ends in the Tertiary, as it had begun with a first in the Silurian, epoch. It is not known in what detailed and tabulated shape Forbes would have presented the proof which he considered himself to have ready at hand; but this result seems to show that the facts at the time known might have been cast into some shape of preponderating evidence in his favour. It is certainly remarkable. With respect to the Palæozoic period in Silurian times, the earliest, there are produced more animal forms generically distinct than in all the other later Palæozoic formations together, and in the Permian

POLARITY IN THE GEOLOGICAL DISTRIBUTION OF GENERA.

A.—Law of the Facts.

I.—Numbers from Piclet (and D'Orbigny).

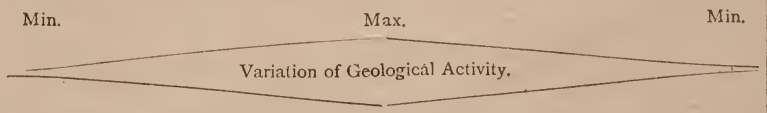
	PALÆOZOIC.				NEOZOIC.			
	Silur.	Devon.	Carb.	Perm.	Triass.	Jurass.	Cret.	Tert.
Protozoa.....	2	...	2	...	8	19	47	33
Radiata.....	66	19	17	1	19	100	92	75
Articulata..	55	5	11	2	9	51	19	63
Mollusca....	90	35	20	10	18	82	91	106
Vertebrata.	2	37	44	16	34	89	84	486
	215	96	94	29	88	341	333	763

II.—Forbes's Theory

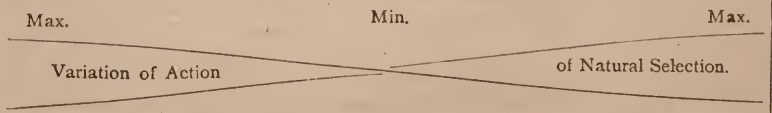
Maximum Devel. of Palæ. Gen. — Minimum Devel. of Palæo. and Neó. Genera. — Maximum Devel. of Neo. Gen.

B.—Physical Theory.

I.—Wallace's, ...



II.—From Darwin,



age, the latest, only a fraction of the produce of any other. Similarly, in the Neozoic period, the Tertiary epoch claims far more than all the previous formations together, while the Trias again, the earliest, produces, like the Permian, only its fractional part.

The grade of the organisms in the scale of animal perfection is of no account. It is the amount of diversity of type alone that is in question, and that is not affected by the consideration how low or how high in the scale, were the forms which the terrene conditions of the time were fitted to produce or maintain.

It may be pointed out that the amount of genera originating in Cretaceous times is a decline on that in Jurassic, so that the theory on that point seems to break down. But, on consideration, the exception may be felt rather to establish than abolish the rule. Of all formations the chalk is the least known or perhaps knowable in an adequately representative manner. It has been nearly swept away—its rocks and its forms of life together. The wonder is, as compared with the Jurassic, that we have so many genera. An enormous lapse of time separates all known Cretaceous rocks from the Tertiaries; whilst the evolution of organic forms takes in the interval a tremendous leap—there being little community of generic forms, vertebrate or invertebrate, uniting the two. The former fact explains the latter. Probably for long cycles to come there will be no resurrection of the intermediate deposits laid down at the cost of the chalk. If we could recover them, doubtless they would disclose the line of continuity, physical and vital, and reveal how much richer in generic forms the chalk really had been than we now find it. There is no other way of explaining the new and far different types of Tertiary ages, or the universal unconformability of Tertiary rocks to the Cretaceous and the denudation to which the latter have been subjected.

But it will be suggested, this generalisation is now eighteen years old—a very old age considering the rapid progress of scientific research meanwhile. Facts bearing on the point must have accumulated largely. Piclet must by this time be much in need of a third edition. Suppose it were got up, and the science brought down to the present day, would the result read as before? It is the progressive accumulation of

facts that tests and establishes or invalidates the soundness of any scientific theory. Does polarity stand that test? I have not been able to make an investigation of the recent additions to Palæontology adequate enough, and am therefore not able to speak with assurance. I observe that Mr. Wallace, who republishes last year the explanation he suggested seventeen years ago, of the facts of which polarity professes to be an expression, appends no note to the effect that the facts have assumed in these years any other form of arrangement. And so far as I know their polar arrangements still stands much as it did. Great additions to fossil genera have been made; and notably to Triassic genera from the St. Cassian beds in the Austrian Alps, as well as those of the oldest periods by Barrande's researches. But I have seen nothing that forbids the conclusion that the earliest Palæozoic and the latest Neozoic formations have on the whole been the greatest gainers, and still show as much as ever, two maxima of generic development. It may be noted that the fact of the Silurian maximum maintaining its place goes to weaken any objection for negative evidence and to corroborate the truly representative character of the ascertained facts.

Besides the growth of Palæontological facts, it may also be objected that the advance in physical geology bears most unfavourably on this polar idea. The one of the extremes of the geological series with which it deals, the Tertiary, remains of course where it was, but what was the other pole has, through the hammer of the geologist and his speculations together, receded immensely farther back; so that Cambria and Siluria may now stand chronologically about the middle of the fossiliferous deposits, or what have been so, instead of being the earliest. "If the theory of natural selection be true," says Darwin, "it is indisputable that before the earliest Cambrian stratum was deposited, long periods elapsed, as long as, or probably far longer than, the whole interval from the Cambrian age to the present day; and that during these vast periods the world swarmed with living creatures." Yet, at the worst, we may take the Silurian as the completion of the first cycle of the earth's course of evolution, the time and the whole state of things, in which the characteristic agencies and conditions of that cycle had reached their goal. It is the results of the earliest

developments of the life-bearing earth summed up; and is thus still the starting point for all future developments. By that time, according to Darwin, in the same section of his work on the "Origin of species," there is some reason to conclude that a complete revolution of the earth's surface had been effected, whereby oceans have since spread themselves out where continents before lay, and continents have arisen where clear open oceans flowed before. This is given as a hypothesis that may possibly be found yet to explain an otherwise inexplicable difficulty—"the difficulty of assigning any good reason for the absence of vast piles of strata rich in fossils beneath the Cambrian system." The earth, it appears, on her march of evolution, having reached the Cambrian stage, then shifted step, as it were, and began to move on along a new line, inaugurating thus a new cycle—the one to which we and the theory in hand belong, the only one that has left clear traces of its course and its character. The old solid earth had become submerged under our present oceans; and the old oceans had their bottoms elevated to be the foundation of the new *terra firma*. This may have been. It explains the loss to observation of the course of previous evolution. But still the earth's known history lies all between the era of that extreme exchange and this: so that if, at the worst, Cambria and Siluria are the goal of a primeval development and the starting point of a succeeding one, at the best they may be the initiation of the only cycle of evolution through which the earth as yet has run. However it may be, it is in the stretch of time between the base of the known geological series and its highest strata that there is, as we have seen, some ground for holding a law of polarity in the distribution of genera of organic beings.

I now pass to the question of a physical theory to account for the profusion of genera at the geological poles. And here let me at once go the length of asking, may it not be possible that natural science during the last decade or so, working entirely in oblivion of the ideas of this Forbesian theory, and even notwithstanding the obstacles in the way of these ideas it seemed in its advance to be raising, has nevertheless actually fallen on results that are capable of being regarded as demanding, and therefore as applicable to account for, the very state of things which polarity describes? Would not the doctrine of

evolution through natural selection, which explains so much else in the field of natural science, explain also why genera were produced in the varying manner asserted by Forbes? It was the impression that this idea may not be altogether groundless that induced me to trouble the Society by now calling to its remembrance such a forgotten and hopeless-like subject as "Polarity in the distribution of genera."*

Polarity is a law of observation—a generalised expression of the observed arrangement of the facts concerned. It is a law of the same class as was in Kepler's hands, the law of the Ellipticity of the planetary orbits. Kepler, with his law of the observed motions, had to wait for Newton with his causal theory of these motions. In like manner, if Forbes were right in that law of palæontological observation, which he called Polarity, he waits for his Newton with some causal theory showing what makes the facts so. And the question I am putting is this, Has not recent science furnished the cause wanted? Is there not something in the hypothesis of natural selection as the *vera causa* of the indefinite modification and transmutations of organic forms—in its conditions, its methods of operation, and its results, that would determine the facts to be somewhat just as polarity describes them? On a consideration of the conditions under which natural selection works favourably and otherwise, and of the conditions under which, by geological evidence it has actually operated from first to last, it would indeed seem as if an explanation of this polar distribution of genera might be given largely in terms of the Darwinian theory. Mr. Wallace, though he argues against the possibility of establishing any such generalisation of the facts himself, strangely argues a theory to account for their being as that generalisation asserts they are. His explanation is shortly this, geological activity argues diminished production, geological repose increased production, of the specific and generic forms: so that if a maximum number of genera be concentrated in the earliest and latest formations, and a minimum in Permian and Triassic formations, we have only to suppose that there was geological repose in the earliest ages of life, with a fit maximum of generic forms corresponding; that intensity of geologi-

* This paper was read to the Perthshire Society of Natural Science.

cal action increased towards the Permian age, when it reached a maximum coincidently with the minimum of generic production; that onward through the Neozoic formations geological activity lessened again till it ended with a second quiescence and the second maximum generification.

This, it will be seen, goes quite beyond Forbes's position. He gave an empirical Law. Wallace, supposing that law established, suggests a physical theory or cause. He plays Newton to Forbes. But with what success? Would the facts of physical geology allow of an explanation of polarity or of anything else on the terms of Wallace? There is evidence enough of intensity of geological action at the middle of the series, but where is the proof of repose at the extremes? And even if the alterations of geological activity and quiescence were in accordance with Wallace's supposition, what is this he asserts of their respective biological influences? Does geological repose account for an accelerated production of generic forms? Does activity account for an arrest thereof? With ample authority the hypothesis of natural selection reverses this order of cause and effect. And altogether it seems to offer such provisions as would promise Forbes his Newton rather in Darwin than in Wallace.

(To be continued.)

SCIENTIFIC NOMENCLATURE.

By the EDITOR.

"The laws requisite for the correct name of an animal or of a plant have become as difficult to establish as the most intricate legal question."—AGASSIZ.

MANY of my readers must be aware that for some time past a fierce war has been raging among entomologists on the subject of nomenclature, and that most entomologists have ranged themselves on one of two sides; one party contending that the law of strict priority should be applied in all cases, the other that a name long used and well-known, though not the oldest, should be retained in preference to a name little known and used, even though the latter has the right of priority.

This bone of contention is of no recent date, for in 1842 an attempt was made to meet the difficulties of the case by a code of rules adopted by the British Association for the Advancement of Science, but which, however, never received the general assent of naturalists, and has long been out of print. A revised code was adopted in 1865, but seems not to have received a better reception than its predecessor.

At the last meeting of the American Association for the Advancement of Science, a committee was appointed by the entomological section, "to report a series of rules for consideration at the next meeting," and in reference to this matter, Mr. W. H. Edwards contributes an interesting paper to the "*Canadian Entomologist*" for February.

After noticing what has been written on the subject, Mr. Edwards submits a code of rules (extracted from the writings of various entomologists of celebrity) for consideration by entomologists.

On the whole Mr. Edwards' suggested code (though meant only for entomologists) seems calculated to meet the difficulties of the case.

It would be absurd, however, for entomologists to separate themselves from other naturalists, and to have a code which should apply only to one branch of natural science. I have therefore made a few alterations in the code, and herewith submit it for consideration.

THE LAWS OF THE SCIENTIFIC NOMENCLATURE OF SPECIES AND GENERA.

1. The names of species and genera must be Latin, or Latinized to that extent that renders them capable of being used in scientific Latin. (Sharp.)

2. For a name to stand, it is necessary that there be an intelligible description or a recognizable figure in the case of a species, and a definition of the essential characters in the case of a genus: in both cases publication is necessary. (Thorell.)

3. Names once given are not to be altered or set aside for any defect or errors. (Sharp.)

4. The name originally given by the describer of a species

shall be permanently retained, to the exclusion of all subsequent synonyms. (Brit. Assoc. Code).

5. In determining the priority of specific and generic names, notice shall be taken only of those works, in which the Linnean binomial system of nomenclature (propounded in 1751) is exclusively and consistently employed. (Thorell.)

6. If a name is placed after the name of a species it shall be that of the author who first described the species.

7. A generic name when once established shall never be cancelled in any subsequent subdivision of the group, but retained in a restricted sense for that portion of the original genus which was considered typical by its author. (Brit. Assoc. Code.)

8. When a name is placed after the name of a genus, it shall be that of the author who established the genus in the sense in which it is actually used. (Sharp.)

9. The same specific name may be employed in different genera, but it is advisable that the genera should be sufficiently remote from each other. (Staudinger.)

10. The name employed for a genus in one branch of Zoology may be also employed for a genus in another branch of Zoology or in Botany, and *vice versa*, but it is not advisable.

11. The name employed as a generic appellation may be used as a specific one in the same genus, but such a use is not advisable.

Simple as rule (1) is, and almost unnecessary as it appears to be, yet the following cases for example (not to mention the celebrated *Amphionycha knownothing*) seem to prove that some such law should occupy a prominent position in a code of scientific nomenclature:—*Aulocera Werang* (so called apparently from having been found in the *Werang* Pass) and *Hesperia Illinois* (from the state of that name). Our American friends seem to be the chief sinners in this respect.

In regard to rule (3) it has been asked if, supposing a letter be inverted in the name of a species when published for the first time, the misprint is to be perpetuated in all subsequent printings of the name, and it has therefore been argued that mis-spellings (such as *gallii* for *galii*, *Zeuzera* for *Zenzera*, &c.) should also be corrected; but it seems to me that, whereas in the first case we cannot be said to have a word at all, if an

inverted letter (which, in such a position, is not the symbol of any articulate sound) be retained, in the second we must retain the mis-spelling, for "it matters not in the least by what conventional sound we agree to designate an individual object, provided the sign to be employed be stamped with such an authority as will suffice to make it pass current."

A great deal has been written for and against a literal interpretation of rule (4). I agree with those who hold to a literal interpretation, and for this reason, that if all naturalists of this day were to agree to use only those names which are in use though not having priority, it by no means follows that their successors will bind themselves to follow such an interpretation, but if they adopt the *oldest* names given under the binomial system, then the matter is settled for ever. "All that we can with any justice demand is, that the original name by which a species was first baptized should be recognised to the *exclusion of all others, if it be possible to determine the name with accuracy.*" (Agassiz). "The changes necessitated by an application of the law of priority to the names of species are comparatively small, but appear more extensive than they really are because they necessarily occur most frequently among common species." (W. F. Kirby).

Various dates (1766, 1758, &c.,) have been proposed as the period farther back than which the law of priority should not be carried. Linnè fully and distinctly propounded the binomial system in the *Philosophia Botanica* in 1751 (though he did not apply it universally till 1758), and there can be no reason whatever (as Dr. Thorell remarks) why authors who adopted and systematically applied it should be set aside.

In regard to rule (6), botanists generally, and zoologists in some countries, do not adhere to the principle that the name placed after the name of a species should be the name of the describer of the species, for in those cases where new genera are established for the reception of previously described species, or where a species is removed from one genus to another, the name of the founder of the new genus, or of the remover of the species, supplants that of the original describer of the species. Against this practice several reasons may be brought forward. 1st,—That it is an inducement for vain-glorious individuals to found new genera without sufficient reason, in order that their

names may appear after the name of the species. 2nd,—That it increases an already overburdened synonymy; and that, without the synonyms being given, a species described by Linnè (say) will appear to have been only described by a recent author. For example, *Sisymbrium nasturtium* L. becomes *Nasturtium officinale* Br.; *S. sylvestre* L. becomes *N. sylvestre* Br., &c., and thus, as far as appears from the names, these species were unknown to Linnè. 3rd,—That it is not fair to the original describer. 4th,—That those who practice it are not consistent, sometimes using the name of the author of the genus, and sometimes that of the describer of the species. For example, L'Heritier founded the genus *Erodium* out of part of *Geranium* L. If botanists therefore followed their rules consistently we should have *Erodium cicutarium* L'H.; but instead of that, I find, on consulting five recent botanical works, the following, *Erodium cicutarium* L.; *Erodium cicutarium* L'H.; and *Erodium cicutarium* Sm. in the three remaining works. Again, in one of the most recent British Floras, two Linnean species (*Valeriana rubra* L. and *Serratula alpina* L.) are placed in the genera *Centranthus* DC., and *Saussurea* DC.; but in the one case we find *Centranthus ruber* DC., and in the other *Saussurea alpina* L. And many other cases might be cited. Staudinger ("Catalog" p. xv.) notices a good instance of how this practice may be carried out to an absurd extent. Guénée cites an *Anophila Ramburii* Clercke, from which it follows that Clercke, who died in 1765, dedicated a species to Rambur, who was not born till 1802!

In reference to rule (8) "Carabus of Linnæus included all the insects now comprised in the family Carabidæ, at present divided into several hundreds of genera. To write therefore *Carabus* Linn. when we mean something else may be usual but is not desirable." (Sharp).

In rule (10) it might be better to enact that the same generic name cannot be used twice, but at the same time that the rule should not be *retrospective*, so that names already doubly used be permitted to stand. It might be a matter for consideration, however, whether even this should be allowed.

Though the use of the same word in one and the same genus, both as a generic and specific appellation (rule 11), has been deprecated, I do not see why a name should not be so

used, and instances are not wanting where such a combination exists, *e.g.*, *Cossus cossus*, *Vertigo vertigo*, &c. If rule (4) be adopted we shall have other cases, such as *Nasturtium nasturtium* L. (= *Nasturtium officinale* Br.) &c.

One or two additional rules may require to be framed to meet certain special cases. To these, however, (or to the rules of the nomenclature of families,) I shall not direct attention on the present occasion.

A BRITISH NATURALISTS' AGENCY.

WE have much pleasure in laying before our readers the following suggestions for the establishment of a "Naturalists' Agency" in Britain. The object of, and advantages likely to accrue from, the institution of such an agency are fully explained in our correspondent's letter, so that we need not allude to them further than to say that we trust that such an agency will be soon established, and to entreat all readers of the *Scottish Naturalist* to assist. We shall be glad to answer any enquiries about the matter.

"Wishing as I do to call the attention of naturalists generally to what I believe to be a desideratum in this country, I would be much obliged by the insertion of the following statements and suggestions in the pages of the *Scottish Naturalist*, with a view at some future time of seeing the suggestions laid before the British Association for the Advancement of Science for its consideration and support.

A few years ago a Naturalists' Agency was formed at Salem, Mass. U.S., N. America, and was called "The American Naturalists' Agency." Since that time the Agency has flourished and brought forth abundant and good fruit, and in an incredibly short space of time has become the acknowledged medium for the sale of the proceedings of all the learned societies in America, and through which advertisers on all natural history subjects make known their wants. The objects of this Agency are stated at length in their prospectus, which is transcribed further on. Some of the more important of these objects, however, I may be permitted more directly to call attention to.

The first mentioned in the prospectus is, "To facilitate the purchase of Works on Natural History." Now, many authors who write for journals or for scientific societies, and who retain the copyright, have no *easily attainable* means of distributing copies of their papers; and on the other hand, there are many who have no *easily attainable* means of procuring them. The latter class of people must either obtain copies from the authors, or perhaps purchase a whole volume or whole part of the proceedings, neither of which means are always easily attainable. In America, copies are thrown off of all valuable papers, and the Agency dispose of them for the authors, or procure them for the public.

Another object of the Agency is the *republication* of valuable pamphlets or standard works, and reprinting and *repageing* separate papers or other portions of the proceedings of societies. In order to accomplish this the Agency has secured the support and encouragement of the various learned societies throughout North America. Moreover, the American Agency often reprint valuable pamphlets which were originally published in other countries (especially in Great Britain), but which are now out of print in these countries. No more striking instance of this can be cited than the following:—The British Association for the Advancement of Science some years ago published a Code of Rules, for the guidance of authors and naturalists, on Scientific Nomenclature. In this country it was soon bought up, and became out of print, but in America it is still in circulation, and doubtless hundreds of copies lie ready for the hundreds of young naturalists who in time must learn and keep these rules. In this country I am sure there must be a great many young naturalists who are utterly ignorant of such a pamphlet, and that not through any fault of their own, but simply because it has been allowed to go out of print. Surely an association which professes to advance science should see that such a valuable "grammar of nomenclature" should be within the reach of every young student, and should never allow it to go out of print. I think, further, that effectual means should be taken to prevent in future all valuable pamphlets, books, papers in societies' proceedings, journals, or even in newspapers, from going out of print; and I think that an Agency ably conducted could effect this, for, does not the prospectus of the American

Naturalists' Agency tell us, "The facilities of the Agency for the sale of works relating to Natural History are unsurpassed in this country."

For the benefit of those who feel interested in the subject, I give some extracts from the prospectus of the American Naturalist's Agency :—

"In order to facilitate the purchase of works on Natural History, the editors of the Naturalist have established an Agency for the sale of such works, and any publication mentioned in the following list can be obtained of the agency at the prices annexed.

The prices given are those affixed by the owners of the books. It is particularly requested that parties sending works on sale will price their books as low as possible.

The Agency will also keep on hand for sale, at publication prices, the late and standard works in the several departments of Natural History. Orders will also be taken for works not on the list, and for foreign publications.

All orders for books given on the list must be accompanied with the amount specified, *and books will not be forwarded until the money is received.*

The Agency is prepared to publish for authors any first-class work on Natural History."

"The many letters which we received requesting information about obtaining books and papers on topics of Natural History, induced us to establish an Agency at the office of the *American Naturalist*, for the purpose of supplying Naturalists with Books and Pamphlets, and aiding Authors and Institutions in selling their various publications on the following plan :—

Parties to send to us several copies (not exceeding twenty, unless specially requested) of each book or pamphlet they have for sale, stating the *retail price.*

An account will be opened with each party sending, and credit given at the retail price for all books received.

Parties will be charged on their accounts for any transportation expenses which we have to pay when receiving the packages, which should be sent to us by mail (prepaid when not too bulky).

A classified list of the books will be given from time to time in the *Naturalist*, with the prices of each annexed, and the amonnt to be remitted in addition for postage.

Yearly accounts of each party will be made up, and a statement forwarded regarding the number of copies on hand, and the sales that have been made, for which the cash will be remitted, after deducting any express charges incurred on the receipt of the books, and our commission to defray the expense of the advertisement, &c.

Parties having works on Natural History which they wish to dispose of, can send them to us on the same terms.

We also give in our list notices of the various Scientific Periodicals, and the regular publications of Scientific Societies and Institutions that have made us their agents.

It will be part of the business of the Agency to procure, if possible, any works on Natural History, other than those on its list, that may be ordered.

To Institutions and Societies publishing Proceedings, Transactions, Memoirs, &c., the Agency is proving of great benefit, and authors having extra copies of their own papers for sale are finding it to their advantage, in thus making their papers more widely known."

Now, the above are only some of the advantages which would flow from the establishment of an Agency in this country such as I have attempted to indicate. The very presence of such an Agency would *create a demand* for scientific knowledge. Many small country reading-clubs, many libraries, and many naturalists residing at a distance from the centres of scientific circles would, I believe, hail the advent of such an Agency with pleasure. They would then be enabled to purchase good scientific literature at a low price. By means of the American Naturalist's Agency, I for one have *never failed* in procuring easily any paper read at any meeting of any learned society in the United States that I have applied for; but in this country (mark the contrast) I have *never* succeeded in doing so, without purchasing either a whole volume or a whole number of a volume of the Proceedings, except in such cases as I have received separately printed copies from the authors. Surely science might be advanced by a more general distribution of scientific papers. Again, many appendices to works on Travel are thus lost to the general naturalist public, and notably I may instance the appendices to the earlier Arctic and Antarctic "Voyages." An agency could reprint and repage these appendices, and, I believe, find a sale for them both in this country and in America.

An American correspondent of mine has repeatedly expressed surprise that no such agency exists in Great Britain, and I have often experienced great difficulty in obtaining pamphlets here which my American correspondent wished to procure. I am sure many others must have felt the same difficulty.

Again, to show the enormous circulation and sale of pamphlets, &c., in the United States, I cannot do better than quote in part the Annual Report of the Librarian of the Academy of Natural Sciences of Philadelphia. He tells us that in 1861 the number of donations to the library was 1681. Of these there were 380 volumes, 1295 pamphlets, and 6 maps; so many were folios, so many quartos, &c., &c. Of these, editors presented 157; authors, 209,; societies, 629; and one private indivi-

dual no less than 208; 160 others were purchased by the Library and "Wilson" funds; and the remainder were received from other sources. Of these there were 328 on Conchology alone; 103 on Geology; 45 on Entomology; 39 on Botany; 33 on Ornithology; 53 on General Natural History; besides quite a large number of others on different scientific subjects.

More to recommend the above suggestions I cannot well say, but I think the statements cannot fail to show how great a boon to naturalists a similar Agency in this country would prove, provided it were ably conducted, and fully acknowledged and supported by the leading scientific societies. Scientific circles in time, I believe, would be enlarged, and not be confined to the metropolis, or nearly so. There are plenty of good men out of London, Edinburgh, Glasgow, and the large towns, who have no opportunities of reading, being removed from the principal scientific libraries.

Not one individual, nor indeed any one society, could set such an undertaking afloat, with all the necessary careful and exhaustive machinery of management which would be necessary for its success. But if all the leading societies would jointly discuss its merits and demerits, and at length bring it carefully and repeatedly before the notice of the British Association, I see no reason against its ultimate complete success. But to arrive at this first step it is necessary to ventilate the suggestion, and this cannot be better done, I believe, than by bringing it before the notice of the local societies, and asking each to assist in bringing it finally before a higher court."

JOHN A. HARVIE BROWN.

MEMOIRS ON SCOTTISH TENTHREDINIDÆ.

BY P. CAMERON, JUN.

No. II.—NEMATUS DEGEERI.

TENTHREDO DEGEERI Klug; *Die Blattwespen* No. 169.
T. GEERI Stephens; *Ill. Brit. Ent.* vii. p. 80. No. 25.
DINEURA DEGEERI Hartig; *Die Blattwespen*, &c., 227, No. 1.
NEMATUS DEGEERI Thomson, *Hymen. Scand.*, 80, No. 1.

THE larva of *Nematus Degeeri* is one of the commonest birch feeders in Scotland; in some localities it may be found in very great numbers. Stephens, alluding to the perfect insect, says in his Illustrations, that it is "apparently very rare" in the south, and the imago is certainly not so common as the larva.

Larva.—Head somewhat roundish, narrower than the second segment, light shining-green, with a yellowish tint, covered with short white hairs; eyes small and deep black; mouth organs brown, mandibles black at the tip; feet, light whitish-green; claws brown, black at the extreme tip. The fourteen claspers, light green like the body; the fourth and eleventh segments have none. The body when old is whitish-green throughout, without any marks whatever. The segmental divisions are well marked, being much whiter than the other parts; when filled the dorsal vessel is noticeable by being dark green. A very few short hairs are scattered over the skin. The larvæ when young have a brighter and greener tint than when old. The body is flattish, broad at the thorax, getting narrower towards the anus.

The larvæ are found gregariously, from August to October, on upper surface of the birch leaves, the epidermis of which they devour. They do not often eat it through, but only the upper portion, and when they do so, the fibres remain like a net-work. They are very sluggish and remain almost motionless, with the body closely pressed against the surface, and lying at full stretch on the leaves. I am not sure that they do not reside on the same leaf during all their larval life.

When the creatures become full-fed, they drop to the ground. In the breeding jar, the cocoons, which are oblong, about 4-5 lines long, were spun one against the other, on the under surface of the leaves or singly in the earth. The cocoon is thin, composed of two distinct coverings, but some larvæ, for some reason or other, only spin the inner one. After being some time in the cocoon, the larvæ become shorter and stouter, and the claspers shrink in. About the beginning of May they enter the pupal state.

The *pupa* displays all the parts of the future insect. It is bright green, with transparent white antennæ, feet and wings; the eyes brown. After the insects leave that condition, they re-

main some days in the cocoon, until the limbs become firmer, and get divested of the pupal covering, which sometimes appears to be a difficult matter. At this time the abdomen is greenish.

The larvæ described by De Geer (Memoirs, 2., pp. 266-7., No. 20, pl. 38., fig. 8-10), have been given by authors as those of this species; but those reared by me, and they were taken in different localites, do not agree with his account, in as much as their heads were green with a yellowish tint, not pale orange-yellow, and the dorsal vessel was not at any time remarkably conspicuous like his. I have, however, found, but failed to rear, some larvæ which agreed perfectly with his description, and their habits were identical, so that it may be after all merely a variety.

Imago.—Head narrow, reddish-yellow; eyes and a spot on the top covering the ocelli, black; lower half of the face whitish-yellow; mandibles brownish-black. The antennæ of the same colour as the head, and about the length of the abdomen. Wings long, with brownish nervures; costa and stigmal spot pale testaceous; feet, light reddish-yellow; the points of the posterior tarsi, blackish. The upper surface of the body is sometimes entirely black, with the exception of the last segment or two, but occasionally all the thorax is reddish yellow, or only the prothorax, or it may be of that colour with black spots. Some specimens have the last four or five segments also of that colour. Two white oblong spots are close to the scutellum, and on the anal segment are two sharp projecting prongs. The anal segment is covered with short hairs. The underside of the body is entirely reddish-yellow. Long. corp. 3½-4-lines; Exp. alar. 7-8-lines.

Variety, of the female. Antennæ, blackish-brown.

The saw is short and narrowish, slightly bent at the base; the teeth, twelve in number, somewhat triangular, more of a square shape at the apex, straw-coloured, with black lines going across from the teeth to the back.

The perfect insects made their appearance towards the end of May, and may be beaten out of the birch trees during June, but the larvæ have not been met with earlier than August.

After a careful examination of this insect, I can see no adequate reason why it and its allies should be formed into a

genus (*Dineura*) distinct from *Nematus*, with which they agree in almost everything except in having two instead of one marginal cell in the anterior wings, while from the foregoing description it is seen that the larvæ are likewise similar.

OBSERVATIONS ON THE ŒCONOMY OF THE PARASITES AND INQUILINES OF NEMATUS GALLICOLA AND OTHER GALL-MAKING SAW-FLIES.

By P. CAMERON, Jun.

(First Paper.)

THE insects which live at the expense of gall-making saw flies may be conveniently arranged under three heads. 1st, *Inquilines.*—These feed on the substance of the galls, not on the larvæ of the saw-flies, the death of which, however, is the invariable consequence, and are mostly *Curculionidæ* and *Micro-Lepidoptera.* 2nd, *Parasites.*—These devour the larvæ, sometimes as internal, but more frequently as external feeders, and belong to the hymenopterous families *Ichneumonidæ* and *Chalcididæ*, as well as to the order *Diptera.* 3rd, *Casuals.*—Under this may be arranged sundry insects which inhabit the galls temporarily or permanently, and which are not injurious to the saw-flies, or to any great extent to the galls.

The saw-flies, especially *N. gallicola*, are subject to some form of disease while in the cocoon. A fungus appears to attack them (but it is doubtful if this is the primary cause of their death), and when the cocoons are opened, especially in winter and spring, they are found to contain nothing but a white woolly substance. I am not here alluding to the insects bred in confinement, but to those in a state of nature, and it is astonishing what a number perish thus in some localities. It can scarcely be caused by an excess of moisture, for the same thing happens to those kept in a dry room. I have made careful calculations regarding the mortality of *N. gallicola*, and, taking into account those killed by disease, inquilines, parasites, &c., consider that not twenty per cent. reach the perfect state. Of course, some localities and seasons are more favourable for them than others.

BALANINUS BRASSICÆ Fab.

This is the commonest species found in the galls of *N. gallicola.* It is also found, but very rarely, in those of *N. pedunculi.* I was not able to observe the manner of oviposition, or the eggs, but have found the larvæ when they could not have been more than a day or two out of them. They were then perfectly white, and the fuscous colour of the head was not so conspicuous as it was when they were of a more mature age.

When full-fed the larva is about 1½ lines in length; the head is narrower than the body, and is of a fuscous colour, with the mandibles, which are well developed, of a darker hue. It has neither legs nor claspers, but the segments, especially the anterior, are very prominent, and by their aid they manage to progress at a smart pace when ejected from their nidus; the colour of the body is of a shining pale-yellow. In form it is somewhat cylindrical, stout and flat-looking, with the segments decreasing a little in width towards the anus; a few hairs are scattered over the body.

The weevils devour the contents of the galls like the saw-fly larvæ, and have a peculiar energetic way of jerking the head in feeding or walking. Usually only one larva is found in a gall, but occasionally two, three, and in one instance four, were found living harmoniously together. After they have become full-fed, they eat a round hole in the side of the gall, and drop to the ground, to pass into the pupa state. In the breeding jar they moved restlessly about for two or three days before burying themselves in the earth, and a number which happened to be ejected from the galls before being full fed, completely riddled some willow leaves which were in the jar. Mr. Müller records* the interesting fact that they drop to the ground by means of a silken thread, but this does not appear to be always the case.

The galls which have been tenanted by the weevils may be easily recognised by the round hole in the side—the saw-fly larva escapes by a hole at one end—and by the smallness of the pellets of frass.

Six or seven days after having entered the earth, they cast off the larval skin and enter the third stage of their existence.

* Ent. Mo. Mag., vol. ix. p. 192, and vi. p. 137.

The pupa is shorter and stouter than the larva, and the abdomen is more sharply pointed. At first it is white, but after a day or two assumes a yellower hue; wing-cases, limbs, and proboscis white; eyes black. At the commencement of the pupal state, the proboscis is pressed rather close to the breast, but afterwards projects more from it. The limbs are laid along the breast. When touched or alarmed the pupa moves the abdomen about in a rapid and irritable manner. The larvæ rarely spin a cocoon in confinement, but occasionally they spin a rough one.

The larvæ are found in the galls from the end of June to the end of September. Several broods appear to occur in a year. The development of the insects will occupy about seven weeks. In some localities near Glasgow I found that fully forty per cent. of the galls were occupied by them; on the other hand, in some places they are not found at all, so that the total per centage of sawfly larvæ destroyed by them will be much smaller than that.

How does the weevil contrive to get rid of the proper tenant of the gall? Upon this point, I was unable to make any direct observations, but am strongly inclined to believe that it is distroyed in the egg, or at anyrate when a very young larva. This conclusion is based upon the following facts. I have found in a gall a very young weevil larva, and on the same leaf was another gall in which was an *egg* of *gallicola*. In another instance the two species were found living in separate galls on the same leaf; they were both in the first moult, but the weevil larva was clearly further advanced in its development than the other. These facts seem to point to the conclusion that the growth of the weevil is more rapid than the saw-fly, and they have been found shortly after the galls have arrived a maturity. Although I have examined some hundreds of galls never in a single instance were the two found together, and when a young weevil was placed in a gall with a saw-fly larva, and the gall carefully closed, it shortly afterwards cut its way out, leaving the other uninjured.

It is therefore evident that the inquiline being stronger, and coming to maturity faster than its companion, kills it, perhaps unconsciously, by its energetic manner of feeding. The eggs appear to be also deposited in galls where the larvæ are about

half fed, and in this case the struggle for existence must be harder, but the death of the host seems always to happen.

The larvæ of *B. brassicæ*, themselves almost parasites, are preyed upon by at least two Hymenopterous insects.

On the 26th of July, a larva of a small *Ichneumon* was observed crawling over one of the larvæ, which was then quite lively and evidently uninjured. The ichneumon soon fastened its mouth in the other's side, and I watched it, by the aid of a lens, evidently sucking it with great gusto, and giving now and again a twist to its body, as if wanting to get into a better position to enjoy its meal. While looking at it, I was disturbed and let the two fall to the ground, a distance of about four feet, and on immediately picking them up was interested to find the parasite in the same spot, and sucking away as vigorous as ever. By the 28th it had devoured the tail half of the body; on the 30th the rest of it was gone with the exception of the mandibles, and the parasite had spun up in a white cocoon. Even when full fed it was considerably smaller than the weevil. The dorsal vessel was of a reddish colour.

A still smaller insect, one of the *Chalcididæ*, is the other parasite. Although equally voracious it takes a longer time to finish the larva, and like the other sucks it from the outside. It does not spin a cocoon.

Both these insects feed likewise on the larvæ of the saw-flies.

Acentropus niveus—How to find and capture it.—I would advise any entomologist who wishes to become acquainted with the history of this very peculiar insect, to peruse Mr. Dunning's elaborate essay on the subject, which is published in the "Transactions of the Entomological Society of London, 1872." I am under the impression that the species is much more generally distributed in Britain than is generally supposed, and that on account of its small size and insignificant appearance, it is often overlooked. I purpose, therefore, to give a few hints how to find it. In the first place, it must be remembered by those who look for it, that the early stages of its life are passsed *in the water*, and that, consequently, the perfect insect is seldom found far from that element. It is found from the beginning of June till September with us in the south. The principal food of the larva are the various species of *Potamogeton*, but from recent accounts it appears the moths have been taken abundantly where *Potamogeton* was comparatively rare, but the American water-weed *Anacharis alsinastrum* was common. There was no proof, however, that the larva fed on the latter. I have found the moths most commonly in July. They begin to fly just about dusk close to the surface of the water, and seem to be *swimming* about in broken circles, and often glide out upon the mud at the margin of the water. Though they are very small, their white appearance makes them very

conspicuous, but their capture at night is not altogether easy or very remunerative. They can be taken, however, with a water-net, but whether in the net or not they are very active at night, and their perfection is soon marred. My plan is to find a spot where they are abundant at night, and go the next day to capture them. They settle upon boards, sticks, grass, or any kind of herbage *close* to the water's edge. In the day-time they are sluggish, and may be taken in pill-boxes, &c., off the objects on which they rest. They will also be found settled upon the weeds on the surface of the water, during the day-time. The flight of the insect, once seen, is not easily confounded with any other, and is not easily forgotten, as its erratic movements on the surface of the water reminds one in some degree of the eccentricities of the whirling beetle *(Gyrinus natator)*. I believe it is generally found in abundance where it does occur. In 1871, when I first detected it here, it swarmed to an incredible degree, but last season it was not so common.—G. B. CORBIN, Ringwood, Hampshire.

A New British Dipteron *(Laphria flava)*.—In the second week of August of last year, and during a four days' excursion along the Don, we stayed a day at Colquhomy Inn, situated in that portion known as Strath-Don. On the opposite side of the river to the inn was a slight rise, the incline of which was rather steep, and was covered with long moss, heather, coarse grass, &c., and with fir trees pretty thickly over it; here it was the good fortune of one of our number (Mr. H. Williamson) to capture a specimen of a large fly, which turned out to be a species of *Laphria*. I sent the insect up to Mr. G. H. Verrall, and he has identified it as *Laphria flava* L., new to Britain. The specimen is a female, measuring in length 10 lines, with an alar expanse of 17 lines; the thorax and abdomen are thickly covered with tawny hairs, those on the thorax being rather the longer; the legs are very stout, with black hairs, the tibiæ more or less with light tawny hairs. The head is clothed with long stiff black hairs, the first two joints of the antennæ with tawny hairs, and a row of these extends downwards on each side internally to the eyes, till half-way down the face. Among the *Syrphidæ* which I also obtained there were a single male of *Sericomyia superbiens* Mlr., (*Arctophila mussitans* Fb.); *Sericomyia borealis* Fln.; and *Helophilus pendulus* L., which are common everywhere.; *Eristalis intricarius* L., *E. horticola* Dg., *E. fossarum* Mergle., and *E. rupium* Fb. This last Walker gives as "rare; in Mr. Stephens' collection." I obtained several specimens of it, but that is the only time I have taken it in Scotland. Of the *Cheilosiæ*. I took one or two of *C. æstracea* L., and a number of *C. chloris* Mg.—W. A. VICE, 15 Union Terrace, Aberdeen.

Notes on Lepidoptera in 1873.—As notwithstanding the late spring, the times of appearance of certain Lepidoptera this spring are considerably earlier than they were last year, the following notes may be of interest. The dates within brackets are those of 1872. *Melanippe biriviata* May 21st (June 9th), *Venilia maculata* May 22nd (June 17th), *Noctua plecta* May 29th; hawthorn just beginning to blossom, and some of the oaks scarcely shewing leaf yet. *Chærocampa porcellus* about June 1st (22 days earlier than 1872), *Emmelesia albulata* 14 days later, and *Dianthœcia cucubali* 24 days earlier than 1872. *Fidonia piniaria* (female) May 8th (June 8th female, May 19 male).—THOS. MONCREIFFE, Moncreiffe, Bridge of Earn.

[Possibly the exceptionally mild weather at the end of December and beginning of January may have so far brought the pupæ of these insects to perfection that on the first warm weather after the late spring the perfect insects were able to appear at once.—EDITOR *Sc. Nat.*

PHYTOLOGY.

HOBKIRK'S "SYNOPSIS OF THE BRITISH MOSSES."

THOUGH a new work on British Muscology was much needed, owing to all existing works on the subject being out of date, the announcement made last year by Mr. Hobkirk, that he was about to publish a Synopsis of the British Mosses took most botanists by surprise. It is also unquestionable that after its announcement this new work was looked for with a good deal of curiosity, and not a little misgiving. The reasons for this are manifest. Mr. Hobkirk was not generally known as a muscologist; he had gathered nothing of any consequence; he had distributed nothing; he had published nothing; and he had not added a single new species to the British list. British muscologists had been so accustomed to Berkeley's handbook, Schimper's Synopsis, and Wilson's Bryologia—all expensive works written by world-renowned botanists—that there was some wonder among them as to what would be the character of a work offered to subscribers for 5s., and undertaken by one comparatively unknown. Moreover, the only work approaching to Mr. Hobkirk's in size and price is Stark's British Mosses, a work which certainly gives the mimimum of satisfaction to the student. The size and price, therefore, of the Synopsis, were not very suggestive of good things.

Mr. Hobkirk's work has now been before us for some months. We have tested it in the field and in the study; we have compared its descriptions of species with descriptions of the same species given elsewhere, and with actual specimens, and we have no hesitation in saying that it is not to be mentioned in the same breath with Stark's work. It is almost equal to Berkeley's, except that it has not a single figure of genera or species, and not a line of introduction. To the ordinary

student who has already made some progress in the identification of species, it has some advantages over even Wilson's Bryologia. In fact we know of only one work of the kind without any plates which is in every way superior to it, and that is Dr. Milde's Bryologia Silesiaca. With many merits, it has, however, not a few defects, and to both we would call attention.

The great merit of this Synopsis is the smallness of its size. Though it describes about 560 species, it consists of only 196 pages; and its lightness and general handiness allow the collector to take it along with him to the field without the least inconvenience, and to appeal to it in cases of perplexity. This can be done with no other book on British Mosses worth carrying. Even were this Synopsis twice its size it could still be carried about without any trouble. In fact its great excellence lies in its being a field-book, and we have no doubt but that many will do with it as we are doing, viz., have it interleaved, so that descriptions of omitted European and North American species may be inserted. In this way, when one goes away on an excursion, he can have along with him, in our most unaccessible wilds, descriptions of almost every species likely to be met with.

This most desirable result is attained by a severe economy of space. In such works as Bridel's Bryologia Universa, Schimper's Bryologia Europea, and Wilson's Bryologia Brittanica, the same plant is almost invariably described twice; first the more important characters are given, aud afterwards,—and usually in smaller type,—these are again described, intermixed with a considerable amount of detail. Mr. Hobkirk takes the rational way of at once saying all he has got to say in the way of description, and he thus avoids a good deal of the repetition which has made the works of so many of our earlier botanists unnecessarily cumbersome. Not only is space saved by this common-sense course, but one escapes the studying of two descriptions of the same plant, and thus time is saved as well as space. Again, the synonymy of species, which takes up about a third of the Bryologia Universa, and almost a fourth of the Bryologia Brittanica, is here entirely discarded; and, as a rule, only one name is mentioned in connection with one species. And this we consider to be quite right. To an

ordinary student, synonymy is really of very little use; and it is very little attended to. Besides we are, just now, very much at sea with regard to the true names and synonymy of many species, and will so continue until Lindberg publishes his work on the synonymy of European and North American Mosses—a work for which he has been ransacking such old herbaria and writings as those of Micheli and Dillenius.

In the above particulars Mr. Hobkirk has acted wisely; but we think he has done unwisely in not giving an introduction in which the structure, organs, biography, uses, &c., of Mosses could have been explained, and in which some indications might have been given of the channels into which bryological study is running at present. Such an introduction would have cleared away from the path of beginners a number of those difficulties which are so apt to dishearten all except the most resolute, would have at the outset invested the study with an interest which would have carried the student on over the threshold when his advance would then have become pretty certain, and would have shown reason for a probable departure from a system of classification which, though very easy, may be more artificial than philosophical.

The classification adopted by the Synopsis is mainly that of Wilson, which being founded very much on the position of the fruitstalk and the development and character of the peristome, very unnaturally removes some genera from those with which they are most intimately connected, and places them side by side with those to which they have not the most distant resemblance. In consequence we here have *Anœctangium* separated from *Gymnostomum* to which it is so closely allied in every particular, and placed in close contact with *Leucodon*, a genus as dissimilar as can well be conceived. With regard to the *Hypnaceæ* the classification of Schimper is followed with slight modifications.

Occasionally the classification of Mitten is engrafted upon Wilson's with rather comical results. Wilson lays great stress upon the presence or absence of a peristome, and so retains *Gymnostomum*, which has no peristome, as a distinct genus from *Weissia* which has, *Pottia* from *Anacalypta*, *Anodus* from *Seligeria*, &c. Mitten regards the peristome as of little consequence, and therefore unites *Pottia* with *Anacalypta*, and

Dr. Braithwaite, in the Journal of Botany, following out Mitten's principles to their natural limits, unites *Gymnostomum* and *Weissia* and retains the latter name for the genus so enlarged. Thus *Gymnostomum calcareum* and *G. commutatum* become with him who abolishes the genus *Gymnostomum*, *Weissia calcarea* and *W. commutata* respectively. Mr. Hobkirk, whilst retaining the genus *Gymnostomum* after Wilson, adopts the generic names of these recent aditions to our Moss-Flora, as given by Dr. Braithwaite and includes them in his own and Wilson's genus *Weissia*, forgetting evidently one of two very important things; either that he had in his Synopsis a genus *Gymnostomum* for the express purpose of embracing what some would call non-peristomical *Weissiæ*; or that the two mosses above-mentioned have no peristome!

A good deal may be said with regard to nomenclature, and two or three passages in the work before us give us an opportunity of touching on a point connected therewith. It is allowed on all hands that the name first given to a species should adhere to it ever afterwards, if possible, and that the name also of the nominator should be added thereto. Sometimes it is not possible to retain the generic name of a plant owing to the many changes which take place in men's ideas regarding genera, but in nineteen cases out of twenty it is possible to retain the specific name. Now we hold that the names of the original nominators of plants—the names of those who first distinguished them as species—should alone be attached to them as the names of their nominator. This is too frequently disregarded at the present time. In his Synopsis Mr. Hobkirk, for example, associates the name of Mr. Carruthers with *Seligeria paucifolia* as its nominator. Why should this be so when the plant was well known to, and named by, Dickson seventy years ago? And yet Dickson's name is never mentioned in connection with it! It is true he called it *Bryum paucifolium*, but everything almost was a *Bryum* or a *Hypnum* in his day, and genera had then much wider limits than now, though their limits have been once more expanding of late. Again, the name of Dr. Braithwaite is associated with *Tortula rufa*, which species all allow to have been first distinguished and named by Lorentz, who called it *Didymodon rufus*. But Mitten believes that *Didymodon*, *Trichostomum*,

and *Tortula* all form one great genus, on which he bestows the name *Tortula*. Of course, had Mitten had occasion to mention *Didymodon rufus* as included in this great genus, he would have called it *Tortula rufa*, and according to the modern system, his name would have come after it; but he, dealing with the general points of his classification and not with details, has no occasion to mention it. But Dr. Braithwaite, who follows Mitten's system, has occasion to mention the plant, calls it, under the compulsitor of Mitten's system *Tortula rufa*, and is perhaps the first to do so. On this account, the name of Lorentz appears within parenthesis as a secondary name in connection with the plant, and Dr. Braithwaite's appears as nominator in chief. No one will surely say that this is fair. But this is our modern plan, by which we have very much driven away the names of our older botanists from our books; and it is a plan against which we loudly protest.

In the Synopsis about 560 species are described. Several of these, such as *Campylopus brevifolius*, *Bryum apiculatum*, *Atrichum tenellum*, &c., are admitted on insufficient authority or by mistake; whilst we observe an occasional confusion of species as when it is stated that *Trichostomum zonatum* and *Trichostomum tenue* var. *glaciale* are the same, we notice that *Dicranum glaciale* Berg. and *D. arcticum* Schpr. are described as two distinct species, whereas they are precisely the same plant under two names. *Hypnum Breadalbanense* and *Hyp. rupestre* B.W., seem to us not only misplaced among the *cupressiforme* group, but in all likelihood one and the same, and identical with *Hyp. sulcatum* Schpr. which again cannot well be other than a stunted state of *Hyp. falcatum* Bridel. Though these and others have to be subtracted from the number here recorded as British, a good number, principally of Scottish species, must be added. Among these are *Sphagnum papillosum* Lindb., *S. Kinlayanum* Wils., *S. Lindbergii*, *Phascum intermedium*, *Weissia compacta*, *Grimmia alpestris*, *Mnium insigne* Mitten, *Bryum fallax*, *Hyp. subpinnatum*, *glaciale*, *Starkii*, *Schimperi*, *Fontinalis minor*, &c. Besides, we notice an exceedingly large number of rather rare mosses set down as having been found only south of the Tweed or in Ireland, whereas they have been detected (often in many places) in Scotland—*Didymodon recurvifolius*, *Orthotrichum obtusifolium*, *Tortula pa-*

illosa, *Hypnum vernicosum*, *Bryum neodamense*, &c., are some of this class. Scotch collectors also have occasionally their honours wrested from them. Instead of Crombie being the first to detect *Seligeria tristicha* in Britain, that plant, so minute and so interesting, was first gathered in this country by Miss M'Inroy of Lude, a lady who has with much perseverance prosecuted the investigation of the mosses about Blair Athole, and has there found such plants as *Anodus*, *Seligeria pusilla*, *Hypnum Sommerfeldtii*, *Tortula princeps* and *Dicranum Grevilleanum*.

The descriptions of species are very concise, and considering their brevity, good. Occasionally one detects a slip, as when *Dicranum longifolium* is described as having a *slender* nerve. *Mielichhoferia nitida*—the form of it which grows in this country—is set down as the var. *gracilis*, but it should be referred to the var. *elongata*. *Grimmia Ungeri* is described as without an annulus by Juratzka. The statement is taken without question by Dr. Braithwaite and Mr. Hobkirk, but the plant has a very narrow but distinct enough ring. In the descriptions, we think that a great deal more attention should have been given to the inflorescence and areolation—a diagnosis of the latter being now often essential to the determination of species, and always useful. Perhaps the great defect in the descriptions is that they smack too much of the study of books, and too little of the plants themselves. To hit upon the great distinguishing characters of a moss under the microscope, or under the naked eye, is a thing Mr. Hobkirk does not unfrequently, but not quite so often as we could wish.

However, he has given us a singularly handy book, containing descriptions of about 120 species in addition to those given by Wilson, and he has therefore our sincerest thanks.

JOHN FERGUSSON.

SCOTTISH GALLS.

(Continued from p. 80.)

BY W. H. TRAILL, M.A.

QUERCUS ROBUR L.—(*h*) I last summer got "Oak-apples" at Banchory and at Ballater, both on Deeside. When fresh, they are soft, and covered with a reddish skin, and can be readily cut with a knife. *(i)* Gall of *Cynips (Aphi-*

lothrix) radicis Fab. For a specimen of this gall, from near Glasgow, I am indebted to Mr. Cameron, jun. It consists of a swelling on the root, made up of a mass of oval cells irregularly grouped, the walls coalescing more or less. The wall of each cell is very thin and compact, and the cavity is pretty large. Externally, each cell is about $\frac{1}{4}$-inch by $\frac{1}{5}$-inch. Outside the mass of cells is a layer of compact woody tissue, outside which is a loosely compacted layer. *(k)* Gall of *Biorhiza renum* H. The galls are attached to the chief veins on the lower surface of the leaf, usually in pairs, one on each side of the vein. For a time they remain small ($\frac{1}{3}\cdot\frac{2}{2}$-inch by $\frac{2}{9}\cdot\frac{3}{6}$-inch), and distinctly reniform, but in October they swell up to several times their former bulk, become nearly globular, and readily fall off the leaf. They are smooth, naked, and green. They are monothalamous, and thin-walled. Usually many occur on a leaf. They remain all winter on the earth, and produce their occupants in spring. Abundant at Dunkeld in September, and at Parkhill, near Aberdeen, in October. *(l)* Galls of *Neuroterus fumipennis* H. ? The insects reared from them this spring do not agree with Marshall's description (E. M. M., iv. p. 125), but the galls agree with those of this species. They are the size and shape of "oak spangles," but are flattened, with the centre slightly depressed. They are smooth, with hardly any hairs on their surface; usually bright green, but when on the upper surface of the leaf they are bright red; they become purple when dry. They are monothalamous. Usually they are scattered over the lower surface of the leaf, but occasionally occur on the upper. I have never seen them crowded together like the common "oak-spangle." Common about Dunkeld in September, and Mr. Roy tells me he has seen similar galls on Deeside. *(m)* Galls of *Neuroterus ostreus* H. occurred sparingly about Dunkeld in September, attached to the chief veins or midrib of the leaf below. They are usually ovate ($\frac{1}{2}\cdot\frac{4}{4}$-inch by $\frac{1}{3}\cdot\frac{2}{2}$-inch; they are smooth, naked, and light-green, usually spotted with red. They are thin-walled and monothalamous. At the point of attachment, two valve-like membranes project (one on each side), the remains of a skin which covered the gall in its early stage of development.

In October the gall falls, leaving the valves projecting from the vein or midrib. *(n)* Last autumn, in Perthshire, I found in great abundance the galls of *Dryophanta scutellaris* Oliv. (= *Cynips folii* Hartig.), and have reared the insects from them during the winter. They are attached to the midrib or chief veins, below the leaf. They are spherical, and vary in diameter from $\frac{1}{6}$ to $\frac{3}{4}$-inch. Externally, they are naked, nearly smooth, and red, or green mottled with white spots. They are monothalamous. The walls are excessively thick and fleshy, and contain much sap. *(o)* Galls of *Andricus ramuli* L. occurred to me near Ballater and Banchory, both last and this summer. They are attached to the male catkins in masses averaging $\frac{3}{4}$-inch across, which look very like rolled-up balls of whitish cotton. Each mass is made up of a number of small galls about the size of a whin-seed; which are monothalamous, and have hard compact walls; but are covered externally with long, flat, dry hairs, resembling those of cotton. *(p)* Galls of *Spathegaster baccarum* L., or "Currant Galls," are abundant in Aberdeenshire and Kincardineshire in June. Dr. Buchanan White sent me specimens from Perthshire also. They are globular and vary from $\frac{1}{12}$ to $\frac{1}{4}$-inch in diameter. They are attached to the lower surface of the blade of the leaf, in which case they project slightly on the upper surface also, or to the catkin.

(To be continued.)

Poa sudetica.—In "*The Scottish Naturalist*," II. p. 32, I mentioned having found *Poa sudetica*, but that the locality was not satisfactory. I have since (13th May 1873,) found it in plenty, and apparently truly wild, in Springwood Park woods, especially in one part of them, on a steep bank, under *old* trees, which never could have been under cultivation, owing to the steepness of it. Mr. Wemyss—who has been gardener upwards of twenty years—went with me to examine the station, and he could not see any means by which it could have been introduced. About a week afterwards Dr. F. Douglas visited it, and he also is of opinion that it is truly wild there, especially as we could not detect it in the park adjoining, although there are many suitable places under the trees that are scattered about; which shows that by whatever means it came there at first, it would not be amongst the grass seeds with which the park was sown. —ANDREW BROTHERSTON, Kelso.

New British Oak-Galls.—I have recently found in Aberdeenshire galls of *Andricus amenti* Gir and *A. quadrilineatus* Hartig. which I believe have not been observed in Britain before. Full description will be given in the next number of the *Scottish Naturalist*.—J. W. H. TRAILL, Old Aberdeen.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 88.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

CHRYSORRHÆA L. Rare.

DISTRIBUTION—EAST. o o Tay o o o o o o
WEST. o o o o o

LAT. 56°20″. RANGE IN EUROPE. South and central; South Scandinavia, &c. TYPE. Meridiono-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August. LARVA. May, June. FOOD-PLANT. Sloe, hawthorn, &c. A single specimen flew in, one evening in the summer of 1872, at a window of Moncreiffe House, Perthshire, and was captured by Sir Thomas Moncreiffe, Bart. It is in good condition.

ARCTIIDÆ Steph.

SPILOSOMA Steph.

URTICÆ Esp. Rare. Pascual (in damp places).

DISTRIBUTION—EAST. o o o o o o o o o
WEST. [Solway Clyde] o West-Ross o

LAT. [54°40″]-57°50″ RANGE IN EUROPE Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVÆ. August, September. FOOD-PLANT. Low plants.

I have seen a specimen taken by Mr. A. Davidson in Ross-shire. The Solway and Clyde records are doubtful.

MENTHASTRI Esp. Common. Agrestal and pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. August, September. FOOD-PLANT. Low plants.

LUBRICIPEDA Esp. Somewhat local. Agrestal and pascual.

DISTRIBUTION—EAST. ♀ [Forth] Tay ♀ o o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-September. FOOD-PLANT. Low plants.

MENDICA Cl. Local. Agrestal and pascual.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ o o o o
WEST. o o o West-Ross o

LAT. 56°20″-57°50″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July-September. FOOD-PLANT. Low plants.

PHRAGMATOBIA Steph.

FULIGINOSA L.

Var. *borealis* Stgd. Common. Agrestal, pascual, ericetal. Ascends to 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney ♀
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40″-58°10″. RANGE IN EUROPE. Scotland and Lapland. TYPE. Boreal. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. Low plants.

Scottish specimens all appear to be the var. *borealis* of Staudinger, which is also the form, I suppose, found in the north of England; from Yorkshire southwards, however, the form found is that of the var. *fervida*, but probably inferior in brightness of colouring to South European specimens.

ARCTIA Schrk.

CAJA L. Common. Agrestal (and, rarely, ericetal).

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde ♀ West-Ross o

Lat. 54°40″-58°10″. Range in Europe. Nearly throughout. Type. European. Type in Britain. British.

Time of Appearance—Imago. July. Larva. September-June. Food-plant. Low plants (rarely shrubs).

More maritime in the north, according to Dr. Gordon of Birnie. *A. quenselii* Payk. may perhaps be found on some of the mountains. *Callimorpha dominula* L. ought, from its European distribution, to be a Scottish species.

NEMEOPHILA Steph.

PLANTAGINIS L. Not uncommon. Ericetal. Ascends to about 2000 feet.

Distribution—East. Tweed Forth Tay Dee Moray ♀ Orkney Zetland
West. Solway Clyde Argyle West-Ross ♀

Lat. 54°40″-58°40″. Range in Europe. Northern, central, and on the southern mountains. Type. Septentrionocentral. Type in Britain. British.

Time of Appearance—Imago. June. Larva. September-May. Food-plant. Low plants.

Ab. *hospita* Schiff. White instead of yellow.
Occurs in several places but not commonly.

EUTHEMONIA Steph.

RUSSULA L. Not uncommon. Pascual and ericetal.

Distribution—East. Tweed Forth Tay Dee Moray ♀ o o
West. Solway Clyde Argyle West-Ross o

Lat. 54°40″-58°10″. Range in Europe. Nearly throughout. Type. European. Type in Britain. British.

Time of Appearance—Imago. June, July. Larva. September-May. Food-plant. Low plants.

EUCHELIA Boisd.

JACOBÆÆ L. Local. Usually maritime.

Distribution—East. Tweed Forth Tay ♀ Moray o o o
West. ♀ Clyde o o

Lat. 54°40″-57°40″. Range in Europe. Nearly throughout. Type. European. Type in Britain. British.

Time of Appearance—Imago. June. Larva. July, August. Food-plant. Ragwort *(Senecio jacobæa)*.

LITHOSIIDÆ Steph.

GNOPHRIA Steph.

RUBRICOLLIS L. Not very common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♂ o o o
WEST. Solway ♂ Argyle o o

LAT. 54°40″-57°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. July, August. FOOD-PLANT. Lichens on trees.

QUADRA L. Very rare. Nemoral.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

LAT. 55°20″. RANGE IN EUROPE. Central; South Sweden, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. May, June. FOOD-PLANT. Lichens. A single specimen only has been taken. It was captured at Ayton, Berwickshire *(teste* A. Kelly*)*.

LITHOSIA Fab.

LURIDEOLA Zinck. (1817); *complanula* B. (1834). Local. Usually (but not always) maritime.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray o o o
WEST. Solway Clyde ♂ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and southern. TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. August-June. FOOD-PLANT. Lichens.

L. complana L. (doubtfully recorded from Solway and Moray), from its European distribution, might have been supposed to be a more likely species to occur than *lurideola* L.; *deplana* Esp. (*helveola* O.) may yet be found.

GRISEOLA H. Rare.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

LAT. 57°30″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August-May. FOOD-PLANT. Lichens *(Sticta canina*, &c.*)* and other low plants.

MESOMELLA L. Not common.

DISTRIBUTION—EAST. ♀ ♀ ♀ ♀ Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEAANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Lichens and heather.

SETINA Schrk.

IRRORELLA Cl. Not common.

DISTRIBUTION—EAST. Tweed ♀ Tay ♀ ♀ o o o
WEST. ♀ Clyde Argyle ♀ o

LAT. 55°50″-56°50″- RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-June. FOOD-PLANT. Lichens.

NUDARIA Steph.

MUNDANA L. Common. Near rocks and walls.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-56°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-June. FOOD-PLANT. Confervoid growth and lichens on stones.

SENEX H. Rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. [Solway] o o o o

LAT. [55°]-56°20″. RANGE IN EUROPE. Northern and north-central. TYPE. Septentriono-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August-June. FOOD-PLANT. Lichens (*Sticta canina*, &c.)

NOLA Leach.

CONFUSALIS HS.; *cristulalis* Dup. Local. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay o o o o o
WEST. ♀ [Clyde] o o o

LAT. 55°20″-56°40″. RANGE IN EUROPE. West Germany, France, Belgium, Britain. TYPE. Occidental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, September. FOOD-PLANT. Oak.

CUCULLATELLA L. Local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ Moray o o o
WEST. ♀ ♀ ♀ ♀ o

LAT. 56°20″-57°50″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. May. FOOD-PLANT. Sloe, hawthorn, &c. *N. strigula* should occur in the south.

NYCTEOLIDÆ HS.

HYLOPHILA Hub.

PRASINANA L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Oak. *Earias clorana* L. should occur.

SARROTHRIPA Gn.

UNDULANA H. (1796); *revayana* Tr. Local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ Moray o o o
WEST. ♀ Clyde ♀ o o

LAT. 55°30″-57°40″. RANGE IN EUROPE. Central and southern (reaching to South Scandinavia and Finland). TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July-May. LARVA. May-July. FOOD-PLANT. Sallow, &c.

Besides the typical form (front-wings grey, more or less unicolorous), the following aberrations occur:—*dilutana* Hb. (grey, with a darker costal blotch, or central fascia), *degenerana* Hb. (ashy, variegated with black), *punctana* Hb. (with three [1-6] very distinct black spots).

CYMATOPHORIDÆ HS.

THYATIRA Ochsen.

BATIS L. Not uncommon. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-July. LARVA. September. FOOD-PLANT. Bramble and raspberry *(Rubus)*.

CYMATOPHORA Tr.

OR F. Local. Nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°49″-58°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. July-September. FOOD-PLANT. Aspen.

DUPLARIS L. Common. Nemoral. Ascends to 1200.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-58°. RANGE IN EUROPE. Central and northern. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Birch.

ASPHALIA Hub.

[**DILUTA** F. Local. Nemoral.

DISTRIBUTION—EAST. ♀ o o o o o o
WEST. Solway o o o o

LAT. 55°. RANGE IN EUROPE. West-central. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. June. FOOD-PLANT. Oak.

FLAVICORNIS L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. o ♀ Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. August, September. FOOD-PLANT. Birch.

DILOBA Steph.

CÆRULEOCEPHALA L. Local. Agrestal.

DISTRIBUTION—EAST. Tweed ♀ Tay o o o o o
WEST. [Solway] Clyde o o o

LAT. 54°40″-56°30″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. September. LARVA. June. FOOD-PLANT. Hawthorn.

BRYOPHILIDÆ Gn.

BRYOPHILA Tr.

PERLA F. Not uncommon. About rocks and walls.

DISTRIBUTION—EAST. ♀ Forth Tay Dee o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Central (to South Scandinavia) and south-western. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. February-April. FOOD-PLANT. Lichens on stone.

ACRONYCTIDÆ.

ACRONYCTA Ochsen.

LIGUSTRI F. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°-40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Ash.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(*Continued from p. 96.*)

EDITED BY D. SHARP, M.B.

ACILIUS Schaum.

CANALICULATUS Nic. Scarce. Lowland.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ Moray o o o
WEST. Solway Clyde o o o

SULCATUS Lin.
Var. *Scoticus* Curt. . Rather common. Lowland, highland.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o c c
West. Solway Clyde o o o

GYRINIDÆ.

GYRINUS Aubé.

MINUTUS Fab. Local. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

NATATOR Scop. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay o Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

SUFFRIANI Scriba. Very rare. Lowland, maritime.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

DISTINCTUS Aubé. Scarce. Lowland.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. ♀ Clyde o o o

OPACUS Sahl. Common. Lowland, highland.
DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway Clyde o o o

ORECTOCHILUS Esch.

VILLOSUS Mull. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o o o c o
WEST. Solway Clyde o o o

HYDROPHILIDÆ.

HYDROBIUS Thoms.

FUSCIPES Lin. Abundant. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♂ ♀ ♂
WEST. Solway ♀ ♂ ♂ ♂

HELOCHARES Muls.

PUNCTATUS Sharp. Very local. Lowland.
DISTRIBUTION—EAST. ♂ ♀ Tay ♂ ♂ ♂ ♂ ♂
WEST. ♂ ♂ ♂ ♂ ♂
Rather common in a pond on Moncreiffe Hill, Perth.—D.S.

PHILHYDRUS Thoms.

NIGRICANS Zett. Local. Lowland.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

MELANOCEPHALUS Ol. Common. Lowland, highland.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

MARGINELLUS Fab. Local. Lowland.
DISTRIBUTION—EAST. ♀ Forth Tay ♂ ♂ ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

SUTURALIS Sharp. Local. Lowland.
DISTRIBUTION—EAST. ♀ ♀ Tay ♂ ♂ ♂ ♂ ♂
WEST. Solway ♂ ♂ ♂ ♂

ANACÆNA Thoms.

LIMBATA Fab. Abundant. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂
VARIABILIS Sharp. Local. Lowland.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♂ ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

LACCOBIUS Er.

MINUTUS Lin. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♂ ♂ ♂
WEST. Solway ♂ ♂ ♂ ♂

NIGRICEPS Thom. Local (?). Lowland.
DISTRIBUTION—EAST. Tweed Forth ○ ○ ○ ○ ○ ○
WEST. Solway ○ ○ ○ ○

BEROSUS Thoms.

LURIDUS Lin. Rare. Lowland.
DISTRIBUTION—EAST. ○ ○ ○ ○ Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

LIMNOBIUS Thoms.

TRUNCATELLUS Thunb. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth ○ Dee Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

NITIDUS Marsh. Rare. Lowland.
DISTRIBUTION—EAST. Tweed Forth ○ ○ ○ ○ ○ ○
WEST. ○ ○ ○ ○ ○

CHÆTARTHRIA Wat.

SEMINULUM Payk. Local. Lowland. In damp mosses.
DISTRIBUTION—EAST. Tweed ○ Tay ○ Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

HELOPHORUS Thoms.

RUGOSUS Ol. Scarce. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee ○ ○ ○ ○
WEST. ○ Clyde ○ ○ ○

NUBILUS Fab. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth ○ Dee ○ ○ ○ ○
WEST. Solway ○ ○ ○ ○

AQUATICUS Lin. Abundant. Lowland, highland. In weedy pools.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ○ ○ ○
WEST. Solway ○ ○ ○ ○

MULSANTI Rye. Local. Maritime.
DISTRIBUTION—EAST. ○ ○ ○ ○ ○ ○ ○ ○
WEST. Solway ○ ○ ○ ○

Abundant in pools of salt water by the side of the Nith, below Dumfries.—D.S.

[**GRISEUS** Hbst. Doubtful as Scottish.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

I have never seen a Scottish exponent of this species, and think it probable that some of the allied species may have been mistaken for it.

GRANULARIS Lin. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ o o o
WEST. Solway ♀ o o o

ÆNEIPENNIS Th. Abundant. Lowland, highland.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ o o

ARVERNICUS Muls. Local. Lowland. Frequents sandy banks by the sides of rivers.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

[**DORSALIS** Marsh. Doubtful as Scottish.
DISTRIBUTION—EAST. o Forth o o o o o o o
WEST. o o o o o

"Dollar, Mr. J. T. Syme."—Murray Cat.

HYDROCHUS Thoms.

BREVIS Hbst. Very local. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. ♀ Clyde o o o

ELONGATUS Schall. Rare. Lowland.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. o o o o o

ANGUSTATUS Germ. Rare. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. ♀ Clyde o o o

OCTHEBIUS Er.

EXSCULPTUS Germ. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway Clyde ♀ o o

MARINUS Payk. Local. Maritime.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

PYGMÆUS Fab. Local. Maritime.
DISTRIBUTION—EAST. Tweed Forth ♂ o o o o o
WEST. Solway ♂ o o

BICOLON Germ. Local. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

RUFIMARGINATUS Steph. Local. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

HYDRÆNA Kug.

TESTACEA Curt. Rare. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

In pools by the side of the Cairn at Irongray.—D.S.

RIPARIA Kug. Common. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♂ Moray o o o
WEST. Solway ♂ o o o

ANGUSTATA Sturm. Rare. Lowland.
DISTRIBUTION—EAST. Tweed ♂ o o o o o o
WEST. Solway o o o o

NIGRITA Germ. Local. Lowland
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

GRACILIS Germ. Common. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay ♂ ♂ o o o
WEST. Solway ♂ o o o

PULCHELLA Germ. Rare. Lowland.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. Solway ♂ o o o

ATRICAPILLA Wat. Rare. Lowland.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♂ o o o

PYGMÆA Wat. Rare. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

CYCLONOTUM Er.

ORBICULARE Fab. Local. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ ♂ ♂
WEST. Solway Clyde Argyle ♂ ♂ ♂

SPHÆRIDIUM Er.

SCARABÆOIDES Lin. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

MARGINATUM Fab. Not rare. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

CERCYON Er.

OBSOLETUS Gyll. Scarce. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♂ ♂ ♂ ♂ ♂ ♂
WEST. Solway ♂ ♂ ♂ ♂ ♂

HÆMORRHOIDALIS Fab. Common. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

HÆMORRHOUS Gyll. Local. Lowland.
DISTRIBUTION—EAST. ♀ Forth ♂ ♂ ♂ ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

AQUATICUS Muls. Rare. Lowland.
DISTRIBUTION—EAST. Tweed Forth ♂ ♂ ♂ ♂ ♂ ♂
WEST. ♀ ♀ ♂ ♂ ♂

FLAVIPES Fab. Abundant.
DISTRIBUTION—EAST. ♀ ♀ ♀ Dee ♀ ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

LATERALIS Marsh. Common.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ ♂ ♂ ♂
WEST. Solway ♀ ♂ ♂ ♂

LITTORALIS Gyll. Maritime.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

UNIPUNCTATUS Lin. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway ♀ o o o

QUISQUILIUS Lin. Common.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

MELANOCEPHALUS Linn. Abundant. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

TERMINATUS Marsh. Rare.
DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

PYGMÆUS Ill. Common.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway Clyde o o o

NIGRICEPS Marsh.
DISTRIBUTION—EAST. o o o o o o o o o
WEST. Solway o o o o

MINUTUS Fab.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

LUGUBRIS Payk. Rare.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. o o o o o

ANALIS Payk. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway Clyde o o o

MEGASTERNUM Muls.

BOLETOPHAGUM Marsh. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ ♀ o o

CRYPTOPLEURUM Muls.

ATOMARIUM Fab. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

STAPHYLINIDÆ.

AUTALIA Er.

IMPRESSA Ol. Common in fungus. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ ♀ o
WEST. Solway ♀ ♀ o o

PUNCTICOLLIS Sharp. Common. Highland. In sheep's dung.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ Orkney o
WEST. Solway Clyde ♀ o o

RIVULARIS Gr. Common. Lowland. In dung.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde o o o

FALAGRIA Er.

SULCATA Payk. Local. Lowland.
DISTRIBUTION—EAST. ♀ Forth o o o o o
WEST. Solway Clyde o o o

OBSCURA Gr. Local. Lowland.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway Clyde o o o

BOLITOCHARA Kr.

LUCIDA Gr. Very rare. Lowland. In fungi.
DISTRIBUTION—EAST. o o o o o o o o o
WEST. ♀ Clyde o o o
"Glasgow."—R. Hislop.

LUNULATA Payk. Rare. Lowland. In fungi.
DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. ♀ Clyde o o o

OBLIQUA Er. Common. Lowland, highland. In fungus under bark.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o o
WEST. Solway Clyde o o o

PHYTOSUS Er.

BALTICUS Kr. Rare. Maritime. Under seaweed in sandy places.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. ♀ Clyde o o o

(To be continued.)

ZOOLOGY.

ON A PORPOISE WITH INTERMEDIATE TEETH-LIKE BODIES, &C.

By ROBERT WALKER, F.G.S.E.

THE Porpoise is the smallest, the most common, and, popularly at least, the best known member of the Whale family that frequents the European coasts. It is pretty widely distributed, extending from Greenland to the Mediterranean, if not further south. It is sometimes stranded in its rambles along the coast, it is not unfrequently caught in herring and other nets, to which it is very destructive, and occasionally it gets entangled in the fishermen's long lines. As it is very easily killed or drowned, in these cases it is generally secured without much difficulty. The individual about to be noticed was taken in the latter way, in St Andrews Bay, in the end of July 1872.

It was five feet seven inches in length, and looked a fat, healthy, well-formed animal, having externally the general appearance of the common porpoise *(Phocæna communis)*.

On putting my finger into its mouth I was rather surprised to feel the bluntish points of small intermediate teeth-like bodies, situated on the margin of both sides of the upper and lower jaws. Unfortunately it was too dark by this time to examine it further that night. I could not find anyone to whom it belonged, but, as I was lead to believe that it was not disposed of, I thought it would be safe enough where it was until next morning. On returning to the place where it lay pretty early next morning, however, I was disappointed to see that it had been removed, and still more so when, upon ascertaining its whereabouts, I found that it was already "flensed" for the oil

it contained, and the carcase partly broken up—and otherwise mangled—for the purpose of feeding pigs. The skull luckily was unbroken, and as the lips had been cut away in the flensing operation, all the teeth and intermediate bodies were distinctly displayed.

The latter were small objects, from $\frac{1}{12}$ to $\frac{1}{8}$ of an inch in height, conical shaped, with broadish somewhat oval-formed bases, slightly grooved or wrinkled all round. They were firmly attached to the gum, and when pressed by the finger they did not move more readily than did the ordinary teeth. It was impossible to remove any of them without tearing away part of the flesh at the same time. They were regularly inserted alternately between the normal teeth on both sides of the upper and lower jaws, from the symphysis to the posterior edge of the dental margin, and when fresh their points extended well up between the spatulate portions of the ordinary teeth. The accompanying figure [Plate II.] will give a general idea of the position and appearance of these bodies; as it was taken, however, after the skull was macerated and the gum considerably shrivelled, they are not represented projecting so far up as they did when in a fresh state. On drying the skull a number of these bodies as well as some of the other teeth peeled off with the gum. Ultimately, as the latter continued to shrink, the greater number of the objects in question lost their hold altogether and fell away.

When examined in a detached state the base of each, by which it adheres to the gum, is seen to be slightly concave. When dry they are of a yellowish horn colour, and apparently texture, not unlike the colour and appearance presented by the base of the baleen in some of the larger whales, to which they may have other and more important analogies.

In all the small whales—and in the large ones too—the teeth are loosely inserted in wide shallow groves in the margin of the jaws, with little or no attachment to the bone except what is furnished by the gum. In this respect they seem to have made scarcely any advancement from the foetal condition in which the teeth are placed in the jaws of their precursor, if not their progenitor, the ancient *Ichthyosaurus*.

The porpoise under consideration seemed from the size and position of the fins to be the common species, but as

ONE HALF NATURAL SIZE

Alexander Lamie del.

John Wilson Aberdeen

I could count only twelve pairs of ribs, the matter is still open. It had a number of tubercles or short spines on the upper anterior edge of the dorsal fin. In a paper read at a meeting of the Zoological Society in 1865, Dr. Gray directed attention to these curious tubercles as observed by him on the dorsal fin of a porpoise caught at Margate. Previous to this these tubercles had not been noticed in any of the descriptions of the common porpoise published in this country. Dr. Gray considering the difference anatomically that would appear—from the descriptions of anatomists—to exist amongst the members of this species concluded that he had met with a new animal, which he named *P. tuberculifera*. As subsequently pointed out by himself, however, the spines on the fin had been noticed by Pliny, Camper, and Dr. Jackson on an American specimen. In the additions and corrections at the end of his catalogue of seals and whales, published in 1866, he states that several porpoises caught on the coast of England have been lately examined, and they all have spines or tubercles on the upper edge of the dorsal fin, and that specimens without these tubercles are desiderata. Meantime he retains *tuberculifera* as a var.

Since the publication of Dr. Gray's paper I have examined some eight or nine porpoises, newly caught or stranded on the coast of Scotland, and they all had tubercles on the dorsal fin. On some individuals they were not very apparent, more especially when the animal was fresh. Sex does not appear to me, so far as I have seen, to make any difference in this respect. In the autumn of 1869, I examined a newly killed half grown male at Crail. At the time I could not distinguish any tubercles, and was under the impression that I had found the missing animal. I cut off the dorsal fin and put it in spirit. On examining it about three weeks after, when it had shrunk somewhat, the tubercles although small were quite visible. It would thus appear that in the present condition of the matter the tubercles cannot be relied on to indicate more than possibly a variety of the porpoise.

The skull does not differ materially from that of other porpoises with which I have compared it. It is rather less in proportion to the size of the animal, the beak is somewhat narrower, the foramen magnum is larger, and the vomer is

more exposed in the middle of the palate than is usually the case in the common porpoise. There are only two foramina on the flat part of the front of the head, one on each side of the nasal openings. The brain was in bulk perhaps rather under than above the average in the porpoise. It weighed when extracted by the occipital foramen 16½ oz.

It is certainly not easy to understand how such a large mass of highly convoluted brain as exists in this and some of the other toothed whales should be necessary in the economy of these animals. In Professor Huxley's * reply to Mr Wallace's † statement "That savage man in his large and well-developed brain possesses an organ quite disproportionate to his actual requirements" he remarks, That this objection applies quite as strongly to the lower animals. The brain of a porpoise is quite wonderful for its mass, and for the development of the cerebral convolutions, and yet, since we have ceased to credit the story of Arion, it is hard to believe that porpoises are much troubled with intellect. Nevertheless, it is difficult to see how these animals, any more than savage man, should have such large brains, if they are not the result of the operation of the law or force that developes all the other bodily organs according to the increased functions, which the changing environment of the animals has rendered imperative in order that they may maintain their existence. Still it must be confessed that there is not much known regarding the intellectual attainments of the porpoise, or any of its large brained congeners. It seems evident, however, that an animal which is compelled to come to the surface of the water to breathe every 12 or 14 seconds must be placed at considerable disadvantage in the pursuit of its prey. In the case of the salmon, it appears almost inexplicable how it could possibly overtake any of these fishes, considering the rapid rate at which they go through the water, unless its movements in pursuit of them were guided by superior intelligence.

That the porpoise and a number of the other toothed whales kill salmon is beyond doubt, and the havoc they sometimes make amongst these fishes is something astonishing. For instance, Mr Halliday, in his evidence given before Mr Home Drummond's committee in 1835, states that three cwt. of salmon

* Critiques and Addresses. † On Natural Selection.

were taken out of the stomach of a grampus caught at Sandsfield, in the mouth of the Eden.

Mr. W. M. Williams, in a contribution to the cerebral physiology of the porpoise in *Nature* for June last, after quoting Professor Huxley as to the brain of the porpoise, says that many years ago, in a voyage he made from Constantinople to London, they were often becalmed, with porpoises playing about the ship. He frequently plunged overboard and swam towards the porpoises, who directed towards their unusual visitor an amount of attention which "I may venture to dignify with the title of curiosity," and that his recollection of the expression of the eyes of his swimming companions is very different from what he had since seen on the large vacant orbs of acquarium cod-fishes. Mr W. Saville Kent, in *Nature* of July last, notices Mr William's paper, and amongst other interesting facts given relative to the intelligence displayed by the two porpoises at present in the Brighton acquarium, states that the intellect of the porpoise, as foreshadowed by its convoluted brain, exceeds beyond comparison that of the cod-fish or any other representatives of the piscine race. He at the same time considers that the representatives of the *Gadidæ* are by no means the least intelligent of fish. That the investigation of the relation existing between the large brain of the porpoise, as well as some of the other toothed whales, in proportion to the intelligence manifested by these animals, is "a subject of primary interest to the student of cerebral physiology" few will doubt. And now that the matter is receiving attention it is perhaps not too much to expect that it will be found that the large brain of the porpoise, &c., is of the utmost use to the possessors.

St. Andrews, 1st August, 1873.

POLARITY IN THE GEOLOGICAL DISTRIBUTION OF GENERA, AND ITS CAUSE.

(Concluded from p. 104.)

By the Rev. J. WARDROP.

IN testing natural selection for the cause of Polarity, the question is, are there grounds for holding that natural

selection has operated with varying intensity at different times, and specially that it operated with augmented force at the extremes of the geological series, and with a force lessening from each extreme towards the centre? Does it appear that natural selection was operating at a maximum when the production of genera is found to have been at a maximum? and when this had its minimum, is there reason to think that that had its minimum coincidently? or, to put the question in a form that leads directly to a mode of settling it, did the conditions that affect the operation of natural selection concur most favourably when genera are said to have been produced most abundantly, and least favourably when genera were least abundant? Natural selection operates with a force and a rapidity proportionate to the favourable character of certain conditions. Now, if it could be shown that these conditions preponderated in the earliest and latest times, we should then have a cause existent for the preponderant number of genera in these ages produced; and if these conditions could be shown to have grown deficient in an increasing degree for these returns till they failed most of all in Permian and Triassic times, we should then have the other affirmation of Polarity established and accounted for—the paucity of genera originating in those times. Now my contention is, that there is a variety of considerations which look favourably on the attempt to convert each of these hypotheticals into a categorical.

What are the conditions favourable to the action of natural selection? There is one formula that covers them all, viz., changes in the external conditions of life. This, looking away of course from the tendency to variation innate to organisms, is the one element of force in the operation of natural selection that lies nearer than any other to the effect of modifying one type into another. Expose an organism to some change of conditions, from whatever source, and you lay a foundation for natural selection taking the advantage of favourable variations and accumulating them to the extent of transmuting the type. Let us look then at the sources of change in the conditions of life, with an eye to the inquiry, what geological formations may have been favoured most in respect of them, and what least. The survey must be rapid. These sources of change are numerous, varied, mutually complicated, and producing or variously in-

fluencing one another. They might be grouped as geological, geographical, climatal, and organic. I shall select the following—

1. One class concerns *areas of occupation.* The origination of new areas, making a fresh demand on such forms of life as suit the circumstances thus emergent, the alteration of areas already occupied—alteration in extent, position, exposure, degree of isolation; or again, the number of areas causing a multiplication of changed conditions; all this variety affecting areas, furnishes one class of circumstances that tell very powerfully on the conditions of life, and on the intensification and acceleration of the process of selection and the modification of structure. To appreciate the influence thus exercised, two important principles must be borne in mind :—First; That every area tends to be peopled with all the life which it can possibly support. The increase of life and the eagerness with which organic beings lie in wait to seize every inch of unoccupied ground, whether in a new or an old, but only partially, occupied field, secures that every area shall ever make progress towards full occupation. Second, and what is of main consequence, it is only through means of a stock of *greatly diversified* organisms that any area is occupied by all the life which it is capable of supporting.

Now the question is, when did these two principles operate in the peopling of areas of occupation that were most favourably ordered for the action of natural selection, and through natural selection accelerate at a maximum rate the diversification of structure and the production of generic types? Certainly if ever, it must have been in the earliest ages, when the earth was but growing towards the consummation of its capacities as a life-bearing world. If many new fields must be occupied with life when life is a new thing, and being devoid as yet of a great wealth of forms ready provided to furnish the occupants, must provide them as it were on the instant; if only great diversity of structure can fit such living inhabitants as there are for the full occupation of the areas that are waiting till these inhabitants shall increase and multiply and replenish them; and if the conditions of life thus raised and multiplied suit themselves through natural selection with the forms they are fitted to maintain—all this seems but a concentration of reasons why we should expect to find a great profusion of generically

different types of living beings in the earliest times. Modification of structure goes on rapidly and far in the process of naturalisation. And with all else that the primary replenishment of the earth offers in favour of a maximum multiplication of genera, it was like a constant process of naturalisation prosecuted for a long season and on a vast scale—every inch of every area, as it successively grew fit for life putting in its demand for occupation, and hastening the diversification of all the types of life in order to suit itself with its own, and get the right form for the right place. This goes to account for Polarity so far as the early extreme of the geological scale is concerned.

2. We find in *climatal* changes another class of circumstances that affect powerfully the conditions of life and favour the action of natural selection. The greater the changes of temperature, the more, so far forth, is this influence exerted on the conditions of, life and on the acceleration of structural diversification. And the more frequently these vicissitudes occur the greater accumulation will there be of the diversifying effects. Climate has no doubt always through all formations varied with greater or lesser extremes, and quicker or slower vicissitudes, and over larger or smaller areas. Subterranean action elevating or depressing areas, change of ocean currents to heat or cool them, and other constantly occurring geographical changes, not to speak of the place of the earth's orbit in the heavens, would make climate come and go to some extent continually, and exert a subtle and an efficacious power on the conditions of life, and on the vital forms depending thereon. So far as volcanic action is an indication of such more general geological action as affects such changes, it is to be noted that there is a dearth of such action from the Permian to the Chalk age. We have evidence of great vicissitudes of temperature during Tertiary times, from beginning to end. Lately indications of glaciation have been detected in some older formations. But there is no evidence of any such alternations of temperature as are known to have characterised the latest ages. It is these that have enjoyed a maximum degree of this means of altering organic types; and so far again there is an account rendered of the assertion of Polarity in reference to these ages—that there was at this later extreme of the geological scale, a second

maximum of generic productions. As to climate in the earliest ages, these ages possess an element of vicissitude peculiar and special to them, for something surely is to be attributed to the effects of the originally incandescent state of the earth. We have not more reason to believe that there was an incandescent state at all, then we have to believe that as the globe cooled and the incandescence, once universal, receded from the circumference towards the centre, it would leave behind it, when it had shrank so far as to make life possible at all, the whole terrestrial surface subjected to more than the torrid temperature of a palm house, to lessen by degrees through all the grades of heat or cold endurable by life. If the post-cambrian earth be all the earth that was ever seen, and if this cooling from incandescence be part of the physical history of Siluria, it makes a notable addition for the time to the other climatal sources of change in vital conditions, and thus it is brought about that the earliest as well as the latest epochs—the time of the early maximum of generic production as well as that of the late, claims a preponderance of this second source of organic transformation.

3d. The *grade in the scale of organisation* which the forms of life of any period had reached, gave the conditions of life more or less effect in modifying type through natural selection. The higher the organisation of any being, it enters into more complex relations with the organic and inorganic conditions of life; and hence probably the fact that higher organisms change more rapidly than those that are lower. Whencesoever it may be, there is some reason, says Darwin, to believe that organisms high in the scale change more quickly through natural selection than those that are low. So far then as this is true, it will have an influence in determining a greater profusion of genera towards those periods when the scale of life had risen high, and especially in those formations that supplied most largely the conditions for the development of the higher forms on an extensive scale. That is to say, given favourable conditions for the occupation of wide spaces by the vertebrate forms of life, we have, so far, provision made for the favourable action of natural selection and the rapid multiplication of generic types. Now this range of conditions falls on tertiary and present times. Mammals were few in earlier times. Birds not many more. The maximum development of both classes marks the close of

palæontological history. Even fishes and reptiles, if we count (not weigh) them, how profuse soever in generic types in previous formations, abound still more in these—the flourishing period of their fellow vertebrates. So that, in regard to this *third* class of circumstances influencing favourably the working of natural selection in evolving diversity of forms, the scale again preponderates in favour of the recent formations. One more set of conditions adding intensity to the genus-differentiating process falls on a time when the law of polarity asserts a maximum production of genera. And thus, on the whole, it cannot be said that there are awanting facts either to establish the law or to unfold the cause, that the commencement of organic development has been inaugurated, and the goal of its perfection signalised, by a profuse origination of generically-distinct organisms.

It may be said that the above view and treatment of this theory makes it a very different thing from what it was in the hands of its author. It concerns genera, but with Forbes a genus was not anything for the origination of which Darwinism could render a reason. Also, while the theory concerns a numerical variation in the genera produced at different times, its author contemplated no physical agency intermediate between the creator and his generic creations. But, as has already been indicated, taking Polarity in itself as simply a generalisation of the facts concerned, and irrespective of its discoverer's concomitant doctrines, it is perfectly indifferent whether genera were created immediately or by evolution, whether the external conditions were suited with the proper forms of life by immediate creation, or they suited themselves with their appropriate forms by natural selection and the survival of the fittest. Other generalisations of the same theorist, such as that of generic centres (see Jukes' Manual of Geology, p. 492, 1873) admit of being easily wrought into the texture of the Darwinian hypothesis—a fact that may do something in the way of verifying both it and them; and Polarity, the widest, and if you will, the wildest, of them all, suffers change only in the relations it held to his other scientific opinions, not in its essence, when it is similarly treated. Mr. Wallace says this theory died a natural death long ago—the natural death of all false theories, a fate from which, he adds, the great name of its author could not

save it. But false theories should not be allowed to die a natural death—at least when they come from such as Edward Forbes. All such theories should die by violence. At the hands of a just and unsparing scientific criticism, they should have their time cut short. Certainly if Mr. Wallace left the theory of Polarity dead, it must have met its end somehow, in the course of nature or by violence, before he came to the field. His thrusts are not directed so as to have drawn blood of anything living. But perhaps the theory is not dead. There may be life in it, and truth.

Notes from Kelso.—I have recently come across the following:—A. Pochard, on June 13.—A white water-rat, killed amongst the Cheviots on June 21st. It is of a pure white, not like the reddish-yellow white of the albino mole, which I frequently get.—A young male of the short-eared owl, on July 26th. This is an unusual time for a "winter visitor." I believe it was bred in this district.—ANDREW BROTHERSTON, Kelso, August, 1873.

The Squirrel occasionally insectivorous.—While walking on Kinnoull Hill, in July 1862, a squirrel was observed busily engaged amongst the heather and grass. Its head was immersed in a hole, and only raised occasionally to reconnoitre, the jaws being actively engaged chewing some object. Being behind it no alarm was given, so that we cautiously approached at intervals, while its head was in the hole, until, indeed, it barely escaped capture by the hat. In the hole were swarms of the common ants and their larvæ and pupæ, either of which the squirrel had been devouring most intently.—W. C. M.

White Blackbirds.—There has been a curious outcome of these in this district during the past season. A nest was found near Kinnaird House in which one of the young birds was white. The old birds were of the usual colour. About a mile further west there was another nest with a white bird in it also, and it appears that there are two birds of the same kind going about, so that there must have been several broods with albino birds in them. In 1872 there was a nest with one albino in the same district.—CHARLES M'INTOSH, Inver, Dunkeld, August. 1873.

Long-eared Owl.—I found a nest with six and another with five eggs of this species on March 22nd, which, considering the cold season, I think rather early. Last year, a much milder season, I found in March, in the same nest where I found the six eggs this year, five well-fledged young owls and one fresh egg. I think that each pair of owls has two nests not far from each other, and when eggs are taken from one, the hen owl lays in the other.—CHARLES STRATTON, Perth, March, 1873.

Occurrence of the Echinorhynchus spinosus on the Aberdeenshire coast.—In July last a specimen of this rare shark was taken at the mouth of the Ythan by salmon fishermen, and was sent by Mr. Davidson to the Natural History Museum of Marischal College, Aberdeen, where I had an opportunity of examining it. Its measurements were—length 7 feet 3 inches, greatest breadth

(behind the jaws) 11 inches; greatest depth (behind the pectoral fins) 8½ inches, breadth of head between the eyes 8⅛ inches. It is very evident from Couch's figure and description that he had never seen an example of this fish, as indeed he himself says. The figure is so far from correct in almost every point that it is recognisable as intended for that species only by the possession of *two* dorsal fins. As may be seen from the measurements given above, its breadth is greater than its depth, while its length is about as great in proportion to its depth as in any other shark, while Couch's figure represents it as very deep in proportion to its length. The chief points in which it differs from his figure and description otherwise are as follows. The eye is oval, antero-posteriorly, and bluish-grey; the pupil oval vertically, and catlike in colour. The spines cover not only the body but also the snout and the fins, being even more numerous, though smaller, on these parts than on the body. The gill openings are entirely in front of the pectoral fins, on the same level. The tail has a pretty large lower lobe. The colour of the back is dark bluish-grey, which becomes paler on the sides, and is mixed with reddish tints on the belly. The outline figure in Gosse's Marine Zoology represents very well the true shape of the fish.—J. W. H. TRAILL, Aberdeen.

What is Trichiurus lepturus Hoy?—In the recently published part of the Anales of the Spanish Society of Natural History, Professor Poey of Havannah describes and figures a curious fish under the name of *Evoxymetopon tæniatus*. This fish belongs to the family *Trichiuridæ* of Günther, and was captured on the coast of Cuba. Professor Poey, however, thinks that it is probably an accidental visitor, and is really an inhabitant of more northern seas; and he is inclined to think that a fish captured in November 1812 off the coasts of Scotland, and described by Mr. Hoy in the Linnæan Transactions XI. p. 210, under the name of *Trichiurus lepturus* was probably the same species as the *Evoxymetopon tæniatus*. Professor Poey says, that Hoy's description is inapplicable either to *Trichiurus lepturus*, or *Lepidopus caudatus*. Can any of our ichthyologists state whether Professor Poey's conjecture as to the real species of *Trichiurus lepturus* Hoy be correct or not?—D. SHARP.

NOTE ON THE EXAMINATION OF A MALE KELT.

BY W. C. M'INTOSH, M.D., F.L.S., F.R.S.E.

THE Fish was found dead at the side of the river Tay, on the 7th February, 1865, and I am obliged to Mr. John Ferguson, of the Boat of Caputh, for directing my attention thereto.

The weight of the specimen was about 28lbs., but of course it was in a lean condition. It had the following measurements:—

Length from snout to tip of tail,	about 3 feet 4½	inches.
,, to posterior border of operculum,	10	,,
,, to middle of eye, - -	5	,,
,, to anterior base of pectoral,	10	,,

„	„	of dorsal,	1 foot 5 „
„	„	of fatty fin,	2 feet 4⅝ „
„	from the anterior base of pectoral to anterior base of ventral,		10⅛ „
„	„	to anus,	1 foot 5⅛ „
„	„	of fatty fin to tip of tail,	9¼ „
„	of pectoral fin,		4½ „
Breadth of dorsal fin,			3¾ „
Highest point of „	from the line of body,		3¾ „
Length of ventral,			3½ „
Height of fatty fin (from the centre),			2½ „
Perpendicular line to longest tip of anal,			3½ „
Expansion of tail,			10 „

External Appearances.—The general aspect, as usual, differed considerably from the plump and vigorous salmon. The cheeks and sides, moreover, were mottled with reddish pink spots, and two black spots on the operculum were each surrounded by a reddish ring. The tip of the mandible was greatly produced upwards and lodged in a cavity between the intermaxillaries. There was a wound fully an inch and a half long penetrating the right angle of the mouth, and almost separating the maxillary of that side posteriorly. The finger passed upwards and backwards close to the eye and impinged on the cranial bones. This was probably caused by the "gaff" of an angler. The outer border of each ventral fin was rather deeply abraded, so as to expose the base of the rays; and the same injury appeared on the anal about ¾ of an inch above the base—at the most prominent portion of the organ. The inferior edge of the caudal was also worn, about 1½ inch from the base, and a limited abrasion occurred on the superior border; while the centre of the organ was split, and a strip torn out. There were three notches (from abrasion) at the lower and anterior border of the fatty fin. In front of the latter a fungoid patch 1¾ inch in diameter existed—stretching downwards over the ridge of the dorsum on each side. Another of the same size and nature occured on the left side about an inch below the dorsal fin. These fungoid patches appeared to be similar to those often observed on various sickly fishes in fresh-water aquaria. On the tips of the branchial laminæ were many specimens of *Lerneopoda salmonea.*

INTERNAL APPEARANCES.—The liver weighed 5¾ oz., and had externally a few circular indentations caused by *Ascaris capsularia*, Rud. The gall-bladder was empty. The heart weighed fully 1½ oz., and the auricle was distended with blood. The œsophagus contained several examples of *Distoma varicum*, Rud., amongst the mucus. The usual tough, whitish, and translucent mucus occurred in the stomach, entangling many of the *Distomæ*, and showing, microscopically, many cells and granules. A whitish elevation of the mucous surface indicated the position of a specimen of *Tetrarhynchus appendiculatus*, Rud., and another slightly elevated point held an example of *Ascaris capsularia*. The contents of the duodenum were of a dark reddish colour, evidently from admixture of blood, as the microscope showed. This, therefore, differed from the ordinary condition in kelts, and was probably due to injury. The semi-solid and usually orange masses in the centre of the gut were also deep reddish, and their calcareous crystalline constituents chiefly of a radiate type, though fusiform and laminar forms also occurred. The same masses were found in the pancreatic cœca. Between the duodenum and the valvular portion of the intestine the contents consisted mainly of mucus, but at the latter the crystalline masses again appeared. The pancreatic cœca were almost deprived of the fatty investment generally so conspicuous in the well-nourished fish. The milts weighed together 2¾ oz., and internally consisted of a milky semi-fluid granular substance. The swim-bladder was distended, and measured 1 foot 4¾ inches long.

MEMOIRS ON SCOTTISH TENTHREDINIDÆ.

BY P. CAMERON, JUN.

No. III.—HEMICHROA LURIDIVENTRIS.

TENTHREDO LURIDIVENTRIS Fallén; *Act. Holm.* 1808, p. 115, 55.

LEPTOCERCUS LURIDIVENTRIS Thomson; *Hy. Sc. I.* 78. No. 4.

NEMATUS (LEPTOPUS) HYPOGASTRICUS Hartig; *die Blatt.*, 184. 1, Tab. v. fig. 41 (after De Geer).

CAMPONISCUS HEALÆI Newman; *Ent.* No. 62. 215. 1869.

For *Larva* : see De Geer, *Mémoires*. ii. 268, Tab. 38, fig. 11-13; Réaumur, *Mémoires*, *Tom.* v. Tab. 12, fig. 17, 18.

ALTHOUGH widely distributed, this species is somewhat rare, both in the larval and perfect states. I found the former in Glen Fruin, Loch Lomond, towards the end of September, and subsequently a few were received from Dr. Buchanan White, from Dunkeld.* I have taken the imagos at Rannoch. In England it is found in the neighbourhood of London; and on the continent in France, Germany, and Sweden.

The larvæ feed on the upper surface of the leaves of *Alnus glutinosa*, making roundish holes, at first small, but gradually larger and larger; and may be observed lying motionless, with the body pressed close against the surface of the leaves, the colour of which harmonizes remarkably with that of their bodies, which are consequently rather difficult to discover. They have a habit when about to moult of resting on the head and anal segments, the central portion being raised and clear of the leaf.

The *larva* is onisciform, extremely flat; the back being raised and rounded, with the sides very thin, and almost transparent and membranous. The head is narrow, and quite differently formed from the rest of the saw-fly larvæ. It rises sharply from the back, with a hollow in the centre at the top, and the face has a slope in the direction of the feet. When at rest it is partly withdrawn within the overhanging folds of the second segment, with the mouth placed against the body. Its colour is green, with the eyes black. On the top, at the back, are two light brown splashes, and the mouth is of the same colour, but deeper. A few short microscopic hairs are scattered over it. The feet are glassy green, with black claws, and the fourteen claspers are of the same colour and very short. The fifth and twelfth segments are apodal. When the creature is motionless, neither legs nor claspers are visible, being concealed by the overhanging sides. The body in the centre is of a beautiful dark shining green, with the sides, which are waved, whitish, especially at the extreme edge, and fringed with long white hairs. On the third and following segments, except the last,

* I have also seen larvæ in Rannoch and elsewhere in the Highlands, where this species seems pretty widely distributed.—EDITOR.

there are, at the juncture of the segmental divisions, two black irregular dots situated above the flat sides, the one nearest the top being the largest. A dot is also on the second at its junction with the third. Length 5-6 lines; breadth 1½-2 lines.

About the 10th of October, the larvæ buried themselves in the earth, and constructed black oblong cocoons, mixed with grains of earth, from which the perfect insects made their appearance on the 3rd of May.

Imago. Head black, with light testaceous palpi. Antennæ black, covered with short down, and as long as the abdomen. Thorax black, above and beneath, with an irregular oblong testaceous spot on the sides below the wings; wing scales reddish-brown. Scutellar spots white. Abdomen black, with the anal segments beneath testaceous. Feet ochreo-testaceous, with the trochanters and tibiæ whitish. Hinder tarsi, with the apex of tibiæ black; the apex of the joints of the tarsi testaceous. Wings almost smoky, with fuscous nervures and stigmal spot; the latter having the lower part brownish. One of my specimens has only 3 sub-marginal cellules in the anterior wings, as in the section of *Nematus* called *Cryptocampus.*

The male differs in being smaller, in having longer and thicker antennæ, in the pronotum being entirely black, and the anus fuscous.

In none of my caught specimens can I detect the testaceous spot on the side of the thorax, which is observable in those bred, and it may be, therefore, the effects of the unnatural condition under which they were reared. Most of my specimens have the belly entirely black. Length 3-4 lines; exp. alar. 6-7 lines.

The parasite—one of the *Ichneumonidæ*—remains inside the body of the saw-fly larva until the end of spring, when it completes its destruction, and then spins a thin white cocoon inside the other, from which it emerges at the end of June.

Note on Saw-fly Larvæ and Ichneumons.—Every one who has paid any attention to saw-fly larvæ, must have been struck with the curious habits of some of the larger *Nemati*, which feed exposed on the edge of the leaf. Frequently as many as a dozen may be seen ranged along the edge of a sallow leaf, attached to it only by their feet, the rest of the body being flung out in the

air, either standing stationary, or thrown directly over the head, or violently agitated backwards and forwards; and this is sure to be done with extra vigour if they are in any way disturbed, and they seem instinctively to know when anything approaches. What is the meaning of this habit? I think it is not so much for fear of birds, as to scare away the ichneumons that are always prowling about, and this opinion is amply borne out by the erratic way in which their eggs (mostly pedunculated) are found scattered over the larvæ. In one larva about a dozen eggs were found on its body, in every conceivable position, but the most remarkable instance observed, was one in which the larva had attached to its face, directly below the eyes, four pedunculated eggs, two on each side. The peduncles were fastened in some manner to the skin, and the egg proper hung down loose, the whole being nearly half a-line long. When discovered the larva, notwithstanding these singular appendages, appeared quite healthy, and fed vigorously, but in a day or two began to move its head about uneasily, and finally died; but previously to this two of the ichneumons left the egg, and fell to the ground, where they, of course, shared the same fate. This fact is, however, sufficient to show the difficulty the ichneumon (Tryphon?) must have in depositing her eggs in their proper nidus; and it is probably for the same reason that the larger species have acquired the power of squirting a liquid from the pores of the body.

It would be interesting if some one would investigate whether the possession of a bad odour or taste by an insect would deter *insect* depredators from preying upon it. We know that to a certain extent the above qualities protect their owners from birds, but judging from Mr Müller's observations on the voracious manner in which a bug *(Picromerus bidens)* attacked and devoured a saw-fly larva which had a bad smell, it does not seem to be always the case with insects. I have, however, found myself that cockroaches, which are perhaps the most omniverous of all insects, would not eat lady-birds *(Coccinella)* and *Telephori*, while they greedily devoured a large quantity of other insects, given to them at the same time, many of these being small hard-bodied weevils.

Some of the *Ichneumonidæ* prey upon larvæ in the perfect state. I once observed a *Pimpla* attack a small-sized lepidopterous larva, and devour half of it before flying away.—P. CAMERON, jun., Glasgow.

Note on the Larva of Synergus.—In the April No. of this Magazine, I alluded to certain inquiline larvæ, which inhabited pea-shaped galls on oak leaves, and pointed out that they were separated from each other by thin partitions, making the gall polythalamous, so to speak. During the summer I have investigated the subject further, and find that my former account is not strictly correct, but having observed the inquilines ovopositing in the galls, have been enabled thereby to explain the matter, and the following is a summary of the observations made.

The *Synergus* lays her eggs in the gall, while it is in a soft and growing state, and before the larva of the maker has left the egg. On entering their larval life, the inquilines feed on the juices of the gall, and as they reach maturity, form out of the woody matter, while it is still soft, these transparent partitions, and thus contrive to pass the quiescent period of their lives undisturbed by contact with one another, for that is I presume the *raison d'etre*, of the above proceedings. They follow the same practice in many different galls, and their presence seems to affect somewhat the form and size of the galls, either by making them irregular in shape, or of a smaller size. The galls of *Spathegaster baccarum* are frequently tenanted by six or seven inquilines, each in a separate

compartment, and with practice I could always distinguish hese from those which contained the makers. Examined under the microscope, the partitions are seen to be composed of very much contorted cells, but which have nevertheless, some resemblance to the regular woody structure.

As a general rule the inquilines leave the galls some time after the gall-makers; at least this is always the case with those found in the vernal galls.—*Id.*

Occurrence of Hadena assimilis in Inverness-shire.—On the first of July last I took in the same locality where I have previously obtained this species, a very rich dark coloured specimen, on the sixth a second, and on the eleventh a third; the two latter were worn, and all are males. Scotch entomologists should try to breed this fine species, and thereby settle the question as to whether it is merely a variety of *Crymodes exulis* or not. I have taken during the past few seasons 10 specimens, and had a good view of another, which escaped. I have also seen 4 specimens taken in the same locality by a friend, all of which are exactly alike, except the one taken on the 1st ult., which is much darker than the rest, but scarcely to be called a variety on that account. *C. exulis* is said to vary so much that it is difficult to obtain two specimens exactly alike. It is recorded that it passes the winter in the larva state, making long galleries in the moss, and is easily traced. Mr. Greening of Warrington and I have turned up quantities of moss in Inverness-shire without finding any trace of larvæ. It has also been stated that the imago of *exulis* may be found in the evening on grassy slopes creeping up the stems of grass, and in pairs hanging to the long grass. Our *assimilis* is not to be found so. *Exulis* is said to fly in the day time, and may be found hovering about flowers in the sunshine: it is not so with *assimilis*. Only two of the above named specimens are females.—NICHOLAS COOKE, Gorsey Hey, Mount Pleasant Road, Liscard, nr. Birkenhead. 23d August, 1873.

Occurrence of Hadena assimilis in Perthshire.—Mr. W. Herd showed me, on the top of Ben-y-Gloe, a living specimen of this rare moth which he had taken the previous evening in Glen Tilt.—F. BUCHANAN WHITE.

Pachnobia alpina in Braemar.—When tearing up moss on a hill side in Braemar last July I found a chrysalis, which on the morning of my departure disclosed a specimen of *Pachnobia alpina*. This may prove a useful hint to those who have an opportunity of searching for this species.—J. S. ALLIN, 20 Beaumont Square, London.

Trichiura cratægi.—When at Braemar in July last year, my neighbour Mr. Garrow found some larvæ feeding on heather on one of the hills, and gave them to me. They did not answer exactly to the book descriptions of any larva that I could find, and I had some hopes of finding that I had got something new, which, however, did not prove to be the case. They were full fed in the first week of August, but did not emerge until the beginning of July of this year, and then they proved to be a peculiarly coloured variety of *B. cratægi*—very dark ashy-gray or slate coloured, both body and wings, and without any trace of brown. There were four males and one female. All the accounts I can find of this moth concur in saying that the larva is found in May or June, and the moth in September. Have any of your readers experience of its passing the winter in the chrysalis state?—W. TAIT, Broomend, Inverurie.

Lepidoptera of Sutherland.—In the following note are mentioned those species observed by me in August, in Sutherland (meaning by that name the province so called in the lists of Scottish insects), which have already been mentioned in Lepidoptera Scotica, without being given under that province, owing to want of information. I follow the names and order given in the list:—*Vanessa urticæ*, abundant; *Epinephele janira*, abundant; *Pieris brassicæ*, one specimen, *Lycæna icarus*, common; *Saturnia pavonia*, larvæ and cocoons; *Bombyx rubi*, larvæ; *Bombyx quercus*, L. cocoons; *Leiocampa dictæoides*, one larva in Strathnaver; *Lophopteryx camelina* L. one larva in Strathnaver; *Orgyia antiqua*, larvæ; *Dasychira fascelina*, one larva. The remaining species will be mentioned in their proper places in the list.—JAMES W. H. TRAILL, Aberdeen, August, 1873.

Vanessa Antiopa.—Two specimens of this species were seen near Dunkeld last spring.—F. BUCHANAN WHITE.

Helix ericetorum in Sutherland:—While botanizing on the north coast of Sutherland, in August, I found this species of snail very abundant on the sandy banks at Malvich and Farr, and doubtless it occurs in similar localities elsewhere along the coast. The northern limit is given in Jeffreys' work as the Hebrides, no island being specified. At Farr I also found the shells of *Bulimus acutus* very abundant.—JAMES W. H. TRAILL, Aberdeen.

A LIST OF THE SCOTTISH LAND AND FRESH-WATER MOLLUSCA, WITH HINTS ON COLLECTING.

By F. BUCHANAN WHITE, M.D., F.L.S.

AS subjects for study the Land and Fresh-water Mollusks, either dead or alive, are well worthy of attention. In a living state they may be kept, and their habits observed and recorded; when dead, they have this advantage over many other groups of animals that their shells may easily be preserved without losing any of the beauty of form, and little of the beauty of colour; while to the possessor of a microscope their palates supply abundance of material for work and investigation. Moreover, to the naturalist possessed of but little time to devote to his favourite pursuits, the British species, being only about 130 in number, have the additional advantage of not being a group in which he need despair of attaining anything like a perfect collection, and are besides (as regards the majority at least) obtainable at all seasons and in most places; while to him who is not over burdened with this world's pelf, the apparatus required in their capture and preservation, need cost but little.

To the casual observer, a few (often indeed too many) slugs,

and a "wheen buckies" with mottled or banded shells, are apparently the sole terrestial representatives of the numerous "shell fish" that are found in the sea, but to him who knows how to use his eyes, our gardens and fields, woods and rocks, rivers and lakes, have numerous molluscous inhabitants. To assist, therefore, those who are desirous of becoming better acquainted with our Scottish species, I have briefly noticed the special localities affected by each.

Arion ater L.—Appears to be common everywhere, though, if the testimony of certain farmers is to be believed, less common than formerly, owing probably to the more extensive drainage of the land. I have seen specimens not unfrequently over 3000 feet above sea level. This animal varies considerably in colour: I have found, but rarely, specimens nearly white. It is decidedly carnivorous, as well as herbivorous; I once found one devouring a specimen of that common moth, *Spilosoma menthastri.*

A. hortensis Fer.—Common everywhere, and ascends as high as *A. ater.*

A. flavus Müll.—Is considered by some authors as merely a variety of the last. It is said to be common everywhere and to be a more tender species than *hortensis.*

Limax gagates Drap.—Is said to have occurred once, in the west of Scotland.

L. agrestis L. (*nec* Drap.)—Too common everywhere.

L. marginatus Müll.—Is not an uncommon species throughout the country. It may be found on trees, especially beech, on the trunks of which it may often be seen in abundance after rain. It is occasionally, however, to be found on rocks, as, for example, on Ben Lawers, where it ascends more than 3000 feet above sea level. Like some others of the genus, *L. marginatus* is attracted by the "sugar" put on trees by collectors of moths.

L. lævis Müll. (*brunneus* Drap. ?)—Mr. Jeffreys says that this species is common everywhere. (British Conchology, v., 156.)

L. tenellus Müll.—"North Marine, Shetland" Jeffreys (*l. c.* v., 156).

L. flavus L.—Common; usually in or near houses, inhabiting sculleries and damp cellars. It is more rarely found in woods.

L. maximus L.—Not uncommon in the same places as the last, but more frequently found in woods, often ascending trees

and not uncommonly visiting the sugar placed there by Lepidopterists.

Vitrina pellucida Müll.—Common everywhere, especially among decaying leaves.

Succinea putris L.—Appears to occur throughout Scotland, but is not, in my experience, very common. All the specimens I have found are very small. It frequents plants and stones near water. I have taken many specimens out of the dead grass of the overhanging bank of a pond in winter. At this season the mouth of the shell was closed by a diaphragm such as may be seen in many species of *Helix*.

S. elegans Risso.—Occurs throughout the country, but is either not common, or is passed over as the preceding. It occurs in similar localities. Var. *ochracea*, Shetland.

S. oblonga Drap.—Very rare. Said to have been found near Glasgow. It inhabits sandy places near the sea.

Zonites cellarius Müll.—A common species everywhere, frequently under stones. I have found the var. *complanata* and *compacta*, near Perth.

Z. alliarius Müll.—Equally common as the last. Var. *viridula*, Shetland.

Z. nitidulus Drap.—The commonest of the genus, occurring in all sort of places and attaining a considerable elevation.

Var. *nitens:* more common than the type, and frequenting dryer places.

Z. purus Alder.—In woods, under stones, and among dead leaves, not very uncommon throughout the country. The var. *margaritacea* seems to be commoner than the typical form.

Z. radiatulus Alder.—In woods among dead leaves, but not very common. It occurs throughout the country.

Z. nitidus Müll.—Though apparently occurring throughout Scotland, *Z. nitidus* is not a common species. It inhabits woods, where it is found among dead leaves in damp shady places. From its love of moisture it is also to be found on the banks of lakes and ditches and it is said not to be an unfrequent inhabitant of orchard houses.

Z. excavatus Bean.—This is the rarest of the genus, and though widely distributed, is local, and not common. It has occurred in the south and south-west of Scotland, near Glasgow, in Argyleshire, Bute, Aberdeenshire and Ross-shire. It inhabits the same kind of places as the two preceding species.

Z. crystallinus Müll.—Rather common throughout the country, among dead leaves in woods, and under stones in more open damp places. I have found it in abundance and very fine under stones in a wet meadow by the side of the Tay, near Perth.

Z. fulvus Müll.—Throughout, but never abundant; among dead leaves and on stones in woods.

Helix aspersa Müll.—Throughout, but, especially in the north, chiefly near the sea; inland it is rare and local. In dry weather it hides in holes in walls, but after rain comes out in great numbers. The var. *exalbida* occurs on the sea coast.

H. arbustorum L.—Not uncommon throughout Scotland, but rather local, frequenting damp rocks and damp shady hedge banks. It is almost the only *Helix* that is to be found on the high mountains, where it is not uncommon and attains an elevation of at least 3000 feet. I have found the var. *flavescens* near the sea in Fife; the var. *alpestris* occurs (but rarely) in several parts of Perthshire and Aberdeenshire; and the var. *fusca* in Shetland.

H. nemoralis L.—Is a very common species everywhere. The varr. *hortensis*, *hybrida* and *major*, all occur, the first as common as the type, the other two less commonly. The var. *minor* is recorded by Jeffreys from Shetland and Ross-shire, and I have a series from Balgowan, Perthshire, where it seems to pass gradually into *hortensis*.

H. caperata Mont.—As far north as Moray, chiefly near the sea. It abounds on many sand hills, burying itself in the sand about the roots of grass, and under stones.

H. ericetorum Müll.—Near the sea on sand hills in several places, more especially on the west coast. The var. *instabilis* is reported from Iona and Mull.

H. lapicida L.—Found at Hawick by Mr W. Grant Guthrie.

H. rufescens Pennant.—Bowling (Trans. Glasgow Nat. Hist. Soc. I. p. 196). Var. *albida;* in the same locality. In this locality (which, as far as I am aware, is the only Scottish one), it is entirely maritime.

H. concinna Jeffreys.—Said to be generally distributed, and in the Perth district it is certainly as common as the next species, from which it is most easily distinguished by the shape and colour of the animal. Both species occur on and under

stones, beside hedges and edges of fields, and upon the leaves of nettles and other plants. A heap of loose stones near a bed of nettles is pretty certain to yield many specimens.

H. hispida L.—A common species, especially in the low and cultivated country. I have found the var. *albida* at Perth.

H. sericea Drap.—A rare species in Scotland, where I have not myself met with it. Jeffreys says "from the Moray Firth southwards," and it appears in the lists of several of the south-western counties, as Ayrshire and Wigtonshire. The broad leaves of the butterbur *(Petasites)*, and beds of nettles seem the favourite habitats.

H. fusca Mont.—Is another species of some rarity. It has been taken in the following counties at least: —Ross, Aberdeen, Kincardine, Perth, Lanark, Renfrew, Bute, Ayr, and Kirkcudbright. It frequents shady places "among nettles and dog-mercury" (Jeffreys), "under leaves and upon brambles" (L. Reeve), "on the leaves of *Petasites*" (Haddin). I have found it among coarse grass in a damp place, and on honeysuckle and ivy. Like other species, it is most easily found in wet weather.

H. lamellata Jeffreys.—A most beautiful little shell, and though local, not uncommon where it does occur. It is the most common species of Helix in the wooded highland glens, where I have found it at an elevation of 1200 feet—it probably attaining greater altitude. I have met with it as far north as Ross-shire and it is likely to occur throughout the highlands, and, not improbably, in suitable localities throughout the lowlands also. It inhabits woods, especially of birch, living among dead leaves, especially the decaying-fronds of the softer ferns, such as *Aspidium oreopteris* and the Lady fern. Jeffreys (B. C. 1. 175) says, "especially among dead holly leaves," but though I have carefully searched, I have never been able to find *lamellata* or any shell among holly leaves, even in the most likely-looking places. To obtain *H. lamellata* and some other species such as *aculeata* and *pygmæa*, *Carychium*, &c., I fill a large bag full of the decaying leaves of *Aspidium oreopteris*, or other soft ferns growing in dampish places in open woods (as for example the hollows on the sides of hills, narrow glens, or near the channels of hill streams), scraping up from the ground below the fern, the decayed fronds of the previous year. When the bag is full—

it is prudent in filling it to make sure that there are shells in the locality—I take it home, dry the contents, and then pass them through a seive several times; on examining the sifting a rich harvest of shells may often be reaped.

H. aculeata Müll.—A widely distributed but not abundant species, frequenting the same kind of places as the last, but more universal in the lowlands than it. It should be searched for in the same manner, and may easily be passed over from its resemblence to a prickly seed.

H. pulchella Müll.—This shell well deserves its name. It is a widely distributed but rather local species; in the highlands it appears to be very rare. It lives about the roots of grass in either dry or wet places, on rocks, walls or sandy shores. I have found it most commonly by shaking over a piece of paper the tufts of grass growing in the corners, or on the narrow ledges, of dry rocks. Many shells of different species may be easily obtained in this manner. About Perth I find the var. *costata* commoner than the type.

H. rotundata Müll.—A very common species under stones, and about rocks, walls, &c., but less common in the highlands. The var. *minor* is alpine, and is recorded from Shetland; the var. *alba* is rare, but has been found at Aberdeen, and I once met with it near Perth.

H. rupestris Stud.—A rather local species, but common where it does occur. It has been found as far north as Sutherlandshire, but I have never seen it in the highlands. It lives on dry rocks and walls, under loose stones or in narrow chinks, sometimes among the roots of grass on ledges in company with *H. pulchella.*

H. pygmœa Drap.—Not uncommon among dead leaves in woods as far north as Ross-shire (where I have found it), but probably often overlooked from its small size. It should be searched for in the same manner as *H. lamellata.*

Bulimus acutus Müll.—A maritime species occurring on sandhills on several parts of the coast both east and west, as far north as Durness. The var. *bizona* occurs in Iona.

B. obscurus Müll.—Widely distributed, but not found everywhere; I have never seen it in the highlands. It lives on walls and rocks, hiding in dry weather among the roots of grass or sticking to the rock behind depending tufts. It is one of the

shells I find on narrow ledges in company with *H. pulchella*. The young animal covers its shell with an encrustation of mud, and thus often escapes notice.

Cochlicopa lubrica Müll.—A common and widely distributed species, living under stones and among dead leaves in both dry and wet places. It is less common in the highlands. The var. *lubricoides* is not uncommon near Perth.

Azeca tridens Pult.—Very local, but apparently common where it does occur. It has been found at Bridge of Allan (Foulis), and in Dumfries-shire (Somerville). It lives among moss.

Clausilia laminata Mont.—Rare and local. Among ivy on a shaded rock near Perth, where I discovered it some years ago. It is said to frequent decayed leaves about the trunks of trees, especially in beech woods.

C. perversa Müll. Common (but less so in the highlands) living on rocks and walls, and among moss at the roots of trees. It attains an altitude of 2400 ft. on Ben Lawers. The var. *Everetti* is reported from Shetland, and I have found it and the var. *tumidula* at Perth.

Balia perversa L.—A widely distributed but local species. It is most abundant on rocks—hiding behind tufts of grass—and under the stones in dry stone dykes; less abundant below loose bark of trees. The shell of this species (amongst others) seems to attain a greater size in Scotland than it does in England. I sent specimens to Mr. Jeffreys in illustration of this, and he remarks (B. C. v. 161) that they are rather larger than English. This may be caused by the moister atmosphere and lower temperature of the Scottish summer permitting the animals to feed for a longer period. As is well known, many molluscs remain dormant in hot dry summer weather, in the same manner as they do in winter.

The same circumstances which cause these shells to be larger in Scotland than they are in England may also be the reason why many Scottish insects attain a greater size than English examples of the same species.

Pupa muscorum L—Rather scarce, but widely distributed, and perhaps passed over as the next, and lives in similar localities.

(To be continued.)

PHYTOLOGY.

SCOTTISH GALLS.

(Continued from p. 128.)

By J. W. H. TRAILL, M.A.

They are smooth, diaphanous, green usually when attached to the leaf, red partially or entirely when attached to the catkins; in this latter case they look much like a bunch of red currants. They are monothalamous, and have very thick fleshy walls. The insects eat their way out of the galls in June and July. *(q)* I found several galls of *Trigonaspis magaptera* Panzer in the month of June, both last year and this year, in Parkhill woods. They were on the *trunks* of oaks, in crevices of the bark. Sometimes two are more or less united, but usually they are separate. When well formed they are globular, pea-sized, smooth and naked; and are bright red in colour. They are monothalamous, with rather thick fleshy walls. Like the last they soon shrivel up, and disappear early in July. This year I have reared a good number of the insects. *(r)* Galls of *Andricus inflator* Hartig, were in June found by me on an oak bush on Craigandarroch at Ballater. They are terminal (or axillary) swellings on the young branches, of an ovate form, about $\frac{1}{4}$ inch by $\frac{1}{5}$ inch; smooth externally, or with small leaves or leaf scales attached; open by a small hole at the apex across which a thin membrane is stretched. Colour green, brownish near the apex. Walls thin, cavity large, containing at the bottom a small ovate inner gall about $\frac{1}{12}$ inch by $\frac{1}{16}$ inch. This is attached by its base to the bottom of the cavity, its apex pointing to the opening in the outer gall. It is brownish black, thin and papery, yielding readily on pressure. The remaining species of oak galls are, I believe new to Britain. *(s)* Galls of *Andricus quadrilineatus* Hartig occurred to me commonly on oaks at Banchory on June 7th

and at Ballater and elsewhere in this district for some time afterwards. They usually occur on the catkins, 4 to 5 on each. They are oval, about $\frac{1}{6}$ inch by $\frac{1}{8}$ inch. The surface is green, naked, but irregularly striated faintly. On making a section each is found to contain a whitish hard inner gall closely surrounded by, and grown to, the fleshy green outer case, and enclosing a comparatively large cell. When allowed to dry the striæ became much more apparent, and could be seen to form an irregular network, the variations of which in depth and regularity have been considered as warranting the conclusion that they belong to different species of *Andricus*. Though usually occurring on the catkins they are not seldom attached to the mid-rib of a leaf at one side, and form a gap in the lamina opposite it. In every respect but situation these latter resemble those on the catkins, and are clearly formed by *Andricus quadrilineatus*. From the figures and description given by Mayr those on the leaves are clearly those described by Schlechtendal and named by him *Cynips marginalis*, which is only, as Mayr suggests, a synonym of *Andricus quadrilineatus*. *(t)* Galls of *Andricus amenti* Gir.—On looking over some oak catkins collected by Mr. W. Vice and myself, at Ballater (along with the galls of *A. quadrilineatus)*, there were found to be numerous specimens of the galls of *A. amenti*, new to Britain. The galls are sessile on the catkins; they are ovate, and are attached by the blunt end; the apex is sharp and is slightly bent to one side. Length $\frac{1}{16}$ inch to $\frac{1}{12}$ inch, greatest breadth half as much. Surface covered with very short stiff hairs, colour brown. They are monothalamous and very thin-walled. Several of the insects have emerged. *(t)* Galls of *Spathegaster vesicatrix* Schlechtendal.—On Saturday, July 5th, I found galls of this species common in oak leaves at Banchory, where I had seen a few, about a month before, in their earlier stages without recognising them as galls. This species also is, I believe, new to Britain. They are sunk in the substance of the leaf entirely at first, but as they approach maturity they project both above and below, forming a very low double cone, and enclosing a cavity of some size, the walls being very thin. When mature they are readily seen, being

whitish, while the leaf is green, but till maturity they are green like the leaf. They are then very difficult to find, the readiest eye-mark being the radii which pass from a small knob in the centre to the circumference. On the upper surface this arrangement is very regular and distinct, but it is less regular below, and there is no central knob. Both surfaces are naked. The form is oval, about $\frac{1}{8} \times 1\frac{1}{2}$. Almost all that I found were empty, but a few contained inquilines.

Brassica campestris L. (Turnip).—Last February, at Old Aberdeen, I found galls of *Ceuthorhynchus sulcicollis* Gyll. on roots of turnips. They are scattered irregularly over the root, especially below the surface of the earth; and project rather more than half a hemisphere of $\frac{1}{6}$ to $\frac{1}{2}$ inch diameter. Walls in consistence and appearance are like the root. The galls are monothalamous and are usually distinct, but sometimes two or more are united.

Hypericum pulchrum L.—The galls on this plant already described have been found by Dr. White at Castleton of Braemar this summer.

Ulex europæus L.—On this plant, Mr. Verrall, during a visit to Aberdeen this summer, detected galls on Scotston Moor, near Aberdeen. I afterwards found the galls abundant near Aberdeen, and succeeded in rearing from them an *Asphondylia* which resembles pretty closely *Asphondylia sarothamni*, but is larger than this species. As it differs in its food-plant from any described species, and is larger than *A. sarothamni*, its nearest ally, I now propose for it the name of *Asphondylia ulicis*. The galls so closely resemble large flowerbuds as to be readily overlooked, though easy of detection after once being recognised. They are a good deal larger, and more inflated than the flowerbuds, but otherwise agree with them closely in appearance. Size about $\frac{3}{8}$ inch by $\frac{1}{4}$ inch. Monothalamous, enclosing a large cavity in which there is not a trace of the inner whorls of the flower. Walls lined with a short white pubescence on which the larva feeds.

Cytisus scoparius L.—*(c)* During the summer I have found a gall which differs from both kinds (pod galls and leaf bud galls) already described in consisting of a distorted flower-

bud, usually situated on a twig bearing a number of flowers. It resembles a considerably swollen half-grown bud. Size about ¼ inch by ⅛ inch. It is frequently surrounded at its base by the sepals, but no other part of the flower can be distinguished. Contains a large central cavity inhabited by a larva which is not cecidomyious, but which I have not yet reared. Banchory, 7th June, common.

(To be continued.)

A New British Moss.—Dr. Moore, of the Royal Botanic Gardens, Dublin, who has already done so much to extend our knowledge of the bryology of the British Isles, and especially of Ireland, has again been so fortunate as to discover another moss hitherto unknown as a native of the kingdom. In 1868, when he was on a visit to the Island of Lewis, one of the outer Hebrides, his attention was taken by a *Sphagnum* growing plentifully on the flat moors, and rising from eighteen inches to two feet above the surrounding surface. In a letter to me, in which specimens were enclosed, Dr. Moore states that he had regarded it as a remarkable form of *Sphagnum cymbiforme*, but so extraordinary that he had drawn up a diagnosis of its peculiarities. This summer he showed the plant to Lindberg, and that distinguished botanist expressed his belief that it was identical with a comparatively recent American species, viz., *Sphagnum Austini* Sull. I have compared specimens of the Lewis plant with original specimens of *Sphagnum Austini* gathered in America by Austin in 1863, and the former do not differ much from the latter except in being stouter and having the branches more crowded upon the stems. It is interesting to find that another American species is a British species also, and that the Floras of Great Britain and America are, by still another link, more closely connected than we were hitherto aware of.—J. FERGUSSON, New Pitsligo.

Anacalypta latifolia.—Last July, Dr. Buchanan White, Mr. J. Allen Harker, and myself, discovered a new and fifth British locality for this extremely rare and interesting little moss. We found it in fair abundance on Craig Koynach, near the Castleton of Braemar. Here, as in the other stations in Great Britain in which it had previously been found, it grows on the finely-pulverized earth of limestone rocks, a soil excelling all others in richness. On Craig Koynach, as on the Caar Rocks and on the rock behind the farm of Tomintoul on Morrone, the other Aberdeenshire localities in which it is found, it loses much of that alpine character which we are naturally led to attribute to it, when we remember that on the Continent it is met with only near the eternal snows on the summits of the Swiss and Jurassic Alps, and that in the shires of Forfar and Perth it appears only at high altitudes. It strikes one as very odd, that from the spot at Tomintoul farm where *Anacalypta latifolia* can be gathered, one can almost pitch a stone into potatoe and turnip fields; and that on Craig Koynach it grows in the heart of a great wood at an elevation of not more than 1400 feet, and associated with a profusion of plants of a subalpine and lowland type. It is almost certain that the plant occurs elsewhere in the north of Scotland, and should be looked for on the limestone of the south flank of the Cairnwell in Glenshee, on the Nether Craig in Blackwater, and about Tomintoul in Banffshire.—ID.

A New British Fungus.—I understand that the Rev. James Keith, M.A., Forres, who is our best Scottish fungologist, has gathered near Forres what

appears to be *Cortinarius traganus*, a plant hitherto unknown as British. It seems to be very common in upland fir woods, and will no doubt be heard of from other quarters now that attention has been called to it.—ID.

The Clavarias of New Pitsligo.—The coast of the Buchan district in Aberdeenshire is one of the most magnificent in Britain, and is very rich in interesting botanical rarities. The inland part of the same district has a bare and almost painful sameness of aspect, owing to the general flatness of the country, and the paltry character of its plantations. These causes when combined with a low temperature make it as unpromising to a fungologist as Nova Zembla or even the Great Sahara. Still, within an area of about a mile all round the village of New Pitsligo, though its woods do not extend much over a hundred acres, and are in fact little better than a pretence, many more species of fungi have been detected than are recorded for the three counties of Kincardine, Aberdeen, and Bamff, by Prof. Dickie's admirable "Botanists' Guide." This little spot, when compared with other places, is very rich in *Clavarias*—beautiful, and generally branched or fasciculate fungi, of which some 34 species have been found in the British Isles. Of these only a very small proportion are known to be natives of Scotland. Dr. Dickie gives only four as having been discovered in the counties embraced by his "Guide." The Rev. J. Keith mentions only the same number as having been found near Forres up to 1871, and until quite recently only two or three were known as belonging to Forfarshire. Within the above-mentioned area around New Pitsligo there are no fewer than ten species at the very least.

In the Gardner and Rattray woods, which lie to the south of the village, you have first of all *Clavaria cristata* springing up through layers of beech and other leaves into which the foot sinks as into a pillow. The colour of the plant is usually whitish, but here it is of a pale-ash somewhat resembling that of *C. cinerea* from which, however, it can always be distinguished by its toughness and acute cristate branches. Near this occurs the much rarer *C. inæqualis* which, in this quarter, is by far the most abundant of the genus. It seems to grow in all our woods, especially in that on the east side of the upper lake of Glaslaw, where it covers an area of several acres, and is associated with *Agaricus clavipes*, a recent addition to the list of British fungi. Everywhere here we find it, not of the normal yellow colour, but of a delicate white, which occasionally, and especially when the plant grows old, has a feeble hint of yellow. I am not aware of this plant having been previously recorded for the north east of Scotland.

In these same woods, and on their borders, other three *Clavarias* can be collected, namely *C. muscoides*, *C. rugosa*, and *C. stricta*. Though the first two seem to be quite common everywhere, according to report, our experience has been that they are rather rare. Only once have we seen *Clavaria rugosa* in all Buchan, and we have a suspicion that something else may have been taken for it. *Clavaria stricta*, on the other hand, is quite common round New Pitsligo at least, and apparently in other places, though it has no doubt been overlooked and confounded with *C. abietina* from which it can be readily distinguished by the longer branches, the darker brown hue, and by its never turning bluish-green when bruised or in decay. It is usually found growing among accumulations of decaying pine leaves, and keeping well in below the branches of spruce trees, where it is almost always associated with its congener.

From the Farm of Greenspeck on towards Tirclossie. there is a narrow belt of wood fringing the highway leading to Fraserburgh, and here several important things are got. First, we have *C. fastigiata*, a much more "strict" species than

C. stricta, and withal of a fine yellow, somewhat approaching that of *Calocera viscosa*, but not so rich. Then we come upon a small quantity of *C. fragilis* which is here in company with *Agaricus Swartzii*, and *Ag. testaceus*, species much rarer than, but not so curious as, the green and yellow *Hygrophorous psittacinus*, which is rather plentiful A little beyond these, springing up through and overtopping the long grass, is another splendid *Clavaria* of a cæspitose habit, often attaining a height of five or six inches, and of a beautiful alabaster white. I was inclined to believe that ultimately it might have to be referred to *C. argillacea;* but one of our first British fungologists regards it as a species closely related to *C. argillacea*. Genuine normal forms of this latter plant grow at no great distance in the same wood, or rather on the mud of an old wall which enclosed it, and has certainly a very different appearance.

About half-a-mile or more to the north east of the village there is a belt of fir trees planted round the base of a singular granite knoll rising up out of the centre of an extensive peat bog. This is the only place in the district where we have yet observed *C. abietina*. In this wood there grow along with it *C. stricta*, and the odd looking *Spathularia flavida*, which in general looks so mightily like a common egg-spoon. The last and perhaps the rarest of the New Pitsligo *Clavarias* is *C. cinerea*. Last year I found it in a little beech wood at the north-end of the village, along with small quantities of *C. cristata* and *C. inæqualis*. This year I can find only the latter there. It is possible that the others may yet show themselves, but one cannot tell. *Clavaria cinerea* seems to be very capricious and fastidious in the choice of its abode, and it may be as capricious in the times of its appearance.—ID.

Occurrence of Centaurea scabiosa L. &c. in Sutherland.—During a walking tour in Sutherland with my friends Messrs Vice and Williamson we found *Centaurea scabiosa* commonly at Farr, on the north coast, especially on a sandy bank on which it abounded along with *Ononis arvensis*, *Daucus carota*, *Scabiosa arvensis*, *Tragopogon pratensis*, *&c.* In the *Students' Flora* the northern limit given for both *Centaurea scabiosa*, and *Tragopogon pratensis* is Moray. The rayless variety of *Senecio jacobæa* was even more common than the ordinary form. We also found *Pinguicula lusitanica* and *Primula scotica* near Farr.—JAMES W. H. TRAILL.

Botanical Notes.—I have met with the following plants during the past summer. *Equisetum pratense (umbrosum)* in the Glas-alt Glen, on Craig-na-dala Beag, in Braemar: not known before, I understand, as an Aberdeenshire plant. In the same locality I found *Ajuga reptans* var. *pseudo-alpina.*—*Cerastium triviale* var. *alpinum*, on Craig-na-dala in Cairn Toul. This plant varies much in the size of the petals. The Cairn Toul plant might almost be mistaken for *Cerastium alpinum;* the Craig-na-dala plant has much smaller flowers; and Colonel Drummond Hay found a plant on Lochnagar that is intermediate between typical *triviale* and the var. *alpinum.*—*Hypnum trifarium*—Craig-na-dala; not found previously in Aberdeenshire nor on the eastern Grampians. —*Aira uliginosa*—common in several localities in Braemar.—*Peziza axillaris* —Morrone, Braemar.

The following plants found by Colonel Drummond Hay, Mr. Roy and myself during an excursion of the Perthshire Mountain Club to Glentilt and Ben-y-Gloe:—*Equisetum pratense*, Glentilt; *Orchis incarnata*, near Falar, at an altitude of 1800 feet. This station was discovered by Professor Barker a few years ago. *Aira alpina*, *Peziza axillaris*, *Solorina crocea*, &c., Ben-y-Gloe,

(*Carex vaginata* was found on Ben-y-Gloe by Mr. J. M'Farlane).—*Utricularia intermedia* near the Bynak Lodge, Braemar.

Exobasidium vaccinii has been very common in Braemar this year, and among other Fungi *Hydnum compactum*, *Trametes pini*, *Polyporus violaceus* and *Gyromitra esculenta* have occurred.—F. BUCHANAN WHITE.

VARIOUS NOTES.

We learn that our contributor, the Rev. J. Fergusson, the well-known bryologist, is preparing for publication a Manual of British Bryology.

A work upon the Birds of Shetland by the late Dr. Saxby (well known for his investigation of the ornithology of these islands). is announced as nearly ready. It will be published by subscription (£1 1s.), and will contain, in addition to many observations on the habits, &c., of the Shetland birds, numerous tinted lithographs from drawings by the author. These plates are very beautifully drawn. Prospectuses may be obtained from the Rev. S. H. Saxby, East Clevedon, Somerset, or from the publishers, Messrs. MacLachlan & Stewart, Edinburgh. From what we know of the late Dr. Saxby's attainments we are satisfied that the forthcoming work is one that should be in every ornithologist's library.

The annual report of the Glasgow Society of Field Naturalists is before us. This Club (established in 1871) appears to be doing good work, especially in investigating the entomology and botany of Clydesdale, where much remains to be done, especially in the first of these departments. To the report is appended a paper upon additions to the lichen flora of New Zealand (with descriptions of new species). This seems to be rather out of place here, but we understand that there are good reasons for so publishing it. We wish the Club all success.

The Alloa Society of Natural Science and Archæology has been showing an amount of energy lately that might well be imitated by many older and more influential Societies. Funds are being raised, and the foundation stone has been laid of a building, in the Grecian style of architecture, which is to contain the museum of the Society, in addition to lecture hall, committee rooms, &c. The lecture hall and museum, situated in the back of the building, is 58 + 28 feet, and 25 feet high. Being lighted from the roof, a gallery 5 feet broad (to which access may be had from the staircase outside the hall) will be carried round, provided with wall cases and table glass cases in front. Besides the hall the front building contains a committee room 25 × 20 feet and a reading-room of the same size above; a cloak room 14+10 feet, with work room above, and rooms for the keeper of the building, &c. The hall will be heated by warm air, and will have three entrances, one of these by the committee room—thus giving direct communication between all the apartments. The cost of the building will be about £1,600, of which a great portion has been raised. Well done, Alloa! We hope that the Society, in forming the museum, will bear in mind the importance of illustrating well the local natural history, and carefully eschew all donations of two-headed calves, South Sea Islanders' cloaks, *et id genus omne*, which so often converts a provincial museum into an "omnium gatherum" of rubbish. We understand that among other collections of natural history and archæology acquired by, and presented to, the Society, the very valuable local collection of geology and mineralogy purchased some years ago by the Society from the trustees of the late Robert Bald, C.E., will have a prominent place in the new arrangements of the museum.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 136.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

MEGACEPHALA F. Local. Nemoral.

DISTRIBUTION—EAST. o o Tay ♂ Moray o o o
WEST. o o o o o

LAT. 56°20″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Aspen.

MYRICÆ Gn. Local. Ericetal. Ascends to 2000 feet.

DISTRIBUTION—EAST. o ♂ Tay Dee Moray ♂ o o
WEST. o Clyde Argyle ♂ ♂

LAT. 55°30″-58°. RANGE IN EUROPE. Scotland and Ireland. TYPE. Scottish. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. August, September. FOOD-PLANT. Sallow, heather, and other low plants.

Staudinger appears to be of opinion that *myricæ* may be only a form of *euphorbiæ*, F., to which species it is certainly closely allied.

RUMICIS L. Common. Agrestal, pascual, ericetal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o c
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Throughout. TYPE. Territorial. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. August-September. FOOD-PLANT. Low plants.

Ab. *lepida.* Usually rather smaller than the typical form; wings darker, nearly unicolorous. Stainton's Manual I., 183 (under *A. salicis;* exclude description of larva, which is that of the ab. of *menyanthidis).* Newman's Brit. Moths 255, (fig).

MENYANTHIDIS View. Not uncommon. Ericetal. Ascends to upwards of 1000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-September. FOOD-PLANT. Heather, sallow, *Myrica, Menyanthes,* &c.

Ab. *salicis* Curtis. Darker, wings nearly unicolorous. Trossachs.

PSI L. Common. Agrestal, nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. August-October. FOOD-PLANT. Various trees and shrubs.

LEPORINA L. Not very common. Nemoral.

DISTRIBUTION—EAST. Tweed o Tay o Moray o o o
WEST. Solway Clyde Argyle o o

LAT. 54°40″-58°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-September. FOOD-PLANT. Birch, alder.

From their European distribution the following species should occur in Scotland, and probably some of them may yet be found:—*aceris* L., *euphorbiæ* F., *auricoma* F., *alni* L., and *tridens* Schiff.

DEMAS Stph.

CORYLI L. Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40″-58°30″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September FOOD-PLANT. Birch, alder, hazel, sallow, beech, &c.

ORTHOSIIDÆ.

TRACHEA Hub.

PINIPERDA Panz. Common. Nemoral. Ascends to 1400 ft.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ○ ○
WEST. Solway Clyde ♀ West-Ross ○

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March-May. LARVA. May-August. FOOD-PLANT. Pine.

Varies with colour greenish instead of reddish (= Var. A. of Guenée, from Northern Europe).

PACHNOBIA Gn.

HYPERBOREA Zett.

Var. *alpina* Westw. (1841); *carnica* Hering (1846). Very rare. Alpine. Altitude, 2000-3000 feet.

DISTRIBUTION—EAST. ○ ○ Tay Dee ○ ○ ○ ○
WEST. ○ ○ ♀ ○ ○

LAT. 56°30″-57°. RANGE IN EUROPE. Carinthian Alps (the var.); Lapland, Norway, Switzerland, &c. (the typical form.) TYPE. Boreal. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. ?
FOOD-PLANT. ?

RUBRICOSA F. Not uncommon. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ○ ○
WEST. Solway Clyde ♀ ♀ ○

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March-May. LARVA. May, June. FOOD-PLANT. Dock, &c.

TÆNIOCAMPA Gn.

POPULETI Tr. Rare. Nemoral.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

LAT. 56°20″ 56°30″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May-July. FOOD-PLANT. Poplar and aspen.

This species might easily be past over as a variety of *incerta*. Among other points of difference the structure of the antennæ of the male affords a good character—in *populeti* the pectinations are linear, in *incerta* they are pyramidal.

GOTHICA L. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂
Orkney o
WEST. Solway Clyde ♂ ♂ ♂

LAT. 54°40″-59°10″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May-July. FOOD-PLANT. Sallow, oak, &c.

Gothicina H.S. (a smaller paler aberration with the dark markings much less distinct) has occurred in Moray and elsewhere.

INCERTA Hufn. (1767); *instabilis* Esp. (1790). Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ ♂ o
WEST. Solway Clyde ♂ West Ross ♂

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May-July. FOOD-PLANT. Various trees and low plants.

STABILIS View. Abundant. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and southern. TYPE. Centro-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May, July, FOOD-PLANT. Oak (and sallow).

T. opima will probably be found, at least in the south.

PULVERULENTA Esp. (1787); *cruda* Tr. (1825). Common but local. Nemoral.

DISTRIBUTION—EAST. Tweed ♂ Tay ♂ Moray o o o
WEST. Solway Clyde ♂ o o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and southern (South Sweden, &c.) TYPE. Centro-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May-July. FOOD-PLANT. Oak.

[**GRACILIS** F. Very local. Nemoral.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o

LAT. 55°50″-56°30″. RANGE IN EUROPE. Central (to South Sweden). TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. April, May. LARVA. May, July. FOOD-PLANT. Sallow.

This species is reported from Peasbridge, Berwickshire (Hardy), and Dalmally (Buxton). I have not seen specimens, and I think that there is possibly some error.

[**MUNDA** Esp. Very local. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

LAT. 55°. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May, July. FOOD-PLANT. Oak, &c.

DYSCHORISTA Ledr.

SUSPECTA H. Not common. Nemoral.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray o o o
WEST. ♂ Clyde ♂ ♂ o

LAT. 55°50″-57°40″. RANGE IN EUROPE. Britain, Germany, Batavia, North France, &c. TYPE. Central. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. ? FOOD-PLANT. ?

YPSILON Bkh. Rare. Nemoral

DISTRIBUTION—EAST. o o Tay Dee o o o
WEST. o o o o o

LAT. 56°20″-57°. RANGE IN EUROPE. Central (to South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. September June. FOOD-PLANT. Narrow-leaved willows.

ORTHOSIA Ochsen.

LOTA Cl. Local. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-57°. RANGE IN EUROPE. Central (to Sweden and South Finland, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. September-October. LARVA. April-June. FOOD-PLANT. Sallow and willow.

MACILENTA H. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ ♂ o

Lat 54°40″-57°50″. RANGE IN EUROPE. Central (to Denmark.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. April, June. FOOD-PLANT. Beech, birch, &c.

FERRUGINEA Esp. Common. Nemoral

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

Lat. 54°40″-57°50″. RANGE IN EUROPE. Central (South Sweden, Finland, &c.) TYPE. Central. TYPE IN BRITAIN British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. April, May. FOOD-PLANT. Sallow, aspen, &c.

ANCHOCELIS Gn.

RUFINA L. Common. Nemoral.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. April-June. FOOD-PLANT. Oak, low plants, &c.

PISTACINA F. Local. Nemoral.

DISTRIBUTION—EAST. ♂ ○ Tay ○ ○ ○ ○ ○
WEST. Solway. ♂ ○ ○ ○

LAT. 54°50″-56°30″. RANGE IN EUROPE. Central and southern. TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. April-June. FOOD-PLANT. Low plants.

LUNOSA Hw. Local. Nemoral.

DISTRIBUTION—EAST. ♂ Forth Tay ○ ○ ○ ○ ○
WEST. Solway Clyde ○ ○ ○

LAT. 54°50″-56°30″. RANGE IN EUROPE. Britain, France, Castille. TYPE. Occidental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. September. LARVA. April, May. FOOD-PLANT. Grasses.

LITURA L. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ ♂ ○
WEST. Solway Clyde ♂ ♂ ○

LAT. 54°40″-57°50″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. May-July. FOOD-PLANT. Trees and low plants.

ORRODHIA Hub.

VACCINII L. Abundant. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ ○ ○
WEST. Solway Clyde ♂ West-Ross ○

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September-May. LARVA. May-July. FOOD-PLANT. Various trees and low plants.

Some of the forms of this variable species are often mistaken for *spadicea* (regarding which as a Scottish species there is no good evidence), but it may always be distinguished by the shape of the wings; in *vaccinii* the hind margin

is not concave below the tip, in *spadicea* it is always *slightly* but distinctly concave.

SCOPELOSOMA Curt.

SATELLITIA L. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO: October-April. LARVA. May, June. FOOD-PLANT. Trees (and low plants).

The difference in colour of the reniform stigma is often considered as a sexual distinction. This is not the case.

XANTHIA Ochsen.

FULVAGO L.; *cerago* F. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September. LARVA. April-June. FOOD-PLANT. Sallow catkins, sallow and low plants.

Ab. *flavescens* Esp. No purplish markings except the lower end of the reniform stigma. Not uncommon.

FLAVAGO F. (1787); *silago* Hb. (after 1800). Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central (South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September. LARVA. April-June. FOOD-PLANT. Sallow catkins, sallow and low plants.

X. gilvago Esp. is said to have occurred in Sutherland; *citrago* L., and *aurago* F., may occur in the south.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 144.)

EDITED BY D. SHARP, M.B.

SPINIFER Curt. Rare. Maritime. Under seaweed in sandy places.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

OCALEA Er.

LATIPENNIS Sharp. Rare. Lowland. On banks of rivers.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

CASTANEA Er. Common. Lowland, highland. In damp moss.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o o

BADIA Er. Local. Lowland.

DISTRIBUTION—EAST. ♀ Forth ♀ o o o o o
WEST. Solway ♀ o o o

ISCHNOGLOSSA Kr.

CORTICINA Er. Very rare. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. ♀ ♀ o o o

RUFOPICEA Kr. Very rare. Highland (?).

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

LEPTUSA Kr.

ANALIS Gyll. Local. Highland. Under bark of fir.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway o o o o

FUMIDA Er. Common. Lowland, highland; under bark.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

RUFICOLLIS Er. Local. Lowland, highland: under bark.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway ♀ o o o

THIASOPHILA Kr.

ANGULATA Er. Local. In nests of *Formica rufa*.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

MICROGLOTTA Kr.

NIDICOLA Fair. Rare. About the holes of sand-martins.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

PULLA Gyll. Very rare

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway o o o o

ALEOCHARA Kr.

RUFICORNIS Gr. Rare. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

FUSCIPES Fab. Abundant in carcasses.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

BIPUNCTATA Ol. Scarce.

DISTRIBUTION—EAST. ♀ Forth o o o o o o o
WEST. Solway ♀ o o o

BREVIPENNIS Gr. Local.

DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway Clyde o o o

A small variety (*fumata* Gr.) has occurred in the Solway and Clyde districts.

LANUGINOSA Gr. Very common. Lowland, highland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

VILLOSA Man. Very rare.

DISTRIBUTION—EAST. o o Dee o o o o o
WEST. o o o o o

LYGÆA Kr. Very rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

MŒSTA Gr. Common.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway o o o o

GRISEA Kr. Common. Maritime.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ ♀ o o
WEST. Solway Clyde o o o

OBSCURELLA Gr. Local. Maritime.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

LUGUBRIS Aubé. Rare. In fungi.

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o o

FUNGIVORA Sharp. Very rare. In decaying fungus.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

CUNICULORUM Kr. Very rare. About the burrows of rabbits (?).

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

NITIDA Gr. Abundant. Lowland, highland.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee ♀ ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

A large variety with the elytra unspotted *(bilineata* Gyll.) has occurred in the Tweed, Forth, and Dee districts.

MORION Gr. Common.

DISTRIBUTION—EAST. Tweed Forth ♀ o o o o o
WEST. Solway ♀ o o o

MYRMEDONIA Er.

COLLARIS Payk. Very rare.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

HUMERALIS Gr. Local. In nests of *Formica rufa.*

DISTRIBUTION—EAST. o o Tay Dee ♀ o o o
WEST. o o o o o

LIMBATA Payk. Very rare. In nests of *Formica flava.*

DISTRIBTTION—EAST. Tweed o o o o o o o
WEST. o o o o o

CANALICULATA Fab. Scarce. Lowland.

DISTRIBUTION—EAST. ♀ Forth ♀ o o o o o
WEST. Solway Clyde o o o

DINARDA Kr.

DENTATA Gr. Very rare. In nests of *Formica rufa.*

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

ILYOBATES Kr.

NIGRICOLLIS Payk. Rare.

DISTRIBUTION—EAST. Tweed Forth ♀ o o o o o
WEST. Solway Clyde o o o

CALLICERUS Kr.

OBSCURUS Gr. Local. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

RIGIDICORNIS Er. Very rare.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. ♀ Clyde o o o

CALODERA Kr.

RIPARIA Er. Rare. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway Clyde o o o

ÆTHIOPS Gr. Local. Lowland.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway ♀ o o o

CHILOPORA Kr.

LONGITARSIS Steph. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway ♀ o o o

RUBICUNDA Er. Local. Riparial.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

TACHYUSA Kr.

FLAVITARSIS Sahl. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth ♀ o o o o o
WEST. Solway ♀ o o o

ATRA Gr. Rare. Lowland. In marshes.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway ♀ o o o

[**UMBRATICA** Er. Doubtful as Scottish.

DISTRIBUTION—EAST. Tweed o o Dee o o o o
WEST. o o o o o

"Berwickshire and Aberdeenshire, Mr. Hardy," Murray. I feel doubtful whether the specimens would be correctly named.—D. S.

SULCATA Kies. Rare. Maritime.

DISTRIBUTION—EAST. o o o o o o o o
WEST. ♀ Clyde o o o

Under seaweed near Corrie in Arran.—D.S.

OXYPODA Kr.

SPECTABILIS Märk. Rare. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway Clyde o o o

LIVIDIPENNIS Man. Common. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway Clyde o o o

VITTATA Märk. Very rare. *

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

* This species is not uncommon as a guest of *Formica fuliginosa*, a species which I believe does not occur in Scotland. I have taken *vittata* at Thornhill and Braemar, and certainly not with the ant in question.

LONGIPES Muls. Very rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

A single specimen was taken at Aberlady.—D.S.

OPACA Gr. Common. Highland, lowland.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray o o o
WEST. Solway ♀ o o o

LONGIUSCULA Gr. Common. Lowland. In swamps.

DISTRIBUTION—EAST. Tweed Forth ♀ o o o o o
WEST. Solway ♀ o o o

RUPICOLA Rye. Rare. Alpine.

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o Clyde o o o

LENTULA Er. Local. Lowland. In marshes.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway Clyde o o o

EDINENSIS Sharp. Rare. Lowland, highland, alpine.

DISTRIBUTION—EAST. o Forth ♀ Dee o o o o
WEST. o o o o o

PECTITA Sharp. Rare. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

UMBRATA Gyll. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

NIGRINA Wat. Local.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o o
WEST. Solway ♀ o o o

VERECUNDA Sharp. Very rare.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o o

EXOLETA Er. Very rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

ALTERNANS Gr. Common. In fungus.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee ♀ o o o
WEST. Solway ♀ ♀ o o

SOROR Th. Very rare. Alpine (?)

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

INCRASSATA Muls. Local. Lowland, highland, alpine.

DISTRIBUTION—EAST. o Forth Tay Dee ♀ o o o
WEST. Solway Clyde o o o

RECONDITA Kr. Rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. ♀ Clyde o o o

FORMICETICOLA Märk. Local. In nests of *Formica rufa.*

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

HÆMORRHOA Sahl. Local. In nests of *Formica rufa*, and also among moss.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray o o o
WEST. ♀ ♀ o o o

AMŒNA Fair. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

PALLIDULA Man. Local. Lowland, highland.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway o o o o

BRACHYPTERA Steph. Rare. Lowland.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

TARDA Sharp. Rare. Maritime.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

HOMALOTA Kr.

CURRAX Kr. Local. Riparial, &c.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway Clyde o o o

INSECTA Th. Local.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee o o o o
WEST. Solway ♀ o o o

PAVENS Er. Scarce.

DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway ♀ o o o

EICHOFFI Scriba. Rare. Riparial.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

CAMBRICA Woll. Common. Riparial.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

GREGARIA Er. Abundant. In varied situations.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

EXIMIA Sharp. Rare. Riparial.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♀ o o o o

FRAGILIS Kr. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

LONGULA Heer. Rare. Riparial.

DISTRIBUTION—EAST. Tweed ♀ ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

DELICATULA Sharp. Very rare. Riparial.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway ♀ o o o

SUBTILISSIMA Kr. Common. Riparial.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o o

LABILIS Er. Common. Riparial.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♀ o o o
WEST. Solway ♀ o o o

(To be continued.)

ZOOLOGY.

ON THE OCCURRENCE OF THE BONITO (*THYNNUS PELAMYS*) NEAR ST. ANDREWS, WITH SOME REMARKS ON THE SCOMBRIDÆ.

By ROBERT WALKER, F.G.S.E.

A FINE example of this rare species in the British seas, was caught in a salmon net at the mouth of the Kenly, about four miles east of St. Andrews, on the 26th July, 1873. The fish was sent to Dr. Moir of this city, through whose kindness I had an opportunity of examining the specimen. It measured from the point of the nose to the fork of the tail thirty-four inches, to the tip of the tail two inches more. The greatest vertical depth of body, a little behind the commencement of the dorsal fin, eight and a half inches. Greatest circumference, at same place, twenty-three and a half inches. Weight twenty-seven and a half lbs. The stomach contained a few vertebræ of the herring. The anterior part of the fish is of a somewhat acute conical shape, the body gradually tapering on all sides from the point where it is thickest to the end of the rather sharp snout. The first dorsal, the pectoral, and the ventral fins, can be depressed at will, flush with the surface of the body; the former in a grove along the back, the two latter in cavities corresponding in depth and shape to the form and thickness of these organs. When the fins are in this position the whole fish will of course present the least possible resistance to the surrounding medium in which it is moving, and in this aspect it may be looked on as a perfect model of an animal, or a body, constructed for making rapid progress through the water. This combined with its great muscular power must make it a terrible foe to the luckless fishes it selects for its prey; even such quick moving species as the different flying-fishes, are not able to

compete with it in this respect, and fall victims in great numbers to its relentless activity. In the tropical and southern seas the Bonito, when in pursuit of these fishes, is often seen darting above the surface of the water just at the moment the latter springs from it, to alight perhaps on the deck of some passing vessel, where they are not in general unwelcome visitors.

The Bonito has been seldom met with in the British or Irish seas, and so far as I am aware it is recorded as having occurred twice only in the Scottish seas. Stewart, in his *Natural History*, published in 1817, states in a rather vague way, that the Bonito is occasionally taken in the Firth of Forth, and Dr. Scouler procured a specimen from the Clyde, in July, 1832. In Ireland, it appears to have been taken some three times, and in England, once or twice.

The Scombridæ, the family to which the Bonito belongs, may be said, speaking somewhat broadly, to be essentially southern and tropical species, many of them having a wide distribution. In recent years some members of the family have been obtained pretty far north. Professor Nilsson records in 1864 the occurrence of an example of *Thynnuthunnina* in the Scandinavian seas, and Malmagren reports a specimen of the Pelamid *(Pelamys sarda)* from the same coast in 1871. This family, as arranged by Dr. Günther,* embraces some one hundred and thirteen species, pertaining to twenty-nine genera. Of these, fifteen species have been obtained from the British and Irish seas, and eight of the above species are recorded from Scotland. In the classification adopted by Yarrell in his British Fishes, a work better known, perhaps, and more used in Britain than any other work on the subject, there are seven genera, and twelve species. Of these, six species have been met with in Scotland. According to Günther †, however, the Horse Mackerel *(Caranx trachurus)*, and the Derbio (*Lichia glaucus)* do not belong to this family, and the Dotted Mackerel *(Scomber punctatus)* seems at best a doubtful species. If these be eliminated the number of species of the latter will be reduced to nine in Britain, &c., and five in Scotland. If Pennant's‡ Tunny *(Thynnus albacoro)* was caught at Inverary, a point on which he is not very explicit, then the number of species observed in Scotland would still be six.

With the exception of the common mackerel, all the Scom-

* Catalogue Fishes Brit. Museum, Vol. 2. † Ibid.
‡ Brit. Zoology, Vol. 3, 1776.

bridæ may be considered rare and uncertain visitors to our coasts. The Tunny *(Thynnus thynnus)*, to which the Bonito bears a close resemblance in shape and habits, has occurred more frequently, excepting the above, than any other member of the family. Sibbald notices it in his "Scotia Illustrata," the late Mr. Don* includes it in his list of the fishes of Forfarshire, and the Rev. G. Gordon† records it from the Moray Firth. The fish has also been taken more than once in the Firth of Forth; and a fine example, about nine feet long, was caught near Queensferry, in October 1868. The late Mr. Beattie,‡ Montrose, secured a fine specimen of the Pelamid *(Pelamys sarda)* that was caught in a salmon net at the mouth of the North Esk, in 1859. It was 23¾ inches long. Mr. Edwards,§ Banff, reports the capture of the Plain Bonito *(Auxis vulgaris)* in a herring net, off Cullen, in September 1859, twenty inches in length. The Blackfish *(Centrolophus pompilus)* another rare species of this family, as arranged by Günther (not Yarrell), was obtained by the Rev. G. Gordon,‖ at Lossiemouth, in 1841, fourteen inches long.

Although it will be seen that nearly all the Scomberoids are rare fishes in our seas, still we may expect, as interest in the subject increases, that by and bye a considerable number more may be added to our present list. These may occur, however, at rather long intervals. Pennant's Tunny *(T. albacora)*, for instance, a good species, does not appear to have been seen on our shores since his day, and Ray's Bream *(Brama Raii)* is another member of the family that was long considered very rare. It was figured as a British fish by Willoughby, from a specimen caught near the mouth of the Tees in September, 1681. Donovan seems to have figured in his Brit. Fishes, the next example obtained, and he says, "since the time of Ray there is no instance within our knowledge or record, to prove that the Gilt-head has been taken, or seen upon our coasts till the year 1792, when a fish of this species was caught in St. Andrews, Scotland, and presented by James Lumsden, Esq. of Innergellie, to the late Mr. Weekes, Proprietor of the Edinburgh Museum, who caused it to be finely preserved, and exhibited. After the dissolution of the Museum, the subject came into our possession, and thus enabled us to submit a figure of this extra-

* Headrick, Agriculture of Forfarshire.
† Zoologist, 1852. ‡ Yarrell. § Zoologist, 1859.
‖ Zoologist, 1841, and Yarrell.

ordinary creature to our readers. We have reason to believe that our specimen is the only one of the species that has been found on the British coast since the year 1681." I may remark that Donovan's fish had two long canine looking teeth in the lower jaw, and that the species has been taken several times at St. Andrews since his day.

St. Andrews, November, 1873.

MEMOIRS ON SCOTTISH TENTHREDINIDÆ.

By P. CAMERON, Jun.

No. IV.—NEMATUS VIRESCENS.

NEMATUS VIRESCENS, Hartig., *Blatt. und. Holzwespen*, 217; 50. (1837).

NEMATUS VIRIDIS? Stephens. *Ill. Brit. Ent.* vii. 30, 13. (1835).

THE eggs of *Nematus virescens* are laid on the upper surface of the leaves of *Salix viminalis* and other sallows, and on those of *Alnus glutinosa*. They are oval, dark green, projecting above the surface of the leaf, and not very deeply embedded in the epidermis. Seven to ten are deposited on a single leaf, at a distance of two or three lines from each other, and never on the nerves. When the young larva escapes from the egg, it commences to eat a round hole, which by degrees reaches the edge, along which the older larvæ are usually found.

The *larva* is cylindrical, about 9-10 lines in length. Head, a little larger than the second segment (except when young), shining grass-green, thinly covered with hairs; eyes situated in a black line, which extends to the top; a small dot beneath the eye. The top is sparingly covered with small dots. Mouth brownish; mandibles brown, black at the tips. Feet glassy yellowish-green, slightly hairy; claws brown; a curved black line over the feet. Fourteen claspers, light-green. Body grass-green, with a black line on each side, at the top, on the edge, and directly over the feet and claspers the folds of the skin are marked with black lines. The dorsal lines end, or get very faint, at the twelfth segment; the anal segment is hairy, with two prongs, the tip often bright red.

The oblong brown cocoons are spun in the earth, or, in confinement, between the leaves. Two broods occur—the first in June or July; the second in August, September, and the early part of October. The larva was first described by M. Snellen van Vollenhoven in 1843.

The *pupa* is bright green, with legs, antennæ, and wings, white; the eyes black.

Imago. Antennæ as long as the body, black above, pale brown underneath; the second joint entirely black. Head pale green, the crown testaceous; mandibles black, palpi fuscous; ocelli situated in a black spot; a small dot behind them, black. Thorax above testaceous; a black stripe in the centre, touching the head; meso-thorax with a broad black stripe on each side; close to these on the inner side is frequently a small black mark; behind, and nearer the edge, are two somewhat triangular spots, also black; the white cenchri surrounded by black. Underneath it is pale green, the meso-thorax somewhat testaceous. Abdomen light green, the first three or four segments—sometimes all the segments—marked with transverse black lines in the centre; also some dots at the base. Feet light green; the hinder tibiæ with a reddish tinge; the knees often black; all the tarsi fuscous; the coxæ somewhat whitish. Wings hyaline, iridescent; costa and stigma green; nervures black. Length, 3-4 lines; exp. alar 8½-9 lines. When the insect is living the colour is a beautiful green; with age this assumes a testaceous hue, and finally becomes straw coloured. The thoracic marks also fade.

The male is much smaller and thinner; the ocelli situated in a large square black mark; the back of the head black. The antennæ are a little longer than the body. Thorax entirely black above; pronotum light green. Abdomen black above; with the segments edged with testaceous; the sides also testaceous.

Nematus virescens is a common species in Scotland, occurring from Sutherlandshire to the border.

No. V.—ATHALIA ROSÆ.

Tenthredo rosæ, Linné. *Fauna Suecica*, Ed. ii. 1555. (1761); Klug, *Blattw.* 87, 2; Hartig., *Blatt-u.-Holzw.* 284, 2.

Phyllotoma rosæ, Fallén, *Monogr. Tenthr.* L. 28, 2.

Athalia rosæ, Dahlbom, *Prod. Hymen. Scand.* 64, 10, pl. 1,

fig. 36-43; Stephens, *Ill. Brit. Ent.* vii. 43, 7; Thomson. *Hymen. Scand.* i. 173, 3.

With the exception of Dahlbom's remark, in the above cited work, of "Ova pallida subtestacea," I have not been able to discover any observations regarding the earlier stages of *Athalia rosæ*. The larvæ I have found to feed on *Erysimum*, *Sisymbrium*, and other cruciferous plants; and in their general habits they do not differ materially from those of the too-well-known *Athalia spinarum*, except that they are not gregarious to any extent. Otherwise the similarity between the two is very close.

Larva. Head small, partly inserted into the second segment; deep shining black, covered with short microscopic hairs. Feet and sixteen claspers black, with the tips of the latter white. Anal clasper, if it can be called such, entirely white. Upper parts of the body to the spiracles lead-coloured; below the spiracles it is whitish. The skin is much wrinkled and folded, hairless, but beset with small tubercles. After moulting the mouth is whitish, and the body entirely of a pale slate colour. Length, 6-7 lines.

My specimens spun small thin brown cocoons in the earth, from which the perfect insects escaped by cutting off one end. I am not quite sure whether the species is double-brooded or not. Full fed larvæ are met with at the end of July, and from a batch found at that time some of the perfect insects made their appearance four or five weeks afterwards, but the remainder did not change till the following spring.

Imago. Antennæ black. Head black; mouth white; palpi testaceous; tips of mandibles black. Thorax black above; pronotum and wing-scales luteous. Cenchri white. Abdomen luteous yellow, black at the base, and with a black spot on the last segment. Feet of the colour of the abdomen; the tibiæ with a white down; the apex of the tibiæ and each joint of the tarsi black; the remainder of the tarsi white. Wings yellowish at the base; the costa and stigma black; the former yellowish at the base. Nervures yellowish at base, black at the tips of the wings. The antennæ, head, and thorax covered with white down.

Numerous deviations from the above description are met with. The antennæ are sometimes pale underneath; the breast either entirely, or more or less spotted with black; and the anterior feet are often without the black markings on the tibiæ and tarsi. The male does not differ from the female

except in size. Length, 2½ to 3½ lin.; Exp. alar. 5½ to 7½ lin.

Kirby and Spence (Intro. i. 192) state that this species is injurious to rose trees, but on what evidence I do not know. The perfect insects are sometimes beaten out of rose bushes, but I do not see what injury they can do to them. Probably *Hylotoma rosæ*, Fab., the larvæ of which feed on roses, is meant.

DIPTERA AT BRAEMAR, ABERDEEN, AND ABERLADY, INCLUDING SIX SPECIES NOT HITHERTO RECORDED AS BRITISH.

By G. H. VERRALL, Sec. Ent. Soc.

HAVING an opportunity of obtaining a short holiday last July, I left London on the night of Thursday, the 17th, in company with Mr. J. H. A. Jenner, of Lewes, with the intention of having a few days' collecting in Scotland. After a rather tedious journey, nearly all of which was in beautiful weather, we arrived at Aberdeen about two o'clock on Friday afternoon, to find that there it was raining, and had rained so much that we expected to catch but little that afternoon. However, after finding out Mr. W. A. Vice, who had kindly offered us his hospitalities during our stay at Aberdeen, and having washed and fed, we found the weather so much improved, that we, and Mr. Traill, ventured to Scotston Moor, and I, at least, was amply repaid, as I captured one species of the *Dolichopodidæ* new to Britain, which seems to be *Sympycnus nigritibialis* of Zetterstedt (Dipt. Scan xii. 4638), described by him in 1855 as *Dolichopus nigritibialis*, from a single male caught by Holmgrem in 1852 in Œland. It has never since been recorded, and has not even been ranged under its proper genus, though Zetterstedt called especial attention to its close alliance with his *D. brevicornis* (=*Sympycnus æneicoxa* Mg). I expect it occurred in some abundance, though I only caught three pairs, as I did not distinguish it at the time from the common *S. annulipes*. New to me also were *Syntormon tarsatus* (abundant), *Tachytrechus notatus* (one male), and *Hilara matrona* (abundant); while of other species I noticed *Dolichopus atripes*, *signatus* and *nubilus*, *Syntormon pumilus*, *Campsicnemus scambus* and *curvipes*, *Gymnopternus cupreus*, *Ardoptera irrorata*, near the extreme corner towards Aberdeen, a *Hilara*, which I cannot name (though also caught at Rannoch in 1870), hovering over the stream near the same corner; it is a greyish species, rather large, and the female has the hind tibiæ flattened and bent; *Clinocera stagnalis*, *Elgiva albiseta*, *Limnia lineata*, *Tetanocera elata?* and in great abundance on a wall a *Spilogaster* (*? consimilis* Fall). The only *Syrphidæ* I saw were *Chrysogaster metallina* (abundant), and *Ascia floralis* (rare).

The evening was spent looking over Mr. Vice's collection, in which were

many interesting species, including a series of *Empis bilineata* Lw. (=*E. punctata F.*), a species of the "*stercorea*" group not previously acknowledged as British, although a re-examination of Curtis shows that his *E. punctata* was this species, and not *trigramma* as I thought before. Mr. Vice sent me specimens in May calling attention to their being distinct, and I expect the species is of northern range in Great Britain, as besides Mr. Vice's specimens I have seen it in considerable numbers in Dr. Buchanan White's collection at Braemar, and one among Mr. T. J. Bold's Diptera; Curtis' locality is also in Forfarshire. Mr. Vice kindly gave me two pairs for my own collection.

Saturday morning early saw us on our way to Braemar, by train to Ballater, and then by coach through the lovely valley of the Dee, passing Balmoral on our left, and arriving at our destination soon after noon. Dr. White had kindly secured us apartments, so after calling in at them, we were soon at work again collecting. During our stay at Braemar, we made excursions to Loch Callater, where we became fearfully hungry, and had to besiege the keeper's house for provisions, which consisted of oatcake, milk, and caraway cheese; then to the Linn of Dee and the Falls of the Garravalt, both of which we tasted mixed with "mountain dew," and finally to Lochnagar, a most profitless excursion for Diptera, though I suppose it would never do for anybody with a useful pair of legs to stop a week in the neighbourhood without paying a visit to "far-famed Lochnagar." This was the only excursion we were able to make in company with Dr. White, as he was away, part of the time we were at Braemar, botanizing in the mountains with Mr. Roy and Colonel Drummond Hay.

Braemar scarcely came up to my anticipations as a collecting spot, though I made numerous interesting captures. Of the *Syrphidæ* I caught one new to Britain, *Spilomyia fallax* L., in a very strange locality, in fact my first recollections on the Tuesday morning were that I was muttering imprecations against some "beastie" that was buzzing loudly against my bedroom window, and when I did get up I made for the window to smash the offending intruder, who was, however, forgiven at first sight, and requested to enter my cyanide bottle; the species seems scattered rarely all over Europe. The next morning about four A.M. there was a still louder buzzing, and of course I turned out in a hurry to catch more, but only found a big *Bombus*, who was evidently jealous of the fuss made about the insignificant thing the day before; *he* was murdered, but about a quarter of an hour afterwards a second woke up, and woke me up too, wherefore he suffered his predecessor's fate; and I slept in peace. Of other *Syrphidæ* I saw *Eristalis rupium*, rather commonly on the banks of the Dee on roses and *Carduus heterophyllus*, *E. horticola* in its company, *Helophilus pendulus*, *Sericomyia borealis*, common, but *all* males, *S. lapponum* (one male), *Leucozona lucorum*, *Syrphus grossulariæ* (one male), *ribesii*, *cinctellus* and *compositarum* (two near Inverey), *Platychirus peltatus* and *albimanus*, *Cheilosia chloris* and *antiqua*, *Orthoneura nobilis*, and *Xylota segnis*.

In the *Dolichopodidæ* I made many useful captures; after catching and bringing home hundreds of *Sympycnus annulipes* from all directions, I found upon examination one specimen of *S. cirrhipes*, the species I was in search of, also a few of a species that I caught at Rannoch, and which stands in my collection under the MS. name of *S. crassipes*, *Dolichopus æneus*, *plumipes*, *vitripennis* and *atripes* were common, *longicornis* occurred on grassy

patches that ran out from the shores of the Dee, *discifer* abounded at Corriemulzie Falls, *urbanus*, *signatus*, and *rupestris* were rare; *Gymnopternus celer* and *nigripennis* were caught; *Tachytrechus notatus* and *consobrinus* were not uncommon on the wet mud in the moor just behind the village, where *Hydrophorus borealis* ran about on the small pools of water; close to the keeper's house at Loch Callater a small stream crosses the road, and on it I noticed four or five *Hydrophori*, one of which after infinite trouble I caught, and when back in London I made it out to be *H. bipunctatus*, though I am not quite sure about it, as my only exponents of that species are at present in Germany; *Syntormon tarsatus* occurred at Inverey, and *Campsicnemus curvipes*, with *Chrysotus gramineus* complete the list of species I noticed.

In the *Empidæ* I caught one specimen of *Phyllodromia vocatoria*, not previously recorded as British; *P. melanocephala* also occurred, as well as *Hemerodromia præcatoria*, *Microphorus clavipes*, *Sciodromia immaculata* (one male), *Empis tessellata*, *grisea* of Fallén (=*pilipes* Mg.) abundant on *Geranium sylvaticum* at Corriemulzie, and one male of a small black *Empis*; *Hilara litorea*, *chorica*? *matrona*, *quadrivittata*, and a species allied to *obscura*, were amongst my captures, while near Inverey I found abundantly *H. nitidula* of Zetterstedt which has not been noticed in Britain before; *Ardoptera irrorata* was not rare on a small bank in the Dee a little above Braemar; *Tachista albitarsis* of Zetterstedt, whether or not that is only a variety of one of the others, abounded on railings and tree trunks just behind the village, and *T. nervosa* was also captured; *Tachydromia pallipes* and *candicans* have been worked out in that terrible genus, and a *Hybos* and a *Cyrtoma* similar to species caught at Rannoch complete this family. In Dr. White's collection were *Empis opaca*, with which he supplied my collection, and *E. bilineata* caught at Braemar early in the season. Of the "Blood-suckers" I noticed *Hæmatopota pluvialis* inconveniently abundant and variable: it puzzles me how kilts agree with this species; I did not feel inclined to try myself. They swarmed about Glen Lui, sitting half-a-dozen at a time on one's trousers; *Chrysops cæcutiens* I only noticed once, while of the three *Tabani* I caught all were different species, the only one I can identify being *T. tropicus*.

Of the *Leptidæ* I observed very brightly coloured *Leptis scolopacea* high upon Cairn Taggart, settling on the sides of the precipices; *L. tringaria* occurred more sparingly near the village, and I caught one *Sympheromyia crassicornis*, a species which abounded at Rannoch in 1870. In the other groups I have only named *Ornithomyia avicularia* (small and dark, like a specimen I caught in Rannoch), *Sarcophaga mortuorum*, *Elgiva dorsalis*, *Tetanocera umbrarum* and *punctulata*, *Limma unguicornis*, and *Ochthera mantis* (in company with the *Tachytrechi*), and *Bibio pomonæ*.

We caught the coach at 4 A.M. on Saturday morning, which made it quite unnecessary to go to bed on Friday night, as that evening was spent at Dr. White's, enjoying his hospitality and looking at his captures, so as may be supposed we slept peacefully in the train after leaving Ballater; but our slumbers were rudely dispelled, as a man suffering from "D. T." entered our compartment on the journey, and after singing for some time at the pitch of his voice, opened the window near which I sat, thus putting me in a draught. When he had resumed his seat I naturally raised it again, and held it by the strap, upon which he immediately sent his fist through the thick plate-glass, and then amused himself by

picking off by successive blows the small triangular pieces of glass which stood out round the edge. The next station rid us of his society, though he tried to convince the guard that we had been trying to rob him, showing his bleeding hand as evidence. We had time to breakfast at Aberdeen, and arrived at Edinburgh in the afternoon.

I have made myself a tacit promise that whenever I can get a day to spare in Scotland, it shall be spent at Aberlady, perhaps the most successful collecting spot I was ever in, though I have never yet been able to reach what is described as the best place, having had my hands filled before reaching it. Its most noticeable features in Diptera are the *Dolichopodidæ* on the sea shore and in the wood by its side. This year I caught in abundance *Machærium maritimæ*, *Synarthrus pallipes*, *Dolichopus salinus* (on the mud like a *Tachytrechus*) *D. trivialis*, *plumipes*, *nubilus*, *claviger* (in the wood, only unfortunately I mistook it for *discifer*), *Gymnopternus chærophylli* swarming on *Umbelliferæ* in the wood) *Sympycnus annulipes*, *Campsicnemus armatus*, (with very dark legs), *Chrysotus gramineus*, *Medeterus truncorum* or *tenuicauda*, Lw. *Hydrophorus bisetus*, and *Psilopus Wildemanni*. *Hygroceleuthus diadema* occurred sparingly, being I suppose nearly over, as it was in abundance at the end of June, 1870; one *Psilopus platypterus* and one *Hydrophorus balticus* completed the captures in this family.

In the *Empidæ* I caught *Chersodromia hirta* (the first of the genus I ever took), *Hybos culiciformis*, *Rhamphomyia variabilis* and *umbripennis*, *Hilara litorea*, *interstincta*, and a third species, the same as one I caught a few of, near the mouth of the Cuckmere in Sussex last May.

Beris geniculata (one male), which I never saw alive before, *Pachygaster ater* and *Nemotelus uliginosus* (nearly over), represented the *Stratiomyidæ*; but when I was at the locality in June 1870, *Nemotelus uliginosus* abounded, and in its company was *N. notatus*, Zett., a species which I believe has not hitherto been noticed as British, though I have seen it from other localities.

In the *Syrphidæ* I saw *Syrphus tricinctus*, *glaucius*, and *vitripennis*, *Cheilosia chloris* (very shy), and on the marshy space just beyond the town two or three *Helophilus trivittatus* hovered about the pools of water. In the *Muscidæ* I have named *Elgiva dorsalis* and *Limnia unguicornis*, and in the *Bibionidæ*, *Scatopse pulicaria* Lw.

This list of my captures does not include a large number of *Muscidæ* and other small species, but is tolerably complete in the *Syrphidæ*, *Dolichopodidæ* &c., and I have mentioned every species I know, however common, as the locality will be the most northerly hitherto recorded in Great Britain for many of them.

The next night mail brought us back to London and business; but the holiday was thoroughly enjoyed, and we met with great kindness and hospitality from all friends previously known by correspondence only.

Occurrence of Nematus Wttewaalli Voll.—This year I have bred from larvæ found feeding on sallows, in Calder Wood, near Glasgow. *Nematus Wttewaalli* Voll. which is now, for the first time, recorded as a native of Britain. As the insect and its transformations will be described in an early number of the "*Scottish Naturalist*" I need not further allude

to the subject here.—P. CAMERON, jun., 136 West Graham Street, Glasgow.

Occurrence of Leioptolus brachydactylus Tr. in Scotland.—Of this rare plume I took a specimen near Blair Athole last summer.—THOS. MONCREIFFE, Moncreiffe House, by Perth, Nov., 1873.

Capture of Hypermecia augustana Hb. in Perthshire.—In looking at some Tortrices lately taken near Perth by Mr. W. Herd, I found two specimens of this species. In one of them the basal blotch is similar in colour to the basal blotch in *H. cruciana* (*i.e.* greyish), but its shape is that of *H. augustana*. These two species are considered doubtfully distinct by some entomologists.—F. BUCHANAN WHITE.

Hallesus auricollis and other Neuroptera.—*Hallesus auricollis*, of which the only British exponents were a few taken by me in Rannoch some years ago, has been found in two other localities during the last autumn,—in the north of England in great abundance, by Mr. M'Lachlan, and by myself beside the Dee in Braemar. *Limnophilus borealis* Zett. (*pavidus* M'L.); a single specimen of this was taken in August last by Mr. Traill in Strathnaver, Sutherlandshire. A specimen of *Megalomus hirtus* was taken near Aberdeen last summer by Mr. Traill. Mr. M'Lachlan thinks that possibly two species are confounded under this name: the few British exponents are smaller and darker than those from other parts of Europe.—*Id.*

Captures of Lepidoptera at Ardrishaig.—A few hours with the net on 6th August produced *Camptogramma bilineata* and *Eubolia mensuraria* among *Pteris aquilina* about 100 feet above the sea, while on 20th August, *Hypsipetes elutata* was common among alders, where one specimen of *Cidaria immanata* occurred, and *Larentia pectinitaria*, all five not previously recorded from Sub-province 32, though doubtless common enough when looked for.—H. JENNER FUST, jun., Hill Court, Falfield, Gloucester, 22nd October, 1873.

Syrphidæ of the Dee District.—During the last two years I have taken the following Syrphidæ in this district; the greater number have been captured within ten miles of Aberdeen:—*Baccha elongata*, Fb. Ballater; *Ascia podagrica*, Fb.; and *A. floralis*, Mg., common; *Syrphus pyrastri*, L.; *S. glaucius*, L. (two of each); *S. ribesii*, L.; and *S. vitripennis*, Mg., very common; *S. corollæ*, L.; *S. luniger*, Mg.; *S. arcuatus*, Fln.; and *S. cinctus*, Fallen, Scotston; *Syrphus cinctellus*, Zett. Banchory; *S. balteatus*, Dg., common; *S. punctulatus*, Verrall, Scotston; *S. compositarum*, Verrall; *S. laternarius*, Müll. Culter; *S. vittiger*, Zett., Scotston; *Platychirus manicatus*, Mg.; *P. albimanus*, F.; *P. peltatus* and *P. clypeatus*, Mg., common; *P. scutatus*, Mg.; *P. scambus*, Lett.; *P. angustatus*, Zett.; and *P. latimanus*, Whl., not so common; *Cheilosia æstracea*, L., common; *C. flavimana*, Mg., one specimen; *C. grossa*, Fln. Rubislaw; *C. chloris*, Mg., common; *C. antiqua*, Mg., Ballater; *C. vernalis*, Fln., Aberdeen; *Leucozona lucorum*, L., single specimens from Rothiemay and Stonehaven; *Rhingia campestris*, Mg., common; *Volucella bombylans*, L., Muchalls, one specimen; *V. pellucens*, rather common; *V. inflata*, F., not so frequent; *Sericomyia borealis*, Fln., common; *S. lappona*, L., Aberdeen and Stonehaven; *Arctophila mussitans*, F., Strathdon; *Eristalis tenax*, L.; *E. intricarius*, L.; *E. arbustorum*, L.; and *E. pratorum*, Stg., common; *E.*

nemorum, L.; and *E. porticola*, Dg., not so common; *E. rupium*, F., Strathdon; *Helophilus pendulus*, L., common; *H. lineatus*, F., Scotston Moor; *Xylota lenta*, Mg., Ballater; *Syritta pipiens*, L., common; *Orthoneura elegans*, Mg., Muchalls; *O. nobilis*, Fln., Aberdeen; *Chrysogaster splendida*, Mg., frequent; *C. metallina*, Fln.; and *C. viduata*, L., common; *Pipiza bimaculata*, Mg., Rubislaw; *Chrysotoxum sylvarum*, Mg., Scotston Moor. I may also mention, though not among the *Syrphidæ*, *Conops quadrifasciata* Dg., one from Scotston. In this list I have mentioned the place of capture when I have not taken the species in any other locality; and those which I have given as *common*, I have noticed to be so; others may be quite as common, as I believe many are, but either I have not come across them, or their numbers may have been small during these seasons, for, as with *Lepidoptera*, I think the numbers of many species vary much in different years, for in several cases, as *Ascia podagrica*, *A. floralis*, *Rhingia campestris*, and *Chrysomia metallina*, I have taken great numbers this year, on the same ground that I searched last season without seeing more than one or two specimens, or perhaps not one.—W. A. Vice, Aberdeen.

Coleoptera in Orkney.—During a visit to Orkney in the autumn of 1873 I observed the following beetles:—*Nebria borealis*, near Orphir, in the same locality where I found it, for the first time in Scotland, in 1849. *Chrysomela fastuosa* in profusion on *Galeopsis tetrahit* var. *bifida* (a plant which I have not seen mentioned as the food plant; in the south it feeds on *Lamium album*). *Chrysomela sanguinolenta* was scarcely out; a few specimens got by searching its food plant, *Plantago maritima*.—J. Boswell Syme, Balmuto, Kirkcaldy.

Melolontha vulgaris.—A specimen of this, taken at Kinghorn, was brought to me in May last. All the other Scottish cockchafers I have seen were *M. hippocastani*, so I imagine *M. vulgaris* is rare in Scotland.—*Id.* [*M. vulgaris* occurs in Perthshire, but much less commonly than *M. hippocastani*, which abounds in some places, as at Dunkeld. I have seen *M. vulgaris* commonly in Kirkcudbrightshire.—Editor.]

Occurrence of the Little Bustard (Otis tetrax. Lin.) in Aberdeenshire.—On the 13th November a female of the above species was shot by J. B. Munson, Esq., on the estate of Fingask, Old Meldrum. This is the fourth on record for Scotland, one having been killed at Montrose in December 1833, one at St. Andrews 6th March, 1840, and one at Elgin 8th February, 1861. Owing to the rarity of the bird, I thought it well to take drawings of the internal structure in *situ*, and also measurements internal and external, the results of which, with the Editor's permission, I may lay before the readers of the *Naturalist* at another time.—George Sim, Aberdeen.

Variety of Rook (Corvus frugilegus).—I have had recently sent me from a friend in Perthshire a curious variety of the Common Rook (*Corvus frugilegus*). It is of a light brown colour, the bill and feet being of exactly the same shade as the feathers. It was shot near Alyth on the 7th July, and is evidently a bird of this year. White and pied varieties are comparatively common, but we have never observed any record of the brown shade having been obtained in Scotland or elsewhere.—James Lumsden, jun., Arden House, Alexandria, 3rd November, 1873.

Osprey (Pandion haliaëtus).—A very fine specimen (a female) of this bird was shot on the Tweed, in front of Floors Castle, on the 24th of May last. It was 23½ inches in length, 5 feet 5 inches from tip to tip of wings, and weighed 3¾ lb.—ANDREW BROTHERSTON, Kelso.

Variety of Hedge-Sparrow.—I had lately a very peculiarly coloured Hedge-Sparrow (which was found dead at Bowhill, September 16, 1873). The under parts were white, with a few spots on the breast, and all the upper side (except the tail, which was of the usual colour,) was light coloured.—*Id.*

A Spotted Crake was shot at Greenknowe, on Oct. 18, 1873.—*Id.*

A LIST OF THE SCOTTISH LAND AND FRESH-WATER MOLLUSCA, WITH HINTS ON COLLECTING.

BY F. BUCHANAN WHITE, M.D., F.L.S.

(Continued from p. 269.)

Pupa cylindracea Da Costa.—A very common species on rocks, walls, in moss, &c., in the lowlands, but not so common in the higher districts.

P. ringens Jeffreys ; *(anglica* Fer.).—This must be considered a very local and often scarce species, though it occurs in several places between Ross-shire and Kirkcudbrightshire. In my experience this species frequents damp ground beside little streams, where it may be found among decaying leaves, &c.

Vertigo antivertigo Drap.—Is said to occur from the Moray Frith southwards, in marshy places. I do not think that it is universally distributed, though common where it does occur, as, *e.g.*, in a marshy place near Perth, where by lifting dead leaves I once found many specimens.

V. pygmæa Drap.—This is said to be also widely distributed, but I have never found it. Like the last, it is said to be fond of wet places, and a good way to find it is to place a log of wood on the wet grass at night, and examine it in the morning. In East Lothian it has been found at an elevation of 1200 feet. I do not remember at present of any record of *V. alpestris* Ald. having been found in Scotland, but as it is chiefly found in the north of England, in Britain, it should occur on some of the hills of the south of Scotland.

V. substriata Jeffreys—Is, I believe, generally considered rather a scarce species, but in northern Scotland at least it

seems the most widely spread and commonest of the genus. It has been found as far north as Ross-shire, and is specially common in the highland valleys, where by sweeping the heather, ferns, &c., with a butterfly net, a number of specimens may be easily obtained, the majority of these, however, being immature; in fact mature specimens seem to be rare. It may also be found under stones and among decaying ferns.

V. edentula Drap.—This is a local and rather scarce species, though widely distributed. I have generally found it on the sides of big stones, among wet grass, and sometimes among decaying fern leaves.

V. minuta Stw.—From personal experience I can say nothing regarding this very small and rare species. It has been found at Balmerino in Fife, and on Salisbury Crags, and is said to occur under stones in damp shady places on hills. Possibly it has, from its small size and probably local habits, escaped notice in other localities.

Carychium minimum Müll.—This beautiful little shell is by no means rare, though possibly, from its small size, overlooked. It may occasionally be found on or under stones, but more commonly under moss in damp shady places. The easiest way to obtain it in abundance, however, is by sifting decaying fern-fonds in the manner already mentioned. It is found throughout Scotland.

Melampus bidentatus Mont.—"Under stones that lie close to the ground between tide-marks on many parts of our coast from Shetland to Sark."—Jeffreys B. C. v. 109. Var. *alba* equally diffused. I know nothing personally of the habits of this or of the two next species.

M. myosotis Drap.—"Abundantly on mud flats and salt marshes in all estuaries." Var. *ringens*, in the crevices of rocks on the open sea coast, near high-water mark. (*l.c.* 107.)

Otina otis Turt.—Rocks between tide-marks, Arran. (*l.c.* 111.)

Planorbis albus Müll.—A common and widely-distributed species, inhabiting weedy ponds and slow streams. I have found it at an elevation of 1000 feet, but it is not a common highland species.

P. glaber Jeffreys.—Rare and local, on water plants in ponds and marshes. Jeffreys says, "from Unst to Penzance, but not generally diffused." I have not met with it myself.

P. nautileus L.—Said to occur throughout, in ponds and ditches. I have only met with it near Perth, where it is rare.

P. carinatus Müll.—Pond in Royal Botanic Garden, Edinburgh, into which it has been perhaps introduced.

P. complanatus L.—"Lochend, Edinburgh" (Haddin in Trans. Glasgow Nat. Hist. Soc. 1. 251).

P. vortex L.—In shallow slow running streams and stagnant water. Widely diffused but not I think common. It occurs near Perth in several places, Aberdeen, Kirkcudbrightshire, &c.

P. spirorbis L.—In similar localities, and of like distribution as the last, which it very much resembles. I have not met with it.

P. contortus L.—This, though rather local, is in my experience certainly the most abundant species of *Planorbis* in Scotland. It inhabits weedy muddy ponds, ditches and marshes. The var. *alba* is reported from Lerwick.

P. nitidus Müll.—In ponds and streams, widely distributed but local. I find a good way to procure shells of this and other small aquatic species, is to take a tin canister full of the mud and decaying plants among which it is found, and on reaching some, turn the contents of the canister into a large basin full of water, and put a piece of muslin over the basin, touching the water; for several days afterwards the molluscs will be found adhering to the muslin.

Physa fontinalis L.—A common species in weedy ponds and ditches. The var. *curta* is the only form that occurs in Perthshire, or indeed that I have found anywhere in Scotland. It attains an elevation of at least 1000 feet.

P. hypnorum L.—This is a much rarer shell than the last, though said to occur throughout. I have not found it myself, but have seen a Perthshire specimen taken by Mr. James M'Farlane. It inhabits ponds and ditches, and may sometimes be found out of the water.

Limnæa peregra Müll.—The commonest and most widely diffused of all the fresh water mollusca, inhabiting rivers, ponds, ditches, and marshes in every locality. I have found it at an altitude of 1700 feet. This species is subject to much variation: the following varieties occur:—*Burnetti* in "Loch Skene, Dumfries-shire;" *lacustris* in mountain lakes and lower localities, as Barean Loch, Colvend, Kirkcudbrightshire; *ovata* in ponds, lakes, and canals, attaining a large size; *labiosa*, "Appin in Argyle;" *picta*, "Alva in the Hebrides;" *decollata* in a cold spring, Glenalmond, Perthshire; *intermedia*, Ross-shire; *oblonga*, Largo, Fife; *sinistrorsa*, near Dalmarnoch Bridge on the Clyde.

L. auricularis L. In ponds, &c. Very rare and local. Pond in Abercorn Park" (Forbes and Hanley, iv. 171); "Monkland Canal" (Dougall, Trans. Glasgow Nat. His. Soc., I. 192).

L. stagnalis L. Ponds and marshes. Very rare and local. Possil Marsh, Glasgow.

L. palustris Müll.—Common in muddy ponds and streams from Aberdeenshire south. Several varieties occur.

L. truncatula Müll.—A common and widely distributed species, inhabits muddy ponds and slow running streams, and often found adhering to plants and stones out of the water.

L. glabra Müll.—Rare and local. Frankfield Loch, near Glasgow (Dougall, Trans. Glasgow Nat. His. Soc. I. 193). I have found it in shallow pools on the Muir of Durdie, near Perth. Almost every specimen in this locality has the three apical segments eroded. (= var. *decollata*, B. W., Trans. Perthshire Soc. Nat. Sc. I.)

Ancylus fluviatilis Müll.—Common and widely distributed, inhabits streams, adhering to stones in the currents. I have found it at an elevation of 2200 feet.

A. lacustris L.—Much more local than the last, found as far north as Aberdeenshire, living in ponds and adhering to the stems and leaves of plants, as the water-lily, Iris, &c. I have found it, in Duddingston Loch, on the leaves of *Stratiotes*, a habit which Linnè notices. All the Perthshire specimens appear to belong to the var. *albida*.

Acme lineata Drap.—Rare and local. In damp places under stones, or in moss and dead leaves. From "Lanarkshire to Cornwall" (Jeffrey's B.C. I. 308), "Inverary and Isle of Skye" (Forbes and Hanley, IV. 290).

Bythinia tentaculata L.—Local. In canals and slow streams. Frazerburgh, Aberdeenshire, and near Glasgow. I have not met with this in Scotland.

Paludina vivipara L.—"Findhorn, Moray Frith" (Rev. Dr. Gordon).

Valvata piscinalis Müll.—Widely distributed and, though local, not uncommon. In ponds, lakes, and gentle streams.

V. cristata Müll.—In similar situations, but either overlooked or much rarer than the last, though widely distributed. I have not found it. It is often attached to roots of water-plants.

Neritina fluviatilis L.—On stones or among gravel in streams. "From the Orkneys to Cornwall."—Jeffreys.

Dreissena polymorpha Pallas.—Local, in canals, &c. In the Forth and Clyde canal at Edinburgh and Glasgow.

Anodonta cygnea L.—In ponds, canals, and slow streams. Local. The only form I have seen in Perthshire is the var. *incrassata*, which is found in the Earn.

A. anatina L.

Unio margaritifer L.—Common in almost all the rivers. The vars. *sinuata* and *Roissyi* occur in Perthshire and elsewhere. This species must be considerably rarer than it was a few years ago, from the immense numbers destroyed by the pearl fishers.

Pisidium amnicum Müll.—In lakes and slow streams. Widely distributed.

P. pusillum Gmel.—Said to occur throughout. Often among wet moss.

P. nitidum Jen.—In ponds, &c. Throughout, but local. The var. *splendens* occurs at Lerwick and in West Ross (B. C. I. 25).

P. casertanum Poli.—In ponds and streams. Said to occur throughout. Near Glasgow (Haddin *l. c. s.*)

P. fontinale Drap.—A common and widely-distributed species in ditches, shallow pools, &c. Many species have been made out of the varieties of this.

Sphærium corneum L.—A common and widely-distributed species in ponds and slow streams. The var. *flavescens* is recorded by Jeffreys from Aberdeenshire and Lerwick. I have found it in several mountain lochs in Inverness-shire, Kirkcudbrightshire, &c.

S. lacustris Müll.—In lakes and marshes. Near Glasgow (Purdie).

The Squirrel in Scotland.—Since from time to time notes on the distribution in Scotland of the Squirrel have appeared in our columns, the following extract from Pennant's "Sketch of Caledonian Zoology" in Lightfoot's "Flora Scotica" (written more than one hundred years ago) may be of interest to our readers:—"Scarce in Scotland; a few in the woods of Strathspey."

Of the Wild Cat Pennant says, "abounds in all parts of the highlands;" of the Pine-martine, "is found in the pine-forests, and takes possession of the holes made by the woodpeckers"; of the Black Rat, "swarms in Caithness and Ross-shire"; and of the Brown Rat, "introduced here within these 60 years"; of the Common Urchin, or Hedgehog, "not found beyond the Tay: perhaps not beyond the Forth" (!); of the Black Eagle, or Ring-tail Eagle (I suppose the Golden Eagle is meant), "in Rannoch, eagles were, a few years ago, so very numerous, that the commissioners of the forfeited estates offered a reward of five shillings for every one that was destroyed: in a little time such numbers were brought in, that the Honourable Board reduced the premium to three shillings and sixpence."

PHYTOLOGY.

LIST OF FUNGI FOUND WITHIN THE PROVINCE OF MORAY, CHIEFLY IN THE VICINITY OF FORRES.

By the Rev. J. KEITH, M.A.

The following list is intended as a contribution towards the filling up of what has hitherto been a total blank in the flora of this district. In preparing it I have been more anxious that it should be accurate so far as it goes, than that it should be extensive, and have excluded not a few species which I have observed, but about which I am more or less in doubt. It contains several species which had not been met with previously in this country. Most of these have been determined by the Rev. M. J. Berkeley, whose exceeding kindness in helping beginners has done and is doing so much to promote the study of this difficult and hitherto much neglected department of botany. I am under similar obligations to Mr. Worthington G. Smith of London.

To save repetition in the list I may add here that all the species from Gordon Castle were collected and kindly forwarded to me by Mr. John Webster, gardener at the Castle.

I. HYMENOMYCETES.

I. AGARICUS, L.

(1). AMANITA, Pers.

1. Vaginatus, Bull. Woods. Common. Var. albida (A. nivalis, Grev.) occurs on Cairngorm.
2. Phalloides, Fr. Woods. Common. Sanquhar, &c.
3. Muscarius, L. Woods. Very common.
4. Excelsus, Fr. Woods. Rare. Dunphail.
5. Strobiliformis, Fr. Borders of woods. Very rare. Found once at Coulmony.
6. Rubescens, P. Woods. Very common.

(2). LEPIOTA.

7. Procerus, Scop. Woods and waste places about Forres. Common.
8. Rachodes, Vitt. Rare. This species has occurred regularly for several years in one spot, in Sanquhar wood near Manachie.

9. Acutesquamosus, Weinm. In gardens. Rare. Year after year in Dr. Innes' garden, and twice in Manse garden.
10. Cristatus, Fr. Lawns, meadows, &c. Common.
11. Terrei, B. and Br. Sandy ground near Forres. Very rare. M. Terry, Esq.
12. Granulosus, Batsch. Woods and heaths. Very common. *a.* Cinnabarinus, Fr. (Terrei, B. and Br.) *b.* Ferrugineus, Fr. Very rare. Castle-Grant woods. *c.* Incarnato-albidus, Fr. Common. Forres. *d.* Subochraceus, Fr. Very common. Forres.

(3). ARMILLARIA, Fr.

13. Aurantius, Schæff. Common. Fir-woods at Forres, Grantown, Dunphail, and Rothiemurchus. Identified by Berkeley. Not yet recorded from any other district.
14. Melleus, Vahl. On and around stumps. Very common.

(4). TRICHOLOMA, Fr.

15. Equestris, L. Fir-woods about Forres. Common.
16. Portentosus, Fr. Common. Fir-woods, Chapelton and New Forres.
17. Fucatus, Fr. Fir-woods. Rare. Beside Loch of Blairs.
18. Flavo-brunneus, Fr. Woods. Common. Brodie, Altyre, and Sanquhar, &c.
19. Albo-brunneus, Fr. Rare. Fir-woods at Loch of Blairs, &c.
20. Pessundatus, Tr. Fir-woods. Rare. Chapelton, Grantown, and Rothiemurchus.
21. Rutilans, Schæff. Fir-woods. Very common.
22. Columbetta, Fr. Woods. Rare. Sanquhar, Sluie, and Darnaway.
23. Imbricatus, Fr. Fir-woods. Very common.
24. Vaccinus, P. Fir-woods. Rare. Between Mondole and Cothall.
25. Murinaceus, Bull. Fir-woods. Common. Chapelton, Altyre, &c.
26. Terreus, Schæff. Woods. Common. Greeshop, Rothiemurchus, &c.
27. Saponaceus, Fr. Woods. Rare. Rothiemurchus.
28. Sulfureus, Bull. Woods. Common. Sanquhar, Chapelton, &c.
29. Bufonius, P. Fir-woods. Rare. Clunyhill.
30. Lascivus, Fr. Woods. Rare. Grangehall, Cothall, &c.
31. Gambosus, Fr. Pastures and roadsides in spring. Common. Sanquhar avenue, &c.
32. Grammopodius, Bull. Pastures. Rare. Among bushes at burnside, Sanquhar.
33. Humilis, Fr. On the ground and among grass. Rare. Manse garden, side of the road to Invererne, &c.
34. Sordidus, Fr. On earth, dung, &c. Very rare. On a heap of scrapings off the road, Sanquhar. Mistaken at first, as it is very liable to be, for Lepista nuda, Bull.

(5). CLITOCYBE, Fr.

35. Nebularis, Batsch. Woods. Very common.
36. Clavipes, Pers. Woods. Common. Sanquhar, Greeshop, &c.
37. Odorus, Bull. Woods. Common.

38. Rivulosus, Fr. Rare. Lawn at Bath-house, Nairn.
39. Phyllophilus, Fr. Rare. Among leaves at Dunphail.
40. Candicans, Fr. Woods. Common (both forms). Forres, Dunphail, Rothiemurchus, &c.
41. Dealbatus, P. Mossy pastures and woods. Common. Forres, Dunphail, Rothiemurchus.
42. Fumosus, P. var. polius, Fr. Rare. At roadside, Rothiemurchus.
43. Maximus, Fr. Meadows and woods. Common. Altyre, Mondole, Sanquhar.
44. Infundibuliformis, Schæff. Common. Sanquhar &c.
45. Geotropus, Bull. Rare. Riverside at railway bridge and at Logie.
46. Flaccidus, Sow. Woods. Common. Sanquhar, Chapelton, and Brodie, &c.
47. Cyathiformis, Fr. Meadows and woods. Common.
48. Brumalis, Fr. Woods, late in autumn. Very common.
49. Metachrous, Fr. Woods. Common. Sanquhar, Brodie, Chapelton.
50. Fragrans, Sow. Woods. Common.
51. Bellus, P. Fir-woods. Rare. Darnaway.
52. Laccatus, Scop. Woods, &c. Very common.

(6). PLEUROTUS, Fr.

53. Corticatus, Fr. Very rare. On a decayed ash tree near manse of Dyke.
54. Salignus, Fr. Rare. On trees between the Heronry and Cothall.
55. Serotinus, Schrad. Very rare. For several years in succession on an ash stump, Sanquhar, and once on decayed birch sticks, lying on the ground at Dunphail.
56. Mitis, P. Common. On dead larch in Altyre woods, &c.
57. Porrigens, P. Rare. In fir woods; Brodie, Rafford, Dallas, Rothiemurchus.
58. Septicus, P. Very rare. On a pile in ditch from gas house.
59. Atrocœruleus, Fr. Very rare. On decayed birch sticks at Dunphail. Identified by Berkeley.
60. Striatulus, Fr. Very rare. On fir sticks in wood near Scurrie-pool bridge.

(7). COLLYBIA, Fr.

61. Radicatus Relh. Rare. Sanquhar and Chapelton woods.
62. Maculatus, A. and S. Common. Chapelton, &c.
63. Velutipes, Curt. On whin and broom roots, &c. Very common.
64. Butyraceus, Bull. Woods. Very common.
65. Stipitarius, Fr. Rare. Roadside near Manachie.
66. Confluens, P. Common, Altyre woods, &c.
67. Conigenus, P. On fir cones. Common.
68. Cirrhatus, Schum. Very rare. On blackened fungi and on the ground in various woods around Forres and at Grantown.
69. Tuberosus, Bull. Rare. On blackened fungi, in various places near Forres.
70. Tenacellus, P. Common. On spruce-fir cones in Altyre woods.
71. Dryophilus, Bull. Woods. Very common.

(8). MYCENA, Fr.

72. Elegans, P. Sanquhar woods. Rare.
73. Rubromarginatus, Fr. On pine wood. Common. Apparently rare about Forres ; frequent at Rothiemurchus.
74. Rosellus, Fr. Sanquhar woods, &c. Common.
75. Purus, P. Woods. Very common.
76. Iris, Berk. On fir sticks. Common. Plentiful at Rothiemurchus.
77. Adonis, Bull. Woods. Rare. Dunphail.
78. Flavo-albus, Fr. Common. On a grassy spot by the roadside behind Drumduan. Common at Rothiemurchus in woods and meadows.
79. Lacteus, P. On masses of fir leaves in woods at Rothiemurchus. Common.
80. Rugosus, Fr. On stumps at Rothiemurchus, Cothall, and Sanquhar. Common,
81. Galericulatus, Scop. On trunks. Very common.
82. Polygrammus, Bull. On trunks. Common. Sanquhar, &c.
83. Parabolicus, A. and S. On a fir post lying on the ground near Forres. Rare.
84. Atro-albus, Bull. Among moss in woods at Dunphail. Rare.
85. Dissiliens, Fr. On trunks. Common. Chapelton, &c.
86. Alcalinus, Fr. On trunks. Common. Sanquhar, &c.
87. Metatus, Fr. Among moss at Dunphail. Rare. Identified by Berkeley. Not previously recorded as British.
88. Vitilis, Fr. Among mossy grass in Greeshop wood. Rare.
89. Hæmatopus, Pers. On a decayed stump at Rothiemurchus. Rare. (The gills were decidedly *red-edged*, as Berkeley describes them, and not as Fries says, *acie omnino concolores*).
90. Galopus, Schrad. Among leaves under trees and bushes at Cothall. Rare.
91. Epipterygius, Scop. Among mossy grass, &c., in woods. Very common.
92. Pelliculosus, Fr. On the ground in wood at Bridge of Findhorn. Rare.
93. Vulgaris, P. In pine woods among moss. Common. Greeshop wood, &c.
94. Stylobates, P. On sticks. Rare. Altyre woods.
95. Corticola, Schum. Among moss on trees. Rare. Noticed twice in Sanquhar woods.
96. Capillaris, Schum. On dead leaves. Rare. Dunphail.

(9). OMPHALIA, Fr.

97. Sphagnicola, B. On sphagnum. Rare. Burgie.
98. Muralis, Sow. On turf walls. Common.
99. Umbelliferus, L. In swamps, exposed pastures, &c. Common. Sanquhar, &c. The alpine variety occurs on the Knock of Braemoray.
100. Rufulus, B. and Br. Roadside behind Drumduan. Rare.
101. Campanella, Batsch. In fir-woods. Rare. Noticed two successive

years at the same spot in Greeshop wood. Var. Badipus. Rothiemurchus.

102. Fibula, Bull. Among moss. Common. Sanquhar woods. Var. Swartzii, Plentiful in Greeshop wood.

103. Integrellus, P. On decayed sticks, etc. Rare. On a prostrate willow tree in Greeshop wood, and again among moss on the trunk of a tree at Dunphail. Verified by Berkeley.

(10). VOLARIA, Fr.

104. Speciosus, Fr. Dunghills, roadsides, etc. Rare. In the neighbourhood of Forres, and besides Loch-an-Eilan, Rothiemurchus.

(11). CHAMÆOTA. Sm.

No species.

(12). PLUTEUS, Fr.

105. Cervinus, Schæff. On stumps. Common.

106. Umbrosus, Pers. At the foot of a gate-post beside Lochan-Eilan. Very rare.

107. Nanus, P. Among saw-dust at Key moss and Loch-an-Eilan. Rare.

108. Petasatus, Fr. On saw-dust. Rare. Sanquhar, Rafford, and Dallas.

(13). ENTOLOMA, Fr.

109. Sericellus, Fr. Woods. Rare. Darnaway forest.

110. Clypeatus, L. Woods and waste places. Common. Greeshop, Sanquhar, Dunphail, etc.

111. Rhodopolius, Fr. Woods. Rare Greeshop and Sanquhar.

112. Sericeus, Bull. Meadows. Common. Grassy path in Greeshop wood, etc.

113. Nidorosus, Fr. Woods. Rare. Sanquhar.

(14). CLITOPILUS, Fr.

114. Prunulus, Scop. Woods. Very common Var. Orcella. Open places. Very common.

(15). CLAUDOPUS, Sm.

115. Variabilis, P. On sticks, etc. Common.

(16). LEPTONIA, Fr.

116. Lampropus, Fr. Pastures. Common. Forres, Dunphail, Aviemore.

117. Serrulatus, P. Woods, etc. Common. Greeshop wood, Altyre, Aviemore.

(17). NOLANEA, Fr.

118. Pascuus, P. In pastures. Very common.

(18). ECCILIA, Fr.

No species.

(19). PHOLIOTA, Fr.

119. Durus, Bolt. In gardens, etc. Common. Sanquhar, Altyre, etc.
120. Præcox, P. Gardens and pastures. Very common.
121. Squarrosus, Mull. In masses about roots of trees. Common.
122. Spectabilis, Fr. Fir-wood beyond Davie viaduct. Very rare.
123. Flammans, Fr. On pine trunks. Common. Chapelton wood, etc.
124. Mutabilis, Schæff. On stumps. Very common.
125. Marginatus, Batsch. On and around stumps in fir-woods. Common. Rothiemurchus.
126. Mycenoides, Fr. Found only once on mosses and decayed leaves of carices in the bog in Greeshop wood. Rare.

(20). HEBELOMA, Fr.

127. Punctatus, Fr. Roadsides in pine woods. Rare. Rothiemurchus.
128. Mesophæus, Pers. Pine woods. Rare. Brodie.
129. Crustuliniformis, Bull. Woods. Common. Altyre, Sanquhar.
130. Fastibilis, Fr. Occasionally about Forres; frequent at Rothiemurchus. Common.
131. Testaceus, Batsch. Meadow at Sanquhar, and riverside near railway bridge. Rare.
132. Longicaudus, P. Woods. Common. Darnaway, Sanquhar, etc.
133. Bongardii, Fr. Rare. Culbin Sands. Mr. Norman.
134. Obscurus, P. On mud in a dried up marsh in Greeshop wood. Very rare.
135. Fibrosus, Sow. In fir-woods. Common. Wood beyond Divie viaduct, etc.
136. Rimosus, Bull. Woods, etc. Very common.
137. Trechisporus, Berk. In woods among ferns. Rare. Clunyhill, etc.
138. Geophyllus, Sow. Woods. Very common.

(21). FLAMMULA, Fr.

139. Scambus, Fr. Below heaps of fir branches. Rare. Rothiemurchus.
140. Spumosus, Fr. In fir-woods and on sawdust at Rothiemurchus and at Grantown. Rare.
141. Carbonarius, Fr. On a spot in an old fir-wood, where a fire had been lighted. Very rare. Altyre.
142. Astragalinus, Fr. On pine stumps. Very rare. Rothiemurchus. Verified by W. G. Smith. New to Britain.
143. Alnicola, Fr. var. salicicola. On a decaying willow in the old castle of Loch-an-Eilan. Rare.
144. Hybridus, Fr. On fir stumps in wood beyond Whitrow, and at Rothiemurchus. Rare.
145. Sapineus, Fr. On sawdust at Keymoss, Rafford, Grantown, and Rothiemurchus. Common.

(22). CREPIDOTUS, Fr. in part.

146. Mollis, Schæff. Among sawdust at Scourie, Rafford, and Aviemore, and on a stump in Darnaway Forest. Common.

(23). NAUCORIA, Fr.

147. Cucumis, P. On little sticks among grass in Sanquhar wood. Very rare.
148. Melinoides, Fr. Lawns, etc. Very common.
149. Pediades, Fr. Roadsides. Common.
150. Semiorbicularis, Bull. Lawns and roadsides. Very common,
151. Conspersus, P. Dyke in the alder wood beside the bridge behind Dalvey Cottage. Rare.

(24). GALERA, Fr.

152. Tener, Schæff. Pastures. Very common.
153. Hypnorum, Batsch. Among moss. Very common.

(25). TUBARIA, Sm.

154. Inquilinus, Fr. On chips in Greeshop wood. Common.
155. Furfuraceus, P. On chips, etc. Very common.

(26). PSALLIOTA, Fr.

156. Arvensis, Schæff. Meadows and sides of fields. Common.
157. Campestris, L. In rich pastures. Common. Berkeley's rufous variety occurs here and there.

(27). PILOSACE, Fr.

(No species.)

(28). STROPHARIA, Fr.

158. Æruginosus, Curt. Woods, meadows, etc. Common.
159. Albo-cyaneus, Desm. Meadows and fields. Common. Greeshop, etc.
160. Squamosus, Fr. Woods. Rare. Sanquhar, Altyre, etc.
161. Stercorarius, Fr. On dung. Very common.
162. Semiglobatus, Batsch. On dung. Very common.

(29). HYPHOLOMA, Fr.

163. Sublateritius, Fr. On old stumps. Very common.
164. Fascicularis, Huds. On old stumps. Very common.
165. Epixanthus, Fr. On fir stumps. Rare. Clunyhill, etc.
166. Dispersus, Fr. On stumps and on the ground in fir-woods. Common. Sanquhar.
167. Lacrymabundus, Fr. On trunks and on the ground. Rare. Forres Church-yard, Rothiemurchus. etc.
168. Velutinus, P. On stumps. Rare. Brodie.
169. Candollianus, Fr. On stumps. Rare. Clunyhill.
170. Lanaripes, Cooke. In the stove at Dalvey. Very rare.
171. Appendiculatus, Bull. On dead stumps. Common. Sanquhar, Greeshop, etc.
172. Hydrophilus, Bull. On sawdust at Loch-an-Eilan. Rare.

(30). PSILOCYBE, Fr.

173. Semilanceatus, Fr. Pastures and roadsides. Very common.
174. Cernuus, Müll. On chips, etc. Common.
175. Fœnisecii, P. Roadsides and meadows. Very common.

(31). PSATHYRA, Fr.

176. Conopilus, P. Between the turnpike road and the river at Waterside. Rare.
177. Corrugus, P. Meadow at Sanquhar. Rare.
178. Spadiceo-griseus, Schæff. On chips. Rare. Break-back.

(32). DECONICA, Sm.

179. Bullaceus, Bull. On horse-dung at Rothiemurchus. Rare.

(33). PANÆOLUS, Fr.

180. Separatus, L. On dung. Common.
181. Fimiputris, Bull. On dung and rich pastures. Very common.
182. Retirugis, Batsch. On dung. Very common.
183. Campanulatus, L. On rich ground. Common.
184. Papilionaceus, Bull. On rich ground. Common.

(34). PSATHYRELLA, Fr.

185. Gracilis, Fr. Railway station at Dunphail. Rare.
186. Disseminatus, P. About stumps of trees. Common.

2. COPRINUS, Fr.

187. Comatus, Fr. Roadsides, etc. Rare. Darnaway, Cothall, Grangehall.
188. Atramentarius, Fr. About old stumps and rich ground. Common.
189. Fimetarius, Fr. On dung heaps. Common.
190. Tomentosus, Fr. On dung and rich pastures. Rare. Sanquhar.
191. Niveus, Fr. On horse-dung. Common.
192. Micaceus, Fr. About old stumps. Common.
193. Hendersonii, Fr. On horse-dung along with A. bullaceus at Rothiemurchus. Very rare.
194. Lagopus, Fr. On rich ground. Rare. Waterford.
195. Radiatus, Fr. On dung. Rare. Sanquhar.
196. Ephemerus, Fr. On dung heaps. Common.
197. Plicatilis, Fr. Pastures and roadsides. Very common.

(To be continued.)

Poa sudetica.—I saw a bank at Newtondon covered with this grass, and Mr. A. Kelly, Lauder, sent me a specimen from Blackadder Woods, where he says it is abundant.—A. BROTHERSTON, Kelso. [From Mr. Brotherston's investigations, I think *Poa sudetica* must be considered an indigenous species, and not an introduced one only.—EDITOR.]

DESCRIPTION OF A SCOTTISH FUNGUS NEW TO SCIENCE.

By F. BUCHANAN WHITE, M.D., F.L.S.

VIBRISSEA MARGARITA *n. sp. Simplex, capite orbiculari, aurantiaco-miniaceo, margine atro-hispido; stipite cylindraceo, atro-hirsuto cum fibrillis articulatis, interne albido-cinereo.* Long. 2-6 lin.

Habitat.—On dead sticks of heather in a pool of water on Mòr Shròn (Morrone) Braemar, at an altitude of 2200 feet. September and October, 1873.

The stems are simple, varying from 2 lines to ½ an inch in height, "springing from complicated threads," and covered with black jointed hairs or fibres; at the junction with the head the stem is less hairy and paler in colour; internally it is solid and greyish-white. The head is flattened obicular (sometimes concave in the middle) and of a beautiful orange-vermillion in colour; the margin has a fringe of close appressed hair of the same character as those on the stem; underneath, the head is paler in colour at the junction with the stem. This species, (which was submitted to the Rev. J. M. Berkeley, whose opinion —given with his wonted kindness—is that it appears to be new) is readily distinguished from its ally *V. truncorum* by the hairy stems and differently coloured heads.

Onobrychis sativa as a Forfarshire Plant.—A paragraph appeared in the newspapers some time ago, giving an account of the discovery of this plant, near the Dundee and Arbroath Railway, by some botanists from Dundee in July last. It stated that there was no record of any Scottish localities for it given by Hooker, &c., and that full particulars of the finding of it would be given in the forthcoming second edition of Gardiner's "Flora of Forfarshire." Though not a matter of much consequence, seeing the plant is looked on as an introduced species to the north of Norfolk (if not also to the south), still it may be as well, as a matter of accuracy, to state that the plant is not quite new to Scotland. Those acquainted with the works of Mr. H. C. Watson will be aware that it is recorded from the counties of Edinburgh and Moray; and further, there are specimens of it in my herbarium, collected in and upon the border of a cutting of the Dundee and Arbroath Railway, by the Rev. J. Fergusson, New Pitsligo, in August, 1866, and sent by him to me in September of the same year.—JOHN ROY, Aberdeen.

GEOLOGY.

TRAP ROCKS.

By F. R. SMITH.

TO one who has spent a dozen of years among the cretaceous deposits of Cambridgeshire, visiting, vampire-like, the tombs of the dead—*of our ancestral dead?*—Dinosaurus, Ichthyosaurus, Plesiosaurus, and their contemporaries; and purloining therefrom, now a spinal column, now a fragmentary skull, and now a caudal appendage, a neighbourhood of bare-faced traps, among which are scattered some beds of presumed non-fossiliferous Old Red Sandstone, must of necessity supply very poor comfort to his old predilections. Such is his reduced state, that he is highly excited, if he find that a boulder has shifted in the river bed, or if he happen on a new species of trap. This latter material has been his great consolation. Bare-faced as is this trap, and uninviting to the palæontologist, it cannot be said to be wholly without interest. Indeed there are some few points about it, that may afford "fresh fields and pastures new" in the poorest districts. There are always its age, position, structure, composition, &c., and a host of minor facts and appearances upon which the speculative and sanguine mind may theorize and assert with advantage eminently to itself.

Kinnoull and Moncreiffe hills form a northern limit to a mass of volcanic rocks that extend south to Edinburgh, where they display their features with great dignity. Dupplin is situated on the north end of this trap district, four miles below Perth. A little south of Dupplin Castle is a small felstone quarry, locally called whin-stone, that exhibits the cannon-ball phenomena. These balls are of all sizes, and show in their decay concentric lamination. The interstices between the balls are filled with disintegrated trap, in the form of a ferruginous earth. Somewhat less than a mile to the north of the Castle, a cutting has been made through a trap dyke, or rather ridge, that extends

for some long distance westwards from Moncreiffe Hill, and is a filled-up fissure that probably resulted from the Perth volcanic phenomena. The structure of this is cuboidal prismatic—that is, the general appearance is that of a mass of irregular cubes piled up in the wildest possible manner, presenting on a small scale most picturesque cliffs. The cube forms are in no wise attached to each other, the filling-up material being decayed trap. This structure gives us an idea of how easily volcanic masses that are scattered over the country were removed. One of these, that lay at the bottom of a rising-ground, presented to my admiring eyes most beautiful glacial marks, when I was heartlessly informed that it had "humbugged the plough for many years before it was raised." I have noticed that cuboidal masses sometimes become spherical as their coats wear off.

It is, to say the least, curious that volcanic rocks should assume a great variety of aspects, combined as they are with great simplicity of composition, about nine chemical substances forming the whole. The felspathic and hornblend families produce from their union nearly all the other varieties. Hornblend seems to be but augite slowly cooled. Changes are wrought among these rocks as easily as changes upon bells. Even the rate of cooling and pressure are of the first importance. If mica is added to a crystalline felstone, or quartz to a crystalline greenstone, either becomes a granite. From the *debris* of the Moncreiffe Hill tunnel, I procured crystalline felstone, greenstone, and trappean ash or tuff, forming a breccia of angular pieces, embedded in a fine-grained base, and other nameless varieties probably representing all the species to be found between Samson's Ribs on the one hand and Staffa on the other. These traps are certainly "*roches hors de serie.*"

Some of these pyrogenous rocks have cooled quickly near the surface of the earth; such are generally cellular or scoriaceous, having been easily expanded by the pent-up gases. Others cooled slowly deep in the earth, or on the floor of the ocean, under great pressure. These are more dense and crystalline. Several of the serial strata present joint planes (limestone for instance), often running at right angles to the lines of deposition. In volcanic rocks, in order to form cubes, we must have three sets of joints, one crossing the other two at right angles. In prismatic columnar structures, the joint planes appear to have begun at the top, where first cooled, and to have struck downwards. A block will often break with a smooth surface, or as

it is called, a conchoidal fracture. The production of joints in rocks is said to result from the condensation of their mass from an aqueous or igneous expansion. But (I now quote Professor Phillips) the symmetry of their arrangement can only be referred to some kind of crystallic action, and the parallelism of the great joints over large tracts of country seems the effect either of electrical currents controlling that action, or of peculiar, perhaps undulatory, movements affecting large parts of the crust of the globe. I need hardly quote Fingal's Cave or the Giant's Causeway.

Professor Faraday divided all bodies into two great classes, those which when placed between the poles of a magnet pointed in a straight line in consequence of their attraction assuming an axial position, and those which are repelled by each pole so that they point at right angles to the line joining the poles, that is, in an equatorial direction. This is the relation between magnetism and crystallization, the one class of bodies being magnetic and the other diamagnetic. A certain line in crystals that tends to place itself parallel to the magnetic axis was called by Faraday the magno-crystallic axis. The Professor also spoke of a force which regulates the motion of crystals as magneto-crystallic; the action is thus described—"The line or axis of the magno-crystallic force tends to place itself parallel or at a tangent to the magnetic curve, or to the line of magnetic force passing through the plane where the crystal is separated." Galvanism is a force that may aid in shaping or modifying forms. Chemical affinity and electricity—two very nearly related forces—as also cohesion, are constantly employed in the formation of these barefaced traps. How much there is then to be learned about these indigenous materials. Subtle forces are now being laid hold of that will ere long lead on to great generalizations. These volcanic rocks are the parents of all other materials on the globe; the whole of them being for the most part combinations of silicic acid with iron, alumina and magnesia, potash and lime, and soda. It is very wonderful that the vast variety of strata have been formed out of these.

In the Earn valley below Dupplin many "fortification" agates are found. These have been formed in cavities by the infiltration of silicic acid in a state of solution. Indeed, quartz is silica, and amethyst, cairngorm, jasper, onyx, agate, catseye, cornelian, bloodstone, opal, chalcedony, flint, cherb,

and other stones are mere varieties of the same chemical material, stained by the presence of iron, magnesia, &c.

The peculiar "weathering" of trap is due not to any propensity that it has for assuming odd forms, the forms were assumed on its solidification. The plane surfaces are the first to disintegrate, being exposed to the percolation of water. "Sand" or "earth-pipes" are sometimes seen in positions that have been exposed to the solvent power of rain.

VARIOUS NOTES.

We have much pleasure in informing our readers that the Rev. J. Fergusson, New Pitsligo, and Mr. John Roy, Aberdeen, are preparing a "Guide to the Botany of the North-East of Scotland," which is intended to include the district between the Tay and the Spey. It will contain full information of the localities, local names, etc., both of flowering plants and cryptogams. It is also intended to give descriptions of species found in the district, when they are not described in British books. It is proposed to publish it by subscription, and we understand that it will probably be ready in the course of 1875.

We have received the programmes of an International Botanical Congress, and of an International Horticultural Exhibition, which are to take place at Florence under the auspices of the "Société Royale Toscane d'Horticulture" between the 11th and 25th of May, 1874, and under the Presidency of Professor Parlatore. Some twenty-two themes are proposed for discussion at the Congress. Among them we especially notice one on the possibility of establishing a rational distinction between the groups known by the names of *species*, *race*, *variety*; another on the character and origin of island floras; and another on the character and origin of alpine floras, and particularly on the causes which limit their extension. At the Exhibition a large number of gold, silver, and bronze medals are offered as prizes. From what we hear, a concourse of the most distinguished botanists and horticulturists in Europe may be expected, and we should advise any of our readers who meditate a visit to Italy next spring to visit Florence during the Congress, to which any botanist will be admitted by ticket (which may be had from the President for the asking before March 1st). Italian will be the official language, but any member can use at all times his mother-tongue if he prefers to do so. Botanical excursions in the neighbourhood of Florence, and to Pisa, etc., are also planned, and we have no doubt that any foreign botanist who presents himself will have "a good time of it."

We have also received a valuable contribution on the subject of Zoological Nomenclature, by Dr. Sharp. We hope to be able in next number to notice this pamphlet at greater length.

"Monograph of the Collembola and Thysanura," by Sir J.

LUBBOCK, BART.—This constitutes the volume for 1871 published by the Ray Society, and is a good example of the class of works which that Society should confine itself to publishing, instead of wasting its means in issuing reprints of old books and translations of German works (since every naturalist can, or should be able to, read German nowadays). Should the Society continue to publish volumes similar to the one before us (and we are glad to see that such is its intention), we have no doubt of its prosperity, and have no hesitation in recommending our readers to become subscribers.* In the present work we have descriptions of all the known species of *Collembola* and *Thysanura* (in other words *Poduridæ* and *Lepismidæ*), besides anatomical and other details and remarks on the evolution of the Insecta. The 78 plates (of which 31 are coloured), which make this volume magnificently illustrated, are devoted to figuring nearly 54 species, and to giving anatomical details, and representations of the curious scales with which many of the species are adorned.

Dr. Moore of Glasnevin has made a valuable addition to the works on British Cryptogams, in form of a Synopsis of the Irish Mosses. It is a reprint from the Proceedings of the Royal Irish Academy, and will prove extremely useful not only to the Irish botanist, but to every bryologist.

THE MAGAZINES.

[Under this heading we purpose noticing from time to time, some of the chief articles, of interest to the naturalist in Scotland, contained in the various scientific journals. It must be remembered that in doing so we only make a selection, and that our space will not permit us even to mention many articles of high importance.]

In the *Entomologist's Monthly Magazine* Mr C. G. Barrett continues his revisal of the British Tortrices—a work for which all collectors of these insects should be grateful. Mr J. Scott gives description of certain new British species of *Homoptera*, of which there are probably many new ones still to be found in Scotland. Mr Birchall in describing the Irish form of *Melitæa aurinia (artemis)* considers that some specimens received from Mr. Chapman, and taken at Dunoon, belong to the alpine var. *merope*. [See *Scottish Naturalist*, I., page 167. The ordinary Scottish form does not differ greatly from the northern English. Mr. Birchall tells me that the Dunoon specimens occurred at about 400 feet elevation only.—Editor *Scottish Naturalist.*] Mr. E. G. Meek contributes a paper on the habits of the British species of *Sesia*, which will probably prove useful. Mr. Champion notices the *Coleoptera* taken by him in Braemar. [We hope to give some day a complete list of all the insects taken in Braemar.—Editor *Scottish Naturalist.*] Mr. Buckler describes the larva of *Crambus pinetellus*,

*Subscriptions 21s. per annum. For particulars apply to the Rev. T. Wiltshire, 25 Granville Park, Lewisham, London, S.E., from whom also members can obtain (at a reduced rate) copies of the works already published by the Society.

which feeds on grasses near the root. Mr. M'Lachlan gives a note of Wallengren's determinations of the *Trichoptera* of Zetterstedt's *Insecta Lapponica*. The Rev. T. A. Marshall recommends carbolic acid as a preservative of insects from mites, *Psoci*, etc. The drawers and boxes should be washed with a weak solution, which leaves no stain. The sheets of card-board on which *Coleoptera*, etc., are to be gummed, should be medicated in like manner.

In the *Journal of Botany* from May to December, 1873, we find the following:—"Additions to the British Lichen Flora" by the Rev. J. M. Crombie, including many Scottish species. "Recent addition to our Moss Flora, Part VI." by Dr. Braithwaite, in which the author discusses the *Orthotrichaceæ*. Of the *Orthotricheæ* full descriptions and Lindberg's conspectus of the European species are given. The generic name *Ulota* is replaced by the prior *Weissia* Ehrhart (1779), the *Weissia* of Hedwig (1782), an utterly different genus, being replaced by *Simophyllum* Lindberg. "On the distribution of plants during the post-glacial period" by A. Nathorst. Dr. Trimen gives a description and synomymy of the two forms of *Rumex obtusifolius* L.—*Friesii* Gren. and Godr., the common British form, and *sylvestris* Wallr. lately found beside the Thames. By some authors these are considered distinct species. The great difference lies in the fruit, and figures are given showing the distinction. *R. sylvestris* should be looked for in Scotland—it occurs in Sweden. Baron von Mueller calls attention to the probability of the occurrence of *Chenolea hirsuta*, a plant extremely like *Suæda maritima*, with which it grows. When the pubescence of the *Chenolea* has become lost, the horse-shoe-shaped embryo affords a good distinction—the embryo of *Suæda* being circinate. "On some Lycopodiaceous plants from the Old Red Sandstone of the North of Scotland," by W. Carruthers, F.R.S. (with a plate). "New British Fungi." by W. G. Smith, including five Scottish species. Each number contains a list of the articles in the botanical journals, both British and foreign, etc.

In *Grevillea*, the editor (Mr. M. C. Cooke) continues his descriptions of Fungi added to the British list since the publication of his Handbook. These include a few Scottish species. "On the Rarer Lichens of Blair-Athole" by the Rev. M. J. Crombie, includes 65 species, of which 8 are new species, 7 new varieties and forms, and 7 others new to the British list. Mr. Crombie remarks that there is a marked contrast in many respects between the Lichen Flora of the S. W. Grampians (Breadalbane), Central Grampians (Blair-Athole), and N. Grampians (Braemar). "Addition to the Lichen Flora of Great Britain" by Dr. J. Stirton, including six species from Scotland. "New British Hepaticæ" by Dr. Carrington (whose long-looked for work on these plants we trust will soon make its appearance), including one Scottish species. There are besides several excellent articles on structural and physiological botany, and each number has usually a plate and list of recent cryptogamic literature.

In *Nature* two articles on the geology of the "Southern Uplands of Scotland" by Professor Harkness, are noteworthy.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 184.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

CIRRŒDIA Gn.

XERAMPELINA Hb. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°40″-56°30″. RANGE IN EUROPE. Britain, France, Belgium, S.W. Germany, Austria. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. April-June. FOOD-PLANT. Ash (especially the buds).

EUPERIA Gn.

PALEACEA Esp. *(fulvago* L. was another species). Not common. Nemoral.

DISTRIBUTION—EAST. o o Tay ♂♀ Moray o o o
WEST. o o o o o

LAT. 56°20″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE — IMAGO. August. LARVA. May, June. FOOD-PLANT. Birch and oak.

TETHEA Ochsen.

SUBTUSA F. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed o Tay o o o o o
WEST. o o o o o

LAT. 55°20″-56°30″. RANGE IN EUROPE. Central (to S. Sweden). TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. April, May. FOOD-PLANT. Poplar.

COSMIA Ochsen.

TRAPEZINA L. Common in the lowlands; rare in the highlands. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central (to S. Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Oak, birch, etc.

NOCTUIDÆ.

NOCTUA L.

GLAREOSA Esp. Not uncommon. Nemoral and ericetal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-58°40″. RANGE IN EUROPE. Britain, W. Germany, Belgium, France, Bavaria, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May, June. FOOD-PLANT. Broom, dock, etc.

DEPUNCTA L. Local. Nemoral.

DISTRIBUTION—EAST. o o Tay ♀ Moray o o o
WEST. Solway o o o o

LAT. 54°50″-58°40″. RANGE IN EUROPE. Britain, central and south Germany and France, Alps, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-September. LARVA. September-May. FOOD-PLANT. Low plants.

UMBROSA Hb. Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Britain, Belgium, central and north France, W. and N.W. Germany, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August-May. FOOD-PLANT. Low plants.

RUBI View. Not uncommon. Nemoral. Ascends to 1200 ft.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central (excluding Sweden). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. In the south double-brooded, June (end), July; and August (end): in the north single-brooded, June-August (beginning). LARVA. September-May (June, July). FOOD-PLANT. Low plants.

Northern specimens differ from southern English ones, in being rather larger, and the forewings with a clearer less clouded ground colour.

FESTIVA Hb. Not uncommon in the lowlands; abundant in the highlands. Nemoral. Ascends to 1600 ft.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°50″-58°20″. RANGE IN EUROPE. Central (excluding Sweden). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

Ab. *conflua* Tr. Common in the highlands. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde Argyle ♀ ♀

LAT. 54°50″-57°40″. RANGE IN EUROPE. Northern and alpine. TYPE. Boreal. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. May-September. FOOD-PLANT. Low plants, "preferring *Silene acaulis*."

Many authors consider that *festiva* and *conflua* are good species, distinct from each other. Dr. Staudinger says of *conflua* "perhaps a northern and alpine variety of *festiva*, or a Darwinian species." Mr. Buckler tells me, that the only difference between the larvæ of *festiva* and *conflua* is one of colour alone, and Mr. Doubleday, I believe, is inclined to unite the two. In Scotland, I think *conflua* can only be considered as an aberration of *festiva*, distinguished in extreme forms by its smaller size and less variegated colour, but connected with it by many intermediate forms, so that it is

difficult to say where the one ends and the other begins. In Iceland, from which there is before me a series, *conflua* has more claim to specific rank, but is probably only a northern var. of *festiva*. In that locality the larva very probably feeds on *Silene acaulis;* in this country, I should say, it very rarely does so.

DAHLII Hb. Not uncommon. Nemoral.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central (excluding South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Low plants.

BRUNNEA F. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Low plants.

STIGMATICA Hb. (*rhomboidea* Esp. was another species). Not common. Nemoral.

DISTRIBUTION—EAST. o Forth Tay ♀ Moray o o o
WEST. o Clyde ♀ ♀ o

LAT. 56°-57″40°. RANGE IN EUROPE. Central (to Sweden?). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-June. FOOD-PLANT. Low plants.

TRIANGULUM Hb. Not very common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway ♀ Argyle ♀ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central (to South Sweden, &c). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Low plants.

DITRAPEZIUM Bkh. Very local. Nemoral.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

LAT. 56°20.″ RANGE IN EUROPE. Central (to Sweden?) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE.—IMAGO. August. LARVA. September-May. FOOD PLANT. Low plants.

C-NIGRUM L. Common. Nemoral and pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-58°20″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

PLECTA L. Common. Nemoral and pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

AUGUR L. Common. Nemoral and pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀

LAT. 54°40″-57°40. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Shrubs and low plants.

CASTANEA Esp. (1795); *neglecta* Hb. (after 1800). Not uncommon. Ericetal.

DISTRIBUTION—EAST. o o Tay Dee Moray ♀♂ o o
WEST. Solway ♀♂ ♀♂ ♀♂ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. West central TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August. LARVA. September-May. FOOD-PLANT. Heather and low plants.

Two forms are distinguished by Staudinger—the typical *castanea*, which is reddish brown, and the var. *neglecta*, which is grey. The former is the less common. In Scotland both occur, as well as intermediate forms.

BAJA F. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♂ o o
WEST. Solway Clyde Argyle ♀♂ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Low plants.

SOBRINA Gn. Rare. Nemoral and ericetal.

DISTRIBUTION—EAST. o o Tay ♀♂ ♀♂ o o o
WEST. o o ♀♂ ♀♂ o

LAT. 56°40″ RANGE IN EUROPE. Central Germany, Switzerland, and Central Russia (the var. *Gruneri* is alpine and boreal). TYPE. Boreal. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. ? FOOD-PLANT. ?

I have not seen many enough specimens to say whether they should be referred to the type or to the var. *Gruneri*, but I should be almost inclined to consider that they form another var.

XANTHOGRAPHA F. Common. Agrestal, pascual, nemoral. Ascends to 1300 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♂ o o
WEST. Solway Clyde ♀♂ ♀♂ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central (to Sweden?) and south-west. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-September. LARVA. September-June. FOOT PLANT. Low plants.

Very variable; hind wings often altogether dark, not always, as described, whitish with a darker border.

TRIPHÆNA Ochsen.

PRONUBA L. Common. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40″-57°40″. RANGE IN EUROPE. Throughout. TYPE. Territorial. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-June. FOOD-PLANT. Low plants.

COMES Hb; *orbona* F. (but *orbona* Hufn. is the next species). Common. Agrestal and nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. From Sweden (?) southwards. TYPE. Centro-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

Varies considerably in colour; an extreme form (black and red) is *T. Curtisii* Newm. which, however, is connected by intermediate forms with the ordinary *comes;* it occurs in several places, especially in Moray, Dee, Tay, and Clyde.

ORBONA Hufn. (1767); *subsequa* Hb. (1787). Not common. Nemoral.

DISTRIBUTION—EAST. o o ♀ Dee Moray o o o
WEST. o ♀ o o o

LAT. 57°10″-57°40″. RANGE IN EUROPE. Central; south and central Scandinavia, &c. TYPE. European? TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-September. LARVA. September-May. FOOD-PLANT. Low plants.

I believe that this species, which has been taken at Inverurie *(Tait)*, Fyvie *(Traill)*, and Forres *(Norman)*, is occasionally passed over as a form of the last. The narrower, more oblong wings, and especially the distinct black spot (like that in *pronuba*) near the tip of the front wing will at once distinguish it.

FIMBRIA L. Not uncommon. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. From Scandinavia

southwards. TYPE. Centro-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-September. LARVA. September-May. FOOD-PLANT. Birch, sallow, broom, and low plants.

JANTHINA Esp. Common. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and southern. TYPE. Centro-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Ivy and low plants.

AGROTIS Ochsen.

LUCERNEA L. Not common. Rupestral (usually maritime).

DISTRIBUTION—EAST ♀ Forth Tay Dee Moray o o o
WEST. [Solway Clyde] o o o o

LAT. 56°-57°50′. RANGE IN EUROPE. High Alps, Pyrenees, Britain, Sweden, Finland. TYPE. Septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. LARVA. September-May. FOOD-PLANT. Low plants.

SIMULANS Hufn. (1767); *pyrophila* F. Not common. Agrestal (often maritime).

DISTRIBUTION—EAST. o Forth Dee Moray. o o o o
WEST o Clyde o o o

LAT. 55°40″-57°40″ RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

OBSCURA Brahm. (1790); *ravida* Hb. (after 1800). Not common. Agrestal.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway Clyde o o o

LAT. 55°-56°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Low plants.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 192.)

EDITED BY D. SHARP, M.B.

CŒRULEA Sahl. Rare. Riparial.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

LURIDIPENNIS Man. Common.
DISTRIBUTION—EAST. ♀ ♀ ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

LONDINENSIS Sharp. Rare. Lowland.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway ♀ o o o

HYGROTOPORA Kr. Common. Lowland.
DISTRIBUTION—EAST. ♀ ♀ ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

ELONGATULA Gr. Common. Lowland.
DISTRIBUTION—EAST. Tweed ♀ ♀ ♀ Moray ♀ o o
WEST. Solway ♀ o o o

VOLANS Scriba. Abundant. In varied situations.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway ♀ ♀ o o

CLAVIPES Sharp. Local. Alpine.
DISTRIBUTION—EAST. o o ♀ Dee Moray o o o
WEST. Solway Clyde ♀ o o

TIBIALIS Heer. Common. Alpine.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

VESTITA Gr. Common. Littoreal.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway Clyde o o o

NITIDULA Kr. var. *nitidiuscula* Sharp. Local. Alpine.
DISTRIBUTION—EAST. o o ♀ Dee Moray o o o
WEST. Solway ♀ o o o

OBLONGIUSCULA Sharp. Rare. Lowland, highland.
DISTRIBUTION—EAST. ♀ ♀ Tay ♀ ♀ o o o
WEST. Solway Clyde o o o

SILVICOLA Fuss. Rare.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway o o o o

VICINA Steph. Abundant. In varied situations.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

CRASSICORNIS Gyll. Very rare. Highland.
DISTRIBUTION—EAST. o o o Dee Moray o o o
WEST. o o o o o

PAGANA Er. Rare.
DISTRIBUTION—EAST. Tweed Forth o o Moray o o o
WEST. o o o o o

GRAMINICOLA Gr. Abundant. Lowland.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

HALOBRECTHA Sharp. Common. Maritime.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway. ♀ o o o

PUNCTICEPS Th. Local. Maritime.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. ♀ Clyde o o o

OCCULTA Ep. var. *fungivora* Th. Common. In fungus.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

PICIPES Th. Scarce. Under bark.
DISTRIBUTION—EAST. o Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

EXCELLENS Kr. Rare.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway Clyde o o o

MONTICOLA Th. Local. In fungus.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway. o o o o

SUBGLABRA Sharp. Rare.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway Clyde o o o

ANGUSTULA Gyll. Rare.
DISTRIBUTION ?
I have Scottish individuals of this species, but without note of their locality.—D. S.

LINEARIS Gr. Local. Under bark.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

PILICORNIS Th. Rare. Under bark.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

DEBILIS Er. Local. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

FALLACIOSA Sharp. Local. Lowland.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

CIRCELLARIS Gr. Abundant. Lowland, highland.
DISTRIBUTION—EAST. oo Forth Tay Dee oo oo oo oo
WEST. Solway oo oo oo oo

ÆGRA Heer. Rare. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

IMMERSA Heer. Local. Under bark.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. oo oo o o o

EREMITA Rye. Common. Lowland, highland.
DISTRIBUTION—EAST. oo Forth Tay Dee Moray oo o o
WEST. Solway Clyde oo o o

AUBEI Bris. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. o o o o o
Found by Mr Hislop in Scotland.

GEMINA Er. Local. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

CURTIPENNIS Sharp. Local.
DISTRIBUTION—EAST. o Forth Tay Dee o o o o
WEST. Solway o o o o

ANALIS Gr. Abundant. In varied situations.
DISTRIBUTION—EAST. ♀♀ Forth Tay ♀♀ ♀♀♀ ♀♀♀ ♀♀ ♀♀
WEST. Solway ♀♀ ♀♀ ♀♀ ♀♀♀

CAVIFRONS Sharp. Rare. Highland (?).
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

SIMILLIMA Sharp. Rare. Riparial.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

EXILIS Er. Local. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

PALLENS Redt. Rare. Riparial.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. Solway o o o o

VALIDIUSCULA Kr. Local.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o o o o o

PARALLELA Man. Local. In nests of Formica rufa.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o

DEPRESSA Gyll. Common. In moss and leaves.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ Dee Moray o o o
WEST. Solway ♀♀ o o o

AQUATICA Th. Common.
DISTRIBUTION—EAST. Tweed Forth Tay ♀♀ Moray o o o
WEST. Solway o o o o

ÆNEICOLLIS Sharp. Abundant.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ ♀♀ ♀♀ o o o
WEST. Solway ♀♀ o o o

XANTHOPTERA Steph. Abundant. In decaying vegetable matter and fungus.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ ♀♀ Moray ♀♀ o o
WEST. Solway ♀♀ ♀♀ o o o

INCOGNITA Sharp. Rare. Highland. About decaying branches of Scotch Fir.

DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. Solway oo o o o

VALIDA Kr. Rare.

DISTRIBUTION—EAST. o Forth oo oo Moray o o o
WEST. Solway oo o o o

SUCCICOLA Th. Common.

DISTRIBUTION—EAST. oo Forth ooo Dee oo o o o
WEST. Solway ooo o o o

TRINOTATA Kr. Abundant.

DISTRIBUTION—EAST. oo Forth oo Dee Moray o o o
WEST. Solway oo o o o o

HYBRIDA Sharp. Very rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

XANTHOPUS Th. Scarce.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

FUNGICOLA Th. Abundant.

DISTRIBUTION—EAST. oo Forth Tay Dee Moray oo oo oo
WEST. oo oo oo oo

IGNOBILIS Sharp. Local. In decaying fungus.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

DIVERSA Sharp. Rare.

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

CORIARIA Kr. Local.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

SODALIS Er. Local. In fungus.

DISTRIBUTION—EAST. o Forth oo Dee oo o o o
WEST. Solway oo o o o

GAGATINA Baud. Not common. In fungus, dead leaves, &c.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway ♀ o o o

DIVISA Märk. Local.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

NIGRICORNIS Th. Rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

RAVILLA Er. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

PALUSTRIS Kies. Common.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

CORVINA Th. Scarce.

DISTRIBUTION—EAST. o Forth ♀ Dee o o o o
WEST. Solway o o o o

ATOMARIA Kr. Rare.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

CINNAMOMEA Gr. Rare. At the sap of trees infested by Cossus.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

SUBTERRANEA Muls. Very rare.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

SERICEA Muls. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway. ♀ o o o

SUBTILIS Scriba. Rare.

DISTRIBUTION—EAST. o Forth Tay Dee o o o o
WEST. Solway. o o o o

INDUBIA Sharp. Scarce.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

INDISCRETA Sharp. Rare.
DISTRIBUTION—EAST. o o o Dee Moray o o o
WEST. Solway o o o o

MORTUORUM Th. Rare.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

ATRICOLOR Sharp. Abundant.
DISTRIBUTION—EAST. ♀♀ Forth Tay Dee Moray ♀♀♀ ♀♀ ♀♀
WEST. Solway ♀♀ ♀♀ ♀♀ ♀♀♀

ANCEPS Er. Local. In the nests of Formica rufa.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

FLAVIPES Gr. Local. In nests of Formica rufa.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

NIGRA Kr. Abundant.
DISTRIBUTION—EAST. ♀♀ Forth Tay Dee ♀♀♀ ♀♀♀ ♀♀ ♀♀
WEST. Solway ♀♀ ♀♀ ♀♀♀ ♀♀♀

GERMANA Sharp. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay o o o o o
WEST. Solway ♀♀ o o o

SORDIDULA Er. Local (?). In dung.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

CANESCENS Sharp. Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

MARCIDA Er. Scarce.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

INTERMEDIA Th. Scarce.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. Solway ♀♀ o o o

LONGICORNIS Gr. Abundant.
DISTRIBUTION—EAST. ♀♀ ♀♀ Tay ♀♀♀ ♀♀♀ ♀♀♀ ♀♀ ♀♀
WEST. Solway Clyde ♀♀♀ ♀♀♀ ♀♀♀

MACROCERA Th. Local. In dung.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. Solway o o o

CADAVERINA Bris. Local.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

LÆVANA Muls. Local.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. Solway o o o o

CINNAMOPTERA Th. Common.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

VILLOSULA Kr. Scarce.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

ATRAMENTARIA Gyll. Abundant. Lowland, highland, alpine. In dung.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

SETIGERA Sharp. Scarce. In dung.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

PARVA Sahl. Abundant.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

MELANARIA Sahl. Abundant.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

ATERRIMA Gr. Abundant.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

PYGMÆA Gr. Scarce.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

(To be continued.)

PHYTOLOGY.

PROPOSITION FOR A FUNGUS SHOW IN SCOTLAND.

WE have very great pleasure in giving a place to the following letter, and beg our botanical readers to give the matter therein contained their earnest attention:—

"It was wont to be the case that Scotland was well to the front in all, and sometimes led the van in several, departments of botanical research, and I am proud to think that in some of these departments she still maintains her pre-eminence. There are others, however, in which the position which she now holds (in comparison with England, and considering the advances recently made,) is a long way behind that which she once occupied. This, I think, is specially the case with Fungology. Notwithstanding the many and important discoveries lately made by Mr Jerdon, the Rev. James Keith, and a few others, I scarcely think that the most enthusiastic Scotsman will suppose that his country makes the same figure in Fungology as it did when Captain Carmichael made Appin famous.

I believe that one reason why we of 'the north countrie' have not kept pace with our English friends is, that we have not stood shoulder to shoulder and helped each other as they have done. I fear that the meeting of two Scotch fungologists is about as great a rarity as the meeting of two white crows; and so one has to toil on in solitariness at a very intricate subject, without sympathy or encouragement, or help, until one ultimately is apt to give up in despair or disgust. It is different in England. They have there their Fungus Exhibitions, such as that at Kensington and that at Hereford, where such distinguished men as Berkeley, Broome, Bull, Cooke, Smith, &c., meet, show new or rare or *any* species, discuss difficult ones, make excursions to the most promising neighbourhoods, and dine on mushrooms; and where fungologists are started and helped

forward. And thus surely a most powerful impetus is given to the study of Fungi in England from year to year, as is clearly seen.

Now, why should not we in Scotland have such a Fungus Show as that at Hereford for instance? I don't see a single reason why we should not. Very likely we might need to be content with a small Show to begin with, but even of that I am not very sure, as already upwards of 20 Scotch botanists and others have expressed a desire for such a Show, and an intention to send specimens for exhibition. Moreover, I have no doubt but that as Scottish specimens are exhibited at Kensington and Hereford, so English specimens would be exhibited at our Show. Moreover, I have good grounds for stating that I believe some of our most eminent English fungologists would, in all likelihood, be present with us to help us by their large knowledge and experience.

As there are at present more Scottish Fungologists near Aberdeen than perhaps near any other town in Scotland, I would suggest that a meeting of those interested in this matter should be held in Aberdeen, in Professor Ogilvie's class-room, Marischal College, on Tuesday, the 14th April next, at 1 o'clock P.M., to determine whether such a show shall be carried out, and if so, what regulations should be adopted to make it successful."

(Signed) JOHN FERGUSSON.

New Pitsligo Manse.

We understand that a meeting will take place at the time and locality proposed by Mr Fergusson, and we would suggest that those of our botanical readers who can will attend, and that those who though unable to be present yet take an interest in this very interesting matter will communicate by letter with Mr Fergusson or ourselves, signifying their desire to promote a Fungus exhibition, and giving us the benefit of any ideas that occur to them for the successful carrying out of the scheme. We believe that we do not err in saying that Fungi from any part of the country will be very acceptable for the show (when that takes place), even if sent *unnamed*, and thus persons who know little or nothing of that department of botany may help and do good service to science by sending specimens. In our next number we will let our readers know the arrangements determined on at the meetiug in Aberdeen.

LIST OF FUNGI FOUND WITHIN THE PROVINCE OF MORAY, CHIEFLY IN THE VICINITY OF FORRES.

(Continued from p. 217.)

By the Rev. J. KEITH, M.A.

III. BOLBITIUS, Fr.

198. Fragilis, Fr. Roadsides among dung. Very common.
199. Titubans, Fr. Amongst grass. Common.

IV. CORTINARIUS, Fr.

(1). PHLEGMACIUM.

200. Multiformis, Fr. Woods. Rare. Lawn at Altyre and in Darnaway Forest.
201. Glaucopus, Fr. Pine-woods. Rare. Altyre.
202. Cœrulescens, Fr. Woods. Rare. Above Cothall.
203. Purpurascens, Fr. Woods. Rather common.

(2). MYXACIUM.

204. Collinitus, Fr. Woods. Common.
205. Elatior, Fr. Woods. Common.

(3). INOLOMA.

206. Violaceus, Fr. Woods. Very rare. Grangehall—Dr. Murray.
207. Traganus, Fr. Pine-woods. Rather common. In Chapelton wood at Forres; also at Grantown and Rothiemurchus. New to Britain—Verified by W. G. Smith.
208. Callisteus, Fr. Woods. Rare. Dunphail.
209. Pholideus, Fr. Woods. Rare. Sanquhar.
210. Arenatus, P. Woods. Rare. Sanquhar.

(4). DERMOCYBE.

211. Tabularis, Fr. Woods. Common.
212. Diabolicus, Fr. Woods. Common.
213. Anomalus, Fr. Woods. Common.
214. Sanguineus, Fr. Woods. Rare. Glenfernes.
215. Cinnamomeus, Fr. Woods. Very common. Var. Semisanguineus. Common. Sanquhar, &c.
216. Uliginosus, Berk. Boggy woods. Rare. Beside the Marsh in Greeshop wood.

(5). TELAMONIA.

217. Torvus, Fr. Woods. Very common.
218. Armillatus, Fr. Woods. Rare—Mr. Terry.
219. Hinnuleus, Fr. Woods. Common.
220. Gentilis, Fr. Pine-woods. Frequent in Chapelton wood.
221. Iliopodius, Fr. Woods. Common.

(6). HYGROCYBE.

222. Armeniacus, Fr. Pine-woods. Not common. Brodie.
223. Castaneus, Fr. Woods. Common.

V. LEPISTA, Sm.

224. Personata, Fr. Woods. Common. Sanquhar, &c.

VI. PAXILLUS, Fr.

225. Involutus, Fr. On the ground in woods, and often on the sides of turf walls. Very common.
226. Atro-tomentosus, Fr. On the ground and stumps in pine-woods. Rather rare. Darnaway—Dr. Innes. Altyre, Sanquhar, Cluny-hill, and Rothiemurchus.
227. Panuoides, Fr. On pine-wood and saw-dust. Rather rare. Forres and Aviemore.

VII. HYGROPHORUS, Fr.

228. Cossus, Fr. Woods. Rare. Darnaway forest and at Loch-an-Eilan.
229. Hypothejus, Fr. Pine-woods. Common.
230. Olivaceo-albus, Fr. Pine-woods. Rare. Between Mondole and Cothall.
231. Agathosmus, Fr. Fir-woods. Rare. Between Mondole and Cothall. New to Britain—Verified by Berkeley. "The scent appears to me a mixture of aniseed and prussic acid"—Berk.
232. Leporinus, Fr. Woods. Rare. Between Mondole and Cothall—Verified by W. G. Smith.
233. Pratensis, Fr. Meadows. Rare. Beside Loch-an-Eilan.
234. Virgineus, Fr. Meadows. Very common.
235. Ceraceus, Fr. Meadows. Only noticed once—at Brodie.
236. Coccineus, Fr. Meadows. Common.
237. Miniatus, Fr. Moist places. Not very common. Brodie.
238. Puniceus, Fr. Meadows. Plentiful beside Loch-an-Eilan.
239. Conicus, Fr. Meadows. Very common.
240. Chlorophanus, Fr. Amongst mossy grass. Frequent at roadsides about Loch-an-Eilan.
241. Psittacinus, Fr. Pastures. Common. Grantown and Rothiemurchus.
242. Unguinosus, Fr. Moist woods and pastures. Not common. The haugh at Loch-an-Eilan.

VIII. GOMPHIDIUS, Fr.

243. Glutinosus, Fr. Fir-woods. Common. Var. B. roseus. Chapelton wood.
244. Viscidus, Fr. Fir-woods. Rather rare. Bridge of Daltulich—Dr. Murray. In considerable abundance in Greeshop wood, also in Altyre woods and elsewhere.
245. Stillatus, Strauss. (gracilis, B. and Br.) Fir-woods. Rare. Altyre.

IX. LACTARIUS, Fr.

246. Torminosus, Fr. Woods. Common.
247. Turpis, Fr. Woods. Rather common. Clunyhill, Altyre, Brodie, &c.
248. Blennius, Fr. Woods. Very common.
249. Uvidus, Fr. Woods. Rather common. Altyre, Darnaway, Sanquhar, Clunyhill, &c.
250. Pyrogalus, Fr. Woods and meadows. Not common. Sanquhar, Sluie.
251. Vellereus, Fr. Woods. Not very common. Sanquhar, Grantown, and Rothiemurchus. In the specimens from Grantown the juice was observed to turn yellow, as noted by Fries, Mon. Hym. Suec., p. 167.
252. Deliciosus, Fr. Fir-woods. Common.
253. Quietus, Fr. Woods. Common.
254. Theiogalus, Fr. Woods. Not very common. Sanquhar, Altyre.
255. Rufus, Fr. Fir-woods. Very common.
256. Glyciosmus, Fr. Fir-woods. Not very common. Brodie, Altyre, Sanquhar.
257. Mitissimus, Fr. Woods. Common.

X. RUSSULA, Fr.

258. Nigricans, Fr. Woods. Common. Sanquhar, Altyre, &c.
259. Adusta, Fr. Woods. Rare. One station in Sanquhar wood.
260. Furcata, Fr. Woods. Common.
261. Virescens, Fr. Woods. Common.
262. Rubra, Fr. Woods. Very common.
263. Cyanoxantha, Fr. Woods. Rare. Clunyhill, Sanquhar.
264. Heterophylla, Fr. Woods. Common. Altyre, &c.
265. Fœtens, Fr. Woods. Very common.
266. Emetica, Fr. Woods, Common. Grantown, &c.
267. Fragilis, Fr. Woods. Very common about Forres.
268. Decolorans, Fr. Woods. Common. Greeshop, &c.
269. Aurata, Fr. Woods. Rare. One splendid specimen in Sanquhar wood.
270. Nitida, Fr. Woods. Not common. Altyre.
271. Alutacea, Fr. Woods. Common.
272. Lutea, Fr. Woods. Rare. Sluie and Sanquhar.

XI. CANTHARELLUS, Fr.

273. Cibarius, Fr. Woods. Common.
274. Aurantiacus, Fr. Woods. Common.
275. Umbonatus, P. Very rare. Among Cranberry bushes in the wood below Grantown.
276. Infundibuliformis, Fr. Woods. Rare. Sanquhar and Dunphail.
277. Muscigenus, Fr. Very rare. On Tortula ruralis on a cottage roof—Dr. Innes.
278. Retirugus, Fr. Very rare. On Hypnum cuspidatum in a bog, Rafford.

XII. NYCTALIS, Fr.

(No species.)

XIII. MARASMIUS, Fr.

279. Urens, Fr. Woods. Common.
280. Peronatus, Fr. Woods. Common.
281. Oreades, Fr. Lawns and pastures. Common.
282. Fusco-purpureus, Fr. Rare. On sticks among grass by the side of the Sanquhar avenue.
283. Rotula, Fr. On fallen twigs and sticks. Not uncommon. Greeshop wood and Sanquhar.
284. Androsaceus, Fr. On fallen leaves, &c. Occurs in all our woods.
285. Epiphyllus, Fr. On fallen leaves, &c. Not very common; but plentiful above Cothall.

XIV. LENTINUS, Fr.

286. Cochleatus, Fr. On trunks. Rare. Sanquhar and Altyre.

XV. PANUS, Fr.

287. Torulosus, Fr. On birch stumps. Plentiful at Brodie and at Aviemore.
288. Conchatus, Fr. On trunks. Very rare. Greeshop wood.
289. Stypticus, Fr. On stumps. Not common about Forres, Blervie, and Greeshop woods.

(None of the species of XEROTUS, Fr., TROGIA, Fr., SCHIZOPHYLLUM, Fr., or LENZITES, Fr., have been met with in the district.)

XX. BOLETUS, Fr.

290. Luteus, L. Fir-woods. Common.
291. Flavus, With. Woods. Very common.
292. Laricinus, Berk. Among larches. Rare. In larch plantation at Loch-an-Eilan.
293. Bovinus, L. Firwoods. Common.
294. Badius, Fr. Woods. Not very common. Clunyhill, Altyre, &c.
295. Piperatus, Fr. Woods. Not very common. Altyre, Darnaway, Clunyhill, &c.
296. Variegatus, Fr. Pine-woods. Not very common. Chapelton, &c.
297. Sulfureus, Fr. Growing in dense clusters among sawdust beside Loch-an-Eilan, Rothiemurchus. The species is new to Britain, and very rare. Fries had only met with it once when his Monographia was published—at Upsalia, where it occurred in a precisely similar situation.
298. Chrysenteron, Fr. Meadows and woods. Common.
299. Subtomentosus, L. In same situations as the last; but less common.
300. Pachypus, Fr. Woods. Rare. Sanquhar.
301. Edulis, Bull. Woods. Common.

302. Luridus, Fr. Woods. Common.
303. Erythropus, P. Woods. Rare. Clunyhill.
304. Scaber, Fr. Woods. Common.

XXI. STROBILOMYCES, Berk.

(Species not found.)

XXII. POLYPORUS, Fr.

305. Brumalis, Fr. On dead branches. Rare. Banks of Findhorn, between Sluie and Cothall.
306. Schweinitzii, Fr. Pine-woods. Rare. Altyre woods opposite the Heronry, wood beyond the Divie viaduct, and Castle Grant woods, Grantown.
307. Perennis, Fr. On the ground. Common. Occurs here and there throughout the district.
308. Squamosus, Fr. On trunks, especially of ash. Common.
309. Picipes, Fr. On trunks, especially of willow. Greeshop wood.
310. Varius, Fr. On Ash stumps. Altyre.
311. Elegans, Fr. On trunks. Altyre. Large beech in Cromdale churchyard—Rev. W. Forsyth. Var. Nummularius. Sanquhar, Altyre.
312. Giganteus, Fr. On trunks. Very rare. Burgie—Dr. Gordon.
313. Sulfureus, Fr. On trunks. Very rare. Banks of Findhorn opposite Cothall.
314. Cæsius, Fr. On fallen sticks. Rare. Banks of Findhorn above St. John's Mead.
315. Destructor, Fr. On fir stumps. Not uncommon. Greeshop and Mondole woods, and at Dallas and Grantown.
316. Fumosus, Fr. Stumps. Common.
317. Adustus, Fr. Stumps. Rather rare. Greeshop wood.
318. Amorphus, Fr. Fir stumps. Very common.
319. Hispidus, Fr. Living ash trees. Common.
320. Betulinus, Fr. Birch trees. Common.
321. Applanatus, Fr. On trunks and stumps, especially of ash. Rare. On an old ash stump at Sanquhar, a living ash tree at Feddan, and again on a decayed ash near Manse of Dyke.
322. Fomentarius, Fr. On trees. Not frequent. Banks of Findhorn on birch.
323. Nigricans, Fr. On birch trees. Common. Along the banks of Findhorn, &c.
324. Igniarius, Fr. On poplar trees, banks of Findhorn: plum trees, Gordon Castle.
325. Annosus, Fr. On stumps and roots of trees, especially of Larch. Very common.
326. Connatus, Fr. Rare. On an elm tree, banks of Findhorn, opposite Cothall.
327. Radiatus, Fr. Plentiful on Alder in some localities, as Greeshop wood; once on Lilac.
328. Versicolor, Fr. On stumps everywhere.
329. Abietinus, Fr. On fir-trees. Common.

330. Violaceus, Fr. On stumps of fir. Rare. Sanquhar, Altyre.
331. Vitreus, Fr. On decayed wood. Rare. Dunphail.
332. Sanguinolentus, Fr. On rotten wood. Rare. Rothiemurchus.
333. Molluscus, Fr. On sticks lying on the ground. Rather common.
334. Vaporarius, Fr. On fallen branches. Common.
335. Terrestris, Fr. On ground or rotten wood. Rare. Clunyhill.
336. Vaillantii, Fr. On rotten wood. Rare. Altyre.

XXIII. TRAMETES, Fr.

(No species found.)

XXIV. DÆDALEA, Fr

337. Quercina, P. Very rare. On an oak stump. Brodie—Dr. Innes.
338. Unicolor, Fr. Very rare. On a fallen birch. Darnaway.

XXV. MERULIUS, Fr.

339. Tremellosus, Schrad. Rare. On decayed birch stumps. Rothiemurchus.
340. Corium, Fr. On trunks. Common.
341. Molluscus, Fr. On fir-sticks. Rare. Rothiemurchus, Dallas, etc.
342. Lacrymans, Fr. On wood work of houses. Too common.

XXVI. POROTHELIUM, Fr.

343. Friesii, Mont. Very rare. On the underside of a fir post lying on the ground. Sanquhar, also at Dunphail.

XXVII. FISTULINA, Bull.

344. Hepatica, Bull. On trunks of old oaks. Rare. Sanquhar.

XXVIII. HYDNUM, L.

345. Imbricatum, L. Pine-woods. Common.
346. Fragile, Fr. Pine-woods. Plentiful in Chapelton wood and at Grantown.
347. Repandum, L. Woods. Common. Var. Rufescens. Common.
348. Compactum, Fr. Fir-woods. Rather rare. Chapelton wood, Relugas, Grantown, Aviemore.
349. Aurantiacum, Fr. Fir-woods. Rare. Grantown. New to Britain —Verified by Berkeley.
350. Scrobiculatum, Fr. Fir-woods. Rare. Chapelton wood—Mr. Norman. New to Britain—Verified by Berkeley.
351. Graveolens, Del. Fir-woods. Rare. Chapelton wood.
352. Auriscalpium, L. On fir-cones, Common.
353. Ochraceum, P. On fallen sticks. Not frequent. Sanquhar.
354. Farinaceum, P. On decayed wood. Common.

XXIX. SISTOTREMA, Fr.

(No species.)

XXX. IRPEX, Fr.

355. Obliquus, Fr. On fallen branches. Rather frequent. Sanquhar.

XXXI. RADULUM, Fr.

356. Orbiculare, Fr. On birch sticks at Manse of Duffus and Sanquhar; also on larch in Altyre wood. Not very common.

XXXII. PHLEBIA, Fr.

357. Merismoides, Fr. On old stumps. Rare. Sanquhar and banks of Findhorn.

XXXIII. GRANDINIA, Fr.

(No species.)

XXXIV. ODONTIA, Fr.

358. Fimbriata, Fr. On sticks lying on the ground. Rare. Sanquhar, Altyre, Dunphail.

KNEIFFIA, Fr., and CRATERELLUS, Fr.

(No species.)

XXXVII. THELEPHORA, Fr.

359. Palmata, Fr. On the ground. Rare. Sanquhar.
360. Laciniata, P. On the ground and sticks. Common.
361. Arida, Fr. On branches of spruce-fir lying in a heap on the ground at Dunphail. Rare.

XXXVIII. STEREUM, Fr.

362. Purpureum, Fr. On stumps. Common.
363. Hirsutum, Fr. On stumps. Everywhere.
364. Spadiceum, Fr. On oak stumps. Sanquhar. Not common.
365. Sanguinolentum, Fr. On fir stumps. Common.
366. Rugosum, Fr. On alder and hazel stumps. Common. Var. Lauro-cerasi. On Laurel. Common.

XXXIX. HYMÉNOCHÆTE, Lev.

367. Rubiginosa, Lev. On sticks. Sanquhar. Not common.

XL. AURICULARIA, Fr.

(No species.)

XLI. CORTICIUM, Fr.

368. Giganteum, Fr. On pine stumps. Common.
369. Lacteum, Fr. On trunks and sticks. Common.
370. Velutinum, Fr. On sticks. Frequent.

371. Sanguineum, Fr. On fir. Rare. Altyre.
372. Sulfureum, Fr. On sticks, &c. Common.
373. Calceum, Fr. On pine wood. Common.
374. Ochraceum, Fr. On pine wood. Common.
375. Quercinum, P. On oak sticks. Darnaway.
376. Cinereum, Fr. On sticks. Common.
377. Incarnatum, Fr. On sticks. Common.
378. Polygonium, P. On a stick. Dumphail. Apparently rare.
379. Comedens, Fr. On branches. Common.
380. Sambuci, P. On elder stumps. Common.

XLII. CYPHELLA, Fr.

381. Ochroleuca, B. and Br. On bramble sticks. Grangehall.
382. Curreyi, Berk. On twigs of broom. Sanquhar. Common.

XLIII. SOLENIA, Pers.

383. Ochracea, Hoffm. On sticks, especially of alder. Common. Forres, Dallas, Dunphail.

XLIV. SPARASSIS, Fr.

384. Crispa, Fr. Very rare. At the foot of a Scotch fir in the Quarry Garden, Gordon Castle, and beside an old fir stump in the wood behind Blervie. The Gordon Castle specimens were very large and fine. The Blervie specimens were smaller, and occurred later in the year. The plant has made its appearance regularly for several years at both stations.

XLV. CLAVARIA, L.

385. Fastigiata, D.C. Grassy sward. Across the Findhorn opposite Moycarse.
386. Muscoides, L. On side of embankment along the Findhorn above the railway bridge.
387. Cinerea, Bull. Gordon Castle, Fochabers.
388. Cristata, Holmsk. Darnaway woods.
389. Rugosa, Bull. Woods. Common.
390. Abietina, Schum. Among moss in fir-woods. Common. Sanquhar, Altyre, &c.
391. Stricta, P. Gordon Castle, Fochabers.
392. Purpurea, Müll. On grassy slope at base of Or Bane, Rothiemurchus.
293. Inæqualis, Müll. Near Dunphail station—Dr. Innes.
394. Fragilis, Holmsk. Plentiful in a meadow at Dunphail.

XLVI. CALOCERA, Fr.

395. Viscosa, Fr. On and about stumps in fir-woods. Common.
396. Tuberosa, Fr. On birch sticks lying on the ground at Dunphail. "The long lost Clavaria tuberosa, Sow., which has never been gathered since his day." Berk.

(To be continued.)

SCOTTISH GALLS.

(Continued from page 173.)

By J. W. H. TRAILL, M.A.,

Rhododendron ferrugineum L.—Dr. Buchanan White sent me specimens of a gall on this plant, received by him from the Rev. J. Fraser, Colvend, Kirkcudbrightshire. When they reached me they were too much shrivelled for a good description, so I will quote from an article on this gall by Mr. A. Müller, in the "Gardener's Chronicle," of July 29, 1871. Those described by him were from Switzerland, but seem identical with the Scotch specimens. He describes them thus:—"Fleshy, fruit-like galls on the leaf, of about the size of a raspberry, smooth. . . The galls, looking with their glowingly red cheeks not unlike small-sized white-heart cherries of irregular shape, were most conspicuous amongst the sober, dark-green foliage of their foster-plants, which at that time (June 23 and following days) only just began to expand their lovely blossoms. The location of the galls is either each separate upon a leaf, or else in the centre of the top of a shoot, in which case the latter, instead of bringing forth its branch of leaves or blossoms, produces a bundle of more or less crowded galls, *i.e.*, converted leaves or blossoms. An examination of many specimens showed that at first they are filled with a spongy white substance, enveloping a solitary egg, and that subsequently when this hatches, the larva begins to feed on the surrounding matter, thus gradually forming a chamber round itself. Taking into account all that I have seen of this gall, I consider it to be the production of a sawfly belonging probably to the genus Nematus." The insect is yet unknown, and Mr. Müller advises sweeping the bushes in August and September for its capture. I trust the clearness and fulness of the above description will be sufficient justification for the copiousness of the extracts I have made from Mr. Müller's interesting notes on the subject. I was informed by Mr. Roy that in July he was shown galls in abundance on a rhododendron at Aboyne, in Aberdeenshire, probably *R. ferrugineum* also; I have not as yet, however, seen specimens from this locality.*

* I remember seeing this gall long ago in Perthshire.—Ed.

Fraxinus excelsior L.—I found galls of *Diplosis botularia* near Ballater, on the Dee (at 700 feet above the sea), at Lintrathen, and at Dunkeld.

Plantago lanceolata L.—The galls occur on the flower-stalks, usually near the head, but may be near the root. Usually only one occurs on each stalk, but sometimes there are two. Each consists of a swelling of the stalk uniformly all round, varying in length from ¼′ to ⅔′, and averaging in breadth ⅙′. It is strongly marked with the ribs of the stalk, which it resembles in colour and surface. Each contains one larva of *Mecinus*. Found in June by Mr. William Bannerman, on Old Aberdeen Links. I have since found them there very commonly, but have seen them nowhere else. Dr. Buchanan White, however, informs me that he has found them, (and similar galls on *P. maritima*,) at Colvend, in Kircudbrightshire. I have also found on the Links galls at the base of the leaves, consisting of a uniform swelling, and which seem to be formed by the same insect.

Rhinanthus crista-galli L.—Near Aberdeen I found a good number of examples of this plant treated by larvæ of *Cecidomyia* similarly to the leaves of Valerian.

Thymus serpyllum L.—*(a)* The galls on *Thymus serpyllum*, formerly described by me, are caused by mites [*Phytoptus (Calycophthora) serpylli*], and the larvæ mentioned as occuring in them are only inquilines. *(b)* The gall consists of a flower-bud which becomes swollen to at least twice its natural size, still remaining immature, like an ordinary bud, and its external appearance otherwise remaining unchanged. On removing the calyx a sort of closed sac is found inside, ovate in form, green with a pink apex. Calyx about ¼′ by ⅛′. Inner-sac about ⅛′ by $\frac{1}{16}'$. Sac thin-walled, monothalamous. Each contains one larva of a *Cecidomyia*. Usually several galls occur on the same head. Very common on Old Aberdeen Links.

Nepeta Glechoma Benth.—*(a)* Near Dunkeld, in the autumn of 1872, I found galls of *Cecidomyia bursaria* Bremi, pretty commonly on leaves of *N. Glechoma*. They occur almost always on the upper surface of the lamina, very seldom on the petiole. They resemble in shape rifle-bullets contracted at the base; length $\frac{1-4}{32}'$, breadth $\frac{1-2}{32}'$. They are thickly haired; the hairs are greyish, the gall itself green. They are thin-walled, and enclose a large cavity containing one orange larva.

When mature they fall off, leaving holes in the leaf. Usually there are several on a leaf. *(b)* In 1873 Dr. Buchanan White sent me galls which had been sent him by Sir T. Moncreiffe, from Perthshire, in June. They are formed by *Aulax Glechomæ*. The galls are usually situated on the midrib of a leaf, but some times on a side vein or on the petiole, and project chiefly below. They are sometimes separate, sometimes two or more grow together. When separate they are spherical, ⅛′—¼′ diameter, but when united they form masses sometimes about one inch across. The surface is reddish-brown or green, and is covered with short whitish hairs. When distinct, each gall is monothalamous, and has very thick fleshy walls, there being a compact inner cell, closely surrounded by a fleshy outer wall.

Polygonum Persicaria L.—On this plant there occurs galled leaf margins, consisting of an involute margin, which becomes thick, hard, fleshy, and red or yellowish, and contains one or more larvæ of *Cecidomyia persicariæ* L. Usually several leaves on a plant affected. Found by Dr. Buchanan White near Dunkeld, in September, 1872.

Polygonum amphibium, L.—Similar galls were found by me on this plant near Dunkeld, in September, 1872.

Polygonum viviparum L.—In June, 1873, Dr. Buchanan White found galls in Braemar, which resembled the above in every way except in being of smaller size. One of the leaves sent me by him contained a small white compactly-spun cocoon.

Populus tremula L.—*(a)* Galls of *Cecidomyia tremulæ* Winnertz, occur usually on the twigs or petioles, sometimes even encroaching on the lamina. They are irregularly rounded, the size of a small pea, smooth externally, and vary in colour, those on the petiole being reddish or yellowish, those on the twigs resembling the bark in colour. Internally they are hard and woody; the central cavity is small. The larvæ emerge from the galls in the end of July or the beginning of August, and the galls then dry and become brown, but retain their form. Common in Glen Gairn and Braemar. I have found on the leaves themselves, near Ballater and near Balmoral, in August, 1873, galls which may belong to the same species, but which differ from those just described in being lenticular, only ⅛′ diameter and $\frac{1}{12}$′ deep; besides which I have never found them in the same locality. Usually also a number of galls of this latter kind

occur on a leaf, while of the former there are seldom more than one. Both are common where they occur. *(b)* These galls are situated just where the lamina joins the petiole. usually two occurring on a leaf; sometimes one or three. Form roundish, or irregular; size $\frac{1}{16}'$ to $\frac{1}{12}'$ diameter. Surface marked or wrinkled. Colour green or somewhat reddish. Contains an irregular cavity, in which occur multitudes of four-footed mites *(Heliacyus populi?)* of a reddish or white colour. Ballater to Braemar, July to September. *(c)* Galls of *Batoneus populi* Kirch. The galls of this mite have been already recorded (Sc. Nat. I. 155) by Mr. Norman as Scottish. Dr. Buchanan White, in August, gave me specimens found by him in Braemar, and a few days later, near Balmoral, I found abundance of dry galls, and a few still fresh. They were chiefly attached to the branches, and formed rough irregularly rounded masses $\frac{1}{2}'$ to $3'$ in diameter. They are green or reddish when fresh, and are covered with a short downy pubescence. When dry they are black, hard, and friable. *(d)* Another mite-gall, an Erineum growth, I found very abundant on leaves of aspens, near Balmoral, on August 23, 1873. These galls are indicated on the upper surface by one or more raised blister-like patches, like those so commonly produced on poplar leaves by a fungus. The raised patches have a yellowish colour, and are thus readily detected. Below, there is a recess, thickly lined with red or brownish hairs, among which many four-footed mites *(Phytopti)* can be readily detected.

(To be continued.)

ON THE FLOWERING PLANTS OF THE CARSE OF GOWRIE, IN PERTHSHIRE.*

By COLONEL H. M. DRUMMOND-HAY, C.M.Z.S.

THE Carse of Gowrie has within comparatively recent times undergone a great change. At one period it must have been one large extended lake or marsh, open to the influence

* An abstract of a Paper read before the Perthshire Society of Natural Science. As the author intends to use the material contained in this paper in the forthcoming *Flora of Perthshire*,

of the tide, and studded with several islands which, though now entirely surrounded by dry and cultivated land, are still denominated Inches (*e.g.* Inchyra, Inchmichael, Inchture, &c.) That this was the case we have abundant evidence, and amongst other proofs may be mentioned the occurrence of the common reed *(Arundo phragmites)* abundantly in many of the corn fields, where the roots are so deep down as to defy extirpation, as well as that the clay of the Carse is thickly perforated with the roots and stems of aquatic plants, which perforations are in the common parlance styled "pipings." Since the Carse has ceased to be a marsh, draining and cultivation has considerably altered the native flora, and many plants which probably occurred in former times have disappeared, while a few species have been added.

But before proceeding farther, it will be necessary to explain what may strictly be considered, in a botanical point of view, as the Carse of Gowrie district. To define it by boundaries of parishes, some of which extend into Strathmore, or to take the low grounds only, which in the real acceptance of the term is the Carse proper, would not truly be representing the flora of the district. I therefore confine myself entirely to the watershed or basin of the Carse; and the better to carry this out, though it may seem rather an arbitrary arrangement, I include that portion of the watershed which lies to the south of the Tay, taking the slope above Orchard Neuk on the north face of Moredun or Moncreiffe Hill, and the rising ground above and below Elcho, from the foot of Friarton Island to a little below Inchyra Ferry, and thence across the Tay, and along its left bank to Invergowrie burn. The north side I define by the line of hills, or that portion of the Sidlaws, the drainage of which descends into the Carse, and finally into the Tay, from Barnhill, near Perth, in a north-easterly direction, along the crest of Kinnoull Hill to the Lynedoch Monument at the back of Murrayshall, keeping the ridge at the top of Over-Durdie Moor, by Airnbathie at the head of the Den of the Godens and Pitroddie, across by Evelick and the Biel Hill, which separates the Den of Balmyre at the head of Kilspindie from that of Rait, on by the back of Fingask, Kinnaird, Pitmiddle, Abernyte, and Lochton, to the hill of South Ballo, in the parish of Longforgan; thence due east along the county march by the Piper Dam (once a fine sheet of water, but now drained), lying at the foot of the Blacklaw Hill, and at the north side of it in Fowlis-

Easter, and then due south to the Den of Fowlis (still following the county march, which here assumes a zigzag form), round by Balrudery, and on to Invergowrie—thus describing an area from east to west as a crow flies of about 15 miles in length, and from 2 to about 5½ miles in width.

In the district thus defined we have several distinct botanical regions. In the highest grounds there are a few spots still retaining their old heather-clad appearance, but which from repeated burnings, and over grazing by sheep, are becoming less year by year. In such places the characteristic plants are *Viola lutea*, *Genista anglica*, *Polygala*, *Trientalis*, *Trollius*, *Pinguicula*, *Parnassia*, *Polygonum viviparum*, &c. Below this region come the "Braes of the Carse," rocky and gravelly, and intersected by shady "dens," in which *Paris*, *Geranium lucidum*, &c., flourish, while on the "Braes" and their rocks *Geranium sanguineum*, *Viola hirta*, *Dianthus deltoides*, *Potentilla argentea*, *Lactuca virosa*, *Lychnis viscaria*, &c., find a congenial habitat. We next have the Lower Carse, or flat ground, which, though strictly an arable country, and tenanted chiefly by the common field plants, with a few casuals more or less common to all corn-growing districts, has still a few odd corners left where *Pyrola*, *Listera*, &c., grow. Finally we have the banks of the Tay, the stronghold of many aliens now thouroughly naturalized—various *Asters*, *Mimulus*, &c.—replaced farther down where the water becomes brackish, by *Aster tripolium*, *Glaux*, *Spergularia maritima*, &c.

There are perhaps many districts of equal extent in the county which can boast of a much larger flora, for the Carse, being in a great measure composed of highly cultivated arable clay land, and devoid of marshes, lakes, or water of any great extent—with the exception of the Tay, which, from its being a tidal river, and a large portion of it brackish, possesses few aquatic plants—and having moreover no very high land, 900 to 1000 feet being the maximum, is destitute of many species that are found in more favoured districts; still, as will be seen, the list is by no means an insignificant one, represented as it is by 68 orders containing 457 species (besides 21 varieties), and if we add 20 more species said to grow in the Carse (but which have not as yet come under my notice), we have little short of 500. I may remark that among the species mentioned I have not ventured to enumerate any of those in the Genus *Rosa* or the Genus *Rubus*. It would be taking up too much space to enter at any great

length on the plants contained in this list, or even to give their bare names. I will therefore confine myself to mentioning merely a few that may be considered noteworthy.

Ranunculus auricomus L.—Though by no means an uncommon plant in the county, this is yet not very generally dispersed, and in the Carse is rather local. It frequents moist shady places on the banks of the Tay, near the station at Kinfauns, the Dens of Balthayock, Fingask, Kinnaird, and a few other similar localities. Its petals are often imperfectly developed, and sometimes even wanting, and in that form it is given in some lists as a variety under the name of "*depauperatus*;" but as I have noticed the corolla in all stages of undevelopment, I incline rather to the opinion that it is a mere malformation to which from soil or other causes the plant is liable—in this latter state I have frequently seen it on the banks of the Tay.

R. hirsutus Curt.—Abundant on some pastures, waste ground by road sides, &c. It is a plant that does not seem at all relished by cattle, cows, horses, or even donkeys; sheep, however, seem to have no objection to it, which is well exemplified in a park near me, where it was formerly plentiful throughout. Some few years ago, however, it was found necessary to divide the field by a paling, when sheep were kept on the one half and cattle on the other: the plant being an annual, and having been regularly eaten over, is now perfectly eradicated where the sheep are, while on the other side of the paling it abounds in large masses.

R. sceleratus L.—Not uncommon, though often overlooked from growing in places not generally frequented except by duck hunters, or aspiring botanists, as it luxuriates among the deep mud banks on the Tay below high water mark; it is also found plentifully in many of the Carse ditches.

R. arvensis L.—I first noticed this some eight or ten years ago, in a wheat field near Megginch, and considered it then as either a rare plant or a mere casual, and I am not aware that it has been recorded from other parts of the county. Since then, I have discovered it to be of frequent, I may say of general, occurrence in the wheat fields (autumn sown) of the Carse. In one field, on stiff white clay, and rather poor soil, in the Lower Carse, I noticed it last July so abundant as at a little distance to give the whole field a yellow appearance. The butter-cups generally are acrid, and of more or less a poisonous character, but of them all this is believed to be the most poisonous, and yet its

rough hairy seeds are greedily devoured by partridges, and in some parts of England it is said to be their favourite food.

Thlaspi arvense L.—Rare in the county, but not uncommon in the Carse. I have not met with it on the low clay grounds, but it abounds in dry gravelly fields on the Braes in several places.

Nasturtium terrestre Sm.—Not common, but widely dispersed, and found both in the ditches of the low ground and on the higher grounds. *N. sylvestre* is commoner, but only grows on the banks of the Tay between Perth and Inchyra.

Saponaria officinalis L.—Not a true native, but quite naturalised at Kinfauns, Rait, &c.

Reseda lutea L.—Local, but pretty abundant on the spot where it grows, viz., on dry rocky ground in the parish of Kilspindie, nearly its most northern station in Britain.

Dianthus armeria L.—This was first discovered as a Carse plant, more than thirty years ago, by my friend Mr William Gorrie (who accidentally came across it while traversing a small piece of rough ground in the parish of Errol), by whose kind directions I re-discovered it last year in the same neighbourhood. It is far from plentiful, and not nearly so abundant, from what Mr Gorrie tells me, as it formerly was.

Lychnis viscaria L.—Not uncommon in the Carse, and well dispersed all along the Braes—the rocks being well suited to its tastes.

Sagina nodosa E. Meyer.—Though a common plant on our coasts, I notice this as it may not be generally known to be not uncommon in bogs and marshy spots on the higher grounds in the district, and other inland spots. I have, however, never noticed it down on the lower grounds, or near the river, where it might be supposed to exist.

Cerastium holosteoides Fries.—A very rare glabrous variety of *C. triviale* Link., which, according to Hooker, has only been found near Newcastle and Perth, on the banks of the Tyne and the Tay, on which latter river, from the foot of Friarton Island down to below Seggieden, I have found it not at all uncommon on shingly places, and even on coarse grassy spots, but always below high-water mark, being quite aquatic in its habits. I first noticed it some years ago at Seggieden, and Mr Gorrie tells me that when the island of Derry or Inchsherrie, near there, was connected with the mainland, a dark green smooth-leaved *Cerastium* was noticed for the first time to come up most abundantly on the shingle, which was dredged up from the bed of

the river. The seed may possibly have been originally deposited in the bed of the river with ballast.

C. arvense L.—Near Kilspindie and Invergowrie.

Melilotus officinalis Willd.—Occasionally to be met with in hay fields and waste places, but rare, and has been noticed at Seggieden, above Rossie Priory, and near Invergowrie.

Vicia angustifolia Roth.—Not a common plant in the Carse, but grows on some of the rocky knolls at the back of Fingask. I have also noticed it on dry stony ground near Millfield, between Invergowrie and Longforgan.

Prunus communis Huds.—Under this head are now included the three following varieties, which were formerly considered to be distinct species :—1. *P. domestica* L.—Not common, but found in some very old hedgerows about Elcho. 2. *P. insititia* L.—This, and the former, I first discovered some years ago. It also may be considered as a rare shrub in the Carse, and I am not even aware that it has been found in other parts of the county; several bushes of it occur along the water side, opposite Seggieden ; it also grows with the former in the old hedgerows about Elcho. 3. *P. spinosa L.*—Common.

Aremonia agrimonioides Neck.—My reasons for noticing this plant is not only because it is common in many parts of the Carse, but because, though perhaps not a native, it has been *so long* and is *so well* established not only in the Carse of Gowrie but also about Scone and the neighbourhood of Perth, that I think it should ere this have found a place in the British lists, being quite as worthy or more so than many others. In Hooker's *Students' Flora* it is designated as a garden escape, and in the London catalogue it is stigmatised as an *alien* and a *waif*. It is, I believe, a native of Italy, and may possibly have been brought from thence as a garden plant—which I should think it was no longer—and is surely as worthy of being recorded as the vagrant *Mimulus luteus*. The *Aremonia* I have gathered more than forty years ago near Rait, where it grows still. It abounds on some banks and woody places about Kinfauns, and is also found at Seggieden, Kilspindie, Fingask, and other places.

Epilobium angustifolium L.—Growing, evidently in a wild state, on some almost inaccessible rocks in the Den of the Godens, above Pitroddie.

Lythrum salicaria L. — Sparingly in the marsh below Elcho.

Sedum villosum L.—On some damp rocks in an old quarry

above Orchard Neuk. I have not found it elsewhere in the district.

Sium angustifolium L.—This by no means common plant in Scotland, frequents the ditches in one or two places in the Carse. I have noticed it about Rossie Priory and Glendoick.

Sambucus ebulus L.—A rare and local plant in the Carse, as well as, I believe, elsewhere. It is to be found however very abundantly on the wooded banks below the old Castle of Balthayock, and sparingly in the old churchyard at Invergowrie. The leaves and succulent stems when bruised emit a strong and highly unpleasant odour, and, being believed to have the effect of driving away rats and mice, it is said to have been planted by our ancestors for that purpose round their dwellings, hence probably the reason for its being so frequently found in churchyards and round old ruins.

Galium mollugo L.—A rare plant in Scotland. The only place it has been noticed in the Carse as yet is in the neighbourhood of Rait, where in company with Mr William Gorrie I gathered it last summer.

Senecio viscosus L.—In one or two places chiefly near the river. On waste ground near Mylnefield and also near Kinfauns.

Phyteuma spicatum L.—A solitary plant of this species was discovered by me some years ago at Seggieden, growing under some old trees, where it still exists. Having I believe only been otherwise met with in the county of Sussex it is not likely to be a native of the Carse, and yet I can find no record of its having been cultivated in the neighbourhood.—*See Botanical Exchange Club Report, p. 12, 1872.*

Cuscuta trifolii Bab.—In the very hot and dry summer of 1870 this dodder was very abundant in the clover fields in the neighbourhood of Seggieden and other parts of the Carse, so much so that in some places the clover was completely killed down, leaving large yellow patches composed entirely of the parasite. Though looked for carefully every year since, I never have noticed it again, and can therefore regard it only as a casual, imported in the clover seed, the dryness and heat of the season having been favourable to its growth.

Verbascum nigrum L.—For several years I have noticed an occasional plant of this handsome species on some shingly banks in the neighbourhood of Seggieden, and although a southerner, and said not to be found further north than Stafford,

it may be entitled to a place in the Carse flora, at all events as a casual. Its congener, *Verbascum thapsus* L., is of regular occurrence in the Carse.

Veronica anagallis L.—In ditches at Kinfauns and near Cairnie Mill, and I have no doubt on a little search it will be found in other places also.

Veronica montana L.—On Derry Island in several large patches, and also in the Den of Balthayock.

Calamintha acinos Clairv.—Has been found in one or two places, but seems to prefer the light dry soils of the braes to the lower grounds, having been noticed on the knolls at the back of Rossie Priory, and obtained this summer above Kilspindie on rocky ground that appeared at one time to have been under cultivation. It may therefore possibly have been introduced in former days by seed among corn.

Galeopsis angustifolium Erhr.—First noticed several years ago on a dry gravelly knoll above Seggieden. Since then I have found it in various places, at Kilspindie and Rait; also on the dry knolls at the back of Fingask and Kinnaird, where it is abundant.

Cynoglossum montanum Lam.—In two places in the Carse—a few straggling plants about Barnhill, and very abundantly in some of the hedge banks and woody places in the neighbourhood of Fingask. Don discovered this species in the same locality in which it now grows as far back as 1820. Its congener, *C. officinale* L., is also found in the Carse.

Rumex hydrolapathum Huds.—This plant I have known for some years as a denizen of the marsh below Elcho. Though a common plant in England, it is by no means so in Scotland; and on my forwarding specimens to Dr. Boswell Syme, he describes it in his report to the Exch. Club for '70-'71 as a very scarce plant in Scotland, the occurrence of which in the county of Perth required to be substantiated. He then adds, the only question that remains is, whether it be indigenous? "the banks of the Tay producing so vast a number of aliens that suspicion is sometimes cast on plants which are true natives of the locality." I grant that the Tay has a bad name in this respect; nevertheless, I can see no reason to doubt that this is a true native of the Carse, having not only found it at Elcho and on both banks of the Tay, but also in some of the Carse ditches, which are at a distance from, and have no connection with, the spot where it was originally found.

Daphne laureola L.—Grows at Pepperknowes, on the most inaccessible parts of the rocks, and far from any dwelling, but probably introduced.

Euphorbia exigua L.—Though found from Banff and Forfar southwards, this may be considered as a rare plant, if not in the county generally, certainly in the Carse, where I have frequently searched for it. It was only this last summer that I detected it growing pretty plentifully on some arable land above Balthayock.

Cephalanthera ensifolia Rich.—In the Kinfauns woods, growing in a small scattered patch. It has for long been known as a native of the Methven woods on the other side of Perth, and though possibly also long known to have been a Carse plant, there is no record of its being so further than the mention made to me by Mr. Gorrie lately, that he had some recollection, more than 30 years ago, of the late Mr. Robertson, then gardener at Kinfauns, stating that it grew in the neighbourhood. Whether introduced by Robertson from Methven (as has been suggested) is doubtful; at all events it is thoroughly established now.

Orchis incarnata L.—This is by no means rare on the Carse Hills, where it is abundant in ground suited to it nearly along the whole range. It can at once be distinguished from *latifolia* by its less robust growth, its flesh or white coloured flowers, and especially by the leaf, which is at the tip concave or boat shaped. It seems to prefer the high grounds, as I have never noticed it in the low Carse, even in places where *latifolia* is very frequent.

Butomus umbellatus L.—This is another Elcho Marsh plant, first noticed by me in 1869, on which a doubt has been thrown as to its being a true native (see Dr. Boswell Syme's Exch. Club Report, 1870-71), for what reason I know not, unless it be merely those mentioned above—that everything from the Tay savours of suspicion. In my own mind I fully believe that it is native: it abounds in the marsh, and is so much at home that I see no cause for doubt whatever.

Sparganium simplex Huds.—Though not a rare plant, I am not aware of its having been previously recorded from the Carse; it is a much stouter and more robust form than what I have noticed in other parts of the county. It grows in one or two places in the Carse ditches, and I have no doubt would be more abundant were it not, along with other aquatics, rooted out annually in cleaning the ditches. Its congener, *S. ramosum*, is

far more generally dispersed, owing perhaps to its being more deeply rooted in the soil, and thus escaping annihilation.

Typha latifolia L.—Another Elcho Marsh plant on which doubt has been cast, but for which I see no cause whatever. It grows in two spots in the marsh, and is also found inland on the north side at Cairnie Milldam, where I am afraid it will not long continue, as the dam is now disused and got quite silted up. The Elcho Marsh plants I first discovered some four or five years age, being the first season in which the river-side grass was *not* cut down.

Eleocharis acicularis Sm.—Though I enumerate this as a Carse plant it is scarcely so, as I found it just over the line of demarcation, in Laird's Loch, which drains into the Isla.

Carex limosa L.—Grows freely in Airnbathie Loch, the only place in which I have as yet noticed it.

Phleum pratense L., var. *nodosum* L.—A curious geniculated and prostrate form, frequenting stiff clay and partial to cart-roads, and found near Glendoick and Kinnaird.

Sclerochloa distans Bab.—Grows pretty freely in the marsh at the mouth of the Invergowrie Burn, and also along the muddy shores of the Tay as high up as Kingoodie, where the water is brackish.

Equisetum umbrosum Willd.—This is another rather rare plant, recorded for the first time as found in the Carse. As yet I have only met it on one spot, where it abounds, at the foot of the den of Pitroddie; and higher up, above the den of the Godens, may be seen its close ally, *E. sylvaticum*—a much commoner plant, but rare and local in the Carse.

Supposed Poisonous Pasturage.—When in Strathspey some time ago, I was told that if cattle or horses were allowed to graze on the top of Cairngorm or Ben-muic-dhu they died in ten minutes. Can any of your readers tell me the origin of the belief?—JOHN MACGREGOR, Ladywell, Dunkeld. [I have several times heard this reported in Braemar, but, like Mr. MacGregor, I am equally at a loss to account for the belief. There is so little herbage on the top of these mountains that it might be supposed that it was a jocular way of saying that herbivorous animals would die of starvation there; but my informants were evidently serious. Can any of our friends throw light on the origin of the tradition, which can have no foundation in fact I think?—EDITOR.]

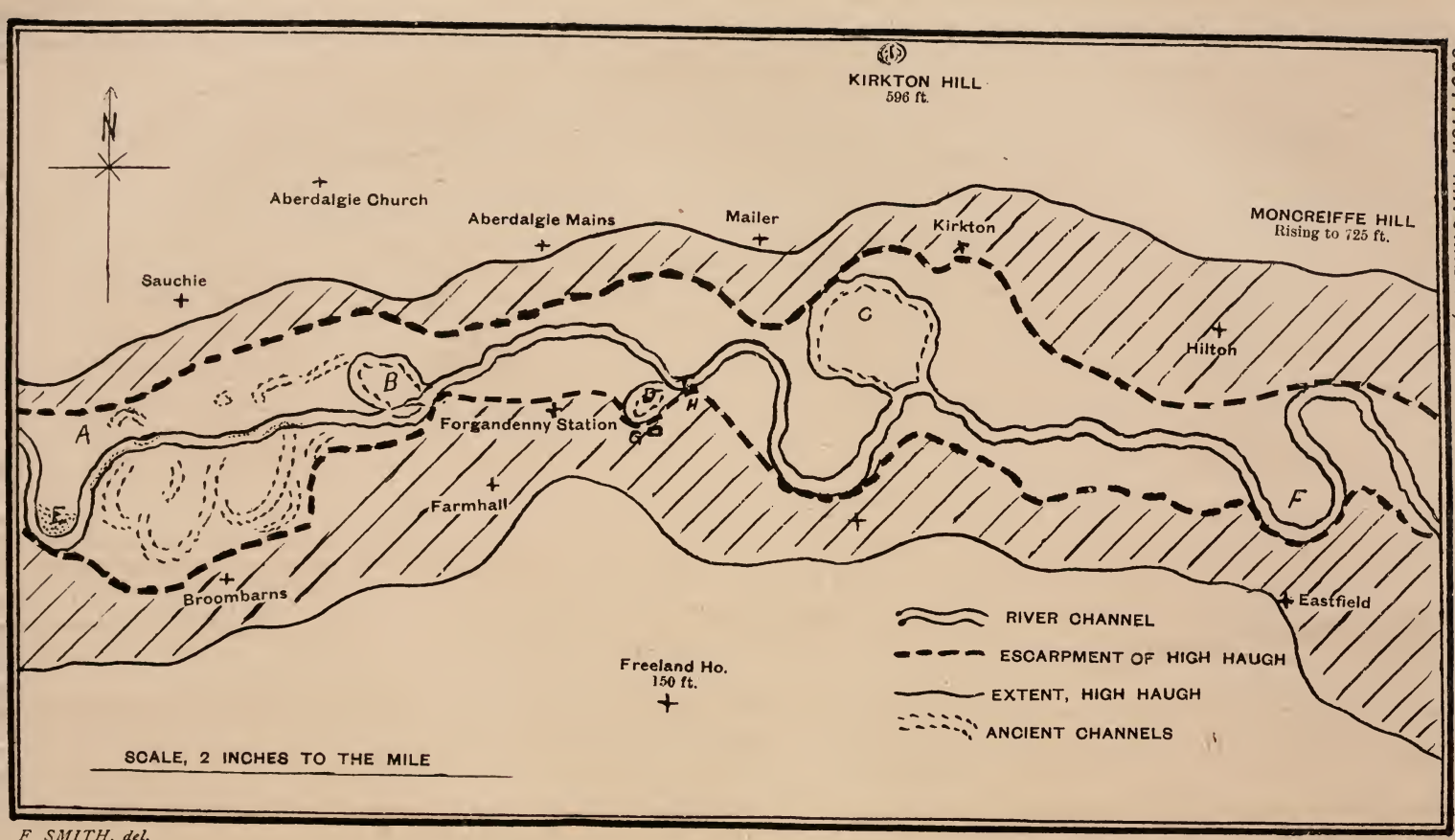
GEOLOGY.

THE EARN VALLEY.

By F. SMITH.

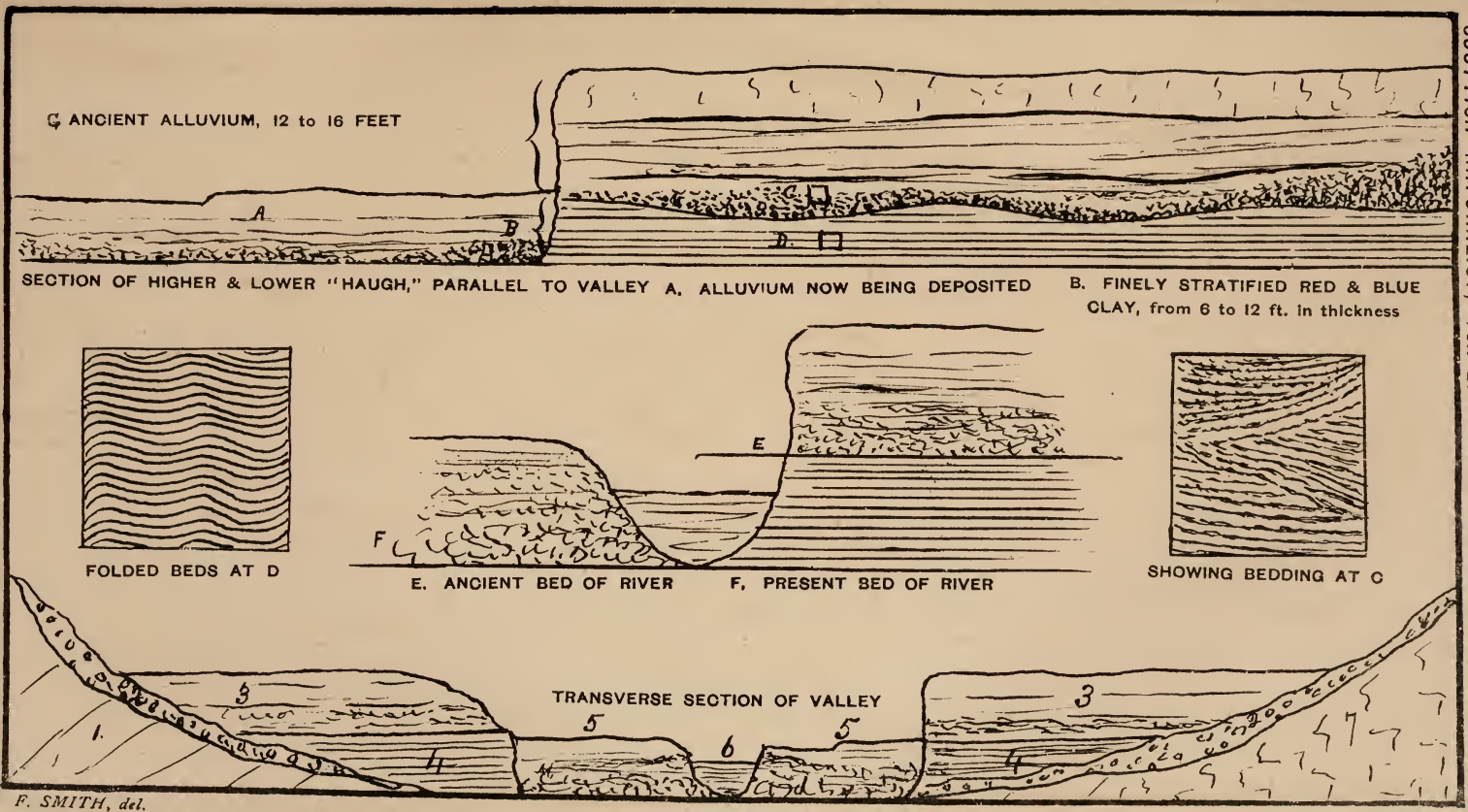
FOR nearly two years I have devoted occasional spare hours to observation of the river Earn, and its geological surroundings. Its winding appearance and variable conditions were as soon as observed sufficient to make me inquisitive about its history and present being as a river. My cottage is situated some 300 feet above the stream, whence I have watched its fluctuations—now swelling out of all proportion, and spreading far and wide upon the fields, and now sinking down to a gentle burn, wending its way among pebble-beds and sands.

To watch a river for a length of time may appear to many to be a strange, not to say a trivial occupation. It has been to me a labour of thought, and a labour of love, for which I can show no "hard cash," but a coin of another stamp, and of another value. Mine is a medium of Old Time's manufacture, which is exchanged for a knowledge indescribably interesting, ennobling, and engrossing to the man of leisure, and comforting and exalting to him who plods his way. To look upon my river, and the valley through which it wanders, one might imagine that its channel were fixed, and the valley unalterable, but this is by no means the truth. That the river when it has rushed down and spread across the fields, invariably sinks into its old channel again is true so far as one generally cares to know. But we did not see the mass of boulders and pebbles hurrying along with the water, and the hundreds, perhaps thousands of tons of sediment, borne hither and thither on the angry tide. These are best seen by those initiated into the river's secret, but the secret will out to any inquisitive mind, for the "book in the running brook" is a page of nature open alike to all. Seen from above, the river presents the most astonishing serpentine windings. In the distance of about 3½ miles, between the gardens of Dupplin Castle and Bridge of Earn, the stream follows all the points of



F SMITH, del.

J. BELLOWS, lith.



F. SMITH, del.

J. BELLOWS, lith.

the compass over and over again, sweeping out into the most extravagant curves, now from the right bank, now from the left, till the length of the river's journey is considerably increased.

Geographically the Earn is situated in a valley running east and west, formed by the Ochill Hills and the lower Grampian spurs of Ben Voirlich on the south, and a tract of variable country ranging from Moncreiffe Hill, through low-lying grounds and lofty eminences, to the culminating height of Ben Chonzie (nearly 3000 feet) north of Loch Earn, in the west. Geologically the Ochill Hills are of igneous origin, and consist essentially of "Trap." Moncreiffe Hill on the north is also trap, whence passing westward for several miles, this same material trap breaks here and there through beds of Old Red Sandstone; thence we pass through Silurian and Cambrian into the gneiss and schistose rocks of the south-western Grampians. The floor of the valley is an alluvial plain, where—

> The spirit of a sea
> Still presiding where it laved
> Tells me that it once hath roll'd.

It is not, however, the spirit of a sea that haunts this alluvial tract, but the image and superscription of a river, of this river Earn.

I had noticed, before visiting the lowlands, that when the sun sank at the western end of the valley, and every hillock and undulation became distinctly marked by the opposing shadows, long lines ran here and there across the alluvial tract—now sweeping curve within curve, now with the stream, now forming a greater or less angle to its course; and in times of flood these self-same lines were seen as well-marked margins to the stranded water. These, along with the alluvial appearance of the valley, is the superscription of the river. The lines and margins are its ancient banks, and show how much it has wandered over the valley in the long lost past. Some of these exhibit comparatively modern positions of the stream, others relate to changes in a remote antiquity. On descending into the valley to inspect these flood margins, I found that some were channels wide and shallow, others merely represented a difference in the height of the tract by escarpments varying from a few inches to 2 or 3 feet. I now saw that there were two distinct levels in the alluvial part of the valley, a higher and a lower "haugh"—the lower averaging 8 feet above the river, the higher reaching 26 feet. The flood margins and ancient channels are to be seen only on the lower haugh.

My interest became at once very much increased by observing several large pebble and gravel beds that had been or were still being formed by the river. In some places they were piled up eight feet at least above the level of the water. It was soon seen that these pebble-beds corresponded to curves in the river, and not to other beds on the opposite side, but in every case to a steep bank, the pebble-bed generally dipping gently under the stream. The steep bank always presents (unless artificially protected) a tumble-down appearance, the green turf overhanging or breaking away in masses,—in other words, it is being denuded. The pebble and gravel beds are being deposited.

In this process of denudation and restoration the stream follows a definite rule, that may be stated thus: *The river denudes the inner bank of a curve and restores the outer.* This is a rule from the very nature of the phenomenon, but it is none the less a rule, and it leads to curious, and indeed wonderful results. If the river channel were perfectly straight to-day it would hardly be so to-morrow, for the variable rate of the current causes the material in the river bed constantly to change its position,—hence an indirect course. Such a river, surrounded with, and flowing over, loose detrital matter, cannot fail to act in what we consider an eccentric manner.

When a "spate" (that is, a flood) occurs, the power oft he water is wonderfully increased, so that immense volumes of boulders and pebbles are carried along, grinding each other smooth, while the abraded material, and any lighter detritus, is carried away to be deposited wherever the surplus water may find a resting place. When once a heap is thrown up in the river bed it becomes the centre of a general accumulation. Although the unobstructed current carries gravel and even pebbles in its course, its power of sustaining them is gone the instant it receives a check. Any impediment in the bed of the stream, especially during a "spate," is sure to receive constant showers of *debris*, accummulating more and more as it becomes powerful to obstruct. The obstruction necessarily deflects the water. The consequence of this deflection is the abrasion of the invaded bank. The rate of denudation increases with the development of the pebble-bed, which reaches a maximum height of eight feet above low-water.

Bearing in mind the *outer* abrasion and the *inner* restoration with the continued action of the river, the following will be seen to be the effect:—The first or out-going curve is encroached

upon by the corresponding pebble-bed. Two other curves, a necessary result of the formation of the first, are formed at the junction of its extreme ends with the direct course of the river. Here, according to our rule, two new pebble-beds should form on the *inner* side of the curves. This is invariably the case, and the result is that we have three growing promontories encroaching upon corresponding banks that are being denuded. The first promontory extends in an outward direction into the major curve; the two smaller promontories encroach from the opposite side in a lateral direction into the minor curves, that is, upon the first formed promontory. The efforts of these three growing points give the river more and more a circular form until, finally, the lateral promontories meet. The water naturally takes the more direct course, leaving the circular channel a "dead-water." That such is the river's mode of working one has but to turn to the accompanying map (Plate III.) to believe possible, or to pay a visit to the valley to be convinced. If we refer to the map, a fine example of a forming circle may be seen at **E**. If the survey map (1871) may be relied on, the form of this extending promontory has materially altered since its publication. Indeed an alteration is so constantly occurring that the inhabitants of the district describe in positive terms how the river has "gone south" within their remembrance; but the accounts of the rate of its movements are so distressingly conflicting that I refrain from giving any. I believe, from my own observation that the growth of the pebble-beds and consequent denudation may in some cases be several yards per annum. At **A** is a portion of an ancient dead-water, *i.e.*, of a discarded channel. There are others leading to **B**. **B** is a dead-water of comparatively modern construction. It is partially filled, but still contains in parts a foot or two of water. **C** is an immense dead-water, through which the river flowed prior to the incursion of the Caledonian Railway. But the engineers cut through the neck of land at **I**, and gave the river a more direct course, simply anticipating the intention of the stream. The neck of land west of **C** is represented too wide, it is I think not more than ten or twelve yards across at this point. The short distance cut through by the railway reduced the river's journey more than a mile. The stream at **F** is working at a much slower pace. This will be understood when it is asserted that the tide is experienced as far up the stream as **D**. **D** became a dead-water in 1853. Previous to

November in that year the river was from 16 to 18 feet deep in this curve, now it is filled up in some parts higher than the ordinary level of the river. This brings us to another consideration, viz.: that of fluviatile deposition. This particular dead-water has filled at the rate of nearly one foot per annum. The history of all dead-waters is doubtless that of **D**. As soon as the current leaves them they begin to fill up by the sediment from the water that is poured into them during every "spate." That all dead-waters fill as rapidly as did **D** I am not prepared to assert. **C** is filling very slowly, but that is owing to artificial obstruction to the free ingress of the water. There are other remains of ancient dead-waters on the south side of the river marked on the map by double dotted lines.

The restoration of the land—not the mere building up of patches of pebbles and sand, but the rearing of wide acres of arable soil, of considerable thickness and void of pebbles, must now be considered. It has been seen how the pebble beds accummulate, it now remains to see how the "loam" is placed above them. To understand this one must again turn to the river, for

> "Men may come, and men may go,
> But it goes on for ever."

I see the river rising 8, 10, 12 feet above its usual level. The pebble beds have long been hid, and the water is out upon the fields. The flood is angry and powerful—full of the *debris* of the torn-up beds, and of the yielding banks, and clouded is its usual lucid face. But it must yield as surely as it came; and foot by foot the greensward shows itself again, till all is peace—the river mild and clear. It has, however, not gone without leaving its footprints behind. Is there not evidence of this wherever the water has been? Has not the thickness of the soil been added to? Is not the grass in many places partially, and in some indeed quite, buried? Undoubtedly that is the case. Then it can easily be seen that if this process be repeated a sufficient number of times, any thickness of fine light soil can be obtained. On the pebble-beds a very ramified grass takes root here and there, and each clump becomes a shelter for straying sand, and apparently increases in vigour in proportion to the quantity of sand it can accumulate. This process aids the heightening of the bed very materially, for the clumps become quite large—as large as sheep, and protect long diminishing lines of sand behind them. These soon

form a hummocky grass field, becoming more level as the distance from the bare pebbles is increased. The foregoing ought to show us the possibility that all the land within the thick broken lines on the map has been denuded and restored—as I dare to assert it has—perhaps again and again. Let us turn once more to the river's banks and we may see more evidence of this. It ought now to be noticed that there are two distinct heights to the denuded banks. One ranging from 16 to 26 feet in height, the lower varying from 7 to 10 feet above the level of the river.

The lower "Haugh" generally forms the river's banks, but occasionally the higher shows a bold front upon the river's side. Upon examining a denuded part of the lower haugh the first impression was that it consisted, except perhaps very low down, entirely of the afore-mentioned arable loam. There is, however, some slight evidence of stratification, and further down the stream gravel bands come in at higher levels, these merge into larger material and finally assume the dimensions and appearance of a regular pebble-bed in every respect similar to those now being formed by the river. This again thins out, and other variously composed beds take its place. There can then I think be no doubt of the fluviatile origin of the lower haugh. As the modern pebble-beds become covered they form a part of the alluvial tract.

The higher "Haugh," as has been seen, is being denuded at a few points on the river's course. The first examination of this was made at the southern extremity of the big curve below C. At the top is about 1 foot of vegetable mould; below this are 3 or 4 feet of, at least on the exposed surface, a slightly indurated clay, with a conchoidal fracture. In this I could detect no lines of stratification. Below this a band of carbonaceous matter occurs, of 3 or 4 inches in thickness, that splits into thin layers very easily. Below this again occurs a clay similar to that above, but indicating signs of horizontal deposition. This alternates with layers of fine silt for about 8 feet, when the clay disappears, and the silt passes into a bed of sand 4 feet thick, with a few small well-rounded pebbles at the bottom. This rests upon, and is clearly defined from, a bed of unctious clay, consisting of alternate blue and red bands. This continues down 12 feet, when it passes under the water. I counted nearly 40 of the alternate coloured bands in the 12 feet.

(To be continued.)

ZOOLOGY.

PROPOSITION FOR THE ESTABLISHMENT OF A SOCIETY FOR THE REPUBLICATION OF RARE TRACTS AND PAMPHLETS ON NATURAL HISTORY.

By JOHN A. HARVIE BROWN.

IN the *Scottish Naturalist* for July, 1873, I endeavoured to draw the attention of its readers to a proposal to form a British Naturalists' Agency; and a certain number of copies of my paper on this subject were thrown off in a separate form, and forwarded to Secretaries of various Natural History Societies, and to other naturalists, soliciting their approval and support; and from a number of these replies favourable to the scheme were received.*

*It may not be out of place here to refer to the correspondence that has passed through our hands with regard to the proposal of an agency.

Mr W. S. Kirby proposes that the agency if established should also undertake the sale and barter of specimens of Natural History which are properly authenticated and identified. Though outside the duties originally proposed for a British agency, still such might quite well in time be incorporated with it. It may be mentioned that in America there is a book published giving the addresses of every naturalist, dealer, &c., in America, classified under the heads of conchology, botany, &c., besides a mass of other information useful to naturalists. Such a publication would be useful in this country, yet I am not aware that any such exists. The trade would I believe readily support the publication of such a work.

A publisher and bookseller of twenty years standing fully endorses the remarks printed in the *Naturalist*, and says—"Not so much for publishing new works, which would perhaps be looked upon with a jealous eye by some portion of publishers, but to assist them (publishers and authors) in distributing their works through the different learned societies and libraries of the whole world; the reprinting of such works as are 'out of print,' and the copyright of which is out. . . . . I think an agency like this could be carried on at a very slight expense, which might be raised, in the first instance by an entrance fee, and afterwards by a small yearly subscription."

A secretary of two influential societies in Edinburgh (Dr. J. A. Smith)

I now propose somewhat to alter my original proposition, and instead of taking the American Naturalists' Agency entirely as a model, I propose to combine its method of working with that followed by the "Ray Society"* at the time of its original conception by Hugh E. Strickland, Dr. Johnstone, Sir William Jardine, and others of our eminent naturalists. My reasons for

writes:—"It would, indeed, be a great advantage if any way could be contrived so as to enable one to get copies of papers on different subjects of Natural Science, often totally locked up in different transactions of Societies and Journals." Would that all secretaries of Natural History Societies in this enlightened country could be brought to think in the same liberal spirit, and chief amongst them "The British Association for the Advancement of Science." Dr. Smith, in a later communication, proposes for the new Society (not the agency) the following title, which will, I think, do as well as any other, viz:—"The British Naturalists' Publication Society," for the publication and distribution amongst its members of original papers, and also the republication, &c., especially referring to the *Mammalia*. To this I would add, "and *Aves*"—leaving *Invertebrata* to be taken in hand, as hereafter shown, by the Ray Society, and not interfering with the work of that Society at all, if possible.

Lastly. Professor Newton writes so much to the point that I would suggest that his letters be printed *in extenso* (with his permission). But I may here be allowed to make a few remarks on part of his second letter, dated 17th October, 1873, which is somewhat unfavourable to the establishment of an agency. Professor Newton writes,—"As to reprints, I think it is very doubtful how far they would ever pay. No one who has the chance of consulting an original work ought ever to put up with a new edition of it—for the purpose of quotation, at least." Now, in answer to this, with all due deference to such an authority as Professor Newton undoubtedly is in all such matters, I would say,—1st. The establishment of a Society instead of an agency will dispose of the first objection, because it is proposed "That the Society should not accumulate capital." 2nd. It is for those who have *not* the chance of referring to expensive editions or scarce originals that it is proposed to establish such a Society, whose duty will be to assist all inquiries in these and other directions, and by reprinting in "fac simile," to supply its members with as near an approach to perfection as is obtainable by the comparatively poor. It is only in the libraries of the rich that many old and valuable editions are found; or in places not attainable to "provincial naturalists." Naturalists in our great cities do not stand in need of a friend and counsellor to show them where a book may be consulted, or to help them in the same way or to the same extent as one living far from cities requires. But they might also find a Society such as I propose *useful*, and be willing to further science by adding their mite to its support. Even a name or two to head our lists with,—smallest contributions gratefully received.—J. A. H. B.

*For a full account of the conception and foundation of the "Ray Society" in 1843, *vide* "Memoir and Papers of Hugh E. Strickland," by Sir W. Jardine. London: Van Voorst. 1858.

thus altering my first proposal, and now suggesting a *Society* instead of an Agency, are—

1. By forming a Society a capital for the purposes required, and to be hereafter mentioned, may be secured, which a Company or an Agency composed of a limited number of individuals might find difficulty in raising or would scarcely like to risk.

2. No steps would require to be taken towards the work of the Society until a sufficient number of members were secured, representing a sufficient capital for printing and republishing a smaller or greater number of pamphlets and tracts on Natural History.

3. The actual work of an Agency, after the Society becomes firmly established (if ever it be established), might be incorporated with the other business of the Society, and this at less probable expense and risk than if undertaken by an Agency acting without the ready capital which would be furnished by an unlimited number of members and subscribers.

I may here also take the opportunity to remark that the Ray Society has succeeded far beyond the expectations of its original founders, and has had an uninterrupted and useful existence for more than 30 years. It may be urged by some people who read my proposition that while the Ray Society flourishes there is no room for another having similar objects and ends in view. But in answer to this I would say, there is no need for the new Society aspiring to a competition with the old and firmly founded one, or interfering with the latter's business, and this for the following reasons:—

1. In a list of the publications of the "Ray Society" now before me there are only two works treating of *Vertebrata*, and of these one refers to *Reptilia*—"The Reptiles of British India" (by Dr. Günther)—and the other to *Pterylography* (by Nitsch).

2. Of a list of volumes in preparation for future years there is only one out of ten, unless we except "A Synopsis of the Fauna and Flora of Palestine," by Rev. H. B. Tristram, which will treat of *Vertebrata*.

3. Therefore it would appear that the large body of the members of the Ray Society, or at all events of the publishing committee, are students of *Invertebrata*, or—from the number of botanical works—students of botany; and that therefore there is room and to spare for a Society which would direct its attention principally to the *Vertebrata*.

4. The Ray Society does not appear to devote its attention

to the reprinting of tracts and pamphlets as a principal part of its business, or when it does, such in great measure refer to botanical subjects. Therefore there is room for a Society which would consider the publication of such smaller tracts, pamphlets, &c., as a principal part of its business.

5. Ornithology and mammalilogy are excluded apparently from the subjects chosen by the Ray Society—at least there is little appearance of the study of these sciences amongst the members, judging from the publications. These sciences have many votaries at the present day, and many of these it may be believed would gladly avail themselves of a Society such as I propose, to procure in a cheap form good literature on their favourite studies.

The above are some of the reasons why a new Society need not interfere with the work of the Ray Society.

Taking the outline of the plan for the foundation of the Ray Society and the prospectus of the American Naturalists' Agency jointly, for a model, I would then propose as follows :—

1. That a Society, to be called the Society for the purpose of publishing original papers on Natural History, principally on *Mammalia* and *Aves*, and for reprinting in *fac-simile* rare and useful tracts, pamphlets, &c., on the like subjects, be formed.

2. The subscription to be (say) £1 per annum.

3. The number of the subscribers to be unlimited.

4. Each subscriber to receive annually a copy of all the publications of the Society published during the year, which are also to be sold at a reasonable price to the public.

5. The Society not to accumulate capital, but to publish annually a greater or less amount of matter according to the state of the funds.

6. The Society to act as an agency for the procuring of rare pamphlets and tracts already published elsewhere, and for that purpose to enter into correspondence with similar societies, agencies, booksellers, &c. at home and abroad, charging those employing them a small commission.

7. The Society to print for authors, or to undertake the employment of printers for authors. (This item, however, for further consideration).

Further, I would propose that the Ornithological and Mammalilogical portions of the publications be kept separate, *as far as possible*, the better to satisfy the demands of individuals.

This might be effected by publishing a series of each, and where such could not be separated, a "Miscellaneous" series.

The further business of the Society need not be treated of here, such as the election of office-bearers, publication committee, agents in the trade (if thought advisable to have any), &c. All this can be accomplished later, should the foundation be effected, and when the names of eminent and influential men of science appear on the list of those favourable to the scheme, and willing to heartily give their assistance. Those who have already thought it worth while to append their names to the former suggestion, I hope will not withdraw them from this, which is offered in the belief that it is more feasable, and more likely to succeed, and I would ask all who agree in part or in whole with it, as well as those who disagree and who take sufficient interest in the matter, to assist with their ideas and advice. I believe I am correct in saying that the pages of the *Scottish Naturalist* are open to discussion on the subject, and that in saying so I am also expressing the wishes of the editor.

Dunipace House, Falkirk, February, 1874.

Blennocampa aterrima Klug., a Saw-fly new to Britain.—I have seen a specimen (male) of this addition to the British list, which was taken by Dr. Buchanan White at Braemar. It may be at once distinguished from the other *Blennocampæ*, by its almost entirely black body (the anterior tibiæ in front being dirty white), and by the very long antennæ covered closely with stiff hairs. It forms the type of Dahlbom's genus *Phymatocera;* but it appears to me that its characters are not of more than sub-generic value.—P. CAMERON, jun., Glasgow.

Crœsus varus Vill.—I captured this species among the alders at Dall, Rannoch, in June. Its transformations have been excellently described and figured by Snellén van Vollenhoven.—*Id.*

Diptera in the North of Scotland.—During the second week of August last, a friend and I made a short trip to the north; sailing from Aberdeen, we arrived at Kirkwall in eleven hours, but that day we were unable to procure much, because of the wind, which was very high, and the next day we were only able to be out for about three hours in the morning; during the remainder of the day it was heavy rain. Upon the third day we were more successful; the sun was very hot, and we expected to do great things when we started over the hills and moors to Stromness, which town we were obliged to reach that night, so as to leave by steamer early next morning. During the three days I only obtained about forty species of Diptera (a few belonging to the *Muscidæ* I do not include in the following list):—

Sphœrophora menthastri, L.; *Syrphus vitripennis*, Mg.; *S. balteatus*, Deg.; *Platychirus manicatus*, Mg.; *P. albimanus*, F.; *P. peltatus*, Mg.; *Rhingia rostrata*, L.; *Volucella inflata*, F. This fly was very abundant, more so than I have seen any where else,—in fact I had never seen more than two or three together before; here they were scattered over the moors in great numbers,—all that I took, but two, were females. *Sericomyia borealis*, Fln., also abundant; one specimen of *S. lappona*, L. was seen. *Eristalis arbustorum*, L.; *E. nemorum*, L.; *Helophilus pendulus*, L.; *Syritta pipiens*, L.; *Chrysogaster viduata*, L.; *Empis tessellata*, Fb.; *Hilara nana*, Mg. in great numbers, over a stream near which was a young plantation of trees, the only ones I saw on the island, except in Kirkwall. *Heleodromia fontinalis*, Hal.; *Rhamphomyia variabilis*, Fln., very numerous; *R. flava*, Fln.; *Cyrtoma spuria*, Fln.; *Hemerodromia monostigma*, Hms.: *Dolichopus rupestris*, Hal.; *D. griseipennis*, Stann.; *Argyra argentina*, Mg.; *Syntormon pumilum*, Mg.; *Synarthus pallipes*, F.; *Sympycnus annulipes*, Mg.; *Campsicnemus curvipes*, Fall; *Lonchoptera punctum*, Mg.; *Tachina vulpina*, Fal.; *T. spinipennis*, Meig.; and *Anthomyia lardaria*, Fb. Rather disappointed with our three days' captures upon the island, we left Stromness for the mainland where we hoped for better things. Arriving at Thurso near mid-day, we proceeded to Melvich, eighteen miles along the coast, westward; at which place we remained the next day, and visited the braes along the coast, and some moorland, but little turned up among the flies. The country up to this, and for nearly eighteen miles further on, is very poor, and to us was unprofitable, but near to Betty Hill, which is at the mouth of the Naver, the country is more broken up, and a day's search and netting was very profitable; especially so in regard to Diptera was a sandy brae and field nearly covered with the wild carrot and *Centaurea scabiosa*, L. From Betty Hill we proceeded along the course of the Naver, the day was again unfavourable or I think much might have been got here; there is a good deal of birch wood and other cover, and although so bad a day we were very well satisfied. I should have much liked another day in the Strath, but it could not be; the day after we were up Ben Klibreck, and the next saw us at Lairg. The road between Altnaharra on Loch Naver, and Lairg is through the worst hunting ground I think I ever saw, and yielded nothing but a few spiders, one *Agrion*, and, near Loch Shin, a specimen of *Syrphus compositarum*, Ver. During the six days in the county I took the following, with perhaps a dozen that I have not yet made out:—*Sphœrophora scripta*, L.; *Syrphus ribesii*, L.; *Platychirus peltatus*, Mg.; *P. albimanus*, F.; *Leucozona lucorum*, L., one specimen at Melvich; *Rhingia rostrata*, L.; *Sericomyia borealis*, Fln.; *Eristalis intricarius*, L.; *E. nemorum*, L.; *E. arbustorum*, L.; *Helophilus trivittatus*, F., one at Betty Hill; *Chrysogaster viduata*, L; *C. metallina*, Fb; *Chrysomyia formosa*, Sc.; *Hæmatopota pluvialis*, L.; *Leptis lineola*, Fb.; *Sympheromyia crassicornis*, Hms., this fly was very abundant at a place some distance east from Betty Hill, and it was also taken in Strathnaver; *Empis stercorea*, L.; *E. punctata* F.; *Rhamphomyia variabilis*, Fln.; *Hybos grossipes*, L.; *Platypalpus comptus* Wlk.; *Hemerodromia præcatoria*, Fln.; *H. monostigma*, Hms.; *Dolichopus atripes*, Mg.; *D. rupestris*, Hal.; *D. plumipes*, Scop.; *D. trivialis*, Hal.; *Gymnopternus germanus*, W.; *Tachytrechus notatus*, Stann.; *Chrysotus neglectus*, W.; *Campsicnemus scam-*

bus, Fall.; *Hydrophorus borealis* Lw.; *Echinomyia grossa*, L.; *Tachina vulpina*, Fal.; *T. detracta*, Wlk.; *T. spinipennis*, Meig.; *Dexia canina*, F., this was in great abundance at Betty Hill; *Musca Cæsar*, L., and *Musca nitens*, Zett.—W. Armston Vice, Aberdeen.

Insecta Scotica; Addenda and corrigenda to the list of Lepidoptera of Scotland.—I see that you set down the food of *Orthosia suspecta* as unknown. The larva eats birch, and will also eat poplar, but prefers birch. —W. Buckler, Emsworth, Hants.—You appear to doubt the occurrence of *Tæniocampa gracilis* in Scotland. The late Richard Weaver generally came here to show me his insects when he returned from Scotland, and one year he had a number of *gracilis* among them, and also a good many of the variety of *gothica*, called *gothicina* by Herrich-Schäffer; he said they were taken near Rannoch. Weaver took large numbers of an *Oporabia* in Scotland, which is quite distinct from *dilutata*; it is more like *filigrammaria*, but I am very doubtful of its being a variety of this species, as it is much larger. Weaver took the moths in August, six or eight weeks earlier than *dilutata* appears.—H. Doubleday, Epping.—*Bombyx populi* has recently occurred at Hawick, and must be added to the list of "Tweed" insects. —W. Grant Guthrie, Hawick.—I see *Arctia lubricipeda* is marked as likely to be got in the Tweed district. I have one that I got among among some insects collected here in 1839. I also had a specimen of *Halias prasinana*. —J. Anderson, Preston, Dunse.

Notes on Tineina.—*Coleophora lixella*. Mr W. Herd has taken this near Perth, thus greatly extending its known geographical range in Britain. —*Coleophora viminitella*. To this species Mr Stainton is inclined to refer a specimen, bred by me from a larva feeding on *Vaccinium vitis-idæa* (in company with *C. vitisella*) at Braemar. *Viminitella* usually feeds on sallow, but sometimes on *Myrica*. *Argyresthia aurulentella*.—On several occasions I have found a larva feeding in the *berries* of the juniper, but have only recently succeeded in rearing the moth, which turns out to be this species. Hitherto *A. aurulentella* has only been bred from larvæ, mining the *leaves* and *shoots* of juniper. It appears to be a widely spread species in Scotland. *Zelleria n. sp.*—I have seen some specimens of a *Zelleria*, taken on Moncreiffe Hill by Sir T. Moncreiffe and Mr W. Herd, which I suspected might be a new species, and which suspicion is confirmed by our great micro-lepidopterologist, Mr Stainton. It is desirable that more specimens should be looked for, and that its habits should be noted. Some specimens are nearly intermediate between *heparielle* and *insignipennella*, but rather more dingy, while others are violet-brown along the costa, with the tip redder, and the inner margin pale ochreous, and a black spot on the fold near the middle of the wing.—F. Buchanan White.

Bythinia tentaculata var. decollata.—As you do not mention the occurrence of this variety in your list of Scottish shells, I may mention that I found it some years ago at Colvend, in Kircudbrightshire.— R. Wood, Westward, Wigton, January, 1874. [I am obliged to Mr. Wood for calling my attention to this matter. I also found this shell in Barean Loch, Colvend, but somehow omitted to mention it in the list of Scottish shells.—F. B. W. W.]

Honey Buzzard *(Pernis apivorus).*—A specimen of this rare falcon was frequently seen in this locality in February last.—GEORGE SIM, Gourdas, Fyvie, March, 1874.

Green Woodpecker *(Picus viridis).*—A specimen of this bird was seen near Fyvie Castle in January last. Id.

The Landrail in January.—I observe it stated, on the authority of an Irish journal, that a landrail was shot in County Antrim on the 6th February in the present year, and it has been suggested as a problem, whether it had migrated so far in advance of the usual season, or whether it was a bird of last year which had not migrated at all. In connection with the above, it may be interesting to state that, on the night of the 31st January ultimo, in Forfarshire, I heard repeatedly the unmistakeable crake of the landrail. For nearly a week previous the weather had been unusually mild.—JOHN STEVENSON, Glammis.

VARIOUS NOTES.

We are glad to observe signs of life in Dundee. That town, long noted for its commercial enterprise, has had nearly an equal, but not enviable, celebrity for its poverty and deadness in regard to the study of natural science. But now we trust that that reproach will soon be wiped away, and that the members of the recently founded "Dundee Naturalists' Society," a copy of whose constitution is before us, will do good work, and show their fellow-citizens that there are other and more valuable *dona Dei* in the fields, woods, and mountains of the interesting county of Forfar, than that wealth for which the inhabitants of the town of the "*donum Dei*" are deservedly remarkable. The Society has already upwards of 40 members, which number will probably soon be considerably increased. We recommend to the Society the formation of a good local museum of the natural productions of Forfarshire.

At a recent conversazione, the Montrose Natural History and Antiquarian Society (exemplified at least by one of its chief members), showed that it knows what its proper work is. In his address, Dr Howden (the member in question) laid great stress upon the importance of the formation of a museum of *local* objects of natural and civil history, such a collection being of very great utility both for scientific and educational purposes. We ourselves took an opportunity, in a lecture recently given, of urging the same upon the Alloa Natural History and Archæological Society, and as both Montrose and Alloa are fortunate in possessing good museum buildings, we do hope that the members of the respective Societies will have a sufficient amount of energy to carry into effect such a laudable scheme.

As bearing on the interesting subject of the Geographical Distribution of Plants and Animals, a paper recently communicated to the Royal Physical Society of Edinburgh by Dr. Robert Brown, may be mentioned. Dr. Brown thinks that the great bulk of the Fauna and Flora of Greenland was derived from Europe, with which at one time he considers that that country was united either by continuous land or by a chain of islands, of which it is

possible that Iceland, Bear Island, and even perhaps the Shetlands and Orkneys are remains. The European nature of the Greenlandic Flora is remarkable, and shows that the separation from America, though slight, yet must have been of long continuance.

In our last number we noticed the International Horticultural Exhibition and Botanical Congress to be held at Florence in May next. It may be useful to some of our readers if we now inform them that the Italian Railway Companies have promised a reduction of 50 per cent. on the carriage of persons and things to and from the Exhibition, and that the Railway Companies of other countries it is hoped will also reduce their fares. Every country will be represented at the Exhibition, even such distant ones as Brazil, Australia, Mexico, etc. We shall be happy to give any of our readers who think of sending objects for exhibition, or of being present, further and later information contained in the *Bulletin Circulaire*, to be issued from time to time.

"The Object and Method of Zoological Nomenclature," by Dr. Sharp.—In our last number we alluded to this interesting pamphlet. The author first traces the origin of the binomial system of nomenclature instituted by Linnè, discusses the advantages and disadvantages of that system, treats of the giving of names to new species, and of the identifying of species already named (but regarding whose names there is some doubt), as well as the advisability or non-advisability of the naming of varieties. The chief point however is a suggestion that the *name* of a species should be considered to be the generic and specific appellations which were first applied to it, and that these two words *together* constitute the name of the species and are inseparable, and that in speaking of a species it will be sufficient to mention it by its earliest name (thus defined). In classifying and cataloguing species they should be arranged under their proper (modern) generic names, the name of the species (consisting of two words as mentioned above) remaining however intact. For example, Linnè named a beetle *Scarabæus typhæus*, which is now placed in the genus *Minotaurus*, and would usually be termed *Minotaurus typhæus*. Dr. Sharp would, however, retain the name *Scarabæus typhæus* in speaking of the insect, but in cataloguing it would place it in the genus *Minotaurus*, still however retaining the two words *Scarabæus typhæus* as the *name* of the species. In this manner the author thinks that the difficulties which are daily accumulating around biological nomenclature may be lessened. For the arguments he uses and the propositions set forth we refer the reader to the pamphlet, the perusal of which we recommend to every biologist.

"A Monograph of the British Annelids—Part I.—The Nemerteans."—We congratulate the author, our contributor, Dr. M'Intosh, and the Ray Society, on the production of this work. It will increase the reputation which the author has already attained as a naturalist of the first-class, and it will make the public more confident that the Ray Society is doing its proper work. The first 150 pages or so are devoted to a consideration of the anatomy, physiology, etc., of the Nemerteans, and the rest of the volume to descriptions of the genera and species. Ten large plates (nine of them coloured) illustrate the work, and are chiefly from the exquisite drawings of the author's lamented fellow-worker and sister, to whose memory this invaluable work is appropriately dedicated.

PHYTOLOGY.

BRYOLOGICAL NOTES.

Dr. Buchanan White has kindly sent me specimens of what he considers to be his *Hypnum Braedalbanense*, and, after careful examination, I cannot help thinking that they are clearly referable to *Hypnum subsulcatum*, Schpr. Synop., which latter again cannot well be anything else than one of the innumerable forms of *Hypnum commutatum*. Dr. White's specimens show a very sportive nerve. Sometimes it is long; sometimes it is so short as to be almost obsolete; sometimes it is narrow and rather prominent; sometimes it is broad and flat; usually it is single; but very frequently it shows a very decided tendency to split up into two or three forks. This form is plentiful near the summit of Ben Lawers, and occurs occasionally on others of the Scottish mountains.

Accompanying the specimens of *Hypnum Braedalbanense* was part of the original specimens of *Hypnum rupestre*, B. W., sent to Wilson and Schimper, and declared by the former to be unknown to him, and by the latter to belong to a new species. Were it not for the decisions of these great men I should have had not a shadow of hesitation in declaring the plant to be *Hypnum callichroum*, Bridel, for I am unable to detect a single point in which the one differs from the other.*

Much more perplexing are the original specimens on which Wilson founded the species *Grimmia subsquarrosa*. Those which Dr. Buchanan White has also sent me were first gathered by him on Moncreiffe Hill, near Perth, in 1864. At once they strike one as remarkably similar to *Grimmia trichophylla* and *G. Muhlenbeckii;* and it is between these two that *Gr. subsquarrosa* must rank if a separate position is to be assigned to it. From both of these it differs in the denser ramification, in the leaves being more or less suddenly enlarged and crowded towards the apices of the branches, more rigid, and when wet, subsquarrose. The last character does not seem to be a very constant one. On closer examination under the microscope, *G. subsquarrosa* differs from *Muhlenbeckii* (the margins of the leaves of which, by the way, are rarely, if ever, quite plain, as described by Schim-

* "*H. rupestre* now appears to me to be rather too closely related to *H. callichroum;* but as Dr. Schimper considers that it has claims to distinctness, I think it as well to leave it as it is."—F. B. W. W. in Trans. Ed. Bot. Soc. 1867. Wilson also changed his opinion, and referred the moss in question to *H. hamulosum*. To a great extent I agree with Mr. Fergusson.—F. B. W. W.

per and others,) in the roundish-quadrate, denser, smaller, less sinuous areolation in the middle and upper portions of the leaf, in the shorter medial basal cells, and very much in the nerve. The nerve of *G. Muhlenbeckii* is unique among the hair-pointed *Grimmiæ*, being stout, prominent, and angled on the back near the apex of the leaf, owing to the presence of wings similar to those in *G. patens*, but not so distinct. The nerve of *G. subsquarrosa*, on the other hand, is rounded on the back in the usual way and not quite so strong. From *G. trichophylla*, on the other hand, *G. subsquarrosa* differs in the roughly denticulate hair-points, and in the much shorter basal cells. Indeed it seems to be a species which has appropriated to itself the hair-points of *G. Muhlenbeckii*, and the nerve and general areolation of *G. trichophylla*, while it has aimed at having an areolation at the base of the leaf peculiar to itself.

During the past year several mosses have been gathered in the north-east of Scotland, which had not been previously observed there. One of the rarest and most interesting of these is *Hylocomium Oakesii*, Sull. Last summer, very much to my astonishment and delight, I came upon it growing plentifully in this its second and most unexpected British station, where it assumes a much more compact habit than on Ben Lawers. The area to which it here seemed to be confined was small, but future search may show it to be larger. This is the third moss of those hitherto regarded as confined to Ben Lawers in their British distribution, which was added to the north-east of Scotland during last year ; and there are now very few mosses on Ben Lawers which have not a home on some mountain or other east of Ben-y-Ghloe.

Among other important additions to the list of mosses of the same district may be mentioned:—*Phascum bryoides*, *Sphærangium triquetrum*, *Ephemerum cohærens*, *Fissidens pusillus*, *Tortula ambigua*, *Trichostomum convolutum*, *Pottia Wilsoni*, *Bryum Tozeri*, *Bryum neodamense*, *Rhynchostegium depressum*, *Eurhynchium androgynum*, and many others. The number of mosses now known to be natives of the north-east is very large, and yet some of the commoner species seem to either shun the district, or to be confined to one or two localities in it. *Rhynchostegium confertum* is one of these. Can any of your readers send me a specimen from a locality to the east or north of the Isla?

Whilst so many mosses new to the district have been recently discovered, new stations have been found for many of the rarer species, such as *Trichostomum glaucescens*, *Gymnostomum viridulum* (which now seems to have been found in Ireland), *Catoscopium nigritum*, *Cinclidium stygium*, *Grimmia Ungeri*, *Grimmia unicolor*, *Hypnum vernicosum*, *Pottia crinita*, etc., etc.—J. Fergusson, New Pitsligo.

A New British Fungus.—In September last I had the good fortune to come upon a very small quantity of the beautiful *Hyphelia rosea*, growing upon a half-decayed birch tree in the north-east of Scotland. It seems to be rare, as others and myself have searched for it from Alyth northwards, but without success.—J. Fergusson, New Pitsligo.

Agaricus erinaceus Fr.—I lately found a specimen of this fungus, which is, I believe, considered to be rare, on the dead branch of an oak here.—Thos. Moncreiffe, Moncreiffe, Bridge of Earn.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 232.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

PRÆCOX L. Local. Maritime (very rarely inland).

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ ♀ o

LAT. 55°-58°40″. RANGE IN EUROPE. Central (excluding Sweden). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August. LARVA. September-May. FOOD-PLANT. Low Sallows and low plants.

STRIGULA Thnb. (1788); *porphyrea* Hb. (after 1800). Common. Ericetal. Ascends to 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST Solway Clyde Argyle West-Ross ♀

LAT. 54°40″-59°20″ RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July, LARVA. August, May. FOOD-PLANT. Heather.

AGATHINA Dup. Local. Ericetal.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray ♀
[Orkney] o
WEST. o o ♀ ♀ o

LAT. 55°30″-57°40″. RANGE IN EUROPE. Britain, France, Belgium, W. Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August. LARVA. September-June. FOOD-PLANT. Heather.

OBELISCA Hb. Very local. Pascual. Maritime?

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. [Solway] ♀ o o o

Lat. [55°]-56°. Range in Europe. Central (to South Sweden) and south-east. Type. Central. Type in Britain. English.

Time of Appearance—Imago. August. Larva. September?-May. Food-plant. Low plants.

[AQUILINA Hb. Very local. Pascual. Maritime?

Distribution—East. o ♀ ♀ ♀ Moray o o o
West. o Clyde o o o

Lat. 55°30″-57°40″. Range in Europe. Central. Type. Central. Type in Britain. English.

Time of Appearance—Imago. July, August. Larva. September-June. Food-plant. Low plants.

By Dr. Staudinger *aquilina* is considered as a var. of *tritici*, and some others think that it is a doubtful species. Mr Doubleday, however, is of opinion that it is a good species, forming one of a very puzzling group of *Agrotes*, of which *tritici* may be considered the type. From that species it may be distinguished by its comparatively longer wings, usually larger size, and paler and more ochreous colour, especially of the subcostal line, which in *tritici* is of usually a whitish tint. In this group we find really good species, separated from each other by such slight (but constant) distinctions that would scarcely serve to characterise varieties in some other groups.

TRITICI L. Not uncommon. Pascual. Maritime (much rarer inland).

Distribution—East. ♀ Forth Tay Dee Moray ♀♀ o o
West. Solway Clyde ♀♀ ♀♀ o

Lat. 54°40″-57°40″. Range in Europe. Central and northern. Type. Centro-septentrional. Type in Britain. British.

Time of Appearance—Imago. July, August. Larva. September-May. Food-plant. Grass and other low plants.

The specimen in the Linnean collection, bearing the name of *tritici* in Linnè's writing, is the more unicolorous variety, *eruta* Hb.

NIGRICANS L. Not very common. Agrestal and pascual.

Distribution—East. Tweed Forth Tay Dee Moray o o o
West. Solway Clyde ♀ ♀ o

Lat. 54°40″-57°40″. Range in Europe. Nearly throughout. Type. European. Type in Britain. British.

Time of Appearance—Imago. June-August. Larva. July-June. Food-plant. Clover and other low plants.

CURSORIA Hufn. Local. Maritime.

DISTRIBUTION—EAST. o Forth ♀ ♀ Moray o o o
WEST. [Solway] Clyde o o o

LAT. 55°30″-57°40″. RANGE IN EUROPE. North-western, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-September. LARVA. September-June. FOOD-PLANT. Maritime low plants.

CORTICEA Hb. Not very common. Pascual, nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central, northern, and south-eastern; South France, &c. TYPE. Centro-septentrional and -meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-May. FOOD-PLANT. Low plants.

EXCLAMATIONIS L. Abundant. Agrestal, pascual, nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde Argyle ♀ ♀

LAT. 54°40″-57°40″. RANGE IN EUROPE. Throughout. TYPE. Territorial. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. July-May. FOOD-PLANT. Grasses and low plants.

LUNIGERA Stph. Local. Pascual, maritime.

DISTRIBUTION—EAST. o Forth ♀ ♀ Moray o o o
WEST. o ♀ o o o

LAT. 55°50″-57°40″. RANGE IN EUROPE. Britain (?North France). TYPE. British. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August. LARVA. August-May. FOOD-PLANT. Dandelion, *Polygonum*, etc.

Dr. Staudinger queries this as a var. or Darwinian species only.

SEGETUM Schiff. Common. Agrestal, pascual, nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Throughout. TYPE. Territorial. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-September. LARVA. July-May. FOOD-PLANT. Low plants.

SAUCIA Hb. Not common. Nemoral.

DISTRIBUTION—EAST ♂ ♂ Tay Dee Moray o o o
WEST. Solway Clyde ♂ ♂ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. West central and southern; South Germany, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August-May (?May-June, and August-October). LARVA. July-August. FOOD-PLANT. Low plants.

YPSILON Roth. (1776); *suffusa* Hb. (after 1793). Common. Agrestal, pascual, nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde Argyle ♂ o

LAT. 54°40″-57°40. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE — IMAGO. June-September (or May, June, September). LARVA. September-May?; May-July. FOOD-PLANT. Roots and leaves of low plants.

As regards both this and *saucia* there is some doubt whether the moth is double-brooded or only irregular in its time of appearance; hence there is some uncertainty as to the proper time for the larva. *A. puta* Hb. is said to have occurred in "Solway."

VESTIGIALIS Roth. (1776); *valligera* Hb. (after 1793). Locally abundant. Maritime.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ o o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central and northern; South France, &c. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Roots of grasses.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 240.)

EDITED BY D. SHARP, M.B.

MUSCORUM Bris. Abundant.

DISTRIBUTION—EAST. ♂♀ Forth Tay Dee ♂♀ o o o
WEST. Solway Clyde o o o

PILOSIVENTRIS Th. Scarce. In dung.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

FUSCA Sahl. Common.

DISTRIBUTION—EAST. ♂♀ ♂♀ Tay ♂♀ ♂♀ o o o
WEST. Solway o o o o

SUBSINUATA Er. Scarce.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

MONTIVAGANS Woll. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

ORBATA Er. Local. In sandy places. (? Maritime.)

DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o o o o o

FUNGI Gr. Abundant.

DISTRIBUTION—EAST. ♂♀ Forth Tay Dee Moray ♂♀ ♂♀ ♂♀
WEST. Solway Clyde ♂♀ ♂♀

CLIENTULA Er. Common.

DISTRIBUTION—EAST. o Forth Tay Dee o o o o
WEST. Solway ♂♀ o o o

CRIBRATA Kr. Very rare.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

PLACUSA Kr.

PUMILIO Er. Under bark of dead trees.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. o o o o o

DENTICULATA Sharp. Rare. Among the oozing sap of birch trees.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

PHLŒOPORA Kr.

REPTANS Grav. Common. Under bark of dead trees.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

HYGRONOMA Kr.

DIMIDIATA Grav. Very rare. In marshes.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

"Lurgie Loch."—R. Hislop.

OLIGOTA Kr.

INFLATA Man. Rare. In vegetable refuse. Lowland.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

PUSILLIMA Grav. Rare. In vegetable refuse. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

ENCEPHALUS Kr.

COMPLICANS Steph. Scarce. Amongst moss. Lowland.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

GYROPHÆNA Kr.

GENTILIS Er. Local. In fungus. Lowland.

DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. Solway o o o o

AFFINIS Mann. In fungus. Lowland.
DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. Solway o o o o

NANA Payk. In fungus. Lowland.
DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. Solway o o o o

CONGRUA Er. In fungus. Lowland.
DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. Solway o o o o

LÆVIPENNIS Kr. Rare. In fungus. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

Six specimens found on the Corstorphine Hills, June 12th, 1866.—D. S.

MINIMA Er. Very rare. In fungus. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

A single individual found near the junction of the Nith and Scar, August 22d, 1867.—D. S.

STRICTULA Er. Very local. In fungus. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

Abundant in *Dædalea quercina*, growing on oak-stumps near Eccles.—D. S.

DIGLOSSA Kr.

MERSA Hal. Very local. Maritime.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde o o o

MYLLÆNA Kr.

DUBIA Grav. Local. In marshes.
DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway o o o o

INTERMEDIA Er. Local. In Sphagnum.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

MINUTA Grav. Common. Among Sphagnum.
DISTRIBUTION—EAST. Tweed Forth Tay ♀♀ ♀♀ o o o
WEST. Solway. o o o o

ELONGATA Math. Riparial. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

KRAATZI Sharp. Rare. Among Sphagnum.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o o o o o

BREVICORNIS Math. In damp places. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway Clyde o o o

GYMNUSA Kr.

BREVICOLLIS Payk. Rare. Among Sphagnum. Lowland.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

VARIEGATA Kies. Among Sphagnum. Lowland, highland.
DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway ♀ Argyle o o

HYPOCYPTUS Kr.

LONGICORNIS Payk. Common. Lowland.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

LÆVIUSCULUS Mann. Amongst moss. Lowland.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

SEMINULUM Er. Very rare. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

TRICHOPHYA Kr.

PILICORNIS Gyll. Rare.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o

(To be continued.)

ZOOLOGY.

THE FOOD AND USE OF OUR RAPACIOUS BIRDS.

By GEORGE SIM.

IN this, as in every other subject, there are two parties holding different views; the one affirming that these creatures are of no use whatever, and therefore their extermination much to be desired; the other, that they are of use—in short, are indispensably necessary to the well-being of the feathered creation and of man.

Of those holding the latter opinion I am a humble adherent. And although in numbers we are in the minority, I venture to say, weighed in the scales of reason, we overbalance our opponents very considerably; and why? because those differing from us have not considered the matter further than this:—they occasionally see rapacious birds kill game, therefore they conclude that by destroying the one, they increase the numbers of the other, and thereby augment their own gain. On our side, however, the whole subject has received some consideration, taking into account, not merely the supposed mischief they do, but also the good, coming to our conclusion by the result.

Individually, it is a subject which has engaged my attention for many years, and for the past ten, I have carefully examined the stomach of each bird as it came to hand, and although against my own interest, I am bound in honesty to raise my voice, feeble though it be, against a practice so diametrically opposed to the interests of humanity, that of exterminating what is at present known by the term *vermin.*

The present destructive treatment of our rapacious animals is a subject which may now be said to be of national importance, and one, too, which if much longer allowed to run its present course, will ultimately result in much more serious consequences than is at present thought of.

For a long time back the aim has been to have as many (if

not all) of our hawks and owls destroyed as possible, and what has been the result?—disease on every hand among those birds known as *game.* The predominating idea is, that the more *vermin* killed, the greater will the number of our *game* be: assuming, be it observed, that rapacious birds live in opposition to the increase of game,—is such the case? Have those holding these views considered the subject, or have they examined the poor birds killed, so as to prove what they assert? Emphatically *no;* they have not. It appears sufficient for them that they have been told by some one, perhaps as ill informed on the subject as themselves, that hawks kill and eat partridges, grouse, and sometimes the "guidwife's chickens." It would further appear as by no means necessary that they should see the hawks do any of the *misdeeds* themselves; they will sharply tell you, "oh, we ken," or "I have been told they do so," or perhaps they may have read, or been told of the Act of 1457, which provides for the preservation of such wild fowl as were serviceable for use—such "as gainis to eate for the sustentation of man, as pertriches, plovares, and sik like foules," and denounces certain penalties against all who should take their nests or eggs; and provides for the destruction of birds of riefe, such as "ruikes, crawes, eirnes, bissettes, gleddes, mittalles, the whilk destroyes beast, corne, and wild foules." Generally it was enjoined that the said birds of riefe "sall utterly be destroyed by all manner of men, by all engine of all manner of crafts that may be founden;" for, adds the statute, "the slauchter of them sall cause great multitudes of divers kind of wild-foules for men's sustentation."

This, or something similar, I believe, is what our bird destroyers are pleased to take for their guidance; but with all respect for their belief, I fearlessly assert that they are wrong, and that no greater mistake could be, than to suppose that these birds should be exterminated. They are the very life of the feathered creation, and the agriculturist's best friend.

This is no hasty unconsidered expression, but my honest conviction, after, as I have said, many years close attention to the subject. Within the past 10 years 305 rapacious birds have passed through my hands, the stomach of each, as it occurred, having been carefully examined and noted at the time. This may be claimed as a decided advantage over those holding opposite, short-sighted, and often self-interested views, that I have examined the matter for myself, while in most instances they have done

nothing, and can say nothing, but "oh, you need not tell us, we have seen them kill game," ignoring the fact that they also do much good.

From the 305 birds (already mentioned) 9 have to be deducted whose stomachs contained nothing, still we have the large number of 296, comprising 17 different species, who had almost nothing in their stomachs but the remains of creatures more or less injurious to farmers, gardeners, and landed proprietors. Of the above 17 species, 3 were Golden Eagles, whose stomachs contained some lamb's wool and part of a rabbit ; 2 Sea Eagles, who had nothing in their stomachs ; 3 Rough-legged Buzzards, nothing in their stomachs ; 3 Common Buzzards, whose stomachs contained frogs and mice ; 2 Honey Buzzards, having wasps and their larvæ as their food ; 2 Hen-harriers, having each part of a rabbit in their stomachs ; 3 Ospreys, besides their ordinary food, which is fish, each had numbers of beetles in their stomachs,—this, be it observed, is an addition to their food, as far as I am aware, not previously noticed ; 6 Peregrine Falcons, stomach of one contained part of a bird, species undistinguishable, the others had their food too far digested to make out what it might have been ; 2 Hobbys, both of whom had shrews in their stomachs ; 12 Merlins, one had just dined on a linnet, and another on beetles, all the remaining ten having mice and shrews ; 1 Red-legged Falcon, whose stomach was filled with beetles and a mouse ; of 36 Kestrels, three had beetles, 1 grasshoppers, 1 larvæ of different kinds, 1 had 60 caterpillars, 30 grasshoppers, 11 beetles, and 1 earwig—the caterpillars being chiefly those which feed on gooseberry-leaves—another had the fur of a rabbit and beetles, and the remaining 29 had mice and shrews—some as many as 7 mice; of 49 Sparrow Hawks, 6 had small birds in their stomachs, the remaining 43 having all mice and shrews ; of 70 Long-eared Owls, 1 had a small bird, and all the others mice and shrews ; of 80 Tawny Owls, 1 had common earth-worms, 2 had small birds, 1 part of a rabbit, another caterpillars, 1 bits of Scotch fir and beetles, and another a weazel ; 4 had empty stomachs, the remaining 69 having all fed on mice and shrews ; 16 Barn Owls, all having mice of several species ; of 14 Short-eared Owls, one had just breakfasted on a jacksnipe ; all the others had mice.

This (as already stated) is the fruits of ten years' work ; and, as will have been seen, mice constitute the principal food of our rapacious birds. Hence I maintain—in short would demand, as every

one having the good of his country at heart ought to demand—that these animals should not only be spared, but closely protected. Look at the doings of the French in a similar matter, and look at the result; the same may be said of the gardeners in and around London, who lately took to killing the small birds, and the result was the increase to such an extent of several species of flies, that people had their fruit-trees not merely injured, but totally destroyed. To this it may be answered, that we have now got acts of parliament to prevent such doings. Acts have lately been passed which point in the right direction, but fall miserably short of what ought to be.

Let it not be supposed that I am of opinion that hawks do not kill game birds, for this I admit they do, especially the Peregrine; but while admitting it, I hold that they ought to be allowed to live, and for that very purpose, because it is evident their preservation is necessary to keep our game in good healthy condition. This condition is maintained by killing off weakly and sickly birds, and keeping strong ones in watchful healthy motion, since it appears as essentially necessary for the lower orders of creation, and perhaps the higher also, to have some neighbour for whom they require to be on their guard. Shew me a people who fancy that they have subdued all their enemies, and have given themselves up to ease and luxurious living, and you at the same time exhibit a nation dropping into feeble, listless effeminacy, if not absolute decay. So it is with our game; kill off their natural enemies, and you destroy the balance of nature, and disease and death is the sure and natural result. Thus it hath been, and thus it will continue to be, if the present short-sighted policy is continued. An able writer* observes, "If the innocence of infancy is touching, still more so is the even more harmless character which (overlooking carnivorous instincts implanted in certain families for a wise purpose) attaches to the lower animals. It is common, under the influence of prejudice, to do gross injustice to the characters of these denizens of nature's common. *We do not sufficiently reflect on their respectable qualities.*" This is most true, nay, lamentably true as regards our rapacious birds. Again, the same writer says, "The carnivorous animals are simply the police and undertakers of the inferior creation, preventing their too great increase, and clearing off all such as grow weakly and die, ere

* Vestiges of the Natural History of Creation.

they can become in any degree a burden to themselves or a nuisance to other creatures."

Let our rapacious birds live, and the mortality among grouse and partridges will to a considerable extent cease. It appears as something remarkable, the trouble and expense people put themselves to, to provide artificial means for keeping the destroyers of their crops within proper limits. As instances of what I refer to, I may mention the Associations formed (in various parts of the country) for the destruction of wood-pigeons, the number of people employed in killing moles, and the many devices resorted to by gardeners and farmers to protect their fruit and seed crops. If hawks and owls were allowed to live, gardeners would be saved much of the trouble they now have in protecting their fruit from blackbirds, thrushes, and other small birds, nor would they have (as is often the case) their newly sown pease devoured by mice. Farmers would not have half the mice in their stack-yards, nor moles and mice in their fields, and landed proprietors would not have the mortification of seeing (as they frequently do) what was but a short time ago a thriving plantation, now nothing but a lot of dead scrub, and this by an enemy which it is beyond their power to reach, viz., field mice. Let our beautiful owls live, and while owners of plantations are comfortable in bed, these night-birds will range their woods and copses, devouring the destructive little rodents by the dozen, keeping them in check in a far more effectual way than is to the owners possible, supposing they spend thousands of pounds in the attempt, and this too without costing them one halfpenny. It is a true saying, "Give a dog a bad name, and you may hang him;" and thus it is with our hawks and owls, although no one who has studied their habits and mode of living can honestly lay anything to their charge; yet the hand of every person who knows them not is raised against them: strange is it not that blind prejudice would keep men so long from seeing their own true interest! Even so far back as 1769, Pennant, in speaking of the Short-eared Owl, says, "The farmers about Washenbrough are fond of the arrival of these birds, as they clear the fields of mice, and will even fly in search of prey during the day, provided the weather is cloudy and misty." It is evident that even at this time the good sense of those farmers has not extended beyond their own neighbourhood, for I have known instances where over a dozen moles have been got in the nest of a sparrow-hawk by those who had killed the

bird, and this too without the idea ever occurring to those committing such deeds, that farmers' fields would be kept clearer of such creatures, and at much less expense than their present mode of having to feed and pay a person for that purpose. What will not prejudice make men do and say?

If nothing better can be devised, let us return to the good old time when the preservation of "haks" was strictly under the eye of the legislature, when the killing of a hawk or taking of their eggs was visited with three months' imprisonment and the finding of sureties to good behaviour for seven years after; and when the nobles and barons were encouraged in the exercises of hunting and hawking, as forming "the only means and instruments to keep the haill leiges bodies frae not becoming altogether effeminate." At present the "hail leiges" have much need to be careful least they lapse into a state somewhat worse than effeminacy, for they would appear (to use an old Scotch expression) to be "gawn gyte" in their present determination to exterminate all creatures branded with the name of *vermin*. But I hope the dawn of a better state of things is not far distant, when reason will compel grasping man to see that he must act for the general good, and not for himself alone, and to let nature balance herself, never raising his hand against her creatures except when absolutely necessary. Then, and not till then, may we hope for the additions to the food supply, the want of which is so much spoken of at present.

Now, all I ask is, that those holding the opposite opinion in this matter may examine each bird they kill, say for the next twelve months, endeavouring at the same time to lay aside their prejudice, and then candidly give us the result, and their ideas thereon. Grant this, and there is no fear of the issue. Not that the subject would then be finally settled, but that the proper treatment of it would be begun, culminating, I doubt not, in the universal condemnation of the present thoughtless, wasteful, and unnatural custom. Then will men begin to see the beauties of nature, and that "all things work together for good."

As has been remarked, gamekeepers and others think that by destroying rapacious birds game will increase, and as rapacious birds are allowed to multiply, game would proportionately diminish. Now this I deny. And in support of my belief, I would point to those countries where *vermin* (as it is known in this country) is not so persecuted as in our own land. Look at the

Passenger Pigeon of America, as described by Col. Ross King.* He says, "While quartered at Fort Rattlesnake, an old frontier post near Niagara, I beheld the air filled and the sun obscured by millions of pigeons, not hovering about, but darting onward in a straight line with arrowy flight, in a vast mass a mile or more in breadth, and stretching before and behind as far as the eye could reach. The duration of this flight being about fourteen hours, viz., from 4 a.m. to 6 p.m., the column (allowing a probable velocity of 60 miles an hour, as assumed by Mr. Wilson), could not have been less than 300 miles in length, with an average breadth, as before stated, of a mile." Is it possible, I would ask, for such vast multitudes to live if their existence depended upon the extermination of rapacious birds? The question answers itself, and in direct opposition to the extermination theory, for here we have myriads of birds, good for food, living amidst numerous rapacious birds of many species. Turn again to "An Old Bushman,"† and we find (as related by him), game birds of many species living where rapacious birds are seen in vast numbers. See also India, China, and Japan, where pheasants and other game birds abound, where one can easily kill thirty or forty head of game in an hour or two's ramble,—these, be it observed, not mere British battue-birds, which would almost as readily perch on the muzzle of your gun as fly away, but really wild birds, hatched and reared in the bush, where rapacious birds fly in hundreds. Now, in looking to the history of our own island, in former times we find that animals now supposed to be incompatible with the preservation of game were very numerous, and also that game of all kinds were in even greater abundance than at the present time. In short, everywhere we turn, and every way we view this subject, if done impartially, only one conclusion can be arrived at, viz., that our rapacious animals, one and all, should be under strict protection, owing to the immense good they do mankind. Well may every lover of nature long for a return of the old time—

> When the hen-harrier and kite in numbers were seen,
> Circling high, wheeling low, over the heights of Culbleen ;
> And the eagle majestic scoured the country afar,
> From his high eyrie secure upon "dark Loch-na-gar ;"
> When on Morven's bare summit sat the peregrine free,
> And the brown buzzard flew lightly round rough Bennachie ;

* Sportsman and Naturalist in Canada.
† Spring and Autumn in Lapland.

When the bold little merlin, and the sparrow-hawk bright,
Hunted down the wild wood-pigeon, in swift whirring flight;
And the owl lurked secure in the ivy-clad tower,
Sailing forth in the night destructive mice to devour;
When the cunning fox and wild-cat would stealthily creep
Through the brambles and braken, on some braxied old sheep;
When each one played his part in their Maker's great plan,
Dealing forth wisdom, and comfort, and pleasure to man.

Where are they all now? Gone—some of them perhaps for ever! Their dry bones and torn skins hang in the "keeper's museum," and mutely ask those who look upon them (how few, alas! there be that pay attention to, or even comprehend, the silent appeal!)—"Oh, why have you prevented us from doing our appointed work? It would all have resulted in benefiting you in the end!" To this appeal we answer, "May those who have the power, learn wisdom while yet there is time!"

Aberdeen, May, 1874.

MEMOIRS ON SCOTTISH TENTHREDINIDÆ.

By P. CAMERON, Jun.

VI.—NEMATUS VOLLENHOVENI *Sp. n.*

THE subject of the present Memoir belongs to a perplexing group of saw-flies, which closely resemble each other in their larval and perfect states. It has been compared with the descriptions of the species of similar habits described by Hartig, Brischke, v. Vollenhoven, and Thomson, and it does not quadrate with any of them; and such being the case, I think it as well to describe it. I have much pleasure in naming it after my friendly Dutch correspondent, who has done so much to elucidate the life-histories of the saw-flies of Holland.

The *galls* in their general form resemble a cherry; the skin is smooth and glittering; the ground-colour green, or yellowish-green, with, but often without, bright reddish cheeks; and they are sometimes covered with a number of elevations or tubercles, mostly yellowish, which give those so adorned a remarkable resemblance to a strawberry. The cavity in the centre is considerable, the walls are rather thin. Some galls are of an elongated oblong shape. They project from the underside of the leaves, and also slightly through the upper surface. The number on a single leaf varies from one to six; and they are always

situated on the blades, although they may project over the mid-rib. The usual length of the galls is about 4 lines. Frequently there may be observed on the upper surface of the leaves, minute round reddish points,—these I take to be abortive galls. I have only hitherto found galls on *Salix purpurea;* but probably they will occur on other smooth-leaved sallows also.

The *eggs* are deposited during May, just as the leaves are beginning to burst forth; and the galls increase in size in many cases along with them. The egg does not differ from that of *Vallisnieri*, nor from that of any other gall-making saw-flies that I have seen.

The *larva* when young is rather slender, the body glassy white, except when the contents of the food-canal give it a greenish tinge. The head is of a light fuscous-brown, and is covered with a few hairs; the eye-spots deep black; mandibles brown, darker at the apices.

It remains of this colour till it has become full-fed, and is about to quit the gall. The head is then rather small, narrower than the second segment, flattish in front, and of a grey colour, with a tinge of green. Eye-spots black, and a dark irregular oval spot is placed between the eyes, near the top. The mandibles are deep brown, with the palpi white. The feet are grayish-white, with brown claws; the fourteen claspers are of the same colour as the body, but lighter. The body is attenuated, cylindrical, tapering in width towards the anus. Its colour is a shining orange-slate, varying somewhat in different individuals, The segments are well marked, as they project in ridges, and each is divided into three folds.

I have a note of some specimens having a black mark over the anal segment, and of another with the same segment orange while it was young. The larvæ remain in the cocoons till the middle of April, when they change to pupæ, and previous to this the colour becomes much paler. Length 6-7 lines.

Pupa.—On the 26th April I opened one of the cocoons, and found a pupa inside. It was white, with a faint tinge of green; the eyes red. On 5th May the thorax was yellowish, the eyes deep black, mouth brownish, wings white; the feet and antennæ of the same colour, but much more translucent.

The larvæ inside the galls remain curled up somewhat like the form of a J. The frass is of a coffee-brown colour, and is very fine and dry. They do not make a hole for its expulsion like the larvæ of *N. Vallisnieri*, but on the other hand they do

not seem to be such voracious feeders. Neither do they leave the galls until they have become full fed; and I have always noticed that the exit-hole is invariably made too small, so that they have some difficulty in escaping. They walk very fast when outside the galls. The coffee-brown cocoon is longish, scarcely cylindrical, and the silk of which it is composed is very thin. In the breeding-jar they were spun in the earth in masses, one against the other. Some individuals that were confined in a white pill-box spun perfectly white cocoons, while others bored into the cork of the bottle in which they were kept, and formed them there,—the hole hollowed out being exactly of the size of the cocoon.

The flies make their appearance from April to July, and the galls are found from June to October. I am certain that there is not more than one brood in a year, notwithstanding the fact that I have reared the imagos in July from larvæ collected in June. At the Clyde Iron Works, on the banks of the Clyde above Glasgow, the galls are found in thousands, and Mr. Traill has sent me them from the vicinity of Aberdeen.

Imago. Antennæ a little longer than the abdomen, entirely black, or with the apical joints underneath brownish; the third and fourth joints equal, the remainder minutely decreasing in length. Head black, shining, in certain lights appearing as if covered with whitish pubescence; ocelli black; the eyes in some specimens are encircled with brown in the rear. Mouth testaceous white, scarcely pubescent; mandibles black; palpi obscure white, with the bases black. Thorax black, shining; pronotum lined with white, broadly so at the tegulæ, which are of the same colour. Breast black, shining. Cenchri obscure white, often not visible. Abdomen short, thick, and above black, with only a very minute point at the apex testaceous; beneath black, with the apical four or five segments obscure testaceous in the centre; apex angustate, pilose. Feet reddish-yellow, the red predominating; coxæ and trochanters with a decided yellow tinge; tibiæ covered with white down; anterior tarsi, with the joints from the apex of the first, brownish; posterior pair totally brownish-black, as well as the apex of the tibiæ and the calcari. Wings hyaline, but faintly dark throughout, iridescent; costa and nervures pale at the base; stigma totally black or fuscous-black, or with only a very small point at the base fuscous. The nerve of the second sub-marginal cell is usually very faint; the second sub-marginal cell is small

and nearly square; the second recurrent nerve is received into, or very near to, the second sub-marginal nerve, agreeing therein with *N. helicinus* Brischke, which is otherwise quite distinct from it.

The male has the antennæ longer and thicker than in the female, and, moreover, reddish-brown, with the basal two or three joints black. The stigma is larger than in the other sex. Length 2¼-2¾ lines.

N. Vollenhoveni appears to me to come nearest to *N. cinereæ* Retz., Thoms., from which it is distinguished by not having the stigma in the female white at the base, by the abdomen not being so decidedly testaceous beneath, and scarcely so at all above; and by the second recurrent nerve being jointed to the second sub-marginal nerve, or *very nearly* so. In *cinereæ* the recurrent nerve is very perceptibly distant from the sub-marginal nerve in both sexes. In *cinereæ* also the feet are sometimes blackish more or less at the base, which is rarely the case with *Vollenhoveni*. The tarsi of the latter species are also more decidedly blackish, especially the hinder pair. The claws are the same.

I have received from Mr. van Vollenhoven a male of the species described by him under the name of *Nematus viminalis* L. (see *Zoologist* S.S. p. 7721), and I am inclined to regard it as identical with *cinereæ*. It is now impossible to identify with any certainty Linne's gall-making saw-flies, and it is not worth while discussing what species they may be.

N. Vollenhoveni is very much infested with hymenopterous parasites when in the larval condition.

N.B.—To the life-history of *Hemichroa luridiventris* (*ante* p. 158) add: pupa glassy-green, with the exception of the antennæ, wings, and feet, which are white. The insect becomes a pupa at the end of April and enters the perfect state a month after.

To the life-history of *Athalia rosæ* (*ante* p. 197) add: pupa grayish-white, as observed on 25th May.

Turtle Dove (*Columba Turtur*).—On the 28th of May last, an adult female, in fine plumage, was shot at Clifton Park, Roxburghshire. Most likely it would have bred in the neighbourhood—the most forward ova being larger than a pea. Have they been known to breed in Scotland? This is the second turtle dove got in this district lately. *Vide Scottish Naturalist*, II. 70.—ANDREW BROTHERSTON, Kelso.

Egyptian Goose *(Anser Egyptiacus).*—Three of these beautiful birds—a male and two females—were shot out of a flock of seven, on Yetholm Loch, Roxburghshire, on May 22d, 1874.—ANDREW BROTHERSTON, Kelso.

New Localities for some Local Scottish Lepidoptera.—*P. Sttaices* occurs here not unfrequently, but not very plentifully. It seems to be less confined to one spot than the *Zygænæ*, though its head quarters are along with a colony of *Filipendulæ*, as I take single specimens in various places. *M. aurinia (artemis)* has a little colony here too, but it consists of very few members, and is confined to a small piece of moist ground. I have taken *Nola eristulalis* not unfrequently during May.—W. D. ROBINSON DOUGLAS, Orchardton, Castle Douglas.

Scottish Spiders.—The Rev. O. P. Cambridge having kindly furnished me with a list of some spiders which I sent him, which were collected by me last summer in Orkney, Sutherland, and Moray north of the Caledonian Canal (or East Ross), meaning thereby the provinces as defined in the *Scottish Naturalist*, vol. I. pp. 161-2, I am induced to send complete lists of the species collected in these districts, owing to the previous total want of information about their spider *fauna*, even though the lists be but small. *Lycosa agretica* and *Lycosa saccata*, Orkney and Sutherland; *L. rapax*, Sutherland; *L. piratica*, Orkney; *Thomisus cristatus*, all three; *Th. erraticus*, Sutherland; *Clubiona trivialis*, Koch., Orkney and East Ross; *Ciniflo atrox*, Sutherland; *Ergatis benigna*, Orkney and Sutherland; *Textrix lycosina*, Sutherland; *Theridion nervosum*, Sutherland; *Linyphia variegata*, Bl. (= *Neriene variegata* of my previous list), Sutherland; *L. luteola*, Bl., Sutherland and East Ross; *L. alticeps*, Sund., Orkney; *L. reticulata*, Cambr., Sutherland; *L. socialis*, Bl., Sutherland; *L. fuliginea*, Bl., Sutherland; *L. tenuis*, Orkney and Sutherland; *Neriene livida*, Bl., Orkney and Sutherland; *N. pascalis*, Cambr., Sutherland, described in Linn. Transactions as new to science, from a specimen taken by me at Dunkeld; *N. clara*, Cambr., Orkney, just described in Linn. Transactions, from specimens taken on the Cheviots by Mr. Hardy; *N. rubens*, Orkney; *Pachygnatha degeerii*, East Ross; *Epeira quadrata*, Sutherland; *E. apoclisa*, Sutherland; *E. diadema*, Sutherland—all also in East Ross; *E. inclinata*, all three provinces; *E. cucurbitina*, Sutherland; *Tetragnatha extensa*, Sutherland. The following species have been taken by me in "Dee" last year, additional to those recorded for that province in my previous list *(Sc. Nat.*, II., pp. 24-5):—*Lycosa agretica; Lycosa exigua; Clubiona reclusa* Cambr.; *Linyphia alticeps*, Sund.; *Neriene fusca*, Bl.; *N. foveolata*, = *N. elevata*, Cambr.; *Epeira umbratica*. They are all from Braemar, where I have also taken this year *Linyphia rufa* and *Lycosa traillii*. At Ballater I took *Salticus coronatus*. In reference to the list already referred to, I must ask that *Drassus cupreus*, *Clubiona holosericea*, and *C. brevipes* may be deleted from it as being incorrectly inserted, and that there be added to it the following species, new to science, figured and described by Mr. Cambridge in the Linnean Transactions, from specimens sent him by me last summer:—*Clubiona voluta*, Cambr., Aberdeenshire; *Neriene pascalis*, Cambr., from near Dunkeld; *Linyphia lepida*, Cambr., near Dunkeld.—JAMES W. H. TRAILL, M.A.

PHYTOLOGY.

SCOTTISH GALLS.

(Concluded from page 254.)

By J. W. H. TRAILL, M.A.

Salix fragilis L.; S. alba L.—Galls of *Nematus gallicola* on these willows are abundant in all places where I have collected, even to Orkney.

Salix caprea L.—*(a)* Those described in Vol. I., p. 159, are formed by *Cecidomyia capreæ* Winnertz. They are about the size of a large pin-head. They occur also in Perthshire, Forfarshire, and Sutherlandshire. *(c)* This gall occurs on the midribs of the leaves, and is most apparent below. It consists of masses of galls clumped together, and originates in a diseased development of midrib and veins, producing hard woody swellings. Sometimes, though rarely, the galls are separate from each other. Form and size of the masses very variable, but the individual galls are from $\frac{1}{12}'$ to $\frac{1}{4}'$ across. Externally, they are thinly covered with short hairs. Colour —dark green above, yellowish green below. Hard and woody; monothalamous; cavity, small; larva escapes by a small hole in the apex below. Abundant everywhere. *(d)* Galls of *Nematus pentandræ* Retz. = *N. medullarius* H. These consist of a swelling of the petiole (usually towards its base), which becomes twice its proper thickness, and forms an ovate body about $\frac{1}{3}'$ diameter, and $\frac{1}{2}'$ long. Surface, smooth, green, and shining. Structure, hard and woody, enclosing a narrow crooked tunnel in the centre. I am indebted to Mr. Cameron for the name of the species. I found the galls common beside the Gairn and at Lintrathen. *(e)* On the leaves projecting from the upper surface, and forming a small cone on the lower surface. Size, $\frac{1}{16}'$ to $\frac{1}{12}'$ across. Form, irregular. Surface, naked, wrinkled, deep red. Contains a small irregular central cavity, nearly filled with refuse, etc., among which *Phytopti*

dwell. Common in Glen Gairn. *(f)* Rosette-galls, formed by *Cecidomyia rosaria*, occur not uncommonly on *S. caprea*, near Aberdeen. They are at the ends of the twigs, and consist of a kind of rosette of leaves, which differ from ordinary leaves in being sessile and crowded together, forming a noticeable mass, which is still more easily detected in winter, as the leaves of the rosette remain on long after all the other leaves have dropped off. On section, it is found to consist of overlapping leaves, in a bell shape, having at the base a cavity filled closely with hairs, in which live larvæ (one or more). *(g)* Twig-galls consist of swellings on the twigs, more or less distinct, and varying from $\frac{1}{4}'$ to $\frac{3}{4}'$ long, and $\frac{1}{4}'$ to $\frac{1}{2}'$ across. Externally, they are (when dry) naked, slightly ridged longitudinally, and brown in colour. They are woody and thick-walled, but consist of soft fozy tissue, and are polythalamous, each cell being inhabited by one larva of *Cecidomyia*. Sent me from Glasgow by Mr. Cameron; occurs also in Aberdeenshire. *(h)* Consists of Bean-galls on the leaves, resembling in general structure the galls of *Nematus gallicola* on *Salix alba*, but they project rather less from the leaf, and are always green. Common at Fyvie, July, 1873.

Salix aurita L.—On this willow I have found galls, near Aberdeen and at Braemar, which resemble others just described on *S. caprea* so much as to make it useless to describe them specially again. They resemble *(c)*, *(e)*, *(f)*, of *S. caprea*.

Salix cinerea L.—*(a)* Rosette-galls, occur commonly near Aberdeen, and resemble almost exactly those of *S. caprea (f)*. They are also common near Dunkeld and in Sutherland. *(b)* Galls of *Nematus pedunculi* H., occur abundantly from Perthshire northwards to Orkney. They are pea-sized, rounded, and are thickly covered with woolly hairs. *(c)* Twig-galls. These consist of swellings of various degrees (in the twigs) which I have never seen very large. They are most readily detected after the escape of the gall midge (*Cec. salicis* Schranck?) by means of the round hole of exit. Dunkeld and near Aberdeen.

Salix repens L.—*(a)* Abundant wherever the willow occurs from Perthshire to Orkney. *(b)* Similar to *(e) Salix caprea*, but forms a recess alone on the under surface. Common in August in Glen Gairn. *(c)* Twig-galls form swellings on

the twigs $\frac{1}{4}'$ to $\frac{1}{2}'$ long, and $\frac{1}{12}'$ to $\frac{1}{4}'$ across, and tapering at both ends. They resemble the other parts of the twigs externally; internally they are woody and monothalamous—the cavity being pretty large by the time the larva is full fed. Each contains one hymenopterous larva. Found by Mr. W. Vice in Sutherland in August, 1873, and by Dr. Buchanan White in September, 1873, in Braemar.

SALIX PHYLLICIFOLIA L.—*(a)* Occur on the leaves beside the midrib, projecting above, usually one on each side of the midrib, in pairs. Each gall is about $\frac{1}{2}'$ long by $\frac{1}{6}'$ broad and deep on an average, but they vary a good deal. They do not project at all below the leaf. They are monothalamous, cavity being long and narrow, and the walls leathery. Externally they are naked and slightly wrinkled, and the colour is dark green mixed with streaks of reddish-brown. Each contains one saw-fly larva. Abundant in Glen Gairn, &c., along with the next. *(b)* These are Pea-galls on the lower surface of the leaves attached to the midrib and including part of the lamina, being slightly visible on the upper surface. They are slightly flattened, and somewhat irregular—are $\frac{1}{6}'$ to $\frac{3}{8}'$ diameter. Surface naked, smooth or slightly wrinkled, and bright green. Each contains one saw-fly larva. Abundant in Glen Gairn, at Castleton, in Glen Isla, at Lintrathen, &c.

SALIX PURPUREA L.—*(a)* Are Pea-galls attached to the midribs of the leaves below, but slightly visible above. They are rather flattened, and are about $\frac{1}{4}'$ diameter. They have a large cavity in which lives a saw-fly larva. The surface is naked and smooth, green or reddish in colour. Common at Rubislaw near Aberdeen, and at Strachan near Banchory. *(b)* Twig-galls. They occur on the younger (year old) branches, and consist of swellings, which are sometimes 4 or 5 times the normal breadth, and $\frac{1}{3}'$ to $2'$ long. The woody substance of the twig remains unchanged, but the pith is greatly swollen, and is hollowed out into cells separated by partitions. The surface is green like the twig, naked, and smooth or rough. Each gall contains several larvæ of *Cecidomyia salicis* Schranck, which species of midge I reared in the end of May from galls gathered by me in the beginning of May at Strachan near Banchory. I am indebted to Mr. Roy for my first specimens of both these galls.

Betula alba L.—*(b)* The gall consists of a swelling of the midrib, most conspicuous below, and including the origins of the chief veins. When dry, it is light brown (dark at first), nearly smooth, and naked. It is usually nearly cylindrical, but pointed at each end, and measures about $\frac{1\text{-}2}{4}'$ by $\frac{1\text{-}2}{32}'$. Each contains one whitish larva. Dunkeld, Parkhill, Braemar, and Strathnaver (in Sutherland). *(c)* Consists of a blister of the lamina projecting both above and below, so as to inclose a cell. It is usually connected with the midrib, or with a large vein. In shape it is usually oval, $\frac{2\text{-}5}{32}'$ by $\frac{1\text{-}3}{32}'$ when single, but frequently two or more are united. The surface is covered with short hair like the rest of the leaf. The gall is green in the centre, and purple round the sides. The walls are thin ; the central cavity large. Each is tenanted by a larva of *Cecidomyia*, which, when mature, emerges through the lower surface. Common in July and August at Parkhill, Fyvie, Braemar, Sutherlandshire, etc., chiefly on bushes. *(d)* On the same bushes with the last, the buds at the tips of the branches were frequently swollen, and were always in such cases inhabited by the larvæ of *Cecidomyia*, possibly the same as the last.

Alnus glutinosa L.—Both the galls on this tree described by me are formed by *Phytopti* (four-footed mites). Both are abundant everywhere, even to Orkney.

Pinus sylvestris L.—The galls of *Oribata geniculata* have already been commented on by Mr. Norman (*Sc. Nat.*, I. 55). They form rounded swellings on the twigs, $\frac{1}{4}'$ to $\frac{1}{2}'$ in diameter. Internally they are compact, and woody in the centre, with a layer of loose cellular tissue surrounding this, and in the cellular tissue are cavities in which dwell the mites, *Oribata geniculata.* Sent me from Dunkeld by Dr. Buchanan White. I have found them near Ballater, and near Inverury.

Pteris aquilina L.—The galls on this plant consist of the ultimate pinnules, the margins of which are revolute and fleshy. Sometimes one margin is affected, sometimes both. At first the colour is only a little yellower than natural, but ultimately it becomes yellow, and passes then through various shades of brown to black. Each is tenanted by one larva of *Cecidomyia pteridis* Müll., which drops to earth when mature. About Aberdeen, and at Lintrathen, Dunkeld, etc.

ATHYRIUM FILIX-FŒMINA Bernh.; NEPHRODIUM FILIX-MAS Rich.—On these ferns occur pseudo-galls resembling a crumpled-up fern frond, and forming masses ½′ to 3′ in diameter, outwardly resembling the rest of the frond in colour. Each consists of a frond which never unrolls, owing to the midrib being affected. In the interior, the tip of the frond is found in a black decaying condition. In this black stuff lie several larvæ of *Anthomyia* (?). At Parkhill, Dunkeld, Lintrathen, near Glasgow, etc.

(Conclusion.)

LIST OF FUNGI FOUND WITHIN THE PROVINCE OF MORAY CHIEFLY IN THE VICINITY OF FORRES.

(Continued from p. 250.)

BY THE REV. J. KEITH, M.A.

(47). TREMELLA, Fr.

397. Foliacea, P. On trunks of birch, fir sticks, &c. In large masses at Dunphail.
398. Lutescens, Fr. On a stick at Manse of Dallas, and on a stump at Springfield.
399. Mesenterica, Retz. On sticks, especially of broom and whin. Common.
400. Albida, Huds. On fallen branches. Common.
401. Tubercularia, Berk. On sticks. Common. Dunphail, &c.

(48). EXIDIA, Fr.

402. Recisa, Fr. On willow branches in the ruins of the castle of Loch-an-Eilan.
403. Glandulosa, Fr. On oak sticks. Frequent.

(49). NÆMATELIA, Fr.

404. Encephala, Fr. On fir sticks and rails. Common about Forres, and at Rothiemurchus.
405. Virescens, Corda. On furze branches. Common.

(50). DACRYMYCES, Nees.

406. Deliquescens, Dub. On fir sticks. Common.
407. Stillatus, Nees. On fir stumps and rails. Common.
408. Chrysocomus, Tul. On fir sticks.

(51). RHIZOPOGON, Tul.

409. Rubescens, Tul. In fir woods and mossy ground from Forres to Rothiemurchus, where I observed it bursting through the soil in a footpath on a hill side at the altitude of 2000 feet.

(52). PHALLUS, L.

410. Impudicus, L. Woods and waste ground. Common.

(53). GEASTER, Mich.

411. Bryantii, Berk. Found once on Blervie Hill by Mr. Martin.

(54.) BOVISTA, Dill.

412. Nigrescens, P. Pastures. Common—especially in the uplands.
413. Plumbea, P. Pastures. Common.

(55.) LYCOPERDON, Tourn.

414. Cælatum, Fr. Pastures. Common about Forres.
415. Saccatum, Vahl. Hollow in wood behind Old Blairs.
416. Gemmatum, Fr. Pastures. Very common.
417. Pyriforme, Schæf. On and around trunks. Common.

(56). SCLERODERMA, P.

418. Vulgare, Fr. Woods and shrubberies. Common. Brodie, Kinloss, &c. (Var Macrorhizum, Fr. Brodie.

(57). LYCOGALA, Mich.

419. Epidendrum, Fr. On stumps. Common.

(58). RETICULARIA, Bull.

420. Umbrina, Fr. On stumps, &c. Common.

(59). ÆTHALIUM, Link.

421. Septicum, Fr. On stumps, &c. Very Common.

(60). SPUMARIA, Fr.

422. Alba, D. C. On living grasses. Common.

(61). PTYCHOGASTER, Corda.

423. Albus, Corda. On and around fir stumps and posts. Darnaway, Chapelton, Clunyhill, &c.

(62). DIDERMA, P.

424. Vernicosum, P. On grassy turf. Dr. Innes.

(63). DIDYMIUM, Schrad.

425. Nigripes, Fr. On rotten sticks in Altyre wood.

(64). PHYSARUM, P.

426. Nutans, P. On chips. Sanquhar.
427. Album, Fr. On decayed straw, thistle stems, etc.

(65). STEMONITIS, Gled.

428. Fusca, Roth. On rotten wood. Common.
429. Typhoides, D. C. On rotten stump in Greeshop wood.

(66). DICTYDIUM, Schrad.

430. Umbilicatum, Schrad. On decayed stump in Island at Waterford.

(67). CRIBRARIA, Schrad.

431. Argillacea, Pers. On sawdust at Rothiemurchus and Dallas.

(68). ARCYRIA, Hill.

432. Punicea, P. On chips. Sanquhar.
433. Incarnata, P. On rotten wood. Common.

(69). TRICHIA, Hall.

434. Fallax, P. On sawdust at Rothiemurchus in abundance.
435. Clavata, P. On rotten wood. Common.
436. Cerina, Ditm. On rotten wood. Dunphail.
437. Chrysosperma, D. C. On rotten wood. Common.

(70). LICEA, Schrad.

438. Cylindrica, Fr. On rotten stumps. Common.
439. Fragiformis, Fr. On rotten stumps. Very common.

(71). CYATHUS, P.

440. Striatus, Hoffm. Gordon Castle Gardens.
441. Vernicosus, D. C. Stubble and turnip fields.

(72). CRUCIBULUM, Tul.

442. Vulgare, Tul. On sticks, straws, etc. In great abundance on sawdust at Loch-an-Eilan.

(73). SPHÆROBOLUS, Tode.

443. Stellatus, Tode. On a fir stick at Loch-an-Eilan.

(74). LEPTOTHYRIUM, Kunze.

444. Ribis, Lib. On leaves of red currant in Manse Garden.

(75). DILOPHOSPORA, Desm.

445. Graminis, Desm. On Holcus leaves in Greeshop wood.

(76). VERMICULARIA, Tode.

446. Atramentaria, B. and Br. On decayed potato stems.

(77). PILIDIUM, Kunze.

447. Carbonaceum, Lib. On willow branches, Sanquhar.

(78). SEPTORIA, Fr.

448. Heraclei, Fckl. On fading leaves of Heracleum.
449. Ægopodii, Desm. On living leaves of Ægopodium.
450. Hederæ, Desm. On ivy leaves.
451. Fraxini, Desm. On ash leaves.

(79). PROSTHEMIUM. Kunze.

452. Stellare, Ries. On alder in Greeshop wood.

(80). TORULA, Pers.

453. Ovalispora, Berk. On fallen branches, Sanquhar.
454. Pulveracea, Corda. On stumps, Sanquhar.

(81). SPEIRA, Corda.

455. Toruloides, Corda. On a sloe stick, Sanquhar.

(82). BISPORA, Corda.

456. Monilioides, Corda. On a stump in wood at Suspension Bridge.

(83). PHRAGMIDIUM, Lk.

457. Mucronatum, Link. On rose leaves. Common.
458. Bulbosum, Schl. On bramble leaves. Very common.
459. Gracile, Grev. On raspberry leaves. Common.
460. Obtusum, Link. On leaves of Potentilla fragariastrum at Cothall.

(84). TRIPHRAGMIUM, Lk.

461. Ulmariæ, Lk. On leaves of Spiræa ulmaria. Common.

(85). PUCCINIA, Pers.

462. Graminis, P. On grass and corn leaves. Very common.
463. Striola, Lk. On carices.
464. Menthæ, P. On mint leaves.
465. Compositarum, Sch. On leaves of Crepis, etc.
466. Syngenesiarum, Link. On leaves of thistles.
467. Glomerata, Grev. On Senecio jacobæa.
468. Variabilis, Grev. On dandelion leaves.
469. Heraclei, Grev. On Heracleum leaves.
470. Ægopodii, Link. On gout-weed leaves.

471. Anemones, Pers. On anemone leaves.
472. Calthæ, Lk. On leaves of Caltha palustris.
473. Violarum, Lk. On violet leaves.
474. Circeæ, P. On Circea alpina, Dunphail.
475. Fabæ, Lk. On bean leaves, and on leaves of Orobus tuberosus at Grantown.

(86). PODISOMA, Lk.

476. Juniperi-communis, Fr. On living branches of juniper.

(87). USTILAGO, Link.

477. Carbo, Tul. On ears of corn and grasses.
478. Longissima, Tul. On Poa leaves.

(88). UROCYSTIS, Rabh.

479. Pompholygodes, Schlecht. On anemone leaves.

(89). UROMYCES, Lev.

480. Apiculosa, Lev. On clover leaves and stalks.
481. Ficariæ, Lev. On Ranunculus ficaria.
482. Intrusa, Lev. On Alchemilla vulgaris.

(90). COLEOSPORIUM, Lev.

483. Tussilaginis, Lev. On coltsfoot.
484. Pingue, Lev, On rose leaves.
485. Rhinanthacearum, Lev. On leaves of Melampyrum at Sanquhar, and of Euphrasia at Rothiemurchus.

(91). MELAMPSORA, Cast.

486. Salicina, Lev. On Salix caprea.
487. Betulina, Desm. On birch leaves.
488. Tremulæ, Tul. On aspen leaves.
489. Populina, Lev. On leaves of Populus nigra.

(92). CYSTOPUS, De Bary.

490. Candidus, Lev. On cruciferæ.

(93). UREDO, Lev.

491. Caryophyllacearum, Johnst. On Stellaria and Cerastium.
492. Vacciniorum, P. On Vaccinium myrtillus.
493. Bifrons, Grev. On Rumex acetosa.

(94). TRICHOBASIS, Lev.

494. Pyrolæ, B. On winter green.
495. Petroselini, Berk. On Heracleum sphondylium.

496. Oblongata, B. On Luzulæ.
497. Suaveolens, Lev. On thistle leaves.

(95). LECYTHEA, Lev.

498. Saliceti, Lev. On willow leaves.
499. Lini, Lev. On Linum catharticum, Rothiemurchus.

(96). RŒSTELIA, Reb.

500. Cornuta, Tul. On leaves of mountain ash. Very abundant and very fine at Rothiemurchus.
501. Lacerata, Tul. On leaves, petioles, and fruit of hawthorn.

(97). PERIDERMIUM, Chev.

502. Pini, Chev. Found once, but in abundance, in Sanquhar wood.

(98). ÆCIDIUM, Pers.

503. Berberidis, B. On leaves and fruit of berbery. Common.
504. Crassum, Pers. Var. periclymeni, D. C. On leaves of honeysuckle. Grangehall and Sanquhar woods.
505. Ranunculacearum, D. C. On celandine. Common.
506. Grossulariæ, D. C. On leaves and fruit of gooseberry.
507. Urticæ, D. C. On leaves and stems of nettles.
508. Compositarum, Mart. Var. Taraxaci, Grev. On dandelion. Var. Tussilaginis, Pers, On leaves of coltsfoot. Very common. Appearing early in spring.
509. Violæ, Schum. On leaves and petiolcs of violet.

(99). ANTHINA, Fr.

510. Flammea, Fr. On fallen beech leaves at Dunphail in abundance, late in autumn.

(100). ÆGERITA, P.

511. Candida, P. On damp decaying wood. Greeshop and Sanquhar.

(101.) DENDRYPHIUM, Corda.

512. Laxum, B. and Br. On dead potato stems.

(102.) MONOTOSPORA, Corda.

513. Megalospora, B. and Br. On an old stump in Greeshop wood.

(103.) HELMINTHOSPORIUM, Link.

514. Smithii, B. and Br. On dead holly twigs at Roysvale.
515. Macrocarpum, Grev. On broom sticks. Sanquhar.
516. Velutinum, Lk. On rotten sticks.
517. Apiculatum, Corda. On an Ivy stick, Cothall.

(104.) TRIPOSPORIUM, Corda.

517.2 Elegans, Corda. On sticks. Dunphail.

(105). CLADOSPORIUM, Link.

518. Herbarum, Lk. On decaying stems, leaves, &c. Very common.
519. Dendriticum, Wallr. On pear-leaves and blossoms. Pitgaveny.
520. Depressum, B. and Br. On Angelica leaves.

(106). SPORODUM, Corda.

521. Conopleoides, Corda. On dead grasses. Common.

(107). ASPERGILLUS, Mich.

522. Glaucus, Link. On cheese, &c. Very common.

(108). PERONOSPORA, De Bary.

523. Infestans, Mont. On potatoes.
524. Nivea, Ung. On leaves of Angelica Sylvestris in Greeshop Wood.

(109). POLYACTIS, Link.

525. Vulgaris, Link. On decayed herbaceous stems. Common.
526. Cana, Berk. On decaying stems and leaves.
527. Cinerea, Berk. Springing from Sclerotium durum. On a stick in Clunyhill.
528. Fascicularis, Corda. On decaying leaves. Sanquhar.

(110). PENICILLIUM, Link.

529. Crustaceum, Fr. On decaying apples, &c. Very common. (Var. Coremium. Common).

(111). OIDIUM, Link.

530. Fructigenum, Schrad. On a decaying Agaric.

(112). DACTYLIUM, Nees.

531. Dendroides, Fr. On decayed fungi. Common.

(113). SPOROTRICHUM, Link.

532. Laxum, Lk. On cow dung.

(114). ZYGODESMUS, Corda.

533. Fuscus, Corda. On decaying bark. Mondole.

(115). VIRGARIA, Nees.

534. Nigra, Fr. On dead trunks. Sanquhar.

(116). CHÆTOPSIS, Grev.

535. Wauchii, Grev. On a decayed stick. Sanquhar.

(117). SEPEDONIUM, Link.

536. Chrysospermum, Lk. On decaying Boleti.

(117). FUSISPORIUM, Link.

537. Betæ, Desm. On decaying turnip. Dr. Innes.

(119). MUCOR, Mich.

538. Mucedo, L. On preserves, etc. Common.
539. Fusiger, Link. On decaying Agarics.
540. Tenerrimus, Berk. On broom twigs. Sanquhar.

(120). PILOBOLUS, Tode.

541. Crystallinus, Tode. On cow dung. Sanquhar.

(121). HYDROPHORA, Tode.

542. Stercorea, Tode. On dung. Sanquhar.

(122). LASIOBOTRYS, Kunze.

543. Loniceræ, Kunze. On leaves of honeysuckle. Darnaway Woods. Drs. Hooker and Greville.

(123). SPHÆROTHECA, Lev.

544. Pannosa, Lev. On rose leaves. Common.

(124). PODOSPHÆRIA, Kunze.

545. Kunzei, Lev. Var. Myrtillina. Kunze. On Vaccinium myrtillus at Dunphail.

546. Berberidis, Lev. On berberry leaves. Common.
547. Grossulariæ, Lev. On gooseberry leaves.

(125). ERYSIPHE, Hedw.

548. Graminis, D. C. (conidüferous, Oidium monilioides). On grasses. Common.
549. Communis, Schl. On leaves of Ranunculaceæ. Common.

(126.) CHÆTOMIUM, Kunze.

550. Elatum, Kunze. On mouldering straw. thistle stems, &c.

THE FUNGUS SHOW.

THIS we hope will become a reality. The meeting alluded to in our last number was duly held, and there was a good attendance. Professor Ogilvie was called to the chair, and Mr. Roy appointed clerk. A number of letters from all parts of the kingdom, heartily approving of the scheme, were read. A committee, consisting of Professors Dickie and Ogilvie, Rev. Messrs. Fergusson and Beverley, Messrs. Roy, Rennie, and Reid (and subsequently Dr. Buchanan White, and Rev. Messrs. Keith, Anderson, and Stevenson), were appointed to make arrangements. The day of exhibition has not yet been fixed, but it will take place in the second or third week of September, and parcels must be sent to the Music Hall Buildings, Aberdeen, the day before the day of exhibition. From the promises made there is no doubt but that the exhibition will be successful. Intending exhibitors and those interested may learn further particulars from Mr. Roy, 3 Loanhead Place, Aberdeen, or from any member of the committee. The exhibition, it is contemplated, shall be held each year in a different town; it is also in contemplation to form a Scottish Mycological Society for the promotion of the study of Fungi, and a meeting to consider the propriety of this will be held in Aberdeen at the time of the exhibition. By the way, it may be of use to intending exhibitors to mention that Fungi ought each to be wrapped in a separate piece of paper when being packed to be forwarded for exhibition.

VARIOUS NOTES.

We lately noticed the formation of a Naturalists' Field Club in Dundee; it is now our pleasant duty to record the institution of the "Ross-shire Field Naturalists' Club," which took place on April 20th. The President is Sir K. S. Mackenzie, Bart., of Gairloch, and the Hon. Secretary is Dr. Middleton. The objects of the Club are to investigate the natural history of the North of Scotland, and of Ross and Cromarty in particular. The Club is to have a library, and, if possible, a local museum, which, projected at Strathpeffer, will be in connection with it. We wish the new Club all success. The members have a grand and almost unworked field to labour in, and as their Society is the most northerly one in Britain (the one that once existed in Orkney having apparently disappeared), they will occupy a somewhat conspicuous position, and will be expected to render a good account of their labours.

The West, too, is wakening up. We have already alluded to the good work done and doing by the Glasgow Naturalists' Club; now the Rothesay Society are forming an Aquarium on a somewhat large scale. In our next number we hope to be able to give full particulars.

The second part of the transactions of the Glasgow Society of Field Naturalists is before us. It is well got up, and though few of the papers read at the meetings of the Club are given at length, yet there is evidence of a lot of work having been done. There is an exhaustive article on Scottish *Cynipidæ*, by Mr P. Cameron, jun., and an interesting account of an excursion to Ben Lawers, by Mr. James Allan, which should have the effect of making all young botanists who read it long to rush off to that monarch of mountains.

GEOLOGY.

THE EARN VALLEY.

By F. SMITH.

(Concluded from page 269.)

THE beds were next examined where they form a cliff across the north end of "Moncreiffe Pocket" (F). Here the peat bands vary in thickness, sometimes thinning out, at other times developing to 12 inches of compact peat. Nor are the clay and marl bands always so marked. In some places the clay is more dominant than in others. The sand and gravel beds also vary in thickness from 5 to 8 feet, with sometimes larger pebbles at bottom. The bed of red and blue clay is not so fully developed here as where first examined, *i.e.*, it is not of so great a height above the river level. Where this clay band deposit is exposed to the drying effects of the atmosphere it exhibits a beautifully laminated structure, ten laminæ being counted to the inch. The laminæ are somewhat contorted, as shown in Plate IV., D. One might almost believe that the gravel-bed above was contorted too, but the somewhat acute angles exhibited in the deposition indicate an origin in irregularly running water. A square foot, marked out by my stick, is also sketched in Plate IV., C. The peat band is situated within 5 feet of the top of the bank, and superimposed upon a bed of clay that overlies the gravel zone. The whole bed, however, above the gravel, is here filled with vegetable remains, principally of a reed that, I believe, from certain indications, grew upon the spot. I also procured several indeterminate pieces of wood, with a piece of bark of *Pinus sylvestris;* also several portions of the underground parts of the common marsh plant *Equisetum.* These are not generally the portions of a plant likely to be drifted. Also, immediately above the gravel, several *dicotylodenous* tree leaves and hazel-nuts.

One of the most interesting objects obtained here is the elytron of a beetle. It was taken from the cliff by Dr. F. Buchanan White, who kindly informs me, that "upon examining the elytron, I thought it belonged to *Donacia*, a genus of beetles that is found upon plants growing in shallow water, or in marshy places, but not a water-beetle. I sent it to my friend Dr. Sharp, who says, it agrees very well with *Donacia nigra*, but the sculpture is perhaps a little coarser than in that species. *D. nigra* has not been recorded from Scotland, although it is found in England, and occurs rarely in Scandinavia."

One striking feature in these beds is the presence of a large quantity of iron. In some cases thin compact sheets of this mineral occur, in others, friable oxides, but the sand and pebbles are often so solidly cemented that they look like masses of ironstone. All the springs in the lower portion of the valley are highly charged with this mineral, and where these pass through shallow drains, much of the iron is thrown down through evaporation, and oxide produced by the decomposition of certain salts of iron, sulphate and carbonate, &c., by the decaying vegetable matter. Plants in the water-courses become quite coated with red oxide. I believe Pitkeathly derives its mineral waters from these beds.

Opposite the dead-water, **B**, the cliff presents the same appearance and a corresponding sequence to that already examined. Thence I proceeded to **E**. Here the vegetable stratum is well seen, but is somewhat uncertain, rising and falling in broken undulations. Several large tree-trunks were protruding from the vegetable layer, and several had fallen, and were stranded on the pebble-bed. One of these was undoubtedly birch *(Betula alba)*, the others looked like oak, but this could not be determined. One was marked with a spiral groove, as though it had been firmly bound by a powerful climber. Some exogenous leaves were also found, with more hazel-nuts, and a nut of a smaller kind. I had before noticed blackened tree-boles lying in the bed of the stream much lower down.

The High Haugh is here only 17 feet above the river. I had endeavoured to make out that this had been deposited horizontally, *i.e.*, that it did not follow the gradient or fall of the valley. This lowered condition of the Haugh was favourable to that view, but it became less and less tenable as I proceeded. It was easily seen that it had been denuded in its upper beds.

The point now reached is the extreme western end of the map (Plate III). So far I had been uncertain of the origin of this higher haugh although the truth had begun to dawn. I proceeded from this spot to about a quarter of a mile higher up where the High Haugh pushes the river into a narrow limit on the north side of the valley at a point below Dupplin, whence it (the haugh) suddenly deflects in a grand curve to the extreme south side of the alluvial plain towards Forteviot, so that it forms a promontory upon the lower level.

Here the section is a sudden contrast to all that has hitherto been seen. The upper portion is clay like that before noticed, but there is evidence of its having been denuded from above. The vegetable zone is also seen, but somewhat meagrely. The sand bed is almost altogether absent, and gives place to an immense bed of well-rolled pebbles similar in every respect to those that form the pebble accumulations of the lower haugh. This pebble bed is so impregnated with iron that it is an almost solid mass, and has proved an impediment to the denudation of this portion of the upper haugh of which it is a part. For this reason the river has remained pent up within the nase and the high-lying ground on the north, whilst in other parts it has gone from side to side of the valley over and over again. The river has done its best to bring down the barrier, having eaten away all the High Haugh where the low track occupies the valley both above and below. It has even repeatedly during spates rushed over it, denuding its upper stratum of clay. But it has resisted all attacks, and remains to make clear the High Haugh's origin.

In order to appreciate a part—I may not, perhaps, say all—of what we have seen in our valley, of the river and its mode of denudation, of the pebble-beds of the lower and the higher Haughs, and of their respective strata, we must take our backward way among the years—the wondrous, nameless years—that hold our world's great history. Yet, as we have to deal only with the valley of the Earn, we need not scour the earth from end to end, but just turn over one short page, and read the closing lines of the pre-historic record. This will take us back to a period when the British Islands were bound beneath the hand of a continuous winter—when, higher than the mountains, glistened the eternal ice—when every group of hills became a centre from which the glaciers crept adown the valleys and across the plain with never-ceasing progress to the sea. These

ice areas were formed by the slowly accumulated rainfalls or snowfalls of repeated years. They originated, as do ice-fields now in Arctic spheres, where

> "For ever grows,
> Amid a region of unmelting snows,
> A monument—where every flake that falls
> Gives adamantine firmness to its walls."

And as they made their profound march across the hills and down the greater valleys, the clouds fulfilled their mission, and the snows renewed the glittering bergs that ocean bore away. This mighty agent moulded itself to every undulation of the land, and yet it glided on. Its foot was heavy, and its will supreme. Rough ways were made smooth: the ice tore off projecting masses and made of them tools, and the most unyielding rocks were sculptured in a style peculiar to that icy hand. Huge grooves, and delicate lines, and polished surfaces everywhere abound, in evidence of the ice's handiwork. Moreover, the tools that the glaciers used are scattered over the country (also sculptured as described), lying upon, or mixed with, immense patches of the chippings and grindings from this great labour. Many attempts have been made to explain the existence of this intense cold, but all the hypotheses are giving way before the noble diction of Astronomy. This "precession of the Equinoxes" doubtless is the sounding line of these climatic changes. The increase of cold was not suddenly brought about: the Pliocene period is the shadow of the coming event, leading on to glacial times, as the autumn leads to winter. Nor was the glacial period one unbroken epoch of ungenerous rigour. It doubtless lasted long, very long; but there were genial intervals, and these not of short duration, when the vegetation slowly renewed its reign upon our soil, when the animals retraced their steps into the northern regions (Britain probably was not then an island), and even the neolithic man returned to scenes from whence the ice had driven him. Nor is this the extent of change that then took place. The land sank down beneath the sea till the Atlantic rolled among an Archipelago of ice, whence the bergs broke loose to drop the stolen portions of the land wherever they might go. This Arctic Ocean reached at its highest considerably above 2,000 feet. How long it remained at this elevation it is impossible to say; certainly it did subside, not suddenly, but by halting stages. In Ireland four distinct resting heights have been pretty decidedly made

out. In Britain, also, distinct heights at which ancient Arctic beaches occur are well made out, the lowest of which is the 25-feet beach that runs somewhat regularly around both Britain and Ireland.

It should be clearly understood that there were milder periods during this glacial era. Sometimes, as in Lanarkshire, well-stratified deposits occur in which are found the remains of both plants and animals, and yet these are superimposed upon and overlain by glacial drift. Sometimes lake deposits are found in similar positions containing like remains. We have been taken thus far back in geologic history for an unexplained reason, except that that is apparent in believing that our valley was subjected to the grinding and grooving and deepening processes of the glaciers, and that it indeed suffered many changes before its present features were moulded! The reason, however, of this review of the glacial phenomena is that the evidences of land-ice are apparent everywhere in the valley above the level of the higher haugh. From the margin of this haugh on both sides of the valley a thick stratum of boulder clay commences and continues almost unbroken up the steeps for hundreds of feet. This is filled with ice-dressed and some scratched and polished pieces of stone, consisting of Gneiss and Schistose rocks, traps of many kinds, and sandstones, that seem to have come from a north-western direction. Some of these stones are boulders of vast size, weighing many hundreds of pounds. I have not found any such fragment upon the higher or the lower haugh, neither anything like a pebble, excepting in the pebble zones in the haugh beds. At the close of this remarkable series of events, when our northern landscapes emerged from the ordeal with their characteristic features newly moulded into what we now see them, the historic alluvial deposits began to be arranged out of the heterogenous materials that coated the mountain sides and lay thickly spread upon the floor of the valleys. Our Earn then began to be a river—at first a very fickle stream indeed, decreasing in size in the winter and swelling into a very sea in the summer by the melting of the remaining alpine ice. Then the boulder clays and drifts underwent a good deal of disturbance and re-arrangement, making confusion in many instances worse confounded, mixing up deposits of different dates into one untranslatable mass. But the Earn became at last a river subject only to the rising and falling, that results from the rains and the droughts of the seasons, and

then the higher haugh began to be constructed out of the glacial débris, *just as the lower haugh is now being constructed out of the higher.* We have but to see the bed of the river on a level with the top of the red and blue clay band deposits—that is, some twenty feet or more higher than the bottom of the present stream, and there can be no difficulty in believing that the higher and lower haughs both are re-arranged glacial deposits sifted and sorted over and over again through the long, long years, by the waters that come down the valley. The pebble beds are the well rolled fragments of what were massive angular, scooped, and scarred pieces, such as now abound on either side of the valley, in the boulder clay of the higher reaches. The examination of the present river of the lower and the higher haughs testifies to the truth that the comparatively little stream, the Earn, has wrought a great work since it became a river, and is still carrying that great work on. I must, however, be brief. In the higher haugh, there is a fine clay at the top, passing downwards through stratified silt into sand and pebbles, and finally into positive pebble-banks. The lower haugh consists of fine clayey soil (coarser than that above, from constant washing), which passes down through stratified silt and gravel, which merges into vast pebble-beds. In the higher haugh is the remains of a once extensive forest. The trees, I am persuaded, are not mere drifted trunks, but grew and fell where they are lying. Such a forest would readily spring up upon the sand-bed upon which they occur; but I do not think the peat layer was formed by the trees. I presume to think it more probable that some climatic change, or some alteration in the general level, induced a growth of moss, when the trees, dying, fell down gradually where they stood, and were enveloped in the moss. Possibly the two conditions may have existed in the valley together, but never in the same spot at one time. I have seen the embedded trunks without the peat, and the peat without the trees, and the two together. I was very pleased to see in a clay pit at the foot of Fechney School, just outside Perth, what I doubt not is a continuation of, or rather a sequel to, the higher haugh in the Earn valley. There was the same clay and the same vegetable zone uncovered. One large trunk lay down, just as trees often fall, with its head much lower than its rooted end. Another had broken off short, so that its base stood upright in the clay. Below this, I doubt not, the sand-bed might be reached. A portion of a tree in

Dundee Museum drew my attention. Upon inquiry, I found that it was dug up near the Albert Institute. It bears a striking resemblance to the wood of the Earn beds, with which I could not help associating it.

The red and blue bed of clay is much older than the haugh deposit, being related, I think, to the Errol beds. I should not, I fear, have represented it as overlying the boulder clay, it being an earlier (estuarine ?) deposit. Its contortions may have resulted from the pressure of moving ice above. It is, however, entirely free from ice-blocks or positive disturbance; but it is impossible to say how much of it has been removed, seeing that even now the river is removing, from 12 feet above to the bottom of the stream, 20 feet or more of this deposit. It must not be forgotten that the river has been constantly cutting itself a lower channel, ever since it first began to work upon the glacial *débris*.

In the transverse section of the valley (Plate IV.) the figures refer as follows :—1, Old Red Sandstone, dipping towards the north; 2, Boulder Clay; 3, Higher Haugh, or rearranged glacial material; 4, the Red and Blue Clay that ought perhaps to underly (in section) the Boulder Clay; 5, Lower Haugh; and 6, the River.

Very little is said about the Earn valley in this paper. Much more might be said, but I know not whether I may have an opportunity of making further observations.

N. B.—By a most untoward accident, the rule—line 14, page 266—was inversely stated. It was, however, I doubt not, easily corrected by every reader. It should be :—*The river denudes the outer bank of a curve and restores the inner.*

That the shifting of the river is sometimes a rapid process, further evidence is adduced. In a map of the Basin of the Tay, dated 1831, by James Knox, the dead-water D is indicated only by a bend in the stream at its western extremity, so that the river crept over an immense piece of land, wrapping the whole of the north side of D, between the years 1831 and 1845, when the circle was completed and the water broke through, leaving the dead-water which has since filled up. B seems to be indicated by a bend in the stream to the north. This dead-water may also have been formed and cut off since 1831. Other movements are indicated. The Caledonian Railway Coy. should look to Forgan Bridge, for in the effort to protect the central iron columns, the bed of the stream has been filled with trap, which has caused a pebble-bed to accumulate: This is throwing the water on to the west bank, which is rapidly going, and the line being neared.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 284.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

RUSINA Boisd.

TENEBROSA Hb. Common. Nemoral, pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-April. FOOD-PLANT. Low plants.

STILBIIDÆ.

STILBIA Stph.

ANOMALA Hw. Locally common. Ericetal. Ascends to 1200 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°50″-58°30″. RANGE IN EUROPE. Britain, France, west-central Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE — IMAGO. August, September. LARVA. January, February. FOOD-PLANT. Grasses.

CARADRINIDÆ.

CARADRINA Ochsen.

MORPHEUS Hufn. Not common. Pascual, nemoral.

DISTRIBUTION—EAST. ♀♂ Forth Tay Dee o o o o
WEST. ♀♂ Clyde o o o

LAT. 55°40″-57°10″ RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Low plants.

ALSINES Brahm. Not common. Pascual, nemoral.

DISTRIBUTION—EAST. ♀♂ Forth Tay o Moray o o o
WEST. ♀♂ ♀♂ o o o

LAT. 55°50″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. September-April. FOOD-PLANT. Low plants.

This and the next species, though quite distinct, are very similar. The chief points of difference are in the colour, *alsines* being more ochreous, *taraxaci* obscurely purplish, dusted with white towards the costa, and with the markings not conspicuously darker.

TARAXACI Hb. (1793); *blanda* Tr. (1825). Not very common. Pascual, nemoral.

DISTRIBUTION—EAST. ♀♂ Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀♂ o o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central (to South Sweden?) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-April. FOOD-PLANT. Low plants.

QUADRIPUNCTATA F. (1775); *cubicularis* Bkh. (1792). Abundant. Agrestal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♂
Orkney ♀♂
WEST. Solway Clyde Argyle ♀♂ ♀♂

LAT. 54°40″-59°10. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-August. LARVA. September-May. FOOD-PLANT. Low plants, corn, peas, etc.

GRAMMESIA Stph.

TRIGRAMMICA Hufn. (1767); *trilinea* Bkh. (1792). Rare. Pascual.

DISTRIBUTION—EAST. ♂ o [Tay] o o o o o
WEST. Solway o o o o

LAT. 54°50″-[56°40″]. RANGE IN EUROPE. Central (to S. Sweden?) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September?-May. FOOD-PLANT. Low plants.

LEUCANIIDÆ.

LEUCANIA Ochsen.

CONIGERA F. Not uncommon. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST. Solway Clyde ♂ West-Ross o

LAT. 54°50″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Grasses.

LYTHARGYRIA Esp. Common. Pascual, nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ o o
WEST, Solway Clyde Argyle ♂ o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Low plants.

There is a difference between Scottish and English specimens that is difficult to describe. The English insect is a somewhat larger, bulkier-looking one, with coarser-looking front wings, and a more variegated and less clean colour.

LITTORALIS Curt. Not common (possibly only local). Maritime.

DISTRIBUTION—EAST. o ♂ Tay ♂ ♂ o o o
WEST. o Clyde o o o

LAT. 55°40″-56°40″. RANGE IN EUROPE. Britain, north-west France, north Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. Maritime grasses and sedges.

COMMA L. Not uncommon. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay ♀♀ o o o o
WEST. Solway Clyde o o

LAT. 54°50″-56°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Grasses.

IMPURA Hb. Abundant. Palustral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ o o
WEST. Solway Clyde Argyle ♀♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central (to South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. Sedges.

Scottish specimens are rather smaller and have darker hind-wings than English.

PALLENS L. Common. Palustral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-April. FOOD-PLANT. Grasses.

The reddish form is the var. *ectypa* Hb.

CALAMIA Hubn.

LUTOSA Hb. Not common. In reed-beds.

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o

LAT. 56°30″-57°20″. RANGE IN EUROPE. Britain, North central and south-east Germany, south Sweden, Denmark, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—August (end of) -October. LARVA. September-August. FOOD-PLANT. Roots of reed.

TAPINOSTOLA Ledr.

FULVA Hb. Not uncommon. Palustral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-58°30″. RANGE IN EUROPE. Central (to Finland, &c.) TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May, June. FOOD-PLANT. In stems of sedges and *Poa aquatica*.

Two forms are distinguished—the typical one, with front-wings entirely fulvous, and the ab. [? var.] *fluxa* Tr. paler, with reddish or greyish straw-coloured wings; and to the latter all the Scottish specimens I have seen belong.

APAMIIDÆ.

GORTYNA Ochsen.

OCHRACEA Hb. (1786); *flavago* Esp. (1788). Local. Pascual.

DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°50″-56°30″. RANGE IN EUROPE. Central (S. Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August-September. LARVA June, July. FOOD-PLANT. In stems of thistles, ragwort, &c.

Scottish specimens have the dark markings deeper in colour than English; hence the pale markings are more vivid by contrast.

DASYPOLIA Gn.

TEMPLI Thnb. Not common. Pascual, nemoral.

DISTRIBUTION—EAST. ♀♀ Forth Tay Dee Moray ♀♀ o o
WEST. ♀♀ ♀♀ ♀♀ o o

LAT. 56°-57°50″. RANGE IN EUROPE. Finland, Scandinavia, Britain, Alps (of Tyrol, &c.) TYPE. Boreal. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September-April. LARVA. May-August. FOOD PLANT. Roots of Cow-parsnip (*Heracleum*).

HYDRÆCIA Gn.

NICTITANS Bkh. Common. Pascual, nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ ♂
Sutherland ♀♀ ♂
WEST. Solway Clyde ♀♀ West-Ross ♂

LAT. 54°40″-58°30″. RANGE IN EUROPE. Central and Northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. July, August. FOOD-PLANT. Roots of grasses.

The ab. *erythrostigma* Hw. with the reniform stigma orange-red, and the var. *lucens* Frr. larger and (?) more variegated, are mentioned by Staudinger. Both, I think, occur in Scotland, but scarcely deserve distinct names.

PETASITIS Dbld. Not common. Amongst butter-bur.

DISTRIBUTION—EAST. ♀♀ Forth Tay ♂ ♂ ♂ ♂ ♂
WEST. [Solway] Clyde ♂ ♂ ♂

LAT. 55°40″-56°30″. RANGE IN EUROPE. Britain, South-east Germany, Altai. TYPE. Occidento-central. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. August-October. LARVA. June, July. FOOD-PLANT. Roots and stems of butter-bur.

MICACEA Esp. Common. Agrestal, pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀
Orkney ♂
WEST. Solway Clyde ♀♀ ♀♀ ♂

LAT. 54°40″-59°10″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRIRAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May-July. FOOD-PLANT. Roots of low plants.

HELOTROPHA Ledr.

LEUCOSTIGMA Hb.; *fibrosa* Hb. Not common. Riparial or palustral.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ Moray o o o
WEST. [Solway Clyde] o o

LAT. 55°50″-57°40″. RANGE IN EUROPE. Central (to South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Flower-stems of *Iris pseudacorus*.

This the *Apamea fibrosa* of most British lists, but some authors consider that it should be placed in or near the genus *Hydræcia*, and Mr Buckler tells me that a larva which was supposed to be that of this species (but which unfortunately did not reach maturity), was closely allied to the larva of *Hydræcia*.

AXYLIA Hub.

PUTRIS L. Not very common. Pascual.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central (to South Sweden, &c.) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August. FOOD-PLANT. Low plants.

XYLOPHASIA Stph.

RUREA F. Abundant. Agrestal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. Low plants.

Two aberrations occur—1. ab. *combusta* Hw. dark-brown, with the stigmata outlined in whitish; and 2. ab. *alopecurus* Esp. unicolorously red-brown.

LITHOXYLEA F. Not very common. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-May. FOOD-PLANT. Grass and roots of grass.

ZOLLIKOFERI Frr. Very rare.

DISTRIBUTION EAST. o o o Dee o o o o
WEST. o o o o o

LAT. 57°-10°. RANGE IN EUROPE. Ural, Hungary, Berlin (twice), Britain (twice). TYPE. Oriental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September. LARVA. ? FOOD-PLANT. ?

See *Scottish Naturalist*, vol. I. p. 267.

MONOGLYPHA Hufn. (1767); *polyodon* L. (1761, but preoccupied 1759). Abundant. Agrestal, pascual, nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray oo
Orkney o
WEST. Solway Clyde Argyle West-Ross oo

LAT. 54°40″-59°10″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-September. LARVA. August-May. FOOD-PLANT. Low plants (roots).

Varies much in colour, often more or less unicolorously smoky-brown, very dark forms being the ab. *infuscata*, B. W.
X. scolopacina Esp. (and perhaps *X. sublustris*) may occur.

HEPATICA Hb. Rare or local. Pascual, nemoral.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. [Solway] o o o o

LAT. [54°50-]56°30″. RANGE IN EUROPE. Central (? South Sweden). TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Low plants.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 288.)

EDITED BY D. SHARP, M.B.

CONURUS Kr.

LITTOREUS Lin. Lowland.

DISTRIBUTION—EAST. ♂ Forth o o o o o o
WEST. Solway ♂ o o o

PUBESCENS Grav. Lowland.

DISTRIBUTION—EAST. Tweed ♂ ♂ ♂ ♂ o o o
WEST. Solway Clyde o o o

LIVIDUS Er. Lowland. Amongst moss and dead leaves.

DISTRIBUTION—EAST. ♂ Forth ♂ ♂ ♂ o o o
WEST. ♂ ♂ o o o

TACHYPORUS Kr.

OBTUSUS Lin. Lowland. Abundant.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♂ ♂ ♂ ♂
WEST. Solway Clyde ♂ o o

A variety much darker in colour (*T. nitidicollis*, Steph.) has occurred in the Tweed and Forth districts.

SOLUTUS Er. Lowland. Not common.

DISTRIBUTION—EAST. ♂ Forth o o o o o o
WEST. Solway Clyde ♂ o o

CHRYSOMELINUS Lin. Lowland. Common.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

HUMEROSUS Er. Lowland. Amongst moss.

DISTRIBUTION—EAST. ♂ Forth ♂ ♂ ♂ o o o
WEST. Solway ♂ o o o

HYPNORUM Fab. Lowland. Highland. Abundant.

DISTRIBUTION—EAST. ♂ Forth Tay ♂ Moray ♂ ♂ ♂
WEST. Solway ♂ ♂ ♂ ♂

PUSILLUS Grav. Lowland.

DISTRIBUTION—EAST. ♀♀ Forth Tay ♀♀ ♀♀ o o o
WEST. Solway ♀♀ o o o

TERSUS Er. Lowland. Local.

DISTRIBUTION—EAST. ♀♀ Forth o o o o o o
WEST. Solway Clyde o o o

TRANSVERSALIS Grav. Lowland. Amongst moss in wet places. Very local.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

BRUNNEUS Lin. Common.

DISTRIBUTION—EAST. ♀♀ Forth ♀♀ Dee ♀♀ o o o
WEST. Solway ♀♀ o o o

LAMPRINUS Kr.

SAGINATUS Grav. Lowland. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

Found in flood refuse on two or three occasions, on the banks of the Nith and Scar, near Thornhill.—D. S.

CILEA Duv.

SILPHOIDES Lin. Lowland. Amongst refuse.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♀♀ o o o

TACHINUS Kr.

HUMERALIS Grav. In decaying fungus in woods.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀♀ o o o
WEST. Solway ♀♀ o o o

PROXIMUS Kr. In sheeps' droppings. Highland.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o Clyde o o o

RUFIPENNIS Gyll. Very rare ? Highland.

DISTRIBUTION—EAST o o Tay ♀♀ Moray o o o
WEST. o o o o o

FRIGIDUS Er. Very rare. ? Highland.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

The only specimen of this insect which has yet occurred in Britain was captured by me in Strathglass. I sent this individual to Pandellé at the time he had just completed his monograph of the Tachyporini, and it was returned to me by him as a species unknown to him. Pandellé had not been able to obtain specimens of Erichson's *T. frigidus*, described from Unalaschka, but on the male sex only. The Scottish individual is a female, and it, therefore, remains doubtful for the present whether it be the *T. frigidus* Er. or not.—D. S.

PALLIPES Grav. In vegetable refuse. Local.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway o o o o

FLAVIPES Fab. In dung. Rare.

DISTRIBUTION—EAST. Tweed o Tay Dee o o o o
WEST. Solway o o o o

RUFIPES De Geer. Lowland, highland. Abundant.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

[**BIPUSTULATUS** Fab. Doubtful as Scottish.

DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. Solway o o o o

Recorded in Murray's Catalogue as occurring at "Raehills; near Edinburgh; Kinross-shire;" but I am inclined to think some other species than the *T. bipustulatus* must be referred to; *T. bipustulatus* occurs, I believe, solely in association with *Cossus ligniperda*.—D. S.

SUBTERRANEUS Lin. Common.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ ♀ ♀ ♀
WEST. Solway ♀ o o o

LATICOLLIS Grav. Common.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway ♀ o o o

MARGINELLUS Fab. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

COLLARIS Grav. Lowland. Common.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

ELONGATUS Gyll. Lowland, highland. Rare.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

MEGACRONUS Steph.

INCLINANS Grav. Among dead leaves. Very rare.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. o o o o o

CINGULATUS Mann. Rare.

DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. Solway Clyde o o o

ANALIS Payk. Not common.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

BOLITOBIUS Th.

ATRICAPILLUS Fab. In fungus. Common. Lowland, highland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

TRINOTATUS Er. In fungus. Common.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

EXOLETUS Er. In fungus. Scarce.

DISTRIBUTION—EAST. Tweed Forth ♀♀ Dee ♀ o o o
WEST. Solway ♀♀ o o o

PYGMÆUS Fab. In fungus. Abundant.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

BRYOPORUS Kr.

RUGIPENNIS Pand. Highland. Very rare. In moss.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

HARDYI Crotch. Very rare.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

"Girrick."—R. Hislop.

MYCETOPORUS Kr.

LUCIDUS Er. Rare.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. o o o o o

PUNCTUS Gyll. Rare.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. ♀ Clyde o o o

LONGULUS Mann. Not common.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

LEPIDUS Grav. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. Solway ♀ Argyle o o

REYI Pand. Rare.

DISTRIBUTION—EAST. Tweed o o Dee Moray o o o
WEST. o o o o o

Nov. sp. = TENUIS Sharp. Rare. Highland.

DISTRIBUTION—EAST. Tweed o o Dee o o o o
WEST. o o o o o

Pandellé considered a specimen of this insect, which I sent to him, to be a variety of *M. nanus* or *lepidus* (I forget which), and I have, therefore, not carried out my intention of describing it, though I fully believe it will prove that the species is really a distinct one.—D. S.

NANUS Grav. Rare.

DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o Clyde o o o

CLAVICORNIS Steph. Rare.

DISTRIBUTION—EAST. Tweed o o o Moray o o o
WEST. Solway o o o o

SPLENDIDUS Grav. Not common.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

LONGICORNIS Kr. Rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

EURYPORUS Kr.

PICIPES Payk. Rare. Lowland. Amongst damp moss.

DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. Solway o o o o

HETEROTHOPS Kr.

BINOTATA Steph. Maritime. Local.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. ♀ Clyde o o o

QUEDIUS Kr.

LATERALIS Grav. Lowland. Among moss, and in decaying fungus.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

FULGIDUS Grav. Lowland.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀♀ ♀♀ ♀♀
WEST. Solway Clyde ♀ ♀♀ ♀♀

Obs.—C. J. Thomson considers that several distinct species are usually confounded together, and called *Q. fulgidus*. He has given characters which he considers differentiate certain of these species; but the question as to whether these be really species or varieties still requires a very careful examination. Of Thomson's species, I believe I have ascertained the occurrence of *Q. temporalis*, *Q. fageti*, and *Q. punctícollis* in Scotland.

XANTHOPUS Er. Under bark of dead trees. Highland. Rare.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

LONGICORNIS Kr. Riparial. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway (Clyde?) o o o

LÆVIGATUS Gyll. Highland. Under bark of decaying Scotch fir.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o Argyle o o

BREVIS Er. In the nests of *Fornica rufa*. Very local.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o o

IMPRESSUS Panz. Lowland. Common.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

MOLOCHINUS Grav. Lowland, highland. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

FULIGINOSUS Grav. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

[TRISTIS Grav.

DISTRIBUTION—(?)

This species is recorded in Murray's Catalogue as "common," though I have no special record of its observation, nor any Scottish individual in my collection. It probably occurs in Scotland.—D. S.

PICIPES Mann. Not common.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde o o o

NIGRICEPS Kr. Not common.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

PELTATUS Er. Local: among decaying beech leaves.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

UMBRINUS Er. In damp places. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee o o o o
WEST. Solway ♀ o o o

MAURORUFUS Grav. Lowland. Not common.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

SUTURALIS Kies. Lowland. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde o o o

RUFIPES Grav. Lowland.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

SEMILÆNEUS Steph. Lowland.

DISTRIBUTION—EAST. ♀ ♀ o o o o o o
WEST. Solway ♀ o o o

ATTENUATUS Gyll. Lowland. Common.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♀ o o o
WEST. Solway ♀ o o o

FULVICOLLIS Steph. Lowland, highland. In damp moss.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

BOOPS Grav. Common. Lowland, highland, alpine.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway Clyde o o o

SCINTILLANS Grav. Rare. In vegetable refuse. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway ♀ o o o

AURICOMUS Kies. In moss about waterfalls and streams. Local.

DISTRIBUTION—EAST. Tweed ♀ Tay o o o o o
WEST. Solway Clyde o o o

CREOPHILUS Kr.

MAXILLOSUS Lowland. Abundant in carcases.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

The remarkable boreal variety, *C. ciliaris* Steph. has occurred in the Tweed, Clyde, and Argyle districts.

LEISTOTROPHUS Kr.

NEBULOSUS Fab. Not common. Lowland.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway ♀ o o o

MURINUS Lin. Lowland. Common.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ ♀ Sutherland o o
WEST. Solway ♀ o o o

(To be continued.)

ZOOLOGY.

ON THE SALMONIDÆ OF THE EDEN, FIFE; WITH REMARKS ON THEIR CONDITION IN OTHER RIVERS.

By ROBERT WALKER, F.G.S.E.

THE Eden cannot now with much propriety be called an important salmon river, whatever its condition in this respect may have been in the past. It is possible that, from its level and sluggish nature, it never was very well adapted to the active habits of that species. Still it is a river frequented more or less every year by the salmon *(Salmo salar)*; and in favourable seasons they endeavour, in considerable numbers, to force their way up the water. If the pollutions that are at present poured into it were in some degree abated, and some provision made to enable the fish to get over the perpendicular dam dykes erected here and there across the stream, which would allow them to reach the upper portions of the water, where there are some apparently good spawning beds, there seems no good reason why salmon should not be more abundant in this river than is the case at present. Whether, under the most favourable conditions, they would become sufficiently numerous to be of much consequence to any one except anglers, might be a rather problematical matter to determine. At all events, if their number were increased, they would afford excellent sport to the followers of that art; and as this is an open river, all classes would have a like opportunity of enjoying the sport and sharing the produce. Besides, if we wish to take a utilitarian view of the subject, it may be observed that salmon caught in this way are always used as food; the non-angling public would receive a proportion of the benefit, according to the extent in which they were caught, as much as if they were obtained by any other means.

Formerly salmon were caught in the Eden by anglers, and it may be by others, from Guard Bridge to a considerable

way above Cupar, and I believe they are occasionally taken yet in this range. Sibbald states that there is a good salmon fishing between Dairsie Bridge and the Guard Bridge. However this may have been in his time, it is certainly not the case now, so far as the salmon proper is concerned. The sea-trout *(Salmo trutta)* is to be met with in that portion of the river, both in spring and autumn. In the former season, they seem chiefly to move up and down with the tide; in the latter, they are evidently bent on spawning purposes. At Nydie Mill, where the proprietor holds a charter for net fishing, in suitable years very good takes of sea-trout are sometimes got. This is apparently a fishery of considerable antiquity, and is doubtless the place referred to by Sibbald as a good salmon fishing. Its proximity to the cathedral city of St. Andrews was likely to enhance its value at an early period. According to Buckland, the venerable inmates of these ecclesiastical establishments seem in ancient times to have been rather partial to salmon. He endeavours to show that out of twenty-seven cathedral towns in England, eighteen stand upon rivers which, at the time when the towns were founded, produced salmon. At the Nydie fishery there are the remains of an old weir still to be seen extended across the river, to assist in catching the fish, similar (as it appears to me) to the one he notices on the Wye, and said to be the work of the monks of Tintern Abbey.

In spring and autumn, especially the latter, good baskets of sea-trout are caught by the rod in Eden, when the water is in fair condition, and the net not in too close operation. In autumn, in most cases, these trout have both the milt and and roe in an advanced condition, and their object in ascending the river at this season, whatever it may be in spring, is obvious enough. Numbers of them spawn in the Eden every year. The young are met with in different stages of development, when they are called parr or yellow-fins, orange-fins, black-fins, whitling, phinock, etc. The three latter names are after their first return from the sea. Of course, some of these may belong to some of the other migratory species.

It is often stated that the bull-trout *(Salmo eriox* of Yarrell, *S. cambricus* Günther) has been not unfrequently caught in the Eden. I have not, however, seen any trout from that water that could be called with certainty an undoubted individual of that species. Although I have ex-

amined specimens that seemed to possess nearly all the characteristics claimed for that fish, both in the shape of the gill-cover and the stronger maxillary and mandible, unfortunately none of the examples I have met with were of sufficient size to absolutely determine the matter, bearing in mind the amount of hybridism that exists among the *Salmonidæ*. Besides, Dr. Günther states that the former character cannot be in all cases relied upon, that there are examples of *S. trutta* and *S. eriox (cambricus)* which have the gill-covers of precisely the same shape, and that he had not seen a specimen of this trout from Scotland—the *S. eriox* of Yarrell, and others from Scotland, being founded on either males of *S. trutta*, or hybrids between the sea-trout and the common river-trout. He also considers that the bull-trout of the Scottish rivers is not a distinct species, and is either sea-trout of peculiar aspect or (as in the case of the Beauly) hybrids between the salmon and sea-trout, or salmon returned from the sea without being well mended, or sterile individuals of the salmon. However this may be, it seems evident that the so-called bull-trout abounds in the Coquet, the Tyne, the Tees, and other rivers on the east coast. There is also a trout fast increasing in number in the Tweed called bull-trout. Whether these trout in the former rivers belong in the main to *S. eriox*, and in the latter to *S. trutta*, or are to a greater or less extent, as is asserted, hybrids of one kind or other, is on the whole of less importance than the baneful influence they exercise, when too numerous, on the prosperity of the salmon. The trout, from several causes, are enabled to arrive first at, and from their number get an undue command of, the spawning beds, and when once they have got possession of these, it is stated that the salmon is shy of approaching them. In the Coquet, according to Mr. Buckland, the bull-trout have almost exterminated the salmon, and the Tyne and the Tees are threatened with the same fate.

In the latter river there are ten trout or "scurfs" to one salmon. Mr Buckland considers that this unsatisfactory state of matters is owing to the presence of weirs over which the trout can pass when the salmon cannot, and to the size of the mesh of the nets—which I should say is most to blame—through which a great number of the trout escape, while the salmon is captured. The salmon is thus "handicapped," and in the struggle for existence carried on against such heavy odds, the superior animal, as in all similar cases, disappears before its inferior but

more favoured rival. Another cause of the increase of these trout is that they run up the rivers in September and October, when it is illegal to take them, whereas before the salmon acts they were kept under by netting. In order to restrict the increase of the trout, and if possible restore the salmon to the Coquet, the Home Secretary has given the Duke of Northumberland and the Board of Conservators permission to catch the bull-trout when they are running up the river in September, October, November, and December. From statistics given by Mr Buckland, it appears that since the time of fishing was thus extended, during the four years, commencing in 1868, no less than over 131 tons of trout have been killed. While during the same period only 114 salmon and grilse were caught; the number of trout was 71,808. The complaints as to the excessive increase in late years of the so-called bull-trout in the Tweed and other rivers—with the constant result, decrease in the number of salmon—would require to be attended to before it is too late. Experience shows that when salmon are fairly out of a river it is not an easy matter to restore them. The rather serious reports as to the state of these rivers should induce those who have the opportunity, and feel interested in maintaining the prosperity of the salmon rivers on the east coast of Scotland, to look closely to their condition, as they are all fished with nets through which an undue proportion of trout can pass, and it might be found afterward to be rather short-sighted policy to conclude that because comparatively few trout are caught at present they are not numerous in the water. It must be confessed, however, that the prospect in this respect is not very assuring. In looking at recent events one is almost tempted to think that a more unfavourable proceeding for the prosperity of the salmon could scarcely have been adopted than that lately pursued in the Tweed and Allan water in prosecuting anglers for killing "yellow fins," seeing these are the young of the very trout, the increasing numbers of which, we are told, is causing such sad destruction amongst the salmon in all rivers wherever they are allowed to become numerous. It would certainly be better for the public, and the well-being of the salmon, at any-rate, had the law rather permitted encouragement to be given to anglers to catch as many as possible of these young trout, as they are more easily taken at this stage than after they are larger, and, as already observed, the present system of netting is insufficient for the purpose. Irrespective

of the influence of the trout, which is after all only one factor in the result, it is pretty evident that the salmon from other causes is gradually disappearing from many of our rivers. Pollutions, want of water, over-fishing, and such like, may be assisting in this; but very likely there is some other and more potent natural cause in operation, of the working of which we perhaps know nothing further than the general result it is bringing about.

Be this as it may, it seems undoubted that salmon were much more numerous in the last and previous centuries than in the present. Nearly every traveller who visited Scotland then commented on the great abundance of this fish, and one of these states that in the Tay the quantity taken was prodigious. This is still a capital salmon river, unlike the Tweed and some others. The rents here have risen to about, I suppose, double what they were some thirty years ago. The rise of rent is not, of course, a very safe criterion as to the increase of salmon; the former may be increasing, while the latter is stationary, or decreasing. It would therefore be interesting to know how much of the rise of rental in this river is to be ascribed to the augmentation of produce, and how much to the rise in the price of said produce. The late Mr. Headrick, Dunichen, stated that the salmon fisheries about Broughty Ferry, or, on the space where the tide ebbs, between that and Dundee, paid in 1810 a rental of about £2,500. This author also stated that he remembered when servants in the neighbourhood of Stirling used to stipulate that they should not be obliged to eat salmon more than thrice in the week. This is, of course, a common tradition in many parts of Scotland, both as to servants and apprentices. There was an estimate of the probable value of the salmon fisheries of Scotland printed in Edinburgh in 1709. This valuation is perhaps more curious than useful. As far as I am aware, however, it is the first and the only likely attempt made to arrive at an approximation of the value of the whole fisheries of this country upwards of one hundred and sixty years ago. Besides, it seems to be in accordance with the accounts given by travellers and others who paid attention to the subject, as well as with the general opinion of the day; and as a rough embodiment of that opinion put in a tangible form, it is given here for what it may be considered worth. The abstract of the paper, as printed by Dr. Chambers, states:—"An anonymous gentleman in Scotland, writing to the Earl of Seafield on the

improvement of the salmon fishing in Scotland, informs us how the fish were then, as now, massacred in their pregnant state by country people. I have known," he says, "a fellow not worth a groat kill with a spear in one night's time 100 black fish or kipper, for the most part full of rawns unspawned." He adds—"Even a great many gentlemen, inhabitants by the rivers, are guilty of the same crimes, little reflecting on the prodigious treasure thus miserably dilapidated." Notwithstanding these butcheries, he tells us that no mean profit was then derived from the salmon fishing of Scotland. He had known from two to three thousand barrels, worth about six pounds sterling each, exported in a single year. "Nay, I know Sir James Calder of Muirton alone sold to one English merchant a thousand barrels in one year's fishing." He consequently deems himself justified in estimating the possible product of the salmon fishing, if rightly protected and cultivated, at 40,000 barrels, yielding £240,000 sterling per annum. It is impossible to say how far this estimate may have been above the actual value of the fisheries in Scotland at that time. Neither is it easy to say how far it exceeds their value at the present time, although, no doubt, it does so to a considerable extent. In a parliamentary return issued in 1864, the value of the whole salmon fisheries of Scotland are stated at £52,615; but as some eighty fisheries are not included, and others understated, it is perhaps little better, as remarked by an able writer on the subject, "than a multiplicand requiring to be operated upon by some unascertained multiplicator in order to bring out a correct result." Whether the multiplicator should be 2 or 3, or even a higher number, is about as uncertain. After making every reasonable allowance, by way of deduction in the first statement, and addition in the second, and bearing in mind that salmon was selling in Berwick in the end of the last century (and it was not likely to be higher at the beginning) at from two to five shillings the fish stone of nearly 19 lbs. weight, it will be apparent that the difference in the number of salmon caught now and at the commencement of last century must be very great.

The deficiency of salmon in the Eden may be the result of the general decay of the species, somewhat intensified by the sea-trout, and the present incompatible condition of the river itself; whichever, it is certain that they are not now numerous. I believe, however, that the salmon still spawn more or less every year in the Eden. I have

examined both parr and smolt from that river, and convinced myself, and perhaps others, that several of these were undoubtedly young salmon. In examining parr it has to be borne in mind—a fact which, although known long ago, seems strangely lost sight of—that all young salmonoids, including, of course, the young of the river-trout, as well as the migratory species, are at one time parr; that is, they are barred transversely much in the same manner, and of the same colour, as the young of the salmon. There is sometimes a little difference in the breadth, and perhaps the number of the parr markings, but at one period of life they are invariably present. The parr state is considered by some naturalists as an embryonic condition through which the whole genera, if not family, pass; and when it is added that the influence of hybridism, which is very prevalent amongst this class of fishes, has to be carefully considered and allowed for, it will be seen how cautiously determinations require to be made, when dealing with the young or imperfectly developed animal.

The parr of the salmon, when of pure breed, is, I should say, always determinable with more or less certainty. In the case of the other migratory species—and to some extent the river-trout—it is, I believe, impossible when in the parr or orange-fin stage, to distinguish absolutely the one from the other, by external appearance at anyrate. The coloration is alike variable, and the dentition is the same in all; there seems to be no invariable feature whereby they can be identified until, in the case of the latter, after their first return from the sea, when they have commenced to assume the specific characters possessed by the adult members of the species to which they belong. Valenciennes endeavoured to establish a system of classification of the *Salmonidæ*, on the arrangement of the vomerine teeth. This did well enough when confined to grown specimens; but was of no use whatever when applied to young individuals. He considered, however, that distinctive characters should be taken from adult examples only.

Amongst the parrs to be met with in summer and autumn, in most salmon rivers, numbers of the males have the milt fully developed; while the roe in the female remain at a minimum. This curious anomaly involves some of the highest problems in animal physiology, and is, so far as I am aware, without a parallel in any other department of zoology, viz., that of a young animal, while still in the embryonic condition, being sexually mature, and capable

of performing the function, in this respect, of the grown examples, and this often earlier in the season than the salmon itself. Although this strange phenomenon was known to Willoughby, it is perhaps no nearer a satisfactory solution than it was in his day. It is certainly not easy to account for it on any hypothesis, but much more difficult, as it appears to me, on the untenable theory, that these little fishes are young salmon of pure breed. Dr. Knox, who made the parr an object of special study, and who was well acquainted with the development of the salmon in all its stages, as far at least as they are known, or perhaps knowable, was of opinion that the parrs showing this precocity were not of pure breed, but were hybrids of many kinds. This may not imply that all these parrs are the offspring of parents in which hybridism is so strongly manifest that it is apparent at first sight. In numerous instances they may be the consequence of hybridism acting on and through a number of individuals. If these parrs are hybrids, and I do not suppose that there are many naturalists, who have studied the matter, that have much faith in the belief pretty generally entertained by the public, that they are genuine young salmon, then of course they can never become large or adult examples of that fish, although they may through time assume an appearance exceedingly like it. The question is, if they do not become salmon, to what do they grow? Are they the young hybrid fish known in our rivers after they grow large, under the name of bull-trout? I do not mean *S. trutta*, nor *S. eriox*, which sometimes go by that name, but that anomalous fish, neither the one or the other, that is said to be increasing too rapidly in some rivers for the well-being of the salmon. Dr. Günther states that in one specimen of bull-trout from the Beauly, examined by him, the number of pylaric appendages was found to be as low as fifty-four. This is as in the sea-trout, "yet the relative size of the scales on the tail is in all these bull-trout the same as in the salmon." Mr. Buckland says, "That amongst some specimens of trout sent him from the Tees, there was one which, from anatomical indications, he would pronounce a hybrid between *S. salar* and *S. eriox*." Formerly the prolific, or second year parrs, were caught by anglers in dozens every summer, and the trout were kept within proper bounds by other means. Mr. Stoddart, speaking of the bull-trout in the Tweed, and more particularly the Yarrow, says, "Of the slaughters achieved on which, in the golden days of the Ettrick Shepherd, I retain flaming

reminiscences. The night's spoils, on a favourable occasion, rarely fell short numerically of 200." The last salmon acts made all this criminal, and it is not a little significant that the so-called bull-trout have been rapidly outnumbering, and it is said ousting, the salmon, in some of the southern rivers at any rate, ever since.

Of the river-trout, *Salmo fario gaimardi* occurs in all parts of the Eden, from its source to the brackish water near the sea. As in most other rivers, it is subject to a good deal of variation, both in colour and general appearance. In the lower reaches it is seldom or never of a bright colour, those from the brackish water having a brownish appearance, and rarely showing any red spots. This trout is not supposed to exceed fifteen or sixteen inches in length; its flesh is generally whitish and tasteless. *Salmo fario ausonii*, or what at least I take for this variety, is also to be met with in the Eden. So far as my experience goes, it is rather rare, and is a prettier coloured trout than the former, with pinkish coloured flesh, somewhat resembling the sea-trout. It is said to attain to a length of thirty inches. This variety was established by Dr. Günther, and embraces the trout of the most of the English rivers, as well as those of central Europe. It has from fifty-seven to fifty-eight vertebræ, and generally three or four teeth on the head of the vomer, the body of this bone is armed with a double series of teeth frequently as in *gaimardi*, placed in an alternate or zig-zag order. The latter has from fifty-nine to sixty vertebræ, and when it is pretty well-grown it loses the teeth on the head of the vomer. It is found in all the rivers of Scotland, and extends as far south as Shropshire; it is also the trout of Ireland and Scandinavia. When attention is directed to the matter it is not unlikely that both forms will be ultimately found in some of the other rivers of both Scotland and England. Dr. Knox years ago directed attention to a trout from the Scottish waters, which he called the pink-coloured red-spotted river-trout, chiefly found in England. He stated that the streams from the Pentland range contain the red-spotted pink-coloured trout, "analogous to, if not identical with, that of England," and that the common red-spotted trout, coarse and tasteless, is also there. The Isla is another Scottish stream where this trout is to be met with. The trout of the Coquet he said resembled the common river-trout of Scotland; they amuse the angler, but are worthless for the table.

Knox describes another trout that I should like to draw

attenton to, not that I have any faith that it may prove to be a distinct species, if such really exists amongst the Salmonidæ. As he had never seen this trout above the tidal portions of rivers, he called it the Estuary trout *(Salmo estuarius)*. He had examined numerous examples, that were taken by a net in the brackish water at the mouth of the Tyne, East Lothian; and the mouth of the Nith, Dumfriesshire. It had likewise been caught in the estuary of the Forth, the Esk, Yorkshire, and in the sea at the Kyles of Bute. He gives the measurements in a tabulated form of an example of the Estuary, the Tweed, and the Lochleven trout. The Estuary trout holds an intermediate place between the two, being stronger, with stouter maxillæ than the Leven trout; but weaker, with the head and jaws proportionably smaller, than the river trout. The Estuary trout is in general size about a foot in length. Knox stated, however, that he had seen one that weighed 4lbs. In general colouring it resembles the common river trout, with bright metallic tints, scales minute, adherent, the flesh or muscles pink-coloured, sometimes bright red, numerous red spots above and below the lateral line; and it tastes as well as the best Lochleven trout.

University, St. Andrews, August, 1874.

NOTES ON THE ENTOMOLOGY OF SHETLAND.

THE following account of doings in pursuit of Coleoptera during July last (which month we spent in Shetland, a locality of whose beetle inhabitants there is little record), may not be without interest. There are probably few spots in Great Britain where the tourist can pass a more enjoyable time, especially if the weather be as propitious as we found it. The blue sky, and the almost bluer sea, studded with innumerable islands, furnish scenery that can scarcely be surpassed; and it is certainly not everywhere that one can meet with bold precipices 1500 feet high. During our stay we visited the greater part of the islands, fixing our headquarters at Lerwick. Thence we made two tours—the first south to Dunrossness and Fitful Head (about 22 miles)—the second north to Roeness Hill (the highest summit of Shetland), and thence through the Yell to Unst (about 50 miles), visiting other smaller islands *en route*. As we

trusted to nature's own method of progression on these expeditions, except where the sea had to be crossed, and passed many nights at various hotels on the way, we may say without much hesitation, that we collected pretty thoroughly over the whole country. Of course July is not a month in good repute with coleopterists, and it is impossible to say what we may not have missed, by being unable to commence work a month earlier; but, whatever the cause, we were greatly impressed with the scarcity of insects, both species and specimens. As this was more remarkable than could be accounted for, by the lateness of our visit, we had to seek other causes, and arrived at the theory that abundance of insects ought not to be expected in islands of limited extent, in latitude 60° to 65°, treeless, for the most part covered with deep peat, and with no elevation above 1600 feet. However we will leave theorizing.

The *Geodephaga* were perhaps the most plentiful. On the hills the small dark form of *Notiophilus aquaticus* was not uncommon, together with great numbers of *Nebria Gyllenhalli*, *Calathus melanocephalus*, and *Patrobus assimilis*, rare specimens of *Cymindis vaporariorum*, and occasional *Bradycellus harpalinus*. In damp places on the lower ground *Nebria brevicollis* and *Gyllenhalli* occured commonly in company, not unfrequently forming a trio with the aid of *Pelophila* (which we once found in considerable numbers). On the sea shore (and also during a hurried visit to Orkney) *Trechus lapidosus* occurred very rarely, and in flood refuse *T. rubens* was common. In various localities, chiefly under stones, we met with *Dyschirius politus*, *Pterostichus nigrita* (same var. as mentioned in E. M. M. vol. x, p. 252) and *vitreus*, *Amara bifrons* and *lunicollis*, and *Bembidium Mannerheimi* and *Bruxellense*.

Of the *Hydradephaga* we obtained several species which we have not yet satisfactorily determined; one or two may be new, and several others are more or less uncommon, as *Haliplus fulvus*, *Hydroporus griseostriatus* (abundant in one small loch) and *celatus*, *Ilybius fuliginosus* and *Agabus solieri* and *nebulosus*. Many species common in Scotland, were, however, "conspicuous by their absence." The *Philhydrida* furnished absolutely nothing worthy of special remark.

In Scotland the *Brachelytra* generally supply the deficiencies of other groups, but not so in Shetland. Our captures in this group were meagre indeed. With the exception of one *Philonthus* which appears likely to prove new, we met with nothing that

can be called rare. On the sea shore *Ocalea castanea* and *Aleochara algarum* occurred in company with *Homalota vestita*, *Philonthus xantholoma*, and *Homalium lævisculum*. In moss on the hills, *Oxypoda incrassata*, *Homalota eremita*, *Mycetoporus angularis*, *Quedius attenuatus*, *Othius melanocephalus*, *Stenus brevicornis* and *Arpedium brachypterum* put in an occasional appearance, and by promiscuous collecting we obtained *Homalota villosula* and *germana*, *Tachyporus humerosus*, *Tachinus laticollis* and *Quedius tristis* (whose occurrence in Scotland seems to have been hitherto doubtful) and *umbrinus*.

The *Necrophaga* were very sparingly represented, the best being *Choleva fusca and coracina* (the latter commonly).

Of the remaining groups, the species we met with are so few and far between that we will deal with them *en masse*. *Aphodius lapponum* was not uncommon. *Athoïs subfuscus* was exceedingly uncommon, but not local, and *Chrysomela sanguinolenta* and *Coccinella mutabilis* were exceedingly local but not uncommon. *Otiorhynchus blandus*, *Ceutorhynchus ericæ*, and *Donacia comari* also occurred, and an *Apion* not yet determined, possibly new.

As a complete record of our captures may be of value as a contribution to the Natural History of Shetland, we append a list of the species we met with that have not been specially noted above :—

Notiophilus palustris.
,, biguttatus.
Elaphrus cupreus.
Carabus catenulatus.
Leistus rufescens.
Clivina fossor.
Dyschirius globosus.
Loricera pilicornis.
Broscus cephalotes.
Calathus cisteloides.
,, mollis.
Anchomenus albipes.
Olisthopus rotundatus.
Pterostichus niger.
,, vulgaris.
,, strenuus.
,, diligens.
Amara apricaria.
,, spinipes.
Harpalus latus.
Bradycellus cognatus.
Trechus minutus.
,, obtusus.
Haliplus lineatocollis.
,, confinis.
Hydroporus memnonius.
,, Gyllenhalli.
,, erythrocephalus.
,, melanocephalus.
,, nigrita.
,, obscurus.
,, palustris.
Colymbetes fuscus.
,, notatus.
Agabus chalconotus.
,, guttatus.
Gyrinus natator.
Aleochara mœsta.
,, lanuginosa.
Oxypoda opaca.
Homalota gregaria.
,, volans.

Homalota vicina.
,, circellaris.
,, analis.
,, æneicollis.
,, atramentaria.
,, aterrima.
Myllæna brevicornis.
Tachyporus chrysomelinus.
,, pusillus.
Tachinus rufipes.
Quedius fulgidus.
,, molochinus.
,, fuliginosus.
,, semiæneus.
,, boops.
Creophilus maxillosus.
Ocypus olens.
,, cupreus.
Philonthus decorus.
,, marginatus.
,, varius (red var. common).
,, fimetarius.
,, sordidus.
,, nigritulus.
Xantholinus glabratus.
Othius fulvipennis.
,, myrmecophilus.
Lathrobium fulvipenne.
Stenus unicolor.
,, tempestivus.
,, impressus.
Bledius subterraneus.
Platysthetus arenarius.
Oxytelus rugosus.
,, sculpturatus.
,, nitidus.
Lesteva longælitrata.
,, pubescens.
Olophrum piceum.
Homalium rivulare.
,, fossulatum.
Megarthrus depressus.
Silpha rugosa.
Choleva Watsoni.
Scydmænus collaris.
Anisotoma dubia.
Agathidium lævigatum.
Brachypterus urticæ.
Cryptophagus setulosus.
Atomaria analis.
Byrrhus pilula.
Simplocaria semistriata.
Parnus prolifericornis.
Anacæna limbata.
Helophorus aquaticus.
,, granularis.
,, æneipennis.
Limnebius marginalis.
Cercyon littorale.
,, depressum.
,, melanocephalum.
Megasternum boletophagum.
Aphodius ater.
,, rufipes.
Cryptohypnus riparius.
Otiorhynchus atroapterus.
,, maurus.
Cneorhinus geminatus.
Barynotus Schönherri.
Erirhinus acridulus.
Ceutorhynchus contractus.
,, pollinarius.
Rhinonchus pericarpius.
Phytobius notula.
Chrysomela staphylæa.
Corticaria fuscula.

THOS. BLACKBURN, B.A., Greenhithe, Kent.
C. E. LILLEY, Ingress House, Greenhithe, Kent.

August, 1874.

CONCERNING AQUARIA.

By PETER WHITE, L.R.C.S.E., F.B.S.E.,
PRESIDENT OF THE ARCHÆOLOGICAL AND PHYSICAL SOCIETY OF BUTE.

AQUARIA are daily becoming more and more important institutions, in this, as well as in many other countries in

Europe, as a means of advancing science, and of affording a ready means of popular instruction in the natural history of marine and fresh water animals.

Professor Owen says that "An Aquarium of adequate extent, well stocked and skilfully managed, is a means of imparting a knowledge of the colours, movements, food, and habits of aquatic animals to spectators, who in no other way could get such knowledge, and enjoy so interesting a spectacle of nature." And again, Professor Edward Forbes has written that,—"The naturalist whose acquaintance is confined to preserved specimens in a cabinet, can form but a vague idea of the glorious variety of nature, of the wisdom displayed in the building up of the atoms of matter to be the houses of life and intellect; and unless we study the creatures living around us, how can we gain that delightful knowledge?"

Through the energy of the members of the Archæological and Physical Society of Bute, an Aquarium company, limited, has been promoted and carried into effect. The object of the company is to provide a marine and fresh water aquarium (to be erected on the site of the old battery, East Bay, Rothesay), which will not only be subservient to the study of aquatic animals, and the advancement of natural science, but also add considerably to the attractions of the town.

The many natural advantages that Rothesay enjoys, and which no inland place can have, render it peculiarly suitable for such a purpose; *e.g.*, the sea-water to fill the tanks is at hand, costing a mere trifle, and fish, zoophytes, &c., of all kinds abound in the waters of the Firth of Clyde, and can be had at a cheap rate.

After the society had duly considered the matter, it was arranged to start a limited liability company, to be registered under the Companies Acts of 1862 and 1867, with a share capital of £5000, in a 1000 shares of £5 each, with the power of calling up £2000 more if required. Mr. W. A. Lloyd, who is manager of the Crystal Palace Aquarium, and who is consulting naturalist and engineer to the Rothesay Aquarium Company, is of opinion, "That a sum of from £3000 to £4000 can be made to comfortably lodge, even with some degree of elegance of appointment, all the aquatic non-lung breathing animals of Britain, both marine and fresh-water, and all those that can be at present got from abroad."

The site upon which the building is to be erected, has been

kindly granted by the Marquis of Bute, who takes a deep interest in the welfare of the company's projected scheme. It is often asserted that an aquarium would not pay at Rothesay: this remains, however, to be seen. It is true that the directors are not at all sanguine in that direction. The chief aim and desire of the directors and shareholders is to benefit the town, by adding this other attraction, and thus, in a secondary way, much good will be felt by the inhabitants; and at the same time visitors to the Island of Bute will have another source of amusement, in studying the habits, movements, and method of the feeding of the denizens of the deep. But although the queen of Scottish watering places will, as a town, be undoubtedly benefited, the directors have some idea that a good dividend will be given. Rothesay doubtless is very dull during the winter; but summer compensates greatly by sending in swarms of visitors, who are coming and going during at least four months of the year.

The proximity to Glasgow alone offers a peculiar inducement to embark in such a scheme. The great population of that city is always more or less during four months of the year at least, travelling, and Bute is known as a favourite resort. On a Glasgow fair week, it is estimated that no less than 20,000 people visit the Island, and there are numerous excursion parties which visit it also at other times during the season. Rothesay has besides a local population of nearly 9000.

Now it may be reasonably expected that a very large proportion of these would visit the Aquarium. Suppose that during the "fair" week 10,000 people visited it at 6d. per head, there is £250 at once. It is calculated that if the company can realise an income of £1000 per annum, a dividend something like 8 per cent. may be given.

To build an Aquarium of any extent where there is not a large travelling or great resident population, would certainly be to throw away money—that is to say, if a dividend were expected. The success which has attended other Aquaria—such, for example, as those of London, Brighton, Hamburg, Naples, Vienna, etc.—leaves very little doubt that, where you have a large travelling or a great resident population, they will invariably pay as they have paid hitherto. The Crystal Palace Aquarium and the Brighton one have never given less than 20 per cent. The last dividend given at Brighton was 30 per cent.

But I will now pass on from the mere pecuniary aspect of the scheme to the details of the Aquarium building itself, which I have already indicated is to be built upon the site of the old battery. For some time back a number of workmen have been employed excavating and blasting away the projecting rocks in the neighbourhood for the reservoirs, which are to be situated beneath the building. The plans, which have been prepared by Mr. J. Russel Thompson, under-factor to the Marquis of Bute, were submitted to a meeting of the directors, and approved of by them; and it is now fully expected that in a month or so active building operations will be commenced. The building, when erected, will show externally a considerable degree of elegance, and all that pertains to the internal æsthetics of the erection will be adornments of the Corinthian order of architecture. The arrangements inside, when finished, will be as follows, viz. :—A large corridor will run from east to west, forming the main area of the building, and will measure 90 feet long by 15 feet broad. This room will have sixteen large show-tanks, which will contain the larger specimens of marine and fresh-water animals. These tanks will be arranged along either side of the corridor, as well as the passage leading into it. The largest tank will measure 25 by 8 feet; and the average size of the sixteen show-tanks in the long corridor will be 10 feet square. The tanks are made of slate slabs, with artificial rockwork inside, the fronts being composed of plate glass 1 inch thick. There is no lime or metallic substance used in the construction of the tanks : both of these materials would contaminate the water and poison the animals. The slabs and rockwork are fixed by a process of dovetailing. Some cement is also used in fixing the slabs, in such a manner as not to come into immediate contact with the water. All the piping in connection with the Aquarium is composed of vulcanite or hard India-rubber, these two substances being innocuous, and most suitable for the purpose.

Twenty small tanks will be arranged in two side rooms, for the reception of smaller specimens of marine and fresh-water animals. These two rooms will each measure 24 by 22 feet, and will enter off the large hall in the centre of the building. There will also be seven probationary or reserve tanks, for storing specimens as they come into the Aquarium. Their essential use, however, is to prove or test any specimen for a few days previous to putting it into the show-tanks. They also serve the

useful purpose of keeping a reserve stock for supplying the deficiencies caused by the death of any of the animals in the tanks.

It is contemplated also, if other Aquaria are established in Scotland, and notably Glasgow, that the reserve stock might be offered for sale. I am informed, on good authority, that the Crystal Palace Company pay annually to the Brighton Aquarium Company never less than £200.

In the front centre of the building there will be a large entrance hall, measuring 45 by 28 feet; and off this there will be a small refreshment room, with lavatories, etc., etc., for ladies and gentlemen, and for the use of which a small sum will be charged. The large hall will be suitable for conversaziones or concerts.

The elevation to the sea has a frontage of 102 feet in length and 22 feet in height, having a rusticated basement and cornices, with an open balustrading above. In the centre of the building a tower will project from the main line or front, rising a few feet higher, and surmounted by a dome.

There are thirty-six show-tanks altogether in the Aquarium proper. These thirty-six tanks will contain 23,000 gallons of sea water, and 9,000 gallons of fresh water. Besides this quantity of water, it is essential for the more perfect aeration of the water that the two reservoirs—which, I have already stated, are to be placed underneath the building—must contain at least four times as much water as that in the tanks: thus there will be 92,000 gallons of sea water in the one reservoir, and 36,000 gallons of fresh water in the other. The depth of the water in the reservoirs will be 5 feet, and thus a large surface of water is kept in contact with the air to absorb oxygen.

However to keep the water properly oxygenated, and capable of sustaining animal-life, the water is kept circulating from the reservoirs through the tanks, and back again by means of water engines and pumps, the result of this continual motion of the water being the absorption of a large quantity of atmospheric air or oxygen.

If the water were not thus kept in motion the oxygen would soon be exhausted by the animals in the aquarium, the carbonic acid evolved would soon accumulate, and the animals would die.

It is proposed to use a four-horse power turbine water-engine (in duplicate) to circulate the water; the turbine is so constructed that the power can be varied as wished. To feed the turbine 10,000 gallons of water will be required in the

twenty-four hours; this supply, it is expected, will be got from the Rothesay Water Company The *turbine-engine* is being adopted by the Rothesay Aquarium Company, as it is thought to be the most economical method of effecting the constant motion required day and night, summer and winter. Its advantages are that it requires no coals, very little attention, and that the only expense worth mentioning is the rates paid for the supply of the town's water to propel it.

Some of the Aquaria in this country, and on the continent, are worked by steam power, which is very expensive, for besides the wages of an attendant day and night, there is a great consumption of coals, which adds considerably to the yearly expenditure. The water is taken out of the reservoirs by means of pumps, which are worked by the engines—the pumps being made of vulcanite.

It is generally supposed by persons who are not acquainted with the principle upon which aquaria are constructed, and animal-life sustained, that they must have a constant communication with the sea, with an inlet, and an outlet thereto. However, this is not so, for if there was any connection with the sea, the animals would constantly be dying, and simply because, if such were the case, there would of necessity be often recurring changes in the temperature of the sea-water, and the animals being in captivity, would be unable to adapt themselves to those conditions which are most congenial to their existence, and which the wide ocean affords them.

Thus for example, water circulating from the sea in summer would be too hot, while that during winter would be too cold. The fish and other animals in the aquarium being unable to descend to that depth which the fathomless ocean affords them in their natural state of existence—would most assuredly die.

In order, therefore, to carry out successfully the maintenance of animal life in an aquarium, several conditions must be observed, and the most important of these is, that the water must be kept in a perfectly respirable condition, by being brought into constant contact with the atmospheric air by means of machinery, and to ensure that there shall be no interruption to the constant movement of the water two engines are put up alongside of each other and connected with the pumps, so that if one engine were to get in any way disabled the other could be used. The stoppage of the circulation of the water even for a few hours would kill most, if not all the animals, in the aquarium.

The presence of a little vegetation in the tanks promotes very much the purifying process, such vegetation absorbing the carbonic acid given off by the animals, and eliminating the oxygen. It is to be observed that the purifying process is essentially and purely a chemical one.

As in summer the heat causes the water to absorb a diminished quantity of air, this loss is compensated for by making the machinery work much quicker, thereby causing the water to circulate much more quickly from the reservoirs into the tanks.

In summer there is a tendency amongst both animal and vegetable substances to undergo a process of decomposition, called eremacausis. When this occurs they require to be removed. This may be accomplished in two ways—*viz.*, either by increasing the speed of the circulating machinery, or if any of the tanks should be very bad, the whole of the water in these can be readily emptied by means of a syphon, into the reservoir below, such a large body of water not being contaminated in any sensible degree thereby.

The temperature of the building is always kept very cool during summer; being on an average 62° Fahr. This average temperature is sustained all the year round. In winter hot water-pipes are used to keep up an equable temperature of from 60° to 65° Fahr., and the water at 55° Fahr.

The lighting of the aquarium is a matter of the utmost importance, as it greatly depends upon this, whether the water in the aquariums can be kept pure, and those animals which prefer the darkness, or those which prefer light, can be comfortably lodged.

The animals in the tanks may be either viewed through the plate glass forming the fronts, just as if you were looking in at a a shop window; or, as in the case of a table or flat tank, from above, much the same as one would view specimens in the flat cases in a museum. The amount of light admitted should be the smallest amount possible, and just sufficient enough to allow the visitors to see the animals. The reason for this is, that in the sea those animals which prefer the darkness can readily gratify their natural instincts by descending to the bottom, or hiding under sea-weeds, in the crevices of the rock, or under the sand; while those that prefer the light can easily obtain it. In captivity, all these little matters must therefore be attended to, in order that the animals may live in a healthy state.

The diminished light has also the influence of preventing

excessive vegetation in the tanks. If the light be in excess, green vegetation is apt to be over abundant, which is very detrimental to the working of the aquarium, by choking up the pipes, as well as making the tanks look dirty.

"The relations between the light, temperature, and air, and those of vegetation, animals, and water," are of the utmost importance in the healthy guidance of an aquarium. Great attention has been given to this subject, by Mr. Lloyd, of the Crystal Palace Aquarium and he deservedly has the credit of having perfected a system, which at one time, was a problem to solve; namely, how to keep marine animals in a state of captivity without a direct communication with the sea?

Not many years ago, when aquaria were beginning to cause a little sensation on the continent, a certain noble marquis, now deceased, got Mr. Lloyd up from London to superintend the erection of an aquarium for him in Ayrshire. The marquis, who had some ideas of his own with regard to the arrangement of the light, temperature, and other general principles which had to be attended to in such an erection, was quite adverse to those propounded by Mr. Lloyd.

The aquarium was accordingly put up according to the marquis' directions, and against all Mr. Lloyd's remonstrances; who, according to the principles already enunciated, concluded that it would not succeed; and neither it did, for in a very short time the water in the aquarium got into the consistence of pea-soup, and the animals, as a matter of course, all died.

Mr. Lloyd says, with regard to the Crystal Palace aquarium that, "So carefully balanced are the light, temperature, and air, in relation to the vegetation, animals, and water, that not once during two years (previous to 1873) has any tank had to be cleaned, and the animals thereby disturbed, and there apparently will never be a necessity for any manual cleaning. So perfect an adjustment has never hitherto been attained in any public aquarium for the same period."

The animals which are accommodated in the Crystal Palace aquarium, and which give a very fair idea of what are contained in such places of popular recreation are:—*Sponges; Zoophytes; Sea-anemones; Corals; Jelly-fishes; Star-fishes* and *Sea-urchins; Annelides; Crustaceans; Barnacles; Shelled* and *Shell-less Mollusca; Cuttle-fishes;* and *Fishes.* The fishes form by far the largest, and in many respects the most important, interesting, and instructive portion of the collection.

It is anticipated by the directors of the Company, that after the aquarium is fairly started, there will be added a seal pond, and probably a tank for porpoises, which are lung-breathing animals.

Mr. Lloyd of the Crystal Palace aquarium, is very averse to introducing these animals. He asserts that in an aquarium, "The animals must not be lung-breathers, that is to say, they must be either such as the sea-anemones and corals, and some others which have the function of respiration diffused over their entire bodies; or be such as the creatures above them (up to and ending with fishes) which are provided with gills during their whole period of existence. As lunged animals do not require the purifying processes just alluded to, an aquarium is not for their use, and they are therefore excluded from it; and this exclusion applies even to such aquatic animals as water lizards, frogs, and salamanders, in their adult states." I cannot entirely agree with Mr. Lloyd in this respect. An aquarium, in my opinion, should be an arrangement by which the habits and instincts of marine and fresh water animals, whether lung breathing or non-lung breathing, may be observed.

Mr. Lloyd asserts that porpoises, for example, cannot be kept long in an aquarium, as their natural habits of diving (they are essentially divers) for which the formation of their tail adapts them, cannot be carried out in the narrow limits of a tank, and they therefore soon die of consumption, the lungs giving way through confinement, and probably the want of sufficient light.

Suppose they do soon die, their place can be supplied again and again, as objects of attraction, and they would undoubtedly by their frequent introduction, keep up the interest in an aquarium. As they breathe oxygen directly from the atmospheric air, they cannot detract very much from the healthy oxygenated condition of the water.

At the Brighton aquarium the habits and instincts of the porpoise and seals are objects of special attraction to visitors. The seals are kept in an open pond, and do not interfere with the aquarium proper.

In the Rothesay aquarium several tanks will be used in promoting scientific research, and especially that of embryology. The embryology of fish, and especially of the salmon, and if possible, of the herring, will be made objects of special and minute research. So that apart from the pecuniary aspect of

the aquarium, it may become a useful institution in clearing up many of those vexed questions about the embryonic and young conditions of the salmon and herring. It is intended also that the science of embryology will be promoted in a general sense.

Rothesay, August 1874.

Tenthredinidæ in Rannoch.—The following is a list (but not a complete one) of the saw-flies taken during a fortnight's stay in Rannoch in June, 1873. The total number of species found was eighty-five, or about a fourth of the British list. I expected to find some difference between the Rannoch species and those found in the Glasgow districts, but the similarity between the two faunas was much greater than I thought it would be. The boreal species were very few, as were also the pine-feeders, which were indeed conspicuous by their absence, which is rather surprising considering the abundance of the food-plant:—

Cimbex variabilis, rare at Camachgouran and Glenlyon; the larva of the Scotch form feeds usually on birch. *Trichiosoma lucorum*, very common. The males fly in short circles over the tops of the birch trees, making a humming noise; at Glenlyon I found the young larva on oak, a rather unusual food-plant; birch is the commonest food-plant in Scotland. *Abia nitens*, common. *Hylotoma ustulata*, common on birch on the hill-sides at Camachgouran. *Lophyrus pini*, seemingly rare; *L. virens*, two females: another damaged specimen was rescued from the jaws of two large ants; *L. pallipes*, one male and one female in the Black Wood. Mr. M'Lachlan captured some years ago *L. frutetorum* in the same locality. *Cladius eradiatus* Htg., not common. The larvæ feed on upper surface of the leaves of the common rose and the rowan in the autumn. *C. difformis*, one female. *Hemichroa luridiventris* Fall., not uncommon among the alders at Dall. *Nematus Degeeri*, very common on birch. *N.* (*Croesus*) *varus*, Vill., two females on the alders at Dall. *N. crassicornis* Htg., not common: this is perhaps the *N. ruficornis* of Stephens; the larva feeds on sallows. *N. pallipes* Fall., two males on the mountain tops. *N. mollis* Htg., not common. *N. fallax*, common; the larvæ feed on low grasses, and two broods occur in a year, I believe. *N. obductus* Kl., not common. *N. Kirbyi*, one male; *N. ventralis* Pz., Htg. (*abdominalis* Fall.), common on the alders at Dall; I do not know if this species has been recorded as British before. *N. luteus*, very common at Dall: the flat pale-green larva feeds on the upper surface of the alder leaves. *N. wttewaalli* Voll., one female on willow. *N. monticola* Thoms., four males that I caught may perhaps be this species. *N. croceus* Fall., rare. *N. viridis* Ste., very common; I am inclined to believe that *N. prasinus* Htg., is merely a variety of this species. *N. crassulus* Dbm., not uncommon on the banks of the burn at Camachgouran: according to Thomson *N. crassulus* is a gall-maker. *N. appendiculatus* Htg., very rare. *N. cinereæ*, rare. *N. Vallisnieri*, one or two specimens at Kinloch. *N. medullarius* not uncommon at Camachgouran on sallows. Specimens were also captured of a species that is perhaps *N. brachyotus* Foerster. *Athalia rosæ*, very abundant everywhere. *Phyllotoma tenella* Zadd., not rare on birch;

the larvæ mine the birch leaves, and when full-fed spin oval cocoons of thin silk between the epidermal folds in which they pass the pupa state; it is double brooded. *P. vagans* Fall (*melanopyga* Kl.)., not so common. *Fenusa pygmæa*, not common. *Emphytus calceatus*, five specimens. *E. tener* Fall., common. *E. perla*, one individual on rose. *Blennocampa betuleti*, common. *B. fuscipennis* Fall., taken in the Black Wood by sweeping grass, etc. *B. albipes*, common. *B. cinereipes*. *B. pusilla*, the commonest of the genus. *Eriocampa ovata*, common on the alders at Dall, and, as usual, all the specimens were females. *E. annulipes*, more abundant. *Pœcilosoma pulverata*, apparently not rare on alders. *P. obtusa*, one specimen. *P. impresa*, common. *Taxonus coxalis*, one specimen. *Selandria serva*, *S. stramineipes*, *S. morio*, all common. *Strongylogaster cingulatus*, common on *Pteris*, upon which the larvæ feed. *S. delicatulus* Fall. (*eborinus* Kl.), much rarer than the last. *Pachyprotasis rapæ*. *P. simulans*, common. *P. variegata*, one specimen. *Allantus nothus*, abundant. *Perineura nassata* L. Thoms., common. *P. brevispina* Thoms., and *P. excisa* Thoms., much rarer. *Tenthredo scalaris*, *T. punctulata*, *T. mesomela*, *T. olivacea*, *T. atra*, all common. Of the last species specimens were found with the three apical joints of the antennæ white, and they were also smaller than usual. *T. moniliata* Kl., two specimens. *T. livida*, and *T. balteata*, abundant. *T. rufiventris*, rare. *Dolerus eglanteriæ*, not common in marshy places. *D. niger*, one specimen. *D. vestigialis*, common. *Lyda nemoralis* L. (*pratensis* Fab.), rare on pine. *L. erythrocephala*, very rare. *L. arbustorum* Fab., one specimen on rose at Camachgouran on the banks of the burn.—P. Cameron, jun., Glasgow.

Notes on Lepidoptera in Kirkcudbrightshire.—I do not remember a summer in which sugar was so utterly useless; and this though in several portions of the season the weather seemed very suitable. I fully believe myself that a solemn league and covenant has been entered upon by all those noctuæ who have the least pretensions to gentility, to abstain from all spirituous concoctions, seeing how demoralizing and depopulating are the results of tippling! Such habitual *roués*, however, as *Monoglypha* (*Polyodon*) and *Pronuba* have not signed the document, and appeared with their usual effrontery. Among the whimsical disappearances this year, it may be noted, that not one *T. Comes* (*Orbona*) ventured to sugar; and not one *P. Gamma* frisked among the verbenas and petunias. To begin somewhat in order. *Thecla quercus*, swarmed at the oaks, early in August, but as it considered that its patch of purple give it a right to assume imperial habits, it was not easy to entrap. *E. Hyperantus*, ab. *Arete* Müll., appeared occasionally, and *H. Sylvanus*, not a generally abundant Scotch butterfly, was very common in July. If, in the middle of June, one went to the rocks by the sea, and having selected a sunny spot with plenty of *Statice armeria* in bloom, observed a small grey insect come with a rapid and yet quiet flight, and hover over the flowers, a judicious stroke of the net would prove this little visitor to be *Sesia muscæformis*. It occurred too in the larval state, but is more abundant in some other parts of this coast. *C. porcellus* was very scarce this year. Larvæ of *S. populi* might be taken on poplar, and of *Saturnia pavonia* on the moors. *S lubricipeda* was represented by an almost unicolorous specimen. *S. fuliginosa* occurred, and so too *N. plantaginis*;

N. russula was common on the moors. *Nudaria mundana* seemed unusually scarce. *Nola confusalis* was not rare in May. *T. batis* only just occured. I have already mentioned the conspicuous absence of *Noctuæ*; the few not absolutely vulgar, that I got were:—*C. arcuosa*, in tufts of grass; *C. graminis*, common at flowers; *N. brunnea*, at sugar; and *N. umbrosa*, very abundant on a small plot of onion flowers; *C. xerampelina*, near the ash trees; *E. lucipara*, at sugar; *H. thalassina*, a pupa in a rotten log of wood, far in, rather a novel retreat; a very lovely *Plusia V.-aureum; M. maura*, *E. mi* and *glyphica*, not scarce; *P. viridaria (Ænea)*, on the moors. Among the *Geometræ*:—*O. sambucata* was common, for a short while; a lovely, just emerged, specimen of *G. papilionaria* was taken at rest on the grass; *S. clathrata* and *P. petraria* were easy to rouse among the bracken, at the end of June; *A. cæsiata* was plentiful on the higher moors. The genus *Emmelesia* was represented by *Alchemillata*, *Albulata* and *Decolorata*, the last being not uncommon among alders. The only "Pugs" noticed were the very common species. *Thera variata* flew out of pine trees, but rarely. In hopes of rearing *S. muscæformis* I took a quantity of apparently diseased clumps of *S. armeria;* a great many insects indeed appeared therefrom, but all were *H. sordidata (elutata)* quite another thing! *E. plumbaria*, *A. plagiata*, and *T. atrata (chærophyllata)*, were respectively fairly common.—W. D. ROBINSON-DOUGLAS, Orchardton, Castle Douglas, 7th September, 1874.

Occurrence of Rare Birds in the Carse of Gowrie.—It may be interesting to some of your ornithological friends to hear of the observance of the Kingfisher *(Alcedo ispida)* this season in three different localities in the Carse of Gowrie district:—one in the eastern division by Mr Robert Mathew of Gourdie Hill, another by Mr Greig of Glencarse, frequenting the Pow below the house; and on the 2d inst., a third, seen by myself in company with a friend, on the banks of the Tay, below Barnhill, near Perth. The kingfisher was formerly not an unfrequent visitor in the Carse, but of late years, has been seldom or never seen. Thirty years have passed since I had the pleasure of observing these birds in the district. On the following day, the 4th, I had the pleasure of observing another very rare bird on the banks of the Tay—the Solitary Snipe *(Scolopax major)*. The bird rose close to me, and from its size, colour, and flight, I had no difficulty whatever in recognizing the species, the more especially as it is a bird I have been long familiar with in the Mediterranean—though the first time it has ever come under my notice, personally, in Great Britain. In a paper which I had the honour of reading before the Perthshire Society of Natural Science, a year or two ago, allusion was made to the decrease of many of our birds in the Carse. Since then, I am glad to say I have seen a gradual increase of several of those mentioned, such as the Peeweet, Redshank, Lark, and some others; as also the reappearance of the Corn-Bunting, which I have noticed on several occasions this summer. Whether this is caused by the new legislation for the protection of our land and water birds, or the gun licence, it would be difficult to say; but I incline to believe it to be the latter, which has put a salutary check on the indiscriminate slaughter along our hedges and ditches by every idle fellow who could handle a gun; and to to this alone is to be attributed, not only the reappearance of the corn-bunting, but that of our long lost kingfisher.—H. M. DRUMMOND-HAY, Seggieden, Perth, Sept., 1874.

PHYTOLOGY.

THE FUNGUS SHOW.

THE first exhibition of Fungi ever (so far as we are aware) held in Scotland, took place in Aberdeen on September 18th, and was a success in every way; in fact, the promoters of the Show were astonished at the results of their labours, and, judging from the reports of the newspapers, the general public were similarly moved. The number of exhibitors was nearly a hundred, and the collections shown came not only from all parts of Scotland, but even from England and Wales—the well known names of Dr. Bull, Mr. Broome, and the Rev. Mr. Vize appearing in the list of those who sent specimens for exhibition. The number of specimens of the larger Fungi was estimated at upwards of 50,000, while if the Micro-fungi be added, the total number would probably not fall far short of 100,000. The space occupied by the specimens (which were perhaps rather too much crowded together), was 700 square feet.

The meeting was inaugurated on the 17th by a Fungus Foray in the neighbourhood of Aberdeen, by the members of the committee. These, after having been most hospitably entertained by Professor Dickie, divided themselves into two parties, one led by the Professor, the other by Mr J. Roy, the secretary of the committee, to whom much of the success of the Show is due. Among the Fungi found was *Radulum tomentosum*, thus adding a second station for this rare and recently discovered British species.

On the 18th, a numerously attended meeting of botanists was held under the presidency of Professor Ogilvie, at which it was resolved that a society, to be called the Scottish Cryptogamic Society, should be formed for the promotion of the study of cryptogamic botany; and a committee was appointed to organize the society. The society is to have an annual show of cryptogamic plants in one of the principal towns of Scotland (in rotation), and it was decided that the next show should be in Perth in September, 1875. Botanists

desirous of joining the society may learn further particulars by applying to us. Space will not permit us to give a list of many of the rare and interesting fungi exhibited at the show, but we may mention that several species, apparently new, and several only quite recently added to the British lists, were represented. Amongst others were :—*Cortinarius traganus*, *C. orellanus*, *Radulum tomentosum*, *Hyphelia rosea*, *Fistulina hepatica*, (from several Scottish localities), *Sparassis crispa* (from two localities in Scotland), *Geaster Bryantii*, *Helvella gigas*, *Agaricus giganteus*, *A. aurantius*, *A. spectabilis*, *A. porrigens*, *Puccinia Andersoni*, *Protomyces n. sp.*, *&c.*

The largest fungus in the show was a magnificent specimen of *Polyporus giganteus* exhibited by Sir Thomas Moncreiffe, Bart., while a very interesting collection of ergotised grasses was shown by Mr. Stephen Wilson. Some specimens of (apparently) *Polyporus nigricans* found under 12 feet of peat, were shown by Mr. Taylor. Similar specimens have we believe been found in the fens of Cambridgeshire, but the occurrence of fungi in this sub-fossil condition is worthy of more investigation than it has hitherto apparently received. We noticed that the *Polyporus* in question bore the traces of a coleopterous inhabitant, possibly *Cis lineato-cribratus* which attacks it at the present day, but is of somewhat local occurrence in Britain.

Other features of the Show were a collection illustrative of the commoner poisonous and edible species, as well as a curious hat from Eastern Europe formed out of *Polyporus fomentarius* and exhibited by Professor Dickie, who, as well as Professor Ogilvie, exhibited specimens of fungi preserved for the Herbarium.

New British Fungi.—During a walk through the Chapelton fir wood here, last week, the Rev. J. Fergusson and I gathered several specimens of what turns out to be *Agaricus (Tricholoma) virgatus* Fr., a species which I have not seen previously recorded as British. I understand that *Leotia circinans* P. has also been discovered in the north-east of Scotland.—J. Keith, Forres, 28th Sept., 1874.

Note on Discelium nudum Brid.—The first record of this moss as Scottish is by Dickson (in 1801) in his Fourth Fasciculus of Cryptogamic British Plants. It is there mentioned as having been found "prope *Perth*, in Scotiâ, *D. G. Don.*" Specimens from Don or Dickson, I forget which, are preserved in the Edinburgh University Herbarium, and a more particular indication is there given of the locality. Guided by this I searched and found the *Discelium* in some abundance on clay banks of the Tay below Perth. More recently I have seen it on similar banks beside the Earn. It still remains, I believe, a rare moss in Scotland ; I have heard of one other locality only.—F. Buchanan White.

LIST OF FUNGI FOUND WITHIN THE PROVINCE OF MORAY CHIEFLY IN THE VICINITY OF FORRES.

(Continued from p. 312.)

By the Rev. J. KEITH, M.A.

I have to preface the concluding portion of this list by gratefully acknowledging the kind assistance I have received from Frederick Currey, Esq., London, in determining the *Sphæriacei*. All the species about which I had any doubt were submitted either to him or the Rev. M. J. Berkeley, and the reliability and value of the list have thereby been materially increased. —J. K.

(128). MORCHELLA, Dill.

551. Esculenta, Pers. Woods and bushy places. April and May. Rare. Greeshop, Grangehall, Dalvey, Banks of Findhorn from Sluie Var. Conica, Fr., at Sluie.

(129). GYROMITRA, Fr.

552. Esculenta, Fr. In pine-woods. March-May. Rare. Greeshop. New Forres, Altyre, Dunphail, Gordon Castle, &c.

(130). HELVELLA, Linn.

553. Crispa, Fr. Woods and lawns. September. Rare. Altyre, Brodie, Gordon Castle.

554. Lacunosa, Afr. Woods and lawns. Rare. Lawn at Whiterow.

(131). MITRULA, Fr.

555. Paludosa, Fr. On leaves in ditches, &c. April, May. Rare. Sluie and Slatesheugh, Rafford.

(132). SPATHULARIA, P.

556. Flavida, P. Fir-woods. Rare. Wood beyond the Free Church, Rafford, and Chapleton wood.

(133). LEOTIA, Hill.

557. Lubrica, P. Woods and lawns. Hollow in wood behind the cottages at Old Blair, and plentiful in lawn at Altyre.

(134). PEZIZA, Linn.

558. Acetabulum, L. On the ground in spring. Rare. Sanquhar, Gordon Castle.

559. Macropus, P. Woods. Apparently very rare. Kinrara hill.

560. Venosa, P. On the the ground in spring. Rare. Greeshop wood.

561. Cochleata, Huds. Among grass. Brodie, Sanquhar, Grantown.

562. Leporina, Batsch. Lawn at Whiterow.

563. Onotica, P. In woods. Altyre, Sanquhar, Brodie, Darnaway.

564. Aurantia, Fr. Woods. Scourie, Brodie, Gordon Castle, &c.

565. Vesciculosa, Bull. On dung-hills in spring. Waterford.

566. Polytrichi, Schum. On heaths. Glenmore, Abernethy.

567. Granulata, Bull. On cow-dung. Common.

568. Coccinea, Jacq. On sticks. Spring. Frequent above Cothall.

569. Pygmea, Fr. On a whin stump covered with earth, Broomhill, Rafford.
570. Hemispherica, Wigg. On the ground, Sanquhar.
571. Scutellata, L. On wet sticks, &c. Water-wheel at Sanquhar, &c. Common.
572. Stercorea, Pers. On cow-dung, Sanquhar, &c. Common.
573. Virginea, Batsch. Sticks, &c. Frequent. Altyre, &c.
574. Nivea, Fr. Sticks, &c. Frequent. Whiterow, etc.
575. Calycina, Schum. On fir sticks, Darnaway. Var. laricis. Frequent on larch branches, Clunyhill.
576. Bicolor, Bull. On dead oak twigs, Sanquhar.
577. Cerinea, P. On the cut surface of an ash stump, Sanquhar.
578. Caulicola, F. On Carices, near the farm of Bogs, Sanquhar.
579. Schumacheri. Fr. Var. plumbea. On sticks, Dunphail, Sanquhar.
580. Pineti, Batsch. On fir cones, Altyre, Dunphail.
581. Villosa, P. On dead Umbelliferæ, Sanquhar.
582. Rosæ, P. Abundant on dry branches of Rosa canina, Sanquhar.
583. Fusca, P. On fallen alder branches, Greeshop.
584. Firma, P. On sticks. Rather common. Dunphail, Whiterow, etc.
585. Cyathoidea, Bull. On dead Angelica stems in Greeshop wood. Common.
586. Strobilina, Fr. On cones of spruce lying among damp moss in Altyre wood. Found several times.
587. Cinerea, Batsch. On decaying wood. Very common.
588. Axillaris, Nees. On Splachnum mnioides on Skor-gaoith, Rothiemurchus.
589. Atrata, P. On rotten bramble stick, Grangehall wood.
590. Fusarioides, Berk. On dead nettle stems, Thornhill, etc.

(135). HELOTIUM, Fr.

591. Æruginosum, Fr. On oak sticks, Relugas, etc.
592. Citrinum, Fr. On an old stump in plantation at Suspension Bridge, and at Sanquhar.
593. Ochraceum, Fr. On a stick beside the burn at Sanquhar.
594. Salicellum, Fr. On a willow tree at Dunphail.
595. Herbarum, Fr. Nettle stems at Thornhill gate.

(136). PATELLARIA, Fr.

596. Atrata, Fr. On a decayed stump in Greeshop wood and a stick at Invererne.

(137). CENANGIUM, Fr.

597. Cerasi, Fr. On cherry branches. Common. Invererne, Altyre, etc.
598. Ferruginosum, Fr. On Scotch fir branches, Kintessack.

(138). ASCOBOLUS, Tode.

599. Crouani, Cooke. On the ground among small mosses. Rather common. Tarras moor, Rothes, &c.
600. Furfuraceus, Pers. On cow dung. Very common.
601. Glaber, Pers. On rabbits' dung, Grangehall.
602. Ciliatus, Schum. On cow dung. Common.

(139). BULGARIA, Fr.

603. Sarcoides, Fr. On old stumps. Common.

(140). STICTIS, Pers.

604. Radiata, Pers. On sticks and fir cones. Common.
605. Lecanora, Schm. On a stick at Dunphail.
606. Versicolor, Fr. On sticks. Whitrow, Kinkssack, etc.

(141). PHACIDIUM, Fr.

607. Ilicis, Fr. On dead holly leaves. Rather common,

(142). HETEROSPHÆRIA, Grev.

608. Patella, Grev. On Angelica stems. Common.

(143.) RHYTISMA, Fr.

609. Salicinum, Fr. On willow leaves. Dunphail, etc.
610. Acerinum, Fr. On sycamore leaves. Very common.

(144). HYSTERIUM, Tode.

611. Pulicare, Pers. On fallen tree, Altyre.
612. Fraxini, Pers. On ash branches. Common,
613. Curvatum, Fr. On holly branch, Sanquhar.
614. Lineare, Fr. On a stick of broom, Kincorth.
615. Virgultorum, D.C. On dead bramble stems, Greeshop, etc.
616. Conigenum, Fr. On fallen cones of Scotch fir. Common.
617. Melaleucum, Fr. On dead cranberry leaves, Grantown.
618. Pinastri, Schrad. On pine leaves. Common.
619. Juniperinum, De Not. On juniper leaves, Grantown.
620. Culmigenum, Fr. On grasses. Common.

(145). SPOROMEGA, Corda.

621. Cladophila, Lev. On bilberry stems, Sanquhar.

(146). COLPOMA, Wallr.

622. Quercinum, Wallr. On oak twigs. Common.

(147). STEGIA. Fr.

623. Ilicis, Fr. On holly leaves. Common.

(148). TROCHILA, Fr.

624. Lauro-cerasi, Fr. On laurel leaves. Common.
625. Buxi, Cap. On withered box leaves. Common.
626. Craterium, Fr. On dead ivy leaves. Common.

(149). TORRUBIA, Lev.

627. Entomorrhiza, Fr. On a wasp in moss at Sluie.

(150). CLAVICEPS, Tul.

628. Purpurea, Tul. (Stroma). On grains of corn and grasses.

(151). EPICHLOE, Fr.

629. Typhina, Berk. On living grasses. Rather common about Forres and at Rothiemurchus.

(152). HYPOMYCES, Tul.

630. Aurantius, Tul. On decaying Polyporus versicolor, Sanquhar.

(153). NECTRIA, Fr.

631. Pulicaris, Tul. On decaying broom branches. (Fusarium roseum occurred along with it). Blervie.
632. Cinnabarina, Fr. On dead twigs. Very common.
633. Coccinea, Fr. On dead twigs, Sanquhar.
634. Aquifolia, Berk. On holly twigs in hedge at Roy's-Vale.
635. Sanguinea, Fr. On sticks, stumps, sphæriæ, etc., Sanquhar, Greeshop, etc.
636. Episphæria, Fr. On Dothidea ribesia in Manse garden.
637. Russeliana, Mont. On dead box leaves in Manse garden.

(154). XYLARIA, Fr.

638. Hypoxylon, Grev. On stumps and sticks. Common.

(155). HYPOXYLON, Fr.

639. Multiforme, Fr. On birch. Common.
640. Fuscum, Fr. On hazel. Banks of Findhorn. Common.
641. Serpens, Fr. On dead sticks, Cothall.
642. Udum, Fr. On decayed sticks, Sanquhar, etc.,

(156). EUTYPA, Tul.

643. Acharii, Tul. On dead ivy sticks, Cothall.
644. Lata, Tul. On sticks. Common. Sluie.
645. Flavo-virens, Tul. On dead branches. Altyre, Greeshop, etc.,

(157). DOTHIDEA, Fr.

646. Junci, Fr. On stems of rushes. Common.
647. Graminis, Fr. On leaves of grass, Greeshop.
648. Ribesia, Pers. On branches of currant and gooseberry. Common.

(158). DIATRYPE, Fr.

649. Verrucæformis, Fr. On oak sticks. Common.
650. Stigma, Fr. On sticks, especially of hawthorn. Common.
651. Disciformis, Fr. On sticks of beech. Common.
652. Nucleata, Curr. On furze. Common.
653. Ferruginea, Fr. On hazel branches. Cothall, Sanquhar.

(159). MELANCONIS, Tul.

654. Stilbostoma, Tul. On birch. Common.
655. Alni, Tul. On alder sticks.
656. Longipes, Tul. On oak sticks. Sanquhar.

(160). VALSA, Fr.

657. Stellulata, Fr. On elm sticks. Banks of Findhorn.
658. Nivea, Fr. On hawthorn. Common.
659. Leucostoma, Fr. On Prunus Padus. Sanquhar.
660. Ceratophora. Tul. On oak stick. Sanquhar.
661. Pulchella, Fr. On birch post. Brodie.
662. Circumscripta, Mont. On hazel. Sanquhar.

(161). CUCURBITARIA.

663. Laburni, De Not. On dead branches of laburnum. Manse of Dallas, Dunphail, Invererne.
664. Elongata, Grev. On furze. Sanquhar.
665. Spartii, De Not. On dead broom. Sanquhar.
666. Berberidis, Gray. On Berberis in Drumduan hedge.
667. Cupularis, Fr. On dead branches of Prunus Padus. Sanquhar.

(162.) GIBBERA, Fr.

668. Vaccinii, Fr. On living branches of cranberry. Grantown.

(163). MASSARIA, De Not.

669. Siparia, Tul. On birch posts. Waterford.

(164). SPHÆRIA, Hall.

670. Aquila, Fr. On hawthorn sticks. Invererne, &c.
671. Phæostroma, Mont. On elm stick, Darnaway bank, opposite Cothall.
672. Ovina, Pers. On decayed wood. Sanquhar and Greeshop.
673. Capillifera, Curr. On decayed stick. Altyre.
674. Scabra, Curr. On stick of broom. Sanquhar.
675, Spermoides, Hoffm. On rotten stumps. Common.
676. Moriformis, Tode. On sticks at Mondole and at Dunphail.
677. Ruborum, Lib. On bramble stems. Greeshop and Sanquhar.
678. Obducens, Fr. On an old stick. Sanquhar.
679. Pulvis-pyrius, Pers. On an alder stump, and also on a stick. Sanquhar.
680. Jenynsii, B. and Br. On a stick in wood behind Mondole cottages.
681. Loniceræ, Sow. On honeysuckle at Sanquhar, and ivy at Blair chapel.
682. Xylostei, Pers. On honeysuckle. Sanquhar.
683. Spiculosa, Pers; Var. Pulla, Nke. On ivy at Blair chapel.
684. Millepunctata, Grev. On ash twigs. Common.
685. Quadrinucleata, Curr. On honeysuckle twigs. Sanquhar.
686. Clypeata, Nees. On Cornus sanguinea, near Altyre gate.
687. Tomicum, Lev. On common rush, Grantown.
688. Herbarum, Pers. On leaves of grasses and herbaceous stems. Common.
689. Acuminata, Sow. On thistle stems, Grantown.
690. Acuta, Moug. On nettle stems. Very common.

691. Pellita, Fr. On decayed potatoe stems.
692. Doliolum, Pers. On dead stems of Umbelliferæ. Common.
693. Derasa, B. and Br. On ragwort stems. Common.
694. Setacea, Pers. On fallen sycamore leaves, Greeshop.

(165). SPHÆRELLA, De Not.

695. Punctiformis, Pers. On dead leaves.
696. Myriadea, D.C. On dead oak leaves.
697. Rumicis, Desm. On living dock leaves.
All three very common.

(166). CERATOSTOMA, Fr.

698. Caprinum, Fr. Among decayed leaves, Sanquhar.

(167). STIGMATEA, Fr.

699. Geranii, Fr. On leaves of Geranium sylvaticum.
700. Robertiani, Fr. On leaves of Geranium robertianum.
701. Alchemillæ, Grev. On leaves of Alchemilla vulgaris.

(168). DICHÆNA, Fr.

702. Strobilina, Fr. On cones of spruce fir, Altyre and Dunphail.

ADDENDA.

703. Agaricus (Lepiota) cepæstipes, Sow. On wood in stove at Dalvey.
704. A. (Tricholoma) ustalis, Fr. Altyre woods.
705. A. (Clitocybe)opacus, With. Altyre woods.
706. A. (Mycena) peltatus, Fr. Altyre woods.
707. A. (Hebeloma) euthelus, B. and Br. Forres House grounds.
708. A. (Hebeloma) hiulcus, Fr. Clunyhill.
709. A. (Crepidotus) rubi, Berk. On a beech stick, Banks of Findhorn, Darnaway side, opposite Cothall.
710. Cortinarius orellanus, Fr. Mr. Berkeley has informed me that the form which I have given in the list as the var. semisanguineus of C. cinnamomeus belongs to this species.
711. Trogia crispa, Fr. On oak sticks, Sanquhar.
712. Polyporus cervinus, Pers. On a birch stick above Cothall.
713. Clavaria vermiculata, Scop. Lawn at Altyre.
714. Didymium hemisphericum, Bull. On decaying broom twigs, Manachie.
715. Phelonitis strobilina, P. On cones of spruce, Altyre.
716. Uredo confluens, D.C. On Mercurialis perennis. Cothall.
717. Sphærotheca Castagnei, Lev. On meadow sweet and hop leaves. Dalvey, Cothall, &c.
718. Podosphæria clandestina, Lev. On hawthorn leaves.
719. Erysiphe martii, Lk. On pea leaves.

(Concluded.)

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 328.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

DIPTERYGIA Steph.

SCABRIUSCULA L. (1758); *pinastri* L. (1761). Rare. Pascual, agrestal.

DISTRIBUTION—EAST. o o ♀ Dee Moray o o o
WEST. o o o o o

LAT. 57°20″-57°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. July, August. FOOD-PLANT. Dock.

HELIOPHOBUS Boisd.

POPULARIS F. Not very common. Agrestal, pascual.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

LAT. 54°50″-57°10″. RANGE IN EUROPE. Central (to S. Sweden?) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. April, May. FOOD-PLANT. Roots of grass.

CHARÆAS Steph.

GRAMINIS L. Common. Pascual, agrestal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney ♀
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40″-59°10″. RANGE IN EUROPE. Northern and central; alpine in South. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July-September. LARVA. April-June. FOOD-PLANT. Roots of grasses.

CERIGO Steph.

MATURA Hufn. (1767); *cytherea* F. (1794). Local. Pascual.

DISTRIBUTION—EAST. Tweed ♀ ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

LAT. 54°50-57°40″. RANGE IN EUROPE. Central (? South Sweden). TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Grasses.

LUPERINA Boisd.

TESTACEA Hb. Common. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40″-57°40″. RANGE IN EUROPE. Central TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May-July. FOOD-PLANT. Grass (lower part of stem).

CESPITIS F. Rare. Pascual.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o West-Ross o

LAT. 54°50″-57°40″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May, June. FOOD-PLANT. Grasses.

CELŒNA Steph.

HAWORTHII Curt. Not common. Pascual, ericetal. Ascends to 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°50″-58°30″. RANGE IN EUROPE. Britain, Germany, N. France, Finland, Lapland, Ural, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, September. LARVA. May-July. FOOD-PLANT. Cotton-grass (*Eriophorum*).

The ab. *hibernica* Stph. (front-wings less variegated, ferruginous) occurs.

ACOSMETIA Steph.

ARCUOSA Hw. Not very common. Palustral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde ♀ o o

LAT. 54°50″-57°10″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Roots and stems of *Aira cæspitosa*.

Though the imago is so like one of the *Leucaniidæ*, that by some authors *arcuosa* is placed in that family, yet the larva is that of *Miana*, as Mr. Buckler informs me.

MIANA Steph.

STRIGILIS Cl. Common. Pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross ♀

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-April. FOOD-PLANT. In stems of grasses.

FASCIUNCULA Hw. Common. Pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross

LAT. 54°40″-57°50″. RANGE IN EUROPE. Britain, Jutland, Batavia, France, &c. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. ? FOOD-PLANT. ?

LITEROSA Hw. Not uncommon. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Britain, North and South Germany, North France, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-June. FOOD-PLANT. Grasses.

BICOLORIA Vill. (1789); *furuncula* Tr. (1825). Not common. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST, Solway Clyde o o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. September-June. FOOD-PLANT. Stems of grass (*Phalaris arundinacea*).

APAMEA Ochsen.

DIDYMA Esp. (1788); *oculea* (? L.) Gn. (1852). Common. Agrestal, pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀
Orkney ♀♀
WEST. Solway Clyde ♀♀ West-Ross ♀

LAT. 54°40″-59°40″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Grasses.

UNANIMIS Fr. Not common. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway Clyde Argyle o o

LAT. 54°40″-57°10″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-April. FOOD-PLANT. Grasses.

GEMINA Hb. Common. Pascual, nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central; South Sweden, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September-May. FOOD-PLANT. Grasses.

The aberration *remissa* Fr. (much paler and more variegated) has occurred in Tay, Dee, etc.

PABULATRICULA Brahm. (1791); *connexa* Bkh. (1792). Rare. Agrestal.

DISTRIBUTION—EAST. o o Tay o o o o o o
WEST. o o o o o

LAT. 56°50″. RANGE IN EUROPE. Britain, North and Central Germany, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British?

TIME OF APPEARANCE—IMAGO. June, July. LARVA. ? FOOD-PLANT. ?

BASILINEA F. Common. Agrestal, pascual, nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August-April. FOOD-PLANT. (Grains of wheat and then) low plants.

MAMESTRA Treit.

[PERSICARIÆ L. Rare. Agrestal.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway Clyde o o o

LAT. 55°60″-56°20″. RANGE IN EUROPE. Central; South Sweden, etc. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Low plants.

BRASSICÆ L. Common. Agrestal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂♀
Orkney ♂♀
WEST. Solway Clyde ♂♀ West-Ross ♂♀

LAT. 54°40″-59°10. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, July. LARVA. August, September. FOOD-PLANT. Cabbage, etc.

FURVA Hb. Not common. Agrestal, pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂♀ o o
WEST. Solway Clyde ♂♀ ♂♀ ♂♀

LAT. 54°50″-57°50″. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September-June. FOOD-PLANT. Grasses (roots). Frequently confounded with dark forms of *Apamea gemina*.

ALBICOLON Hb. Rare. Pascual.

DISTRIBUTION—EAST. Tweed ♂♀ Tay o o o o o
WEST. ♂♀ Clyde o o o

LAT. 55°60″-56°50″. RANGE IN EUROPE. Central; Sweden, South Finland, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO May, June. LARVA. July, August. FOOD-PLANT. Low plants.

SORDIDA Bkh. (1792); *anceps* Hb. (1804). Not very common. Agrestal, pascual.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central (S. Sweden?). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. September-April? FOOD-PLANT. Low plants.

ABJECTA Hb. Rare.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

LAT. 57°50″ RANGE IN EUROPE. Britain, North Germany, South-west France, central and south Sweden, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. ? FOOD-PLANT. ?

CRYMODES Gn.

EXULIS Lef.; *Hadena assimilis* Dbld. Rare. Ericetal and nemoral. Ascends to upwards of 1000 feet.

DISTRIBUTION—EAST. o ♀ Tay [Dee] Moray ♀ ♀ ♀
WEST. o Clyde Argyle ♀ ♀

LAT. 55°50″-57°50″. RANGE IN EUROPE. Scotland, Iceland, Greenland, Labrador. TYPE. Boreal. TYPE IN BRITAIN. Scottish.

TIME OE APPEARANCE—IMAGO. July. LARVA. September-May. FOOD-PLANT. Grasses (roots).

The Scottish form of this interesting insect was (not unnaturally) for some time considered to be a distinct species, *Hadena assimilis* Dbld. It is now, however, generally admitted to be a form of the excessively variable *Crymodes exulis* Lef., whose headquarters are in Iceland. Closely allied species are found in the Alps, Pyrenees, and Norwegian mountains. The Iceland insect (of which I have seen a series) appears to be generally smaller than ours, and much more variable in its colours and markings. All the Scottish specimens, that I have seen or heard of, are tolerably similar in stature and colour (agreeing with the description in Stainton's Manual, I., p. 274), and would seem to constitute a distinct variety or geographical

race, to which I think the title var. *Doubledayi* might be fitly applied, in honour of the distinguished naturalist who first described the species as British. *Crymodes exulis* has now been taken in five localities in Scotland. The [Dee] rests on a pupa I found in that district, and which seemed to agree pretty closely with the description of the chrysalis of the Icelandic insect; it unfortunately did not produce an imago.

HADENIDÆ.

HADENA Fr.

RECTILINEA Esp. Not uncommon in the highlands; rare in the lowlands. Nemoral. Ascends to 1500 feet.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. ♀ Clyde Argyle ♀ ♀

LAT. 56°-58°40″. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June. LARVA. September-April. FOOD-PLANT. Sallow, blaeberry, etc.

CONTIGUA Vill. Not common; less rare in the highlands. Pascual, nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay ♀ Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD PLANT. Low plants, birch, oak, etc.

THALASSINA Rott. Not uncommon; commonest in the lowlands. Agrestal, pascual, nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle West-Ross o

LAT. 54°40″-57°50″. RANGE IN EUROPE. Central; South Scandinavia. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Broom, low plants, etc.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 336.)

EDITED BY D. SHARP, M.B.

STAPHYLINUS Kr.

PUBESCENS De Geer. Lowland. Common.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde o o o

FULVIPES Scop. Very rare.

DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o Clyde o o o

STERCORARIUS Ol. Lowland. Local.

DISTRIBUTION—EAST. Tweed, Forth Tay ♀ Moray Sutherland o o
WEST. Solway Clyde o o o

LATEBRICOLA Grav. Very rare.

DISTRIBUTION—EAST. Tweed o Tay o o Sutherland o o
WEST. o o o o o

ERYTHROPTERUS Lin. Lowland. Common.

DISTRIBUTION—EAST. ♀ Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ ♀ o

CÆSAREUS Ced. Lowland. Local.

DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway ♀ Argyle o o

OCYPUS Kr.

OLENS Müll. Lowland.

DISTRIBUTION—EAST. ♀ ♀ ♀ Dee Moray Sutherland o Shetland
WEST. Solway ♀ o o o

BRUNNIPES Fab. Lowland. Local.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde o o o

FUSCATUS Grav. Scarce. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway ♂ o o o

CUPREUS Rossi. Lowland, highland. Abundant.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray ♂ ♂
Shetland
WEST. Solway ♂ ♂ ♂ ♂

ATER Grav. Rare. Maritime or riparial.

DISTRIBUTION—EAST. ♂ Forth o o o o o o
WEST. ♂ ♂ o o o

MORIO Grav. Lowland. Common.

DISTRIBUTION—EAST. ♂ Forth Tay ♂ Moray o o o
WEST. Solway ♂ ♀ o o

The *Ocypus Saulcyi*, described by Reiche on a specimen from Peterhead, is probably this species.

PHILONTHUS Kr.

SPLENDENS Fab. Lowland.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

INTERMEDIUS Bois. Rare. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. ♂ o o o o

LAMINATUS Creutz. Common. Lowland.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray o o o
WEST. ♂ o o o o

SUCCICOLA Th. Abundant. Lowland, highland.

DISTRIBUTION—EAST. ♂ Forth Tay Dee ♂ o o o
WEST. Solway Clyde o o o

ÆNEUS Rossi. Lowland, highland. Abundant in carcases.

DISTRIBUTION—EAST. ♂ Forth Tay Dee ♂ ♂ ♂ ♂
WEST. Solway ♂ ♂ ♂ ♂

ADDENDUS Sharp. Lowland. In vegetable refuse. Very local.

DISTRIBUTION—EAST. ♂ Forth Tay o o o o o
WEST. Solway o o o o

CARBONARIUS Gyll. Lowland. Not common.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

SCUTATUS Er. Lowland. Very local. Amongst moss.

DISTRIBUTION—EAST. Tweed Forth Tay o Moray o o o
WEST. o o o o o

DECORUS Grav. Amongst moss. Common.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray ♀ ♀
Shetland
WEST. Solway Clyde o o o

POLITUS Fab. Lowland, highland. Abundant.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

XANTHOLOMA Grav. Maritime. Abundant.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ ♀ ♀
Shetland
WEST. Solway Clyde ♀ ♀ ♀

A variety of the male, with large head, and remarkable differences in the sculpture of the hind-body (*variolosus* Sharp), has occurred in the Forth district.—D. S.

[FUCICOLA Curt. Maritime. Doubtful as Scottish.

Though this species is recorded in Murray's Catalogue as occurring in the Forth district ("Dalmeny"), I feel confident that the large variety of *P. xantholoma* alluded to above would be intended, rather than the true *P. fucicola*.—D. S.

EBENINUS Er. Common.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

Obs.—A red variety of this species occurs (*P. corruscus* Gr.), but I am not aware that it has been found in Scotland. The entire absence of this variety in Scotland would be, if confirmed, a point of considerable interest. —D. S.

CORVINUS Er. Lowland. In marshes. Rare.

DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. Solway o o o o

FUMIGATUS Er. Lowland and maritime. Local.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway Clyde o o o

SANGUINOLENTUS Grav. Lowland. In dung.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

BIPUSTULATUS Panz. Lowland. In dung. Extremely local.

DISTRIBUTION—EAST. o [Forth] o o o o o o
WEST. Solway o o o o

SCYBALARIUS Nord. Lowland. In refuse.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

VARIANS Payk. Abundant. In dung.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ ♀ ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀

AGILIS Grav. In dung. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

LUCENS Man. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

UMBRATILIS Grav. Lowland. Scarce.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway o o o o

MARGINATUS Fab. Abundant. In dung.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♀ ♀ ♀
Shetland
WEST. Solway ♀ ♀ ♀ ♀

VARIUS Gyll. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀
Shetland
WEST. Solway ♀ ♀ ♀ ♀

A variety of this species occurs in which the elytra are red instead of green (*nitidicollis* Bois.); I possess a specimen of this form, from Shetland. —D. S.

ALBIPES Grav. Scarce.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

SORDIDUS* Grav. In vegetable refuse.

DISTRIBUTION—EAST. Tweed Forth o o o o o
Shetland
WEST. Solway o o o o

FIMETARIUS Grav. In decaying vegetable and animal matter.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray ♀ ♀ Shetland
WEST. Solway ♀ ♀ o o

NIGRIVENTRIS Th. In decaying animal matter. Very local.

DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

CEPHALOTES Grav. Common. Lowland.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway ♀ o o o

DEBILIS Grav. Lowland.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde o o o o

DISCOIDEUS Grav. Lowland.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. ♀ ♀ o o o

VENTRALIS Grav. Lowland.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. ♀ o o o

VERNALIS Grav. Lowland. Extremely local.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

* *Obs.*—Several species of the genus *Philonthus* are now found in very various and widely separated parts of the world. *P. æneus* and *P. sordidus* are notable instances of this. It is an interesting and important enquiry as to how far the climatic and thermal circumstances vary in these different localities, but I am not aware that any investigations have yet been made on these points.—D. S.

SPLENDIDULUS Grav. Under bark of dead trees. Very rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

NIGRITA Nord. Among sphagnum. Scarce.

DISTRIBUTION—EAST. ♀♂ Forth Tay o o o o o
WEST. Solway o o o o

MICANS Grav. Lowland. In marshes. Very local.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

FULVIPES Fab. Riparial. Rare.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

TROSSULUS Nord.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

NIGRITULUS Fab. Grav. Amongst moss, dead leaves, &c. Common.

DISTRIBUTION—EAST. ♀♂ Forth ♀♂ ♀♂ Moray ♀♂ ♀♂ Shetland
WEST. Solway ♀♂ o o o

PUELLA Nord. Lowland, highland. In dung, and decaying vegetable refuse.

DISTRIBUTION—EAST. o Forth Tay Dee ♀♂ o o o
WEST. Solway ♀♂ o o o

SERICEUS Holme. Maritime. Very local.

DISTRIBUTION—EAST. o o o o o o o o
WEST. ♀♂ Clyde o o o

Found by Professor M'Nab, near Ayr.

CINERASCENS Grav. Lowland. In marshes.

DISTRIBUTION—EAST. ♀♂ Forth Tay Moray o o o
WEST. Solway ♀♂ o o o

SIGNATICORNIS. Lowland. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway ♀♂ o o o

VILLOSUS Steph. Very rare.

DISTRIBUTION?

"South of Scotland, and Kinross-shire—A. Murray." Murray Cat.

PROCERULUS Grav. Rare.

DISTRIBUTION—EAST. Tweed o Tay o o o o o

WEST. Solway o o o o

PROLIXUS Er. Riparial. Very local.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

XANTHOLINUS Kr.

GLABRATUS Grav. Lowland.

DISTRIBUTION—EAST. o o o o o o o Shetland

WEST. Solway Clyde o o o

PUNCTULATUS Payk. Common.

DISTRIBUTION—EAST. ꝏ ꝏ Tay ꝏ Moray o o o

WEST. Solway ꝏ o o o

OCHRACEUS Gyll.

DISTRIBUTION—EAST. o o o o Moray o o o

WEST. Solway o o o o

DISTANS Kr. Highland. Rare.

DISTRIBUTION—EAST. o o Tay Dee o o o o

WEST. o o o o o

TRICOLOR Fab. Highland. Rare.

DISTRIBUTION—East. o o Tay Dee o o o o

West. o o o o o

LONGIVENTRIS Heer.

DISTRIBUTION—East. o Forth o o o o o o

WEST. Solway o o o o

LINEARIS Ol. Abundant.

DISTRIBUTION—EAST. o o o Dee Moray ꝏ ꝏ ꝏ

WEST. Solway ꝏ ꝏ ꝏ ꝏ

LENTUS Grav. Under bark of Scotch fir. Very rare.

DISTRIBUTION—EAST. o o o Dee Moray o o o

WEST. o o o o o

LEPTACINUS Kr.

PARUMPUNCTATUS Gyll. Not common.

DISTRIBUTION—EAST. Tweed ♀ ♀ Dee Moray o o o
WEST. o o o o o

BATYCHRUS Gyll. Not common.

DISTRIBUTION—EAST. o o o Dee Moray o o o
WEST. o o o o o

LINEARIS Grav. Not common.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

FORMICETORUM Märk. In the nests of the wood ant.

DISTRIBUTION—EAST. o o Tay ♀ Moray o o o
WEST. o o o o o

BAPTOLINUS Kr.

ALTERNANS Payk. Under bark of dead trees. Common.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

OTHIUS Kr.

FULVIPENNIS Fab. Among moss and leaves. Rather scarce.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o Shetland
WEST. Solway ♀ o o o

PUNCTIPENNIS Lac. Lowland. Scarce.

DISTRIBUTION—EAST. Tweed Forth Tay Dee o o o o
WEST. Solway Clyde

MELANOCEPHALUS Grav. Highland, alpine.

DISTRIBUTION—EAST. o ♀ Tay Dee ♀ o o Shetland
WEST. Solway Clyde ♀ o o

MYRMECOPHILUS Kies. Lowland, highland. Amongst moss and leaves.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray o o Shetland
WEST. Solway ♀ o o o

(To be continued.)

END OF VOLUME II.

No. IX.] JANUARY, 1873. [Vol. II.

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Edited by F. Buchanan White, M.D.

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All Scottish Naturalists are invited to contribute original articles, notices of captures, or other communications relating to *Scottish* Natural History.

Among others, the following eminent *Scottish* Naturalists have kindly intimated their interest in the Magazine:—

THE DUKE OF ARGYLL, F.R.S.
DR. ALLMAN, F.R.S., Emeritus Professor of Natural History, University [of Edinburgh.
PROFESSOR DICKIE, University of Aberdeen.
DR. LAUDER LINDSAY, F.R.S.E., F.L.S.
DR. M'INTOSH, F.R.S.E., F.L.S.
R. M'LACHLAN, F.L.S., Secy. of the Entomological Society of London.
PROFESSOR M'NAB, Royal Agricultural College, Cirencester.
DR SHARP.
J. BOSWELL SYME, LL.D., F.L.S.
PROFESSOR YOUNG, University of Glasgow. Etc., etc., etc.

Contributions to the April number must, to insure their appearance, be sent (to the Editor, Dr. Buchanan White, Eastferry, by Dunkeld,) before 1*st March.*

NOTICE.—Scottish Entomologists will oblige by notifying any additions or corrections to the lists of Scottish Insects now in course of publication, and any who can give assistance are requested to do so at once.

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Contributions to the July number must, to insure their appearance, be sent to the Editor, Dr. Buchanan White, Eastferry, by Dunkeld (after 1st May, Castleton of Braemar, Aberdeenshire), before 1st June.

Mr. P. CAMERON, Jr. (136 West Graham Street, Glasgow) will be much obliged to any Entomologist who will send him *larvæ* of *Tenthredinidæ* (Saw-flies), and he will be glad to make the best return he can for any assistance given him. He will also be glad to receive in exchange, gift, or loan any Saw-flies belonging to the genera *Trichiosoma* and *Cimbex*, or *Siricidæ* from any part of Britain.

JOHN W. TAYLOR, 9 Wade Street, Leeds, would be glad to correspond with any person willing to communicate Local Lists of LAND and FRESHWATER MOLLUSKS for any River Basin districts, more especially in Scotland. If desired, would be glad to determine specimens.

ERRATUM.—P. 96, l. 4, for "*GATTATUS*" read "*GUTTATUS.*"

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Contributions to the October number must, to insure their appearance, be sent to the Editor, Dr. Buchanan White, Castleton of Braemar, Aberdeenshire, before 1*st September.*

Many interesting articles (some of them in type) have unfortunately been left out from press of matter, but will appear in next number.

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No. XII.] OCTOBER, 1873. [Vol. II.

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ADDRESS TO OUR READERS.

WITH this number the *Scottish Naturalist* enters on the fourth year of its existence. We therefore take an opportunity of addressing a few words to our friends.

Some complaints have reached us that the Magazine is too "dry and scientific" for some of its readers (one had just the opposite fault to find, "not scientific enough"). It is our constant endeavour to satisfy the requirements of all our friends; and we try to have at least one "popular" paper in each number, but our readers should remember that we are to a great extent in their hands in regard to the contributions sent to our pages.

Some complaints too have been made with regard to the space occupied by "Insecta Scotica." It will be remembered, however, that in undertaking this work (which we trust is, and will be, of use to many of our readers), none of the space of the Magazine proper is occupied, the 16 pages devoted to "Insecta Scotica" being a supplement. We shall not however scruple, in cases of emergency, to devote some of the pages of this supplement to other matter.

In regard therefore to the contents of the *Scottish Naturalist*—be they "dry," or be they "popular"—we crave the kind indulgence of all our readers.

During the year we have now entered upon we have the promise of some articles of great value; amongst others a monograph of the British Dragonflies, by one whose knowledge of these insects is of world-wide reputation. Arrangements have also been made by which we hope to give a plate (plain or coloured) with each number of the Magazine.

We are also pleased to state that this number of the *Naturalist* is printed throughout on New Type, specially cast for it.

In conclusion, we would urge upon each subscriber the importance of *remembering to pay in advance* the trifling sum which constitutes the annual subscription—negligence in this simple matter often causing us great inconvenience and expense. We heartily wish all our kind friends a happy New Year, trusting that they have pardoned all our past shortcomings, and that by endeavouring *to increase the circulation* of the Magazine they will unite with us more and more in promoting the culture of natural science (however small our own share in that great work may be) and in augmenting the fraternity of Scottish naturalists.

All communications to be addressed to the Editor, Dr. BUCHANAN WHITE, Perth.

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CORRECTIONS TO MR. SMITH'S PAPER ON "TRAP ROCKS," p. 219.

Page 221, last line, for "cherb," read "chert."

,, 222, second line from top, for "magnesia," read "manganese."

NOTICE.—From pressure on our space, only half the usual amount of "Insecta Scotica" appears in this number.

No. XV. JULY, 1874. Vol. II.

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