LOCHS AND LOCH FISHING,

BY

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"But the luxurious angler admires another concert. He loves no musick, but the twang of the line; nor any sound, save the ecchoes of waters; no rest nor pause, but impatient till they bite; no flats, nor sharps, but solitary pools and rapid streams; no beats nor shakes, but struggling and strangling; and, in short, no close except that of the pannier. So that I may properly call his harmony their haltering. . . . . Here's suitable diversion, our exercise has equaliz'd the ballance of success: Not an artist amongst us barren of sport. Nor the water out of temper. . . . . We may flatter ourselves the town's our own."—"*Northern Memoirs,*" *by Richard Franck (1624—1690).*

"What though, like commoners of air
We wander out, we know not where,
But either house or hall;
Yet nature's charms—the hills and woods,
The sweeping vales and foaming floods—
Are free alike to all."—*Burns.*

"Why, ye tenants of the lake
For me your watery haunts forsake?
. . . . . .
Common friends to you and me,
Nature's gifts to all are free."—*Id.*

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PREFACE.

MYSTERY, romance, the freedom of the larger heaven, these are the possessions of the lake, so long as a tarn gleams like a blue jewel set in the swart hills, so long as a legend runs, so long as the commoner of air has a heritage.

Of the mystery the kelpie is not alone the overlord; he shares the kingdom with many creations of the fancy born of the grey silence under ghostly hills, of the crested wave, white-gleaming above the dark depths, of the ominous calm of the amber-surface fading into the blackness of the inner places, home of the demon trout, that haunts every lake retaining its legacy of the Wilderness, as an heir of the unknown that may be terrible. Each cast or any cast may bring up this demon trout. The fancy is always raising, hooking and playing him for doom and the breaking of the spell of old enchantment.

Nor is the realism of angling wholly able to check the fancy or lull to sleep the ambitious pleasures of hope. Each lake must be a Loch-na-Breack Mohr and hold its big fish, which, for the most part, are unknown to fame. The Thames angler has his ambitions; but they are ambitions set on a fixed fish known of some men and capable of being known of all. The salmon angler knows the limitations of his most optimistic hopes. Rivers can become low, their area is confined, and salmon will show. The prose of the net deals with figures, and pounds, and ounces. Its arguments are facts, destructive of all mystery.

Least of all can the dry fly angler enter the lists. His feeding fish, his "smutters," his "tailers," his "bulgers," and "genuine risers,"

they are catalogued and tabulated, and their chronicles are writ in the transparency of limpid water and sun-dried shallows.

Of the lake alone is the mystery.

And old romance sits ever by its shores. Even prosaic Loch Leven, where one pays half-a-crown an hour to angle in a fish-pond peopled by a masterful race of civilised fish of lithe activity, has its Lady of the Mere—superior to good days and bad—a possession for ever, set above the bringing down of trout to the grave with blood. East, West, North, and South, over lakes large and small, famous and mutely glorious, the same old romance lingers. The shade of Cormac Doil is with you as you angle in Loch Coruisk; the mountain breeze from every Ben-na-Darch that carries out your line pipes a thousand legends; in the ghostly silence of the evening the boat song of dead clansmen comes across every Hebridean lake, and the air is vocal with the sound of voices long since still; every dismantled ruin is restored; every greener spot on the hillside has its history that is a romance, its legend that is tragic, comic, pathetic, human, but ever dramatic and always interesting.

Of the lake are the mystery and old romance.

And the larger air, the glorious heritage of its commoner? It is the very elixir of life itself, the intoxicant which inebriates in its free sweep when we breathe the same air, live the life of Nature herself, think her thoughts in a glorious union that is of the very essence of the higher and truer Pantheism. In a single week the breathing of such an atmosphere and the living of such a life should send one swinging over moor and fell, over rocks and stones, in the exuberance of new-found life and the paradise regained of super-abundant vigour until the old, fierce fire of the lost youth of the world thrills through every vein, makes each muscle grow instant young, each nerve become a servant of the will and the heart bowed down leap to the rainbow in the sky and catch the music of the shrill, free wind amongst the listening rocks and the dancing reeds.

Of the lake are the mystery, old romance and the larger air.

These attributes alone are sufficient to justify the writing of a book devoted to the charms of loch-fishing and the joys of wandering in lakeland.

But lakeland had a further claim upon the consideration of the

angling writer. It has received but scant justice, and there is no book exclusively devoted to loch-fishing. It was this consideration which tempted me to essay the task of filling up the blank in our angling literature. That I have filled the blank, I neither hope, nor expect, nor pretend. The volume now submitted is the hasty product of thirty evenings' work after days of such toil as modern "evening paper" journalism necessitates. In many respects, it is an incomplete treatise, and in no sense can it be claimed that it exhausts lakeland. Possibly some of its defects in this respect are due to the progressive nature of angling knowledge, and the insoluble, or at least, difficult character of many of the problems of fish-life, fenced as it is with an inviolable, elemental barrier. In any case, if I have succeeded in indicating the kind of thoughts angling compels the angler to think, and have, in their stating, succeeded in vindicating the claim of angling to be not only the contemplative man's recreation, but also the best and most brain-resting of sports for the mind fore-done with the storm and stress of modern life, I shall be amply rewarded.

I may, venture to claim for "Lochs and Loch Fishing," that a consistent theory of fish-life—the Sensational theory—runs through all its pages, that the facts stated are the result of personal observation, and that both the facts and the inferences drawn from them are for the most part original, even if they are not accepted as satisfactory.

With regard to the chapters on the future of our lakes I may mention that, since this volume was in the Press, the facts of some instructive cases have reached my hands, entirely corroborating the theories advanced, which, I now regret, not having put in more dogmatic form. That our lakes yield but a poor harvest compared with the yield of thirty years ago, and that there is no comparison possible between their present productivity and their sport-giving capacity both in the days of Franck and of Thornton, are facts beyond dispute. Franck can be thoroughly relied upon as a witness on this point, while those who doubt that Thornton could kill, inter alia, six trout, weighing 32lbs., in a morning, on Loch Tay, may be doing the memory of that gallant officer an injustice. That the glories of those days can be restored I do not doubt, but the difficulties attending the restoration are great, and are, I venture to think, stated

with fairness, if not with clearness, in the following pages. I may add to what is stated therein that both in the case of salmon rivers and of our lakes, the restoration of natural conditions must be the chief object of all amelioration and reform. As to the former, in the old days when "baggits" and "kelts" could be freely come by, the "spawners" were spared. In these days, the "spawners" are sacrificed and the spawning beds, which should be the chief care of conservators, are shamefully neglected in order that a greater appearance of active interest may be secured by ostentatious and mostly useless stocking with fish purchased with wasted money, which could be far more profitably employed in watching and improving the "redds." One hundred spawners, who make an average success of what is too often the last duty of a salmon, mean an addition of 1,000 fish to the river or loch, or both. The fact speaks for itself. What is true of rivers, is true of lakes, and in dealing with the future of the latter, I have urged the importance of aiding and imitating nature, of making all ameliorations in accordance with her laws, and of constructing our fish-farms and improving existing environments on the lines of her best and most instructive models.

For such errors and blemishes as the volume contains, I need scarcely offer any special apology, though it is perhaps necessary to explain, that here and there, I adopt my own nomenclature, as when for example, I prefer to call a "bob" fly a "first dropper," and to disregard custom. It may also be mentioned that my "hook numbers" refer to the "Pennell-Limerick" old scale, in which No. 12, corresponds to No. 3, new scale.

"Lochs and Loch Fishing" has been almost entirely written; here and there occur a few excerpts from articles which I have contributed to the sporting and daily papers. These excerpts have been sub-edited and adapted to my purpose. For permission to utilize them I am indebted to the kindness of the Editors of "The Field," "The Angler," "The Fishing Gazette," "Westminster Gazette," "Globe," "Bradford Daily Telegraph," and other papers.

The plates have been specially prepared for this work, and I am indebted for the original "pictures" to, amongst others, Mr. Thomas Wilson of Harris, Mr. Hill of South Uist, Mr. Leopold Layard Budleigh-Salterton, and Mrs. Collingwood of Lilburn Tower, Northum-

berland, whose very clever snap-shots of leaping salmon were taken, with the assistance of Mr. A. B. Collingwood, on the Mingan River, Labrador. I regret that a series of plates which I had designed to illustrate the evening rise and loch-fishing in a calm do not appear in the present edition. If the book is ever reproduced, the omission will be rectified. There is nothing more difficult to obtain than pictures of fish and fishing. When you have the subjects, the camera is absent, and when you have the camera, it kills the subjects. Anyone who has ever been followed the livelong day, when angling, by a photographer, will appreciate the difficulty.

In conclusion, if "Lochs and Loch Fishing" has only touched the fringe of the subject and left much to be said, I trust that it will be accepted in the spirit in which it was written by one who, "if no fisher, is a well-wisher to the game" and to all who follow it by stream, loch, canal, pond or sea, North, South, East or West.

HAMISH STUART.

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PART I.

LOCHS AND LOCH FISHING.

CHAPTER I.

The Duffer's Paradise.

"Those fish of simple faith and ready rise,
Trout of the lake, the Duffer's Paradise."—*Anon.*

Pompey's Pillar as the most famous of all possible misnomers has a serious rival in the phrase "The Duffer's Paradise," with which certain angling critics, whose knowledge of the art of loch fishing is in inverse proportion to their self-sufficiency, have chosen to dismiss this department of angling. The purist, whose contributions to the entomology of angling cannot be overvalued, goes even further than the careless critics referred to, and classifies loch fishing as unworthy of serious consideration as a candidate for a position amongst the angling arts. While condemning loch-fishing as a mere off-shoot of the "chuck and chance it" school, he damns it as the worst possible development of that degenerate and out of date system of fishing with the fly.

The careless dictum of the casual critic may safely be ignored. He is generally an all-round angler open to conviction and ready to admit, if only on the evidence of the difference in results secured by difference in methods in loch fishing, that there is far more art in the apparently mechanical casting than meets the eye. In all probability he has seen but one style of loch fishing—the steady, monotonous drift before the wind, the dual control of a certain portion of an ascertained stretch of water thrashed with methodical precision by one angler in the right of the bow, and by another angler in the right of the stern. He has been educated in the belief that there is no possible evolution from this style which, for aught he knows to the contrary or perhaps cares, may have been, and most probably was, the method of Simon Glover when he angled in Loch Tay, and will be the style of his own descendants to the tenth generation when he resigns the rod to other hands and crosses the Styx in the craziest of immortal boats. He has heard from his youth upwards that to fish with the fly for loch trout in a glassy calm

is to essay the impossible, and it is part of his inherited faith that lack of wind is the best possible excuse for hours of idleness and superlative indulgence in the dolce far niente by the loch side. Nay more. He will tell you with all the assurance of a Trentsider waking axiomatic as to the rooted aversion of the salmon of the Midland river to the fly, that a good ripple is a condition precedent to good sport, and if a river fisher with some skill in the special art of the stream will grow equally dogmatic in assuring you against the evidence of your own experience, that when the breeze comes and the ripple curls shorewards the art of loch fishing is reduced to one of merely mechanical skill, while results differ not by reason of any exercise of the head, but in precisely the same degree and from precisely the same cause as does the head of game killed by a good shot in a good position from that killed by a bad shot indifferently stationed on a "cover" or "driving" day. Just as one wild-goose, he may tell you, arguing through the suggestion of this shooting analogy, successfully stalked by the solitary shooter, bringing guile and wile to bear on guile and wile, is worth a hundred "rocketers" sent on to a well-planted gunner by an army of well-arranged beaters, so one river trout successfully circumvented and taken in clear water with a cunning worthy of the Red Indian, is worth a whole cartload of loch trout taken by promiscuous casting by guile that is wholly unambushed. There is in his argument such a measure of plausibility, that ex hypothesi, it may be admitted that he states a half-truth. There is, on the other hand, a fallacy—the fallacy that he begs the question and assumes that it is an accepted axiom that the loch reduces all anglers of average skill to the same level, and is, therefore, by parity of assumption, rather than by parity of reasoning, "The Duffer's Paradise."

Even admitting, however, that success in loch-fishing is dependent absolutely upon difference in mechanical skill, it is obvious that the degree of that skill must vary, and equally clear that if the skill varies, it is capable of being developed and is therefore at once an acquired and a "natural" art—acquired, that is to say, because capable of acquisition by practice, and natural because some loch fishers, sharing the great characteristic of all sportsmen, seem, apart from training and practice, to be more richly endowed with natural aptitudes than are others.

Of anglers, and of the loch fisher as a member of the family, it may

with truth be said that the best are born and made, the inferior samples are made only. And it is quite immaterial whether we speak of the combination of head, eye and hand which together, and by the strength of their unity when lodged in an active frame, physically and mentally well-equipped, make the expert at any sport what he is, or merely assume the quick and accurate eye, the responsive hand that is never in front of the optical sense, which constitute mechanical precision at a sport, ignore the intelligence—the brain of ice deep-seated in its own thick-ribbed tenacity of reasoned purpose—and reduce true genius in one of its manifestations to the dull level of a merely perfect contrivance of unimpeachable parts and immaculate whole.

Assuming this last and lowest form of skill to be the only attribute of the successful loch fisher, even on that assumption the possessor of mechanical ability must necessarily conquer his less richly endowed rival. From the mere fact of this difference in skill, there follows, moreover, the inevitable conclusion that in this mechanical exercise of inherent talent the prima facie vindication of loch fishing as an angling art is to be found. It follows further that when this mechanical skill is absent, or even when it is present, practice can in the one case create it and in the other develop it, until a mastery over all the intracies of the art, in this its lowest form, can be obtained, which proves when in exercise and by the results achieved, that though almost any duffer can hail the loch as his paradise, under favourable conditions, there are open to him higher paths which experience will teach him how to tread.

Even the most rigid disciple of Lochlevenism cannot fail to be struck with certain facts when fishing any lake, that had he caught their inspiration and learned their lesson would have raised him above the merely empirical and traditional methods of the older school.

The first principle of scientific loch fishing is to treat the loch as a large pool in a very slow-running river, or if the apparent bull be permissible, to treat it as a large pool in a currentless river.

The stating of this as the postulate or first principle of the science of loch fishing naturally leads to a consideration of the attitude of the purist. His creed may be briefly summed up in the dogma, that no fish is worth killing which can be killed with any fly not an exact reproduction of a natural fly or by any fly, whether an exact imitation or otherwise,

not acting in a natural manner. This one and only article of his angling constitution proceeds on the assumption that the trout of certain rivers are so highly educated that they can at once detect the very slightest and apparently most immaterial divergence from the natural fly, so that a leg too many or a shade of colouring accentuated is sufficient to make them decline with reasoned scorn the most deftly placed imitation of the real Simon Pure. Certain sorts of river flies used by the "wet" fly fishers, he admits, do resemble the natural article, but this partial holding of the mirror up to nature is, he maintains, rendered wholly valueless in practice, when the fly is made to behave in a manner in which no fly ever does behave. This being so, it is only natural that loch fishing with the fly is pronounced by the purist to be not fly-fishing, but a sort of surface-spinning with the fly. He declares with all the dogmatic fervour of the exclusivist that loch flies are mere abortions, and that qua fly-fishing, loch fishing cannot be a science, because its lures are lusus nature and never deceive trout to their doom by an imitation of nature.

The purists thus fall into one of the most common of all fallacies. They assume that because all asses are animals and all men animals, that, therefore, all men are asses, a position which may be true but is certainly not a logical sequence from the two initial premises. It may be, and indeed is, perfectly true that the trout most worth catching are wary trout deceived to their doom by presenting to them apparently natural food that is really artificial. But it is surely a begging of the question to assume that the natural food of trout does not vary with the environment of the fish, ignoring the well-established fact that the trout is omniverous and a most materialistic optimist in the matter of food possessed of only one dietetic axiom: "Whatever is, is good to eat." It may, perhaps, surprise the purists to be told that on certain lochs the trout, unlike the highly educated trout of the south, who have forgotten that Colonel Hawker ever killed their ancestors from horseback, are no more excited by the rise of a perfect fluttering yellow snowstorm of May flies, than they are by the millions of ephemerids that each summer day dance their brief hour of life away in the fretted shadows and shafts of sunlight beneath the overhanging boughs that weep and wave over the shores of their wide-spreading home. It may still more astonish them to hear the axiom enunciated that loch fishing, when

scientifically pursued, both in the matter of flies and in the methods of using them, is as much a faithful adherence to what may be vaguely termed natural law in the angling world as is dry-fly fishing itself in its very highest development.

The laws of angling when justly stated are as truly non-arbitrary and as wholly declaratory as are the laws which perfect justice would emanciate. The latter would recognise that though principles alone are constant, the circumstances of their realisation so modify them as to give them an appearance of difference that is most deceptive when synthesis usurps the place of analysis.

It is in this very confusing of the science with the art of fishing, or to speak by the card, this confusing of the science and art of dry fly-fishing with the science and art of loch fishing, and in the consequent ignoring of the fact that both rest on the same broad basis of fundamental principle, that the purists have with the ignorance of little experience condemned loch fishing, and with a vehemence, begot of that exclusivism to which I have already referred, have described the loch as "The Duffer's Paradise." I hope in the succeeding chapters to show that the loch-fisher, like all fishers and all students of fish and their ways, stands like Newton on the shores of an undiscovered and certainly but half-explored sea. For him the great book of nature holds chapters that have never been read, or when read, have been imperfectly understood-chapters, on which the light of truth may never shine save through that darkness, dreaded by the life of thought, the sleep of reason that knows no waking—the utter night of old oblivion in which the heirs of all the ages inherit but the deep-dug dust.

I hope in these pages to be able to show that the loch fisher is not the mere machine he is so often represented to be, but an angler who not only adheres pretty closely to the accredited axioms of angling deception by appealing to nature, and that, too, in no narrow and restricted sense of the phrase, but also that he angles as truly with his head and not merely with his hand as does the most up-to-date of dry fly-fishers in the most difficult and consequently ideal of chalk-streams or other southern rivers whose clear waters the "all-seeing cycle of the sun" lights up with a splendour that is a challenge to human skill.

Presuppose the raising and hooking process finished and that the loch fisher is using, as he will and should often use, tackle as fine and

general "gear" as delicate as that of the "dry fly" man, or the "far and fine" exponent of the river, and the playing of a big, or even a decent, fish is quite as difficult in some lochs and far more difficult in others than it is in any river. In certain weed and reed-haunted Hebridean lochs the expert river fisher will find himself completely beaten time after time, until he learns the art of playing a big fish—I mean a fish of from 4 to 8lbs.—from and with a boat. Even comparatively small trout, if he adopts the ordinary method of playing a fish, may give him infinite trouble and by their rushes to windward while the boat goes to leeward may introduce him to difficulties equivalent to those in which he has found himself when a river trout has passed beyond control and gone where he cannot be followed.

If the raising and hooking have to be done in a glassy calm or in a half or whole gale of wind new difficulties arise.

In a calm, whether the fish be rising or not a single boil breaks the surface of the lake from shore to shore, he will have to exercise not only the utmost patience, but the greatest possible measure of delicacy. His "fishy" eye must be of the keenest searching for likely spots—a space between the weeds, a likely hold beside some friendly stone, a taking bit of dark water beneath the boughs, a round bit of grass-covered turf on the bottom, beside, or in, all of which some great trout may lurk. There must be nothing and yet something of the "chuck and chance it" about his methods, but a reasoned purpose carried out with indomitable will. The cast must sweep with the softness of an inspired web to fall with a gentle kiss on the calm surface; it must be sunk to the proper depth and move with the steady precision which an assured plan of campaign can alone give it; if a fish shows he must be watched and only struck at the proper "psychological" moment when intuition and the sense of touch that practice gives, if it does not create, tells him that the fly has been sucked in.

Yet must he in the best sense "chuck and chance it," too. His flies must never be out of the water. Fish lurk or travel in strange and unexpected places, and the mad hermits or tourists of the lake are generally worth catching. A fish will move from deep to deep, from shallow to shallow, and in the mere fact that when moving he travels high and may be killed, not because he is feeding, but because he is in motion, is found not only the justification of continuous casting even on

unlikely water, but also one of those lessons which experience and observation teach.

If fish are rising to the natural fly and feeding, then comes the angler's opportunity, and in calm, bright, fine weather without a ripple from shore to shore, loch fishing then becomes a positive art, and is as truly scientific fishing, even from the entomological and imitative point of view, as is dry fly fishing in its highest development with this exception—and it may be frankly admitted, that the angler is not under the same necessity of concealing himself by ambushed guile of a personal kind. He has simply to keep the boat still, move noiselessly when he does move, cast far and fine, judge and time the rise, often long-drawn out, deliberate and slow, and, when the fish is hooked, play him quietly and effectively.

If when the garish day is done, he has to angle in the dusk or play fish in the pale moon's most uncertain and deceptive light, he will find that a new charm has been added to angling's long list of joys because a new difficulty has to be overcome and a new kind of visual power, dependent to some extent on the sense of touch has to be cultivated.

Before passing, however to practical details, I must—with the apology that angling is essentially the most egotistical of sports and that, therefore, the angling writer is necessarily a person privileged, indeed compelled, to blow the trumpet of apparent self-laudation if he would prove the right to say experto crede—here set forth in support of my theoretical contention that the loch is not the "Duffer's Paradise," certain facts which show a marked difference, if not in the degree of skill possessed by some anglers, then assuredly in the efficacy of their methods.

I confess to be at some loss as to what statistics to quote from amidst a bewildering plethora of choice. However, as all the figures at my command seem to prove the same truth, I choose my results in a particular lake—perhaps the most difficult and "sporting" loch in Scotland as proof of my contention so far as an individual sheet of water is concerned, while I quote the results of my South Uist season of 1890 with a view to the same end in the case of many waters, a greater variety of days and a larger company of brethren "in rods" but rivals in renown.

As to the first, I find that on the loch in question, which is a lovely tree-crowned Argyleshire lake, I killed in eight days 64 trout, weighing 97½lbs., against the average basket of from none to two fish

killed by the other anglers who fished the loch during the same season. This result was achieved not by special skill, but by the steady adherence to particular methods, by an obstinate tenacity of purpose that unrewarded hours of labour could not daunt, and by the use of the head as well as of the hand. The loch in question is a peculiar one, and in a later chapter I shall revert to its idiosyncrasies as the most educative and difficult sheet of water in Scotland, or perhaps out of it.

As to the second, my statistics cover a wider range of days, include by way of comparison the takes of a larger body of anglers, dry fly men and wet fly men, loch and river anglers, salmon slayers and trout fishers, and naturally embrace a greater variety of waters.

The figures are those of the South Uist season of 1890, and the fish were caught entirely with the fly in the very excellent waters of the Lochboisdale Hotel, waters of which I have a very high opinion and many happy angling memories. During twenty-four particularly bad days (some of which were only an hour or so of angling duration), I killed, fishing alone in my own way, 99 sea trout, 130½lbs.; and 224 brown trout, 124¾lbs.; or 325 trout, 255¼lbs.—an average of about 14 fish, 10½lbs., per occasion; whereas a daily average over the same period of fourteen other rods fishing in pairs took, per diem, 68 trout, 31¼lbs.; or about 5 fish, 2¼lbs., per rod. Throughout that season, which was a very fair one, I fished in this district on thirty-six occasions, and secured 110 sea-trout, 140½lbs.; and 358 brown trout, 224¾lbs.—an aggregate of 468 trout, 365¼lbs. (an average of 13 trout 10lbs.) out of a total aggregate for the season in the hotel lochs of 1,036 sea-trout, 1,113¾lbs.; and 3,817 brown trout, 1,693¼lbs.; or, in all, 4,853 trout, 2,807lbs., my proportion of weight being thus over one-eight, and the average (on calculation) per rod of those fishing together just over 3lb.

I have already apologised for quoting these figures in support of my theoretical arguments. They may be left to tell their own story greatly and are "stubborn chiels," which seem to emphasise the conclusion that though the loch may be "the duffer's paradise," in so far as an indifferent angler has a better chance of killing fish in some days on certain lochs than on a river, yet so far from the loch being merely "the duffer's paradise" it affords as wide a field for the exercise of reasoned and mechanical skill as does the river. Nor do lochs yield pride of place

in infinite variety to rivers and there is just as great differences between lakes as there is between streams—some lochs being as much more difficult to fish as a clear running trout stream meandering through an English meadow is than some dark hill-fed torrent that leaps "from the mountain's crown" in the untrodden places of the lonely North or West. The truism, that success in every department of angling, even the simplest, is differentiated by the degree of skill, experience, and intuition possessed by the angler I have specialised and applied to the loch. I should use precisely similar arguments, but different facts, to show that even angling for small roach and confiding gudgeon in the beautiful canals of England is, in the matter of results, equally a question of skill, simple though it looks when one observes an expert professional bait-catcher taking fish by the hundred. An hour afterwards one's opinion as to the simplicity of this kind of fishing would be considerably modified if one met the average amateur with his beer-jar essaying to wile the companions of the same fish to their doom at the same spot and with precisely the same lures. He would catch fish, it is true, but the number of his victims would be as one to ten. So is it with loch fishing. The duffer in most lochs will find a limited sort of paradise when he angles under favourable conditions, or when the fish are small, unsophisticated and hungry. Loch trout, like salmon, will rise to a very badly thrown fly, just as birds will sometimes fly into the shot of the most inexpert of shooters. The triumphs of the duffer on the loch are, however, only duffer's triumphs. Under the same conditions the experienced angler will kill far more fish, while under difficult and "sporting" conditions, the loch may prove the duffer's inferno and the very antithesis of his so-called paradise.

Before, however, I deal with practical loch fishing, there are very many problems to be discussed, which experience on many lakes has suggested and which must be stated for obvious reasons. The problem of the future of our lakes is of such importance to all loch fishers that I make no apology for the many chapters dealing with it and with kindred questions, while it is impossible to state the art and science of loch fishing and to justify the claim of loch fishing to be regarded as both a science and an art and a sharer in the vindication of angling as the contemplative man's recreation without regarding the lake for many other aspects than the narrowest of all—a place in which one can kill fish by certain methods.

CHAPTER II.

Lake-Land and its Lessons.

"And the lake her lone bosom expands to the sky."

From Land's End to John o'Groats and from Loch Leven in the east to the loneliest lake in the wilds of Connemara that resigns the setting sun to Indian worlds, Great Britain and Ireland possess lakes that illustrate every variety of freshwater sea found in the temperate zone. It is true that the United Kingdom boasts no great lakes like those to be found on the Continent or in North America, but relatively to the land area Great Britain and Ireland possess lakes that, on a small scale, are the same in all essential features as the different varieties of lakes of which the "temperate" world can boast. Of the Scottish lakes themselves it may almost be said that they epitonize the lake-life and physical character of the temperate zone, though naturally their fauna and flora are for the most part peculiar to themselves, while certain species of fish and plants are common to both hemispheres.

From the narrower point of view of the oceanographer or lacugrapher to invent a new word, the Scottish lakes form, however, a perfect epitome of all the lakes of the world, and when Sir John Murray has completed his survey of them and published his charts, this fact will be more abundantly established. In the meantime it will suffice to say that in such spreading waters as Loch Lomond, the great chain of lakes running from Loch Ness to the head of Loch Linnhe, Loch Awe, Loch Rannoch, Loch Errochd, and other lakes too numerous to mention in detail, we have samples of the true inland sea in miniature. Smaller lakes of the Loch Vennachar, Loch Lubnaig and Loch Ard type, to name three only of the better known examples, scarcely attain to this dignity, while Lochs Earn and Tay, though deep lakes, occupy a sort of middle position. Shallow lakes like Loch Leven are almost peculiar to the country, while the thousand lakes of the Western Islands, though lacking something of the mystery with which the waters of lakes of

great depth are always shrouded are, nevertheless, equally characteristic and relatively to the other lochs of Scotland, are by far the most interesting to the curious student of fish, if only because they afford him opportunities of studying fish life under circumstances and conditions that very closely approach the primeval order. In other words, the Hebridean lakes are so numerous and so mixed in their physical character, that, on the one hand, the whole of certain islands become in times of deluge practically one vast lake or series of connected lakes in which the fish migratory and non-migratory enjoy a perfect jus spatiandi to the confusion of acknowledged habits, while, on the other hand, certain lakes become of indeterminate character and are neither salt water nor fresh, nor yet brackish, but assume one of those characters to the temporary exclusion of the other two to a degree varying according to the rainfall or the state of the tides or both, and sometimes the strength or direction of the wind. As a result of this peculiar condition of affairs, exceptional opportunities are afforded of tracing the actavic connection between the sea-trout and the common trout. It is indeed natural that in a land where one acre of water occurs to every seven or ten of land (these are the respective proportions of Benbecula and South Uist) and where salt water rivers are found and tidal pools, lochs and ditches abound, the facilities for observing how readily the common trout becomes nomadic and passes from the accredited position of a non-migrant to that of an occasional migrant should be numerous, that afford clear proof the migratory tendency is a pure creation of the necessities of environment.

It may serve a double purpose to here emphasise by an example from these Western lakes the educative aspect of the loch as a guide to the habits of fish.

That all trout are migratory is a proposition whose general accuracy few or no persons who have given the fish any consideration will dispute. The migratory tendency, or, to give it a somewhat misleading title, the migratory instinct, may vary in the degree of intensity with which it manifests itself; but it is always present, and may, for purposes of generalisation, be said to depend for its development far more upon circumstances than upon heredity, it being an almost axiomatic proposition that the strongest traits in "short-generationed" animals, as the results of environment, may vanish under its influence.

If it be accepted that the conditions of existence mould the habits of life, it becomes at once clear that the search for "the necessities," as we term them, is the ruling motive of animal existence. A fish, therefore, if it cannot obtain the necessities in the water in which it finds itself, will migrate, if it can do so, to other water which cannot be less unkind and may well prove more generous in the matter of food. At one season of the year food may be scarce in a particular section of a river and plentiful in its lower and tidal reaches. When such a state of affairs exists necessity will compel the fish to become a rover. When it discovers that roving pays, and has battened on the rich feeding of the estuary, the migration of necessity becomes the migration of choice, and a priori you have the migratory habit established.

That the fish of certain streams pass through these stages can be judged from what has occurred in New Zealand in the case of virgin waters that have been stocked with English trout. In certain of the rivers of that colony food appears to be scarce at some seasons. The consequence was that the fish moved down to the estuary, and thence to the sea, in both of which they found such abundance of food that they have become essentially as migratory fish as the salmon, though descended from so-called non-migratory trout, and have in fact become "salmon trout" in the applied sense of the phrase construed in relation to their habits. Here environment has evidently triumphed over heredity. Nor is there anything unnatural in the victory, for heredity is merely a legacy of habit, which in this sense is not doing what one's ancestors did, but what one's ancestors would have done under similar circumstances.

Viewed in this light, the migratory tendency of the trout is obviously not so much a vice of any particular species of trout as a characteristic of all trout. Though the scientist may insist that certain trout display the migratory tendency in a more marked degree than others, he can only do so at the risk of being involved in contradictions and being brought face to face with practical examples of the same species of trout displaying far different tendencies under far different conditions of existence. While I should be prepared to admit that the tendency of that so-called distinct species of trout the salmo levenensis is to descend, yet cases are on record of its ascending, at seasons other than the

spawning season, during which, of course, the tendency of all the salmonidæ is to ascend.*

Such isolated cases are, however, of no great moment, unless the whole circumstances attending them are proved, in seeking to demonstrate that the migratory tendency is dependent for its development upon environment.

These generalisations lead me to now to consider the speical lesson of certain Hebridean lakes on this point. I take a South Uist case, though I am under no necessity to do so.

On the western side of that island there are amongst many lakes five that are connected in a peculiar kind of way with the sea and with one another. The common outlet to the sea is a ditch some ten to fifteen yards wide, which finally passes through a pipe led out into the Atlantic. Some distance up this ditch another ditch branches off to one of the lochs, into which a small drain falls from yet another of them. In the first of these two lakes bull trout and sea trout abound, and there are great quantities of trout—mostly of a small size, but all, or nearly all, of them presenting the silvery appearance of the trout of the ditch—an appearance which indicates an occasional marine bath, and of which the tangible outward signs are the looseness with which the silver scales adhere to the fish and their liability to rub off and stick to the hands or anything coming in contact with them.

It is important here to note that the conditions of existence in this loch are not of the best, that that its feeding is poor, in fact, just sufficiently irregular in quantity and quality to furnish the necessity which prompts migration, not, however, of the established and habitual, but of the occasional and opportune variety. In the other loch, from which there is a clear passage to the one just referred to, and from it, of course, to the sea, the feeding is probably of the richest and rarest kind to be found in any water of the United Kingdom. The bed of the loch is almost entirely covered with a soft green mossy weed, while its waters are a mass of vegetation, with stretches of sand and fine clean stone between the beds. The lake, as may be supposed, abounds in food of

*An instructive example of this ascending tendency is afforded by trout confined in a reservoir where there are no spawning facilities. If a pipe be led out of the loch from a trough at a lower level than the loch, the fish will ascend the pipe and fall into the trough where they may be secured and the reproductive process completed. The hint and the use to which it is put are of value to corporations.

every kind. Were it not for the fact that is carries an incredible number of lusty fish, the average size of these, at present about ¾lb., would be largely increased. The loch, however, is full of fish, as may be gathered from the fact that I once killed in it 74 trout, weighing 46½lb., in a very short space of time. Here the fish are under no necessity to wander, and they never do wander, though the road to the sea is as open to them as it is to the fish in the lake below, which is much less bountifully supplied with food.

If we now revert to the main ditch, and investigate the conditions prevailing in the three other lakes, whose road to the sea it forms, we will find a still stronger confirmation of the truth that the tendency to migrate is not a predisposition, but the result of predisposing causes operating through necessity upon what we term an instinct, though it may more truly be called an appetite. The lower two of the three lakes are in reality one lake, which has been artificially divided into an upper and a lower lake by a road built through the original lake. At a certain point in this road a breach (bridged over) some five feet wide has been made, so that the two lakes are connected by a small channel of the width just mentioned, and sufficiently deep to allow the passage of a small boat. The lower lake was, as it happens, a portion of the original single lake, which afforded but poor feeding, feeding, in fact, equal in quantity and quality, to that of first of the five lakes mentioned, from which necessity compels and opportunity permits the trout to migrate. This lake abounds in large sea trout, which rarely enter the upper lake in any number, while its ordinary trout are of a small average size, and when large display most markedly all the appearnces usually shown by fish that have had a trip to the sea, and rarely, if ever, that richness and depth of colouring, which, together with their size, would declare them migrants from the upper portion of the divided lake.

That upper portion is rich in feeding, which grows richer the nearer one approaches to its further end, where it is united with the last of the five lakes under notice. It abounds in fine trout of about 1lb. in weight, which never show any tendency to migrate nor any of the signs of ocean sojourn, though the road to the sea is both short and easy. Here again they are not under the necessity of migrating, and the predisposing causes towards migration are more than counterbalanced by the inducements of environment, in the shape of a good and abundant supply

of nourishing and suitable food. Migration would, in fact, be an absolutely superfluous waste of energy and enterprise.

In the last lake of all connected with the one just noticed by a small but short and clear stream, not only is food abundant and of a peculiarly rich nature, but the fish are also less numerous, and the area of water is greater than in any of the other lakes. In it, moreover, the trout present the appearance and other qualities which have led scientists to describe Loch Leven trout as fish descended from land-locked migratory sea trout, which by a long-continued compulsory "non utendum" of their migratory instinct, have merely retained the external features of their sea trout origin—in shape, activity, and a greeny-yellow silveriness of normal colouring best seen in death, and a latent tendency to migrate downwards whenever, as is alleged, the opportunity arises, or, as I maintain, when necessity calls the instinct into active being.

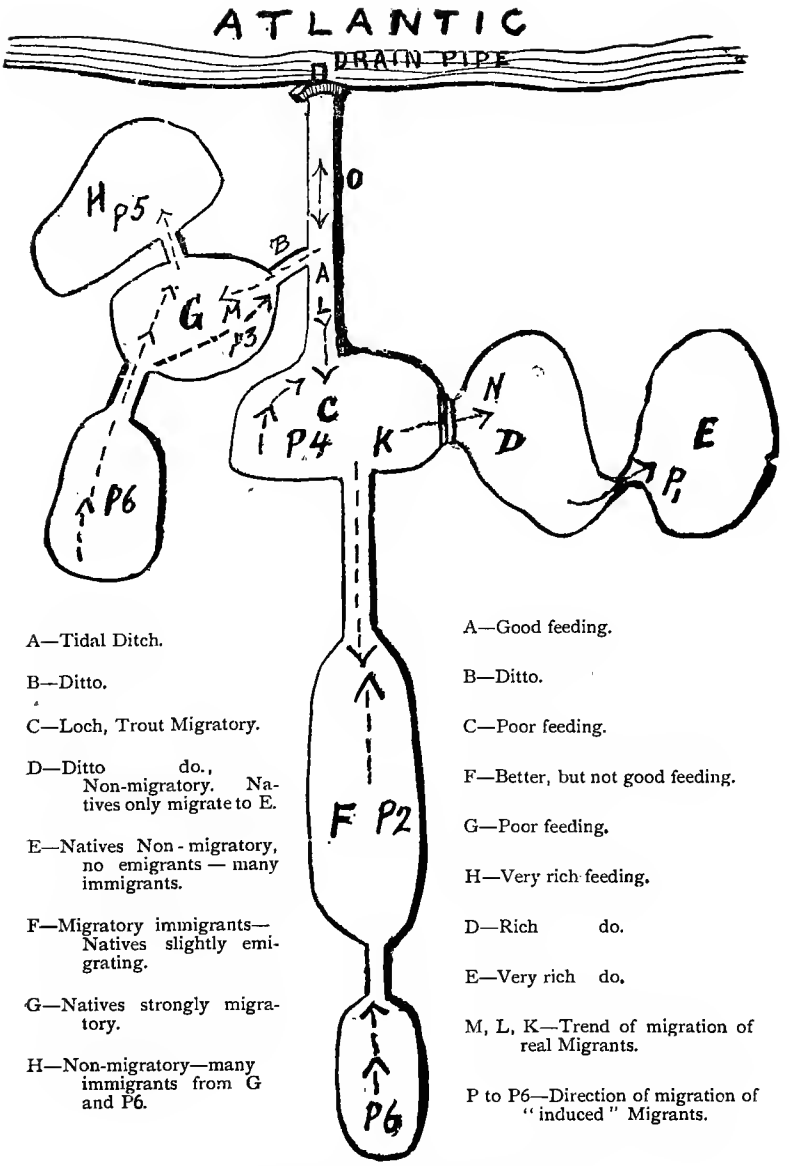
The trout in this last lake never migrate under ordinary circumstances. Even under abnormal conditions, when continuous heavy rains have made all the lakes practically one, they rarely do so. If they did, when the waters had subsided it would be a not infrequent occurrence to take one of these fish, instantly distinguishable by their exquisitely brilliant colouring in life and most characteristic shading in death, their size, shape, and general contour from the different "varieties" of trout in other lakes. On the contrary, though the fish of the other lakes occasionally find their way into the spreading waters of this most ideal home for lusty fish, with its stretches of fair sand and shredded weed, its pure clean water, its patches of reeds and weeds, its shell-encrusted stones and ideal spawning grounds, yet the compliment is rarely returned, for these home-keeping trout would only display "homely wit" if they took to wandering or migrating to less choice pasturing grounds.

One moral of the lesson taught by these Hebridean lakes is clear. It shows conclusively that the tendency to migrate is not an absolute but a relative tendency, conditioned by the necessity for its exercise and proportioned in its intensity by the degree of that necessity. When the tendency becomes a habit through the gratification of the particular appetite which calls it into play, then the fish becomes truly migratory, and not merely a non-migratory fish with a latent migratory tendency. It is also obvious that a fish will continue longest in the element, or, in other words, the adopted environment which best suits the gratifica-

tion of that appetite deserving for the time being to be designated the overmastering sensual impulse.

It may possibly appear that I have already dwelt at too great length upon that variety of lake. the Hebridean, and have elevated it to a position amongst British lakes out of keeping with its merits. I would suggest to the critical reader who holds this opinion to tax his patience by re-reading the very simple but most satisfying lesson in fish habits and characteristics which the dilation on the five Hebridean lakes should have taught him. Nay more. I would even suggest to all students of fish, particularly of the salmonidæ that a month or two spent amongst the waters of the Outer Islands might result in a greater acquisition of knowledge than many laborious years spent in studying waters less adapted by nature for the reading of him who runs. Hebridean lakes do not, it is true, exhaust the world of waters, but they form a chapter in the book of nature which no student should miss reading. No passages are wholly dull, though some are naturally more interesting than others.

Resuming, however, the general subject, here is another simple but pregnant example of the lessons of lakeland. You are fishing, as a man may, with a light heart where the larger air sweeps in free draughts across the moor, and suddenly you notice that you are casting over bright sand of virgin purity and that the water is so shallow and clear that anv fish that are around you should be perfectly visible. You throw your flies without hope, but as a matter of habit over the apparently tenantless portion of water in front of you. There is a flash from nowhere and you hook, play and land a trout. Examine the fish and you will find that his back is a light tawny yellow, his belly and sides almost white. You leave that spot and fish over sand of a darker hue patched with greenish weed. You raise, hook and kill another fish and on examining him you discover that his back is a deep olive hue, while his sides have a yellow tinge, fading to white. Presently you cast over shallow water above a bed of green grass. You see no fish, but eventually you kill one. His back is almost green, his sides a deep yellow, the green of the grass, the yellow of its kindred weeds, the firmer roots that are the foundations of the green home which is his lurking place. A light breaks in upon you and the Great Mother stands revealed. You have probed the secret of her maternal care for the least of



A—Tidal Ditch.

B—Ditto.

C—Loch, Trout Migratory.

D—Ditto do., Non-migratory. Natives only migrate to E.

E—Natives Non-migratory, no emigrants — many immigrants.

F—Migratory immigrants—Natives slightly emigrating.

G—Natives strongly migratory.

H—Non-migratory—many immigrants from G and P6.

A—Good feeding.

B—Ditto.

C—Poor feeding.

F—Better, but not good feeding.

G—Poor feeding.

H—Very rich feeding.

D—Rich do.

E—Very rich do.

M, L, K—Trend of migration of real Migrants.

P to P6—Direction of migration of "induced" Migrants.

ENVIRONMENT AND MIGRATION.

her cold-blooded children. What though the pessimistic analyst, who robs all beautiful thoughts of their charm, with the surgical knife of mis-applied reason, whispers in your ear that the children are unconscious of their parents care, you can rise superior to the cold accuracy of the formalist by remembering that the pantheism of the fluttering fall of a a single sparrow is a Christian philosophy of faith simply because God and nature cannot be thought of apart. Nature not only feeds but clothes her children, and in these three casts you have learnt that her protecting mantle is a coat of many colours, swift to change to the hue best suiting the child that lurks beneath his apportioned share of raiment.

To the lakes of the Southern Hebrides, it cannot be said, that the same interest attaches as to those of the North. The lochs of Jura, for example, are deplorably common-place, even though that island of deer and fabled mountains of gold does boast a loch with, perhaps, the longest name of any lake in Scotland, Loch Joch-Darach-Ghlinn-Astir.

In Islay, however, some of the lakes are exceptionally interesting sheets of water, and three * of them have some peculiarities which suggest further lessons of the lake. They are cited as examples, not as object lessons that exhaust the didactic aspect of the world of meres. Loch Guirm, on the western side of Islay, is a lake without, so far as I am aware, any great depth of water throughout its mile and a half by half a mile of surface. Now in a lake like this the thoughtful angler will look for some lesson deeper than the water lying below its surface. One of many will suffice. It is obviously an ideal lake in which to discover not only the effect of environment upon general habitat, but of special environment upon particular habitat. The first is an easily solved problem. The angler soon discovers that he kills more fish in some places than in others, and it is easy also to see that those places afford the greatest

* I exclude from the interesting lakes of Islay the tarn said to contain the so-called tailless trout, which a recent writer on the fauna and flora of the Hebrides erroneously placed in Loch Finlaggan. The lake in which these trout were said to occur is now tenantless. It lies cradled far up in the wilds of Ben Bhainn. It is a curious lake and the bottom is simply heaped with jagged rocks "confessedly hurled." The native theory was that the fish rubbed their tails off against the rough edges of these rocks. As a matter of fact, Islay trout are subject to a disease of the tail ray which causes it to dry up and drop off, and it is a common thing to catch a trout with a quarter, half, or three-quarters of his tail gone. Tail ray abnomalities are not uncommon, and my friend, Dr. Stewart, "Nether Lochaber," records the case of a mackerel-tailed trout in lone Loch Lydoch, on the Moor of Rannoch.

degree of shelter conjoined with the maximum of food—a golden mean of monopoly at which trout and indeed all fish aim.

To prove, however, that the fittest demonstrate not only the rule of survival but that they are the lords of particular and very choice castles and keeps, strong lurking places set in a land of easy plenty, is not quite such a simple matter. You must either raise and closely note without hooking some specially large fish at an exact spot easily identified, say, beside a certain stone that rises above or is clearly visible below the water, or you must land some such fish, mark and return him unharmed to freedom. If a day or two after you can raise and kill him at the same spot you will have proved that even in lochs fish have homes that are their abodes of choice and not of chance, which they hold against all comers so long as they have the power. If they are big, powerful Rob Roys of the lake you may rest assured that the spot is a specially choice one. From this analogy, you can run through the whole field of nature and see a new, certainly a truer, meaning in the doctrine of evolution.

Two other Islay lakes have a different, but equally pregnant lesson to teach amongst the many lessons all lakes, as all nature, can teach. The lesson I choose is one of exceptional interest to the stocker, and the lochs which teach it are Ballygrant and Lossit. The first of these is a typical small Argyleshire lake of the best and most beautiful kind, a wood-crowned water abounding in food and in trout of the Loch Leven variety, as well as in native trout of most excellent quality. Of late years the loch has been somewhat over-crowded, and the fish have deteriorated in size in spite of the rich feeding. Lossit is an ordinary rough and ready small lake, half tarn, half loch, which nevertheless has some good feeding ground and is usually rich in surface flies, best of all food for trout. It is connected with Ballygrant by a small stream of easy descent, while out of Ballygrant flows the river Sorn, which at its place of exit is fenced with barrier-wire impassable to fish. Twenty years ago in Lossit you could have killed any average day in the week some dozens of small confiding trout running six, seven, and eight to 1lb. In Ballygrant you would rarely have got a fish under one pound, and many would have reached two, some three, and a few even four pounds or more. At present your fish will average about 10 ounces, with an occasional large one. In Lossit, on the other hand, instead of killing any number of little fish, you will kill and would have killed for

the past twelve years on a good day a large number of fish running from six ounces up to and over one pound. Twenty years ago 100 fish would have weighed from 14lb. to 15lb; twelve years ago an actual basket of 103 fish I killed one afternoon weighed 38½lb., and I presume a similar number would, if killed during the present season (1899), weigh even more. There is here not only a very excellent example of the side-charms of angling, but of the lessons which the lake and perhaps the lake alone is able to teach. It is obvious that there arose in Ballygrant a condition of affairs analogous to that in an over-populated country. The struggle for existence became too fierce. The fittest were faring best and the loch was threatened with an oligarchy of avoirdupois—a despotism of the few that were heavy and strong. Certain emigrants of necessity, affording another fine example of the origin and limitation of the migratory habit, essayed the burn and won their way to Loch Lossit. These few established themselves there amongst the pigmy savages, intermarried with some, and ate others up, until, being joined by others from the lake below at intervals, the character of the fishy people inhabiting Lossit and of the "country" itself* was changed and the lake became a sort of United States to the Great Britain of Ballygrant. There is, therefore, in a study of these two lakes to be found not only an object lesson in fish life, but also a sort of rude justification, based upon what is essentially a natural law, for the usurpation of the places of weak peoples by strong races, and a very excellent example of the kind of might that really is right, the might that gives as much as it takes and only asserts its right by recognising a corresponding duty.

Even at the risk of tediousness I will venture upon further illustrating the lessons of the lake from yet some other points of view, premising that in dealing with the more practical aspect of loch fishing I shall possibly have occasion to "moralise" in a similar strain. The aspects of the lake by which I would further illustrate its didactic character may be put in this way.

A certain worthy who was an authority on "finds" used to lay down the law to the fox-hunters of his district in the pregnant words "Them

*It is a necessary conclusion from the observation of fish life that a strong "people" can extract more out of the same environment than a weak, though the position may not be permanently maintained and decay grow by what if feeds upon. There are many forms of food which the feeble people or the decaying race cannot annex or assimilate.—Vide chapter on "Habits of Loch Trout."

places that seem the most likeliest are often less liklier than them places that seems the least likeliest." Mutatis mutandis this phrase of classic purity of diction appears to me to be eminently applicable to angling days. Days that are full of promise in the morning too often close in disappointment, and days that promise nothing are often the richest in fulfilment. A cursory glance over my angling ledger, reveals many such days, sandwiched between days on which the sun shone on the waters of promise. Possibly this contrariness on the part of nature, and the most fickle and most meteorologically responsive of her many children, may account for the fact that my best days on certain lakes should, according to the dicta of the angling Cockers, have been my worst.

Nature in all her aspects, and certainly in her didactic character, is ever an ideal economist. She wastes neither lessons nor moods. It is possible, therefore, that, if you placed me by a Highland loch side, when the wind was coming in cold gusts from the south-east, a leaden sky stretched its cold dome from horizon to horizon, and the mist-laden hills loomed a ghostly grey with blurred outlines through the driving rain, I should be right if I laid down the absolute rule that on such a day there would be no rise of fish in a stiff water, and that only an occasional "mad one" would reward your obstinate perversion of the Shakespearian dictum, "Home-keeping youths have ever homely wits." If, however, I found after experiment that the fish were rising and feeding with a persistency I had never seen them equal in the water in question, I should at once look for nature's lesson hid in the midst of her unwasted mood with its retroactive influence on the humour of the apparently unconscionable trout, who seemed to have thrown axiomatic truth to the south-east wind.

Nor would the reason be far to seek. Analogy is the best interpreter of natural mysteries, for analogy of all methods combines the synthetical with the analytical. I would remember that I had seen grouse sit close on wet stormy days, when the weather seemed to have been broken on the meteorological wheel beyond the surgical skill of its clerical dispenser and from the dust of old oblivion I would rake the experience that such days of "grousish" perverseness have invariably been followed by spells of fine weather. From this analogy, aided by similar experiences drawn from the angling past, I would surmise, and surmise correctly,

that the depression was only temporary, and that the trout knew it, and were already hailing in fancy a smiling morn on the morrow.

This is one of the charms of sport. The student of it who can rise above the mere killing of fish and bird and beast catches something of the wisdom of nature, the lessons of very little things that tell great stories. We are more self-sufficient than wise and more simple than natural, else we would employ men to study animals and prophesy the weather "from the birds" instead of those instruments which are for the most part still the masters of their own truths.

I have, however, already said sufficient to prove that the raising and killing of fish does not exhaust the joys of the loch. Lakeland has charms other than those which appeal to the sense of the beautiful in form. It is replete with the beauty of the fitness of things—of the slavish ministry of all nature's parts to the perfect whole, the kaleidoscopic balance that flits and changes, but never fails to produce a perfect picture of symmetrical design.

Those great yellow argosies of summer—the fat May flies, that flop up and go quivering down the wind in aimless fluttering to the casual eye, are nature's provisional insurance against the rainy day when the shrimps floating past in their dead hundreds may fail to be fruitful and multiply. The gulls that swoop and dip after them on all hands insure that they shall not be wasted when the troutish cupboard is full. Away in the amber shallows you will see countless little black and wriggling objects, like semi-colons, now clinging to the rocks as if for safety, now making little sinuous voyages of no great purpose from one fastness to another amongst the hard but kindly stones. These tadpoles have their place in the economy of the loch. They are the solids that flank the daintier dishes—the last resource of noble troutish bodies when other things fail. They dwell in the shallow sanctuaries for there alone is safety assured.

Search the lake through and through, study it with the eye, not merely of the angler, who desires to bring down its fish to the grave with blood, but with that of the student of the great lessons of little things, and you will find that in the lake as in the whole cosmic order co-operation which exhausts the ideal of economic demand and supply is the ruling principle of the universe. This is the last, but not the least, if indeed it is not the consummation, of the sermons in brooks—sermons of which

the lake is but the larger expression, deeper may be, but not a whit less clear.

CHAPTER III.

Loch Trout and Evolution: why they vary in size and quality.

The Darwinian dictum that the most intelligent of monkeys are divided by a greater gulf from the least intelligent of men than divides the highest from the lowest races of mankind appears, as a necessary conclusion from the observations of the practical evolutionist, to convey the suggestion of a somewhat similar dictum in the case of the salmonidæ. The analogy, is, of course, in many aspects far from being perfect, for the simple reason that there are no monkeys or what would correspond to monkeys in the family of the salmonidæ, though as between trout in all their varied gradations from the civilised trout of our best waters to the puny trout of our poorest waters and fish in general, the comparison is not wholly unjustifiable. It may be presumed that the monkey would resent as an injustice the placing of the blind eel-shaped fish of the caves of Adelsberg with their lizard-like fins in the same position relatively to the trout as the monkey occupies to man. Yet such a comparison is not wholly unjustifiable on psychological, if not on physiological grounds. In any case if evolution can presume, on the plan of the geologist and contrary to the reasoned belief of Lord Kelvin on more or less intelligible grounds, an eternity for evolution to work out the mysterious ends of the Creator, which we see clearly in the tree and dimly in the bud, the ichythologist, whether scientific or merely practical, may be permitted to borrow an odd million or two of the twenty-five allotted by the learned Glasgow professor for the emerging of the world from primeval chaos to present order.

That we must become the debtors of time to explain the differences that exist between the members of the same family of fishes—differences that do not appeal so strongly to the man of science as to the practical student of fish—is aboundantly clear, when yet one stands on the very threshold, and the fish world is still absolutely a region of virgin

mystery. Even after one has wandered for years amongst its thousand charms for the speculative mind, it remains still a region with whose external features alone the observer, to whom the tracking of the old mazes with fresh feet is a labour of love, becomes intimately acquainted. Nature seals certain chapters in her great book, and has fenced round the world of fish as commoners of water with an elemental barrier that has sentinelled from time immemorial, and may sentinel until chaos is come again the mysteries of subaqueous existence.

It is possibly to this intuitive appreciation of the limitations of our power, not less true as yet of air as of water, that we owe not only the fabled monsters of the deep from sea serpent to kelpie, but also the origin of Daedalus and his thousand and one imitators. Possibly, too, it was the same spirit which induced the builders to start work on Shinar's plain and create the first boom that history or its hand maiden tradition has recorded, antedating even the apocryphal giants war with the gods of Olympus.

These reflections are apparently somewhat of a divergence from loch trout. As a matter of fact they are suggested by a very complete chain of ideas associated with loch trout, whose very differences, united as they are by a bond of family likeness of a general as well as a special kind, necessitate, if they are to be accounted for at all, the hypothesis of a common ancestor. From this common ancestor loch trout have, it is true, widely diverged if one is content to regard the matter superficially; a very little consideration, however, soon shows that the degree of the divergence is more apparent than real

A priori reasoning in problems of this scientific and historical character is a most dangerous and misleading guide. Yet few who have considered this question can have failed to ask themselves whether, if we could even conceive of that imaginary golden age of angling, when fishing was not a pastime, that calls forth, if pursued in its true spirit, the best qualities of the heart and the highest energies of head and hand, and awakens from its necessary associations and surroundings the noblest and loftiest thoughts of which human nature in its best moments is capable, but was merely a portion of the daily or occasional quest for food in which the hunting man in the ancient sense was ever engaged, would we find the same or nearly the same differences in trout as now exist? How far we should have to roll back the years, it is not altogether idle

speculation to ask, as we shall presently see, so far as the solution of the practical problem at issue is concerned. Imagine for a moment, however, that period when the rivers of Britain poured their dark waters through the wild glens and primeval forests, and the lakes expanded their lone bosoms to the sky, when the light of each returning dawn was shed in vain, for no man arose with hope renewed to reap the spoil of their teeming waters; when the full pride of day poured its glories on swirling pool and laughing lake and rising fish that knew not, and had never known, the dangers of dancing fur and feather cunningly interblended in varied contrast of colour and form across the surface of their home; when the soft and fading splendours of the dying day crimsoned and empurpled the hills, and steeped in a myriad of varied hues that phantasy of massed clouds which attend the sun in his going down, and no man came to angle at that most pleasant and often most profitable period of the whole day. At that period, and, as scientists reckon time, it was as yesterday, presupposing the conditions of existence were otherwise the same as those of to-day, if man and his works were removed and the evil they have done were undone, it is safe to presume that the order of things, so far as the salmonidæ is concerned, would be as they are.

To go back to remote periods as the zoologist, and still more as the geologist, regard remoteness, would be to explore a world of very different conditions of existence, if that is to say we are to presuppose a common ancestor of the salmonidæ. Such a supposition if evolution means anything, is a necessity of thought, but at the same time to assume a physical postulate which we must formulate but cannot trace is only to acknowledge, so far as fish in general and any species of fish in particular are concerned, that scientific history is only exact when it is analytical and is largely speculative and wholly inferential when it become synthetical. If zoologists cannot discover the missing links in the great chain of evoluted life, then surely ichthyologists can afford to stand and wait, content with the knowledge that if they cannot trace the salmonidæ through all the chances and changes of years back to a common ancestor they have at least been able to assure themselves of the link between the existing varieties of the family and to attribute the differences to their proper origin and cause.

Turning from the temptation to speculate in wider fields, and con-

fining my remarks so far as possible to loch trout, as we know them, it is undoubtedly difficult to believe prima facie that the great differences between the trout of lochs are entirely due to corresponding differences of environment operating through thousands of years or through periods of sufficient, if of indeterminate duration, to produce the results which we see.

Who, for example, comparing an excellent specimen of the fish of Loch Coil-a-Bharra, in Argyleshire, Lower Bornish, in South Uist, and Loch Sarclett, in Caithnessshire, three lakes whose trout are unsurpassed in beauty of shape and richness of colouring by those of any lake in Scotland, with the black and yellow dwarfed fish from some of the peaty tarns of Jura, Harris, or one of the few South Uist lochs carrying such fish, would not find it difficult to believe that the obvious difference, not merely in size, but in stateliness of being was entirely due to years, probable centuries, perhaps aeons of difference in environment? The difficulty of grasping what evolution as a practical process means is as great as the endeavour to realise infinity in time whether looking forwards or backwards. Yet it is equally a necessity of thought. We fail, it is true, to see far up the long slope of time down which the countless years have rolled, and by processes that are bewildering have produced the infinite variety of fish life with its subtle connecting links from the lowest form of it seen in water animals that are a mere congeries of nerveless ganglia to the most shapely and dashing of fish with their fixed habits of apparently reasoned purpose. If we take not merely an order that has branched into a genus, and that again into a species of fish with its varieties, as modified by the special conditions of environment, the mind in endeavouring to grasp the infinite number of moving incidents by flood that have produced the subsequent different development, is lost in a maze of physical causes, real and supposed, that is as perplexing as the labyrinth of the higher problems of metaphysics, the origin of rights and responsibilities belonging to the moral and not the material order. Yet we know that from time immemorial those laws have ever been at work, and have operated mighty changes before men discovered them or gave them formal recognition. It has been finely said that natural law, in the widest sense as embracing all the laws of the physical and moral order was extant "long before Moses was born,

before Aaron rang his golden bells, before there was a phrophet or a judge in Israel." Presupposing, therefore, what is practically an infinite period for their operation, it is easy in theory to grasp as a whole, though impossible to do so in detail, how the infinite variety in fish life arose. Ichythyologists by their researches of a scientific, and in many cases of an anatomical, kind have not left us altogether in the dark as to the connecting links between the higher and the lower forms of fish life, using that phrase to embrace all animals that live in water without being under the necessity of coming to the surface for air.

As an example of this connecting link which may help to simplify the problem, in one of its aspects, of the differences observed in loch trout, lampreys, and lamperns may be cited. These interesting water-animals belong to the order cyclostomata, the genus petromyzontidæ and have been sub-divided into four species, the last of which has two variations, or to speak by the card, is known by two different names, one derived from its habitat, the mud, the other from its lack of visionary power. Some of these species of lamprey affect the sea and one of them, the true sea lamprey, is known as the lampern, and will attack even such fast swimming fish as the mackerel and sea-trout. In proof of this interesting fact I may here interpolate that I once secured in a Hebridean loch a sea-trout of 11b. with a large hole clean through it; the surface of the wound was rough and the formation of the pinkish cicatrix, perfectly healed, suggested the pulpy condition to which the circular motion of the adhering teeth of the lamprey would reduce it. The other two species of lamprey are migratory, while the third is found only in rivers, in which all the four species spawn. Finally it may be mentioned that the mud lamprey for the first three or four years of its existence has the habits of a worm, a fact which emphasises the position that the borer and that very minute "fish" the lancelot seem to be decayed members of the lamprey family, or elevated members of the worm race; in any case they seem to be the connecting link between the annelids and the petromysontidæ. A casual observer would class the latter order with the eels or anguillidae, and, indeed, in some places, Scotland, for example, they are called lamprey eels. As a matter of fact, they belong to a class of their own, and differ in many essentials from eels and from all other fresh water fish, the majority of which, including eels, come under the order physostomi, fish, that is to say, having a duct from the air bladder to

the throat which permits the fish to adapt themselves to the varying pressure of the water. In some aspects, and this is the reason why I have selected them as "missing links," the lampreys are not true fish at all, but seem to rank mid-way between a true fish and the annelid or worm family, while in the shape of their mouths, owing to the absence of true jaws, they approach the tadpole; moreover, the vertebrae, though completely arched, are not separated, as in the case of undoubted fish. Their brain, however, both in formation and nerve branches, is the same as in other fish. The most strongly marked characteristic is the mouth. This organ, armed with strong suckers, enables them to adhere to stones and other substances with the tenacity of a parasite. There are no scales, and a glance at a specimen reveals the total absence of any lateral line. The bronchial gills (invariably seven in number in adults, the eight of the embryo and undevolped petrmyzon being lost in development) are another marked and leading peculiarity. All the different species, unlike the eel, always, as already stated, spawn in rivers, the sea variety ascending them for the purpose. We have here an obviously instructive lesson which, if it does not teach us how the differences between fish arise, at least succeeds in showing that those differences if enormous are not wholly destructive of the traces of a common ancestor. The lampreys are connected with fish, in the popular and in some sort the scientific sense, and possess certain characteristics common to all fish, yet are differentiated from all other fish by characteristics peculiar to themselves. The history of the evolution is a sealed book, but in theory at least, analysis gives to the mind a general idea of the synthetical process that has operated these wonderful ramifications in fish life of which the classifications of the ichthyologist are the chronicles.

CHAPTER IV

Loch Trout and Evolution. The Effects of Particular Environments.

If the problem of accounting for the infinite variety of fish life as a whole is, as I have endeavoured to show, not altogether inexplicable, and the root idea underlying its solution be kept in view, it becomes abundantly clear that the differences between the trout of various lochs are capable of a very simple explanation.

In the first place those differences are differences of degree and not of kind, and we have in consequence a much more limited field of investigation to cover. When we remember the many variations in form fish life has assumed, while still preserving, as in the case of the lamprey, certain common characteristics, and note that as between the trout of this loch and of that we have not the abstruse problem of connecting links to solve, it becomes still more obvious that with the exception of certain analogies, which are first principles in the theory of evolution, we have the question of environment, and of environment alone, to consider. Environment is to fish-life as important as the "standard of comfort" is to our social life, and once a "standard" is set up by environment any departure from it creates precisely the same discontent and unrest in a community of fish as it does in a community of human beings. Happily therefore so far as loch trout are concerned, environment, using the word in its widest sense, is a factor in evolution which we can study in operation without presupposing any such eternity as the geologist, and in some respects the zoologist, is under the necessity of assuming. We will not, it is true, be able by observing its effects to trace the rise of new species, but we can undoubtedly notice its effect, as a powerful cause, upon different communities of the same species. I have already in a previous chapter cited a singular instance of how a more powerful and in every way a fitter race of loch trout were forced through the conditions of their environment to invade the territory of a

more feeble race—springing, of course, from a common ancestor—whose feebleness was the result of the long-continued operation of precisely the same causes as compelled the invasion to wit, overpopulation, an excess of fish over food, and the overmastering in the struggle for it—in the fight for the condition of existence, of the strong by the weak. I showed that within at least eight years, this invasion by a stronger and larger race, conjoined with the partial extirpation by and partial fusion of, the weak with the strong, the small with the larger, had resulted in the production of a race of trout, occupying a middle position between the fish of the upper and those of the lower lake. The invaders being a more powerful and virile race and descended from "fitter" ancestors have naturally been able to make more of the conditions of the same home than did the puny race, whose decadence once established grew by what it fed upon. Possibly the new race may in turn decay. Possibly their virility may enable them by cannibalistic predation to maintain the balance of nature. In any case they at present afford a most perfect illustration of that law of evolution, the survival of the fittest, and illustrate with a clearness that he who runs may read, one at least of the causes that produce the differences which we see in loch trout.

The illustration which this example affords of the effect of environment and the struggle for existence upon the trout of a particlar loch, is very far from exhausting this aspect of the subject, though it not only exemplies the progressive power of environment, but also the retrogression which environment can bring about.

As an example of the retrograde effect of environment, premising that its operation as a deteriorating or ameliorating influence is the same on all members of the salmonidæ and therefore that the analogy is absolutely logical, nothing can be more pregnant of the truth I am endeavouring to elucidate, than the effect of captivity upon the migratory salmonidæ, particularly upon the truest migrant of the three great recognised migrants of the genus, the salmo salar.

It is now, I presume, an accepted fact that up to its assumption of the smolts livery of splendid silver the salmon is a fresh water fish. That marvellous change occurs when the salmon is in a state of nature, or in other words is a free denizen of river or lake, in a few cases during the April or May following its birth, in most cases during the second April or May, and in some instances

during the third recurrence of these months. In all cases when the sea thus casts its silvery shadow before, the change is co-incident with the first dawning, so far as we are aware, of the restless desire for the wider range, the richer tables of the deep, for what, in a word, may be the natural home of the fish as a worker in the field of nature. It is not necessary for my purpose to follow the fish to the sea, and I content myself with pointing out that once he feels the salt water the salmon's habits change. From being a contented pigmy he speedily has the ambitions of a giant and battening on the choicest pastures of the kindly deep with an appetite in strange contrast to his not wholly voluntary abstemiousness when he returns to the river, he realises with incredible rapidity his wildest hopes of changing the condition of a puny dweller in the stream to that of a leviathan. Interesting as is the rapid growth of the salmon when he can enjoy the rights of freedom, he becomes, perhaps, doubly interesting and illustrative of the effect of environment upon fish, quantitatively and qualitatively considered, when he is made prisoner and is deprived of his rights as a commoner of water. The effect of this deprivation is more pronounced in what I may term artificial captivity, when, that is to say, the salmon is imprisoned in a confined area equivalent to a cell and is not merely, so to speak, exiled or transported. The effect of the deprivation will, in other words, vary in degree with the amount of liberty allowed him, and will naturally be more pronounced if the fish is confined in a small pond corresponding to a prison cell or is allowed the freedom of a largish sheet of water or a river, corresponding according to their dimensions and the jus spatiandi they afford, either to the condition of an exile on a small island, or to a prisoner on a great continent fenced by the inviolable sea. When in confinement such as a mill pond connected with their native river by a race, the behaviour of smolts shows what an overmastering impulse is the desire for the sea. I have seen them leap clean out of the pond on to the banks and even when they do not thus commit unconscious suicide in their despair, their restlessness is pitiful. The environment which the sea alone can give is absolutely necessary for their intuitive ambition and deprived of what they appear to feel is a right, their development is almost as phenomenally slow under the unnatural conditions of existence forced upon them, as it is phenomenally rapid when allowed to gratify their instincts. Possibly

in a large sheet of water abounding in food they may occasionally grow with the normal rapidity of non-migratory salmonidæ, but in no case and under no circumstances, that are not natural, do they ever show that tendency to rapid growth displayed by them in the sea. When imprisoned within narrower confines, their growth, even when food is plentifully supplied, is still more markedly arrested. Indeed the unnatural environment of the fish pond will occasionally produce effects upon fish, which clearly show the desperate struggle between the hereditary instinct that is the result of environment and the new characteristics that are wholly the result of altered and, from the traditional stand-point, unnatural environment. I have observed at least one case in which a four year old land-locked salmon, though a bright fish of about ½lb. in weight actually retained the parr marks, which stood out against its white, rather than silvery sides, with far more clearness than they did even during its true infancy.

It is clear, therefore, on this analogy that if a change of environment can reduce the salmon from the condition of a quick-growing and comparatively large fish to that of a very slow-growing and comparatively small fish, environment, rather than an apparent difference in race, the difference being due to environment, must by itself be sufficient to account for the varying size and varying quality of the trout in our lochs.

Another and peculiar example of the retrogressive effect of environment came under my observation in the Hebrides, and as it was the means of establishing the fact that trout and fish generally are subject to tuberculosis—a discovery which, so far as I am aware, has not been followed up—the circumstances of the case may be detailed here. In 1890, while fishing in a South Uist loch, I killed on the same day a couple of trout weighing about 1¼lb. each. These fish were long and lank. They were not, however, merely thin. They were emaciated, and had the sickly, unnatural look of animals suffering from a wasting disease.* Over and above their emaciated consumptive appearance, they

*All or nearly all the symptoms here described are very frequently observed in trout when they reach old age and are about to swim into the waters of everlasting shade, that glide with noiseless ripple through the happy hunting grounds, or as the unpoetic small boy put it, are about to fall into "the everlasting sleep of Haddies." I note the circumstance, as it is just possible, that the trout of the second lake mentioned were old fish that had ceased to be fruitful. It is certain that the sanitary condition of their home had been altered for the worse by the lowering of its level. I desire, however, to avoid confusion of causes as well as of effects. Nevertheless, if the signs of old age and

presented another and unusual feature. They bulged out at the belly, and both fish looked, in consequence, as if they had a paunch, or had swallowed a stone or an india-rubber ball. This paunch, in contrast to their leanness and lankiness, gave them a most ungainly—almost a ludicrous appearance. My gillie, one of the quaintest Highlanders who ever made a bad day into a good one by letting his Celtic fancy have free play in broken English, at once christened the fish "big heads," and declared that a few of the lochs abounded in such fish—a statement which I subsequently verified.*

Curiously enough, three or four similar fish, rather larger in size, were brought in the same evening by another angler, who had been fishing a loch that had practically lain fallow for a number of years. As the house was full of doctors, and the matter was worth sifting, the youngest of them, who was a very skilled anatomist, speedily laid one of the trout on an extemporised dissecting board and revealed, as I had expected, the presence of large ovarian cysts, which may be described, though not defined, as bags appearing to contain yellow glutinous matter of a morbid nature. It then occurred to me to suggest, pursuing the first train of thought which the fish had conveyed to my non-scientific mind, that the fish were suffering from a form of consumption, or, in other words, from tuberculosis. With the idea of demonstrating the truth or fallacy of this suggestion, the fish were carefully preserved for analytical investigation, which established beyond doubt that they contained the bacilli of consumption, and were, in a word, tuberculosed or consumptive fish.

Now in both these lochs the conditions producing the disease appeared to be precisely those insanitary conditions, which, mutatis mutandis, authorities declare to be the cause of tuberculosis in cows. One of the lochs carried a large head of fair conditioned trout up to ¾lb.; anything above that weight appeared not only to be underfed but "cribbed and confined," for the lake was undoubtedly too small for the number of fish in it. The environment was, in other words, tending to-

the signs of consumption in trout are the same, then the extremely instructive inference may be drawn that most trout die of consumption. It is, however, possible that the signs of old age may be mistaken for those of consumption. A trout register of births and deaths should easily avoid such confusion. We do not know the age to which a trout lives in a state of nature.

*Such fish are in Austria called Quixotes or adventurers, and in Sweden "big heads."

wards the deterioration of the fish in quality with their increase in number, and the big fish were dying out. In a few years I have no doubt that the trout of the loch will be found to have altered their character. The process of decay had certainly set in.

In the other loch there appeared to be only large fish, and the whole of them were in shocking condition and, in fact, diseased. The retrogression was due not only to the loch having reached its carrying capacity through not being fished, but also to the fact that drainage had shrunk its area, and rendered it a less fit home for trout of a large size than it, prior to "modern improvements," had been. In both cases the environment was the direct cause of the deterioration, partial in the one case, complete in the other, but in both proportionate to the change for the worse in the conditions of existence.*

Before passing to another example of the effect of environment, I would point out that the case of these South Uist fish disposes of the claim of certain French experimenters that they were the first in 1897 to discover tuberculosis in fish. The method of their discovery was as follows: Into a pond in France tuberculous matter from the lungs and digestive organs of a patient was thrown. The fish—carp—were afterwards noted to die, and the germs or bacilli of consumption were found in plenty in their bodies. Moreover when these bacilli of the fishes were given to other fishes, they proved fatal in the same way. Presuming that the common carp is meant (for there are a good many varieties of carp and of fish that are half-carp half-bream in appearance, which on the Continent might be called carp) it is rather curious that I should have had two carp through my hands which were certainly suffering from ovarian cysts, if not from tuberculosis, and presented precisely the same appearance, in a modified form, as the South Uist trout.

I had been asked by Lord Loudon to come up and witness the netting of a large bream pond at Willesley Hall in Leicestershire, and to give my opinion as to the advisability of stocking the pond with trout. I described the netting of this lake in the "Field" a week or two after it occurred, and mentioned the circumstance that the two carp referred to

*While these pages were in the press (in June) I found that many of the trout of a certain loch, thick-set fish of 1½lb. to 2½lb. were long, thin and attenuated owing to the dearth of fly, May fly and ordinary, as well as the demise of nearly all the shrimps. The long continued cold weather of a phenomenally late season was the cause of the change in environment and in the condition of the trout.

were suffering from ovarian cysts, though, unfortunately, through other matters occupying my attention, I did not take away either of the fish, and so failed to carry the investigation further. If these two carp on being submitted to analysis and miscrospic examination, had been proved to be suffering from tuberculosis, as well as from ovarian cysts, the circustances would have been both interesting and instructive. That they were so suffering I have little doubt, but presumption is not proof.

These tuberculosed trout not only proved that environment is the great factor in producing size, beauty and health, particularly the nast named, in trout, but they also led me, after some observation of their habits, to draw a somewhat speculative inference. In drawing this inference I may have mistaken a cause for an effect, or vice versa. In any case the conclusion which I drew was the rather startling one that fish suffering from tuberculosis develop a sort of blindness.* My difficulty is that I am uncertain whether the tuberculosis causes the blindness or the blindness acts as a predisposing cause towards tuberculosis. In the human patient we know that visual power is often strongly dependent upon bodily health, in the absence of which the patient may either see nothing or things which do not exist to be seen—a paradox which is self-explaining when one remembers that all our sensations are dependent upon the perfect working of a most intricate and complex system of what one may term nerve-signalling.

What I observed was that when these trout fish rose to the fly they took a long time to locate it, and seemed almost to grope for it like a blind man. Their play, allowance being made for their invalid condition, was not merely lethargic, it was purposeless and lacked method. Near the landing net they were unstartled by quick movements of it, and, in a word, betrayed all the symptoms of fish whose sight was defective.

Now, here it may be very properly asked how could, or why should, trout affected by partial blindness take the artificial fly, a lure which can only owe its attractiveness to sight? The answer to the question is simple, yet it might form the text of a hundred angling sermons. Such trout as those with which I am dealing only rise when there is a great rise or "move" on, and when, therefore, rivalry for flies is sufficiently keen to rouse them out of their lethargy. They follow the crowd, so to speak, and because something is stirring bestir themselves. Moreover,

*This is another occasional but sufficiently characteristic symptom of old age.

there is an element of chance in their taking the fly, for partially blind fish are very apt to go bobbing about the surface in an aimless kind of way. When behaving thus if your flies light at their noses they take them in their listless, uncertain fashion.

It would appear, therefore, that, if the fish of a lake rise in a very listless manner, it is just possible thin in this, apart from their condition which can only be seen after they are hooked, there is prima facie ground for the presumption that something ails their environment.

There may be more blind fish than we are aware of. But it is not probable that there are, for the struggle for existence must with them soon end in death. My own experience it that blind fish are not easily come by for purposes of observation. Many years before I caught these Uist trout I had secured some strange lizard-looking, olive-green so-called fish in the mysterious river that passes through the great stalactite grotto at Adelsberg, in Hungary, but these threw no light on the habits of blind fish. Luckily, in 1893, I was fortunate enough to come across a blind trout in a pond, and to be in a position to remove and place him for purposes of observation in a shallow stream. He was a long and lank fish of most sorrowful countenance, and lay like a log wherever he was placed. Often, if one sent a stronger rush of water over him than usual, he would be washed away with it until, to use a nautical phrase, he was brought up "all standing" against some friendly stone or something that gave him a holding ground against the force of the current. He was totally blind, yet he found his food by smell and touch, and was fed, like the other fish in his pond. He pined away to a shadow, however, and finally died after presenting all the appearances of a consumptive fish, and showing all the movements characterising the fish proved to be consumptive and presumed to be partially blind.

I may say in general with regard to consumption in loch trout that I have observed a great increase in its apparent occurrence of late years. The first suspicious case I remember noting was in Loch Skene some 19 years ago. Since then and up to 1890 I observed isolated examples of it in lakes as far sundered geographically as in character. Since 1890 I have naturally been on the outlook for examples of trout either really or apparenttly thus affected. I regret to say, as I have already pointed out, that I have observed an increase, and that, too, even in lochs where the conditions appear not to favour the development of the disease, at

least in epidemic form. Possibly the increased number of cases I have observed may, as the statisticians say, be due merely to a better system of personal notification. If so the increase may be occasional and perhaps much more apparent than real. Possibly drainage may be affecting our lochs as adversely as I believe it has done our salmon rivers. In any view, it is to be hoped that there is no real danger of the fell disease which man is preparing to combat with the weapons of simple sanitation, curative and preventive, but which at present claims a yearly sacrifice from our midst of 70,000 human lives and 40,000 of the cattle on our hills, invading with deadly purpose our choicest lakes and decimating their lusty fish.

Tidal lochs afford another and most excellent example of the effect of environment upon fish. As a rule, to which there are, of course, exceptions (Loch Stennis, in Orkney, and the so-called loch at Strome Dearg, in South Uist, the former to a most marked degree, may be instanced), the common trout found in most tidal lochs or lochs invaded by the tide are small and poor, so long, that is to say, as they remain loch trout pure and simple and do not better their environment. That the tendency of fish to better their environment is one of their strongest impulses goes without saying, and when I come to deal with the future of our lochs, I shall naturally have something to say on the point. In the meantime I venture to lay down the rule, (also subject to exceptions which the tidal loch illustrates), that all trout, who have any necessity to do so, occasionally visit the sea, if, that is to say, they are able to make the trip. This is a statement which must, as I have already indicated, be taken as a mere generalisation. Trout in the upper reaches of a river like the Wharfe in Yorkshire or the Derwent in Derbyshire will never visit the sea if only because there are barriers in the way which no trout can surmount. Nor will they do so if the predisposing cause, lack of food, be absent. If, however, the trout in certain reaches of these streams were deprived of their natural food they would speedily migrate in search of reaches where food might be more abundant., and if the sea were near or easy of access they would most certainly travel as far as the estuary.

The point I desire to emphasise is this: If the life conditions of trout are such that the waters they frequent can be invaded by immigrant food from the sea, then it stands to reason that such fish, if their food supply

otherwise is meagre or insufficient, will follow the food back to the sea. Fish far removed from the sea show a similar restless tendency, and the allurement in all cases is food. Many anglers of the older school, who were much less fastidious in their methods than we are to-day, have set it on record that they have drawn fish from long distances up to their fishing point by the use of salmon roe. Its power to attract they have variously attributed to smell or the operation of shredded portions of it as ground bait. The former explanation is a fanciful one, and on the analogy of the effect of ground bait the floating particles are probably the cause of the trout being drawn up towards the original source of the food.

It is, at any rate, clear (and I have in a previous chapter quoted a singular New Zealand case in which non-migratory trout, so-called, became migratory through visits to the sea rendered compulsory by the lack of and the search for food) that if fish in tidal waters have their appetites stirred by food coming in with the tide and are capable of responding to the suggestion, they will go back with the food and with the tide, in precisely the same way as herring and other tide-feeding and tide-ranging fish do. Now the curious part of the matter is, that the vast majority of the trout in the tidal lochs of the usual type are not in the least degree influenced either by the food borne in by the tide or by the incursion of the tide itself. They seem content to keep up a frail and feverish being in the loch, and their environment being barren and miserable, they are, as a result of it, extremely poor and small specimens of fish, mere fingerlings when they might be giants. A few wiser or more fortunate members of the community do make a trial trip to the sea and speedily attain to a large size, which they no doubt maintain when they return temporarily to the loch by preying on their fellows and by developing the migratory habit. I find by reference to my fishing ledger, that I killed with the fly within a short period more than one of these fish in a certain tidal loch. One weighed 5¾lb. and the other 3¾lb. Both were superb fish in form, colouring and strength, yet the average ordinary trout of the loch was about one ounce in weight, and in colour was a hideous black, in form an emaciated pigmy, and in strength could not match a rather weak minnow. Here obviously a change of environmen at once wrought a corresponding change in the fish and I feel assured that had the position been reversed and large trout been turned

into the loch and the small fish removed, the big fish would either have developed the migratory habit or would speedily have died out leaving behind them an inferior progeny, and they again the "dwindled sons of little sons of little men" until finally the old order was established and the loch once more was reduced to its former position as a lake only holding and only fit to hold small and poor fish so long as they were non-migratory. The example of the tidal loch is, perhaps, the most convincing I have yet given to prove that the differences in the quality and size of our loch trout is entirely due to environment and has practically but little to do with "breed,"* a fine breed of trout being, on the last analysis, the result of environment.

Many further examples could be quoted in support of this contention. I could cite cases of lochs with water exceptionally well suited for trout but poor homes otherwise, which hold very beautiful, but small fish of excellent quality, such as Loch Tanna, in Arran, and Loch Stullivaule, in South Uist; I could adduce many example of very large fish in lochs abounding in small as proofs that the Titans having by chance overcome the difficulties of environment have by this fortuitous victory become superior to environment by creating an environment of habit, the habit of cannibalism and the power to obtain and devour other animal food beyond the reach of their small brethren; and lastly I could adduce examples of fine fish placed in an unsuitable home that because their environment was not imported with them have either died out or been succeeded by a gradually dwindling and decaying race. Enough has already been said, however, to show that the differences in size and quality observed in the trout of our lochs, striking as they are, are the result not of racial or inherent superiority, but of environment. The finest races of men are not the growth of, but must perish in the desert, and so is it with fish. The pigmies of Central Africa are not more truly an example of men who have dwindled because nature conquered and dwarfed them by her own magnificence and prodigality than are the trout of certain lochs the product of that niggardliness with which she has furnished their home. Nature knows. if man does not, that the fish should not be there. She vindicates her own laws by pointing to their condition and it is for us to read and learn the lesson that she has written so plainly on many waters.

* The only advantage a good breed possesses is noted on page 20. It should be noted that the higher the race, the higher is the standard of comfort.

CHAPTER V.

Fishing as the Hand-maiden of Science.

It must often have struck even the casual student that our scientific ichthyologists are better classifiers from the anatomical than they are from the practical standpoint, that they more often chronicle the experience of others than their own and more often quote the observations of previous writers than set forth the results of their own observations.* Nor is the circumstance matter for surprise. The range of the ichtyhologist is not specialised but general, and he must make himself not only master of the structural peculiarities of the fish that swim, as it were, past his door, but also of their kindred in, if need be, the virgin waters of almost untrodden solitudes. If it were possible for the man of science to know fish in the haunts of nature as well and as fully as studious hours in the laboratory have enabled him to know their structural differences, then ichthyology would rise nearer to the level of an exact science than it is to be feared it has done. At the same time all science is complementary and the experience of no practical observer of fish and their habits, however limited his knowledge of scientific terms, whether anatomical or otherwise, can be ignored with advantage by the scientist, whose eye and ear he is. The fishing-rod may, in this aspect, be called the key of many mysteries, because the angler who can rise above the mere slaying of fish is necessarily a keen, because an interested observer, of the multiform varieties of fish life. And even if, as sometimes happen, his whole soul be bent on slaughter, this fact in itself necessitates some study of the habits of his quarry. He may fail to see the beauties of the subject he studies but he cannot wholly miss its practical

*The following is a good example of the way in which the scientist pure and simple writes of the trout from the practical point of view :—"They live on insects, molluscs, spawn, worms, and small fishes, and rush *perpetually after gnats*, which skim over the surface of the water. When their weight is about two pounds, they are as greedy as pike." Comment on this would ruin its sublimity, yet it is an extract from a standard work of most admirable range and great scientific accuracy. The observations on habits are obviouly borrowed and are not the result of personal experience.

lessons. In either case the utilitarian value of angling to science must be immense, and would become greater, if any unity of purpose pervaded the angling world on this important point. Let me here cite, perhaps, the most common example of the aid angling has been to science. I refer to the entomological angler, whom one may in all honesty of purpose term, the blue stocking of the angling world or to give him a more imposing and a more original title the Neo-Imitationist.

In his proper sphere, the Neo-Imitationist is an entomologist who is a specialist, and devotes his attention to the study of those insects which are either water-born or spend their brief hour of life flitting above or floating on the surface of our rivers, I do not, advisedly, add " and lakes." Scarcely a week passes without the " Field," the " Fishing Gazette," or " The Angler " chronicling some example of his work, pregnant with knowledge of the little ephemerids that claim their share in the great heritage of life, those " small things " loved and sung by the poet, whose short share in time might pass unchronicled into oblivion, and their habits remain unknown were it not for the enthusiasm that hurries the entomological angler to probe the mysteries of their little life.

Beyond this point, however, praise will not carry me, because I draw a line of demarcation between practical angling and entomology, that is a kindred study, and taboo the latter when the entomologist angles only as a man of science and indulges in too fine distinctions. I trust I may be forgiven for pointing out that we are in danger of becoming too entomological; by placing a value upon the intelligence and discriminating acumen of the trout, for which there is no reason, we may find that we have dropped the substance of angling for a very vain shadow. If trout have the power of noticing that a leg is missing from a fly, that a colour is accentuated, and that there are three strands instead of five in a tail, as the purists would have us believe, then why do these educated entomological trout take an " Alexandra " or any other fancy fly at all? They should be able to murmur " lusus naturæ," wink the one eye, shut the other, and go and have a feed on what any trout, even the most common, must know is the gammarus pulex. This is possibly a reductio ad absurdum; but what I desire to emphasise is that the moment angling becomes a serious pursuit of purely scientific aim, it may cease pro tanto to possess the interest which is the esse as well as the posse

of observation. Memory and indeed reason can be easily deceived into observing facts presented through the medium of what is a real or imaginary pleasure, which both might fretfully overlook, if the pleasure ceasing to be a labour of love, becomes an apparent, as it is a real, labour of duty.

Far be it from me to maintain that the delightful art of taking fish by imitating nature, known as "dry fly" fishing is not the acme of scientific sport, much more of sport in its imitative aspect, but what I complain of is that it has bred a race of prejudiced, exclusive and pedantic entomologists, amongst whom may be found not a few examples of the angling hypocrite and the angling Pharisee. These I should be inclined to class with those who make a desperate splutter about the vital necessity to their health of a cold tub in the morning when the weather is at its very "iciest," but which no one sees them take.

The entomologist angler of the best type, if he is a bit of a pendant, is an extremely interesting person who has caught the true secret of angling, not as the art merely of catching fish, but of studying the life of many waters. His side issues are intensely instructive and interesting, but when he applies the rigid exclusivism of his scientific discoveries to practical sport he becomes, as I have already pointed out, a sort of reductio ad absurdum.

Still when I have blown this blast against his exclusivism, the entomological angler is, perhaps, king amongst us all, especially in the direct aid which he gives to science. The entomologist, for example, will willingly consult him, and has not Professor Miall said of him, "The names employed by anglers should be noted, as much information respecting the habits of acquatic insects can be extracted from anglers by those who speak their language"? I do not know what the learned professor meant by "speak their language," unless he alluded to the popular nomenclature of flies and so forth, but of this I am assured, our friend the Neo-Imitationist is a useful person to the scientist. His great fault is that he attributes a knowledge not only equal to his own, but far greater than his own to the trout which he endeavours to catch.

I cannot leave him, confirmed malignant as he is in the eyes of the loch fisher, who claims for his sport recognition amongst the branches of scientific angling, without quoting an example of his methods. "The only legs," says one of the school," that would strike the observer,

whether he were man or fish, are the posterior pair which larixæ use to propel themselves through the water." A fly lacking these legs is, there-condemned as a useless imitation which no entomological trout will take!* It will be observed that the information is of scientific value and interest, while its practical application to angling, with the wet fly at least, is utterly absurd, or argues a nicety of distinction no hungry trout (and these are the only fish of general angling interest) is ever likely to show.

The imitative or rational school of anglers thus conjoin an extremely interesting study of entomology with angling, which is most commendable and praiseworthy, and read and expound not the least interesting chapter in that great book of nature studied by all true sportsman that love fin, fur, and feather.

As a further example of the complementary position angling occupies towards science and as a preamble to the point to which I am leading, namely, certain observations in particular lochs, not only of the differences in their trout, but also of the special causes of those differences, I may here cite the possibly well known anatomical distinctions between well-fed and ill-fed fish. The ichythologist has certain trout submitted for his inspection. He dissects them and discovers that the degree of their plumpness or condition varies, under certain exceptions, with the number of the pyloric caecal appendages. When he notes in a still large large number of examples that the relation between the number ofcœcal appendages and condition is more or less proportionately constant he draws an inductive inference and formulates a law. He is, however, not wholly enlightened as to the cause though he sees the effect. It is here that the utility of the angler to science comes in. He should be easily able to satisfy the ichythyologist as to the character of the home from which the fish have come and should thus enable the scientist to lay down the principle that the number of the coecal appendages is de-dependent upon food, is a sign of the abundance or scarcity of food and is valuable as a guide to specific character only so far—and I have already indicated that it is considerable—species depends upon environment and the conditions of existence.

*As another, and perhaps a fairer, example of the assistance the entomological angler affords science, it may be stated that Mr. Halford was the first to discover that the colouring of the larvae of certain ephemerids varied and was not constant.

The obviously complementary character of the discovery that the better fed a trout is, the greater become the number of appendages referred to is a very clear example of the use of science to angling and angling to science. From the practical standpoint of the stocker it furnishes a rough and ready means of obtaining a diagnosis of a reliable character that has nowhere been more clearly proved than in the case of the British trout imported into the waters of New Zealand. Its value is enhanced by the fact that it becomes specific and is not merely a chance symptom in isolated cases. In other words any marked decrease in the number of these appendages even when trout retain external health and condition may be taken as a danger signal that the race is in peril of decaying, and as a sanitary warning that something ails their home.

Though the subject is a tempting one yet its range is so wide that I will content myself with but two or three further examples of the co-relation of science and angling, or with practical fishing generally, of which angling is a specialised department.

Scientists would, for example, have had considerable difficulty in establishing the habits of the salmon in the sea, had not those working on our coasts with stake-nets been able to vouch from their personal observation for the undoubted fact that salmon are, of all fish, the most gregarious and widest-ranging when in the sea. At such a suitable station as the East side of the long peninsula of Kintyre I observed a very striking example of this truth. Up to a certain period of the season not a single fish was taken in the nets at another station higher up the east side of the peninsula and in the Sound of Kilbrannan. The first morning any fish were taken at the North station the haul was not only a record one, but consisted of many varieties of salmon, including Irish fish. Exactly a week afterwards the first fish of the season were taken at the more southerly station. This, too, was a record haul and consisted of the same varied assortment of salmon as the first haul at the other station. The distance between the two stations being ascertainable, the character of the shore and its feeding being known, and the identity of the two lots of salmon as part of the same shoal being established, it was here possible for practical fishing to aid science in establishing the gregariousness, nomadism, and rate of travelling of salmon in the sea under ascertained circumstances.

I have already, though I shall have to recur to them as dealing with practical loch fishing, given two illustrations of the value of lake-trout as weather prophets and as illustrators of the law of "albinism," and will, therefore, further exemplify the mutual assistance which science gives to angling and angling to science by a fact concerning the sea-trout, which is of the first importance. In angling for sea-trout in lochs which so far resemble the sea on a rock-bound coast that there is a considerable depth of water not far from the shore, feeding and hence taking sea-trout are invariably taken right on the beach amongst the breaking waves when there is a breeze and with their noses apparently on the rocks when it is calm. It is a curious fact that the darker the the water of the loch is, the more pronounced does this habit become. The circumstance is singular because it is a regular night habit of the sea-trout in the sea, as the "splash netter" is aware, to lie right on sandy beaches and as close up to rocky shores as it can get. It is true that so far as the latter are concerned the same habit marks it when feeding by day. As, however, the sea-trout is not much of a shore feeder by day and prefers to range the freer water of the estuary when the sun is at his prime, the circumstance in no way robs the fact of its significance. Reverting to the effect of the darker or lighter colour of the water of a loch upon this shore-resting habit of feeding sea-trout, though it is possible that the height of the loch (fullness itself, be it observed, being as often as not a cause of deep colouring) may have some influence on the location of the fish, yet a comparison between the habits of the sea-trout in two connected and in every respect, save colouring, identical lochs, led me to draw the above inference. In the one loch, which as it so happened was nearest the sea and subject to invasions of the salt water at every tide, the sea-trout, though to be taken close in by the shores, were to be had in greater plenty in the central and other portions of the loch. This feature of the loch was admittedly more pronounced when the loch was low and when, therefore, its water in part hill, in part sea-fed, was in its clearest condition than when full and discoloured through the burn which fell into it coming down in peat-stained flood. The water of the other loch, fed as it was by a greater number of burns whose channels were steeper and whose flow was therefore more constant, was invariably darker, while its hue was not robbed of its peaty inkiness by the invasions of the green and

rushing tide to which the other lake was subject. In this second lake the vast majority of the taking fish lay close by the shore, so much so that on the first occasion on which I fished it, remembering only the lessons of the first lake of which this one was the putative mother, I killed but very few fish, until, setting my reasoning powers to work, I conjectured the very truth which I am now endeavouring to illustrate. The thought was a happy one, for I killed in something over an hour and a half some 36 sea-trout off the first bit of shore I tried, taking the fish as fast as I could raise, hook, and land them right amongst the yeast and spume of the breaking waves.

Read with other ascertained facts of a similar kind, science has here a very useful lesson which practical fishing has been able to teach and whose accuracy practical angling appears to corroborate. It establishes very clearly certain habits of the sea-trout which differentiate it from the salmon when, as I have said, the facts stated are added to other ascertained facts. I may mention finally in this connection that when dealing with the habits of sea-trout and salmon in lochs I shall further explain the principle involved by pointing out and illustrating by examples the curious fact that while in the sea the salmon has no habitat or locus, in a loch, unlike the sea-trout, he is apt to establish himself in a fixed hole or home—a fact which shows that the fish reverse their habits of the sea when in lochs, though it must be observed that in the case of the sea-trout there is nothing inconsistent with his confirmed nomadic habits within a certain range in the fact that he should decline to remain a fixture in or about a certain spot in a loch.

A very remarkable instance of the light which fishing, again using the word in its widest sense, has thrown upon the idiosyncrasies of the salmon in the matter of colour and the special share angling has had, in preventing a popular belief from becoming a scientific prejudice, is afforded on the one hand by the practice of "burning the water," and on the other by the fact that salmon are particularly partial to a boiled prawn and are by no means indifferent to a bright red fly.

The former practice is largely based on the love of the salmon for bright objects, the glare of a torch seeming to have the same attractiveness for a salmon as the beacon of a light-house has for birds.

As to the latter it was held by many fishermen that salmon had a similar antipathy to anything red as they had love for something

white—a popular belief that might have passed into a scientific prejudice had not anglers with the red prawn and with flies, either altogether red or with red as their most outstanding colour, demonstrated that there was not the slightest ground for this alleged characteristic.

A curious example of how angling may aid science, is afforded by the fact that the presence of lake-balls in certain of the lochs of South Uist was discovered by anglers. These lake-balls do not, I believe, occur elsewhere in the United Kingdom, and though classified by botanists amongst the algae, their life history is still a mystery. I took some specimens of these balls to the British Museum (South Kensington) in 1891, and as there was not a single specimen of this most curious of all water-plants within its walls, the value of the discovery of them by anglers may be imagined. The balls, I may mention, vary in size as a rule from a walnut to an orange, but I have found them as large as a cocoanut, and in a few cases even as a boy's football. The Botanical Section gave them special accommodation in tanks in a large room and endeavoured without, I believe, much success to solve their whole mystery of which their mode of reproduction and growth, together with the fructification of the green moss interspersed with bell-shaped stems that covers them at certain seasons, were the most interesting features. This example of how angling aids science is, of course, in a different category to the cases I have been considering and which I now resume.

There are, however, cases in which angling experience does not supplement science, cases in which, as a matter of fact the dictum of the scientist is directly opposed to the experience of anglers. Two of the most pronounced examples of this difference of opinion are the feeding of salmon in fresh water and the continued classification of bull-trout and sea-trout as the same fish. When dealing with the question of salmon and sea-trout in lochs, I will have to recur to both these questions and in the meantime will content myself with stating a case analogous to the first, namely the feeding habits of barbel in winter. I do so to illustrate not only the methods by which angling and science aid one another, but to show that an observer noting that the habits of two fish are identical, can draw by analogy an inference which experience may or may not verify, but which remains a logical deduction until disproved.

AN UNNATURAL POSITION: SNAP SHOT OF LEAPING SALMON.

In considering the question whether the salmon does or does not feed in fresh water I came to the practical conclusion that so far as the angler was concerned, it was really a matter of no moment whether or not the salmon feeds in fresh water, so long as he takes with a varying avidity the angler's lures, fly, prawn, worm, phantom minnow, eel's tail, gudgeon, or whatsoever lure he thinks or finds best. Even the most practical angler, the angler for whom angling consists in trying to kill fish, must necessarily study the feeding habits of the object of his quest, and it is, therefore, impossible for him to avoid making those habits more or less of a study if he is to realise even his low-placed ideal of the art of angling.

Some years ago this reflection was suggested to me by the fact, and it is at this point the object lesson begins, that I raised a hornet's nest about my ears for daring to reason as to the possible feeding habits of the barbel in winter, from the fact that lampreys and barbel seek the self-same deeps when the air grows chill. I suggested that it was just possible that the barbel might feed on lampreys, and urged some dweller on the Thames or Trent to try by experiment the truth or fallacy of the generally accredited belief that the barbel does not feed in winter. My conclusion was drawn, not from any special knowledge of the barbel, but from a love of studying fish in general, and an appreciation of the exquisitely balanced and ideally economic laws of nature. One blameless enthusiast in particular made my fad, as he was pleased to term it, a very personal matter, and had the temerity, after roundly proclaiming my ignorance of barbel and barbel-fishing, to offer me in the "Sportsman" a ten-guinea silver cup if I could catch a single barbel in winter with lamprey or any other lure. The challenge of this omniscient dweller by the Trent, whose knowledge of fish and fishing was entirely derived from experience by that stream, I naturally ignored, though as another equally opinionative enthusiast had previously offered me a guinea for every salmon I rose with the fly in the Trent, it was clear that I had thrown away a piscatorial Klondyke.

Nemesis, however, came to my aid, and abundant proof was soon forthcoming that even in the Trent barbel had fallen to the lamprey in winter, while it was proved beyond dispute that in the Thames the barbel will take the lamprey with great avidity, and that fish had fallen to that lure on too many occasions in the past to necessitate the chronicling of separate cases or going into the matter more fully.

The instance cited when analysed is most instructive, for my reasoning was based on the fact that the barbel and the lamprey frequented the same kind of water in winter and on the general principle that if nature compels a fish or an animal to adopt a certain habit and frequent a certain habitat she will provide means of sustenance either in animal or in vegetable form to the degree that is necessary to the fish or animal. If she does not provide it, then the fish or animal (a fish is, of course, an animal) will decline to be bound by the chains of that habit or the prison cell of that habitat, and will seek new quarters and acquire new habits. It is to this very cause, the absence, that is to say, of suitable food and its varying quality and quantity, that so far as sea-fishing station are concerned, is due the recurrence of good and bad seasons. It would be the height of illogical folly to suppose that the great rule of the life of the sea is not equally applicable to the more confined areas of river and lake.

I have already referred to this principle and shall have occasion to frequently refer to it again, not only in the chapter entitled "The Philosophy of the Fly," but also in that dealing with the somewhat speculative habits of salmon in the matter of food, and hence of locus, in fresh water lochs, so far as these habits are of importance to the angler.

As a last example of the aid science gives to angling and vice versa, though certain aspects of the subject have only been suggested not exhausted, I would cite an example of science correcting what at one time appeared to be a conjecture that anglers were only too ready to snap up because, as the "Fishing Gazette" pointed out, it appeared to offer a most glorious excuse for a bad day and "missed fish." I had observed that on bright, breezy days loch trout were very apt to miss the fly through failing to locate it. They seemed to rise and attempt to seize the fly not at the exact spot where it was, but where, as I thought after considering the matter, refraction made it appear to be. It was obviously a very pretty notion, and appeared so eminently original that I consulted Lord Kelvin on the point. The great scientist at once demolished my castle in the air. He declared that the moment the fly touched the water refraction ceased. There was, however, in this dictum not a complete, but only a partial demolition of my theory. So long, that is to say, as the fly was in the air and had not lighted on the water a portion of the ray coming from it, which

and not the fly is what the fish really sees, to put a scientific fact in semi-scientific language, would be reflected, while the ray—all as aforesaid—would be refracted and so deceive the fish as to the exact spot at which the fly was going to alight. In this half-hearted fashion I consoled myself over the fragments of my actinic hobby.

Lord Kelvin's dictum is obviously one of considerable moment to the purists. Dry flies and all flies that imitate natural flies are dressed in the medium of air, and are therefore seen by the dresser through that medium, whereas they are seen by the trout through the medium of water. As, however, it appears that even the most optimistic of entomological anglers does not pretend that human skill has yet succeeded in imitating natural flies to perfection even in a state of rest much less in that condition of life or liveliness which, or its absence ex hypothesi, the trout must be able to note, the position is, perhaps, not so very important. It certainly suggests, however, a fine sample of the irony of dilemma, when one accepts the contradictory hypotheses of the school, which maintains, on the one hand, that imitations of unnamed and unclassified aquatic animals should be made and used under certain circumstances, while laying down the rule that a trout will not take maimed real, or imperfect imitations of, flies in a "state of motion" though they will take the undamaged fly and suck in the approximately perfect imitation "in a state of rest."

Apart from the physics of the question and the effect of the media through which the fly is seen before alighting, as it frequently is, and of the medium through which alone on lighting it can be seen, the intricate problem just suggested may never be solved, until experiments in virgin waters analogous to dry fly waters as we know them have established beyond dispute the degree of education to which a trout, whether by sensational or reasoned memory, can attain. So far at least as lochs approximate virgin waters, and so far as loch trout may be presumed from the nature of their home to be less sensationally educated, or in other words, less frequently alarmed by apparations than are the trout of certain rivers, it is certain that they take with greater avidity a wet fly that imitates a swimming aquatic animal—classified or unclassified—than they will any of the imitations of real flies, whether floating or wet. It is also certain that at times they will take no kind of fly—using the word to cover all combinations of steel, fur and

feather—at all and appear to be just as cautious of imitations in certain lights as are the most "highly educated" trout of chalk streams. So much is this so, that even sea-trout will act like their brown brothers. The problem whether the caution is a mood of matter (or in other words is due to appetite), or is a mood of mind, I do not here pause to discuss. In its proper place in a later chapter dealing with the "Philosophy of the Fly," this and kindred questions are treated at considerable length. In the meantime, therefore, I postpone all consideration of the question, both in the case of loch trout and the "Dons" of the clear rivers of the South.

CHAPTER VI.

The Lessons of some Lakes

Angling is such a speculative subject and embraces within its sphere so many problems and side issues that it is almost impossible to avoid certain digressions from the main subject under discussion and the introduction of what lawyers call irrelevant matter or irrelevant issues. Yet as I regard and interpret angling these speculative digressions, these wanderings into the happy hunting grounds of the unknown are always justifiable and sometimes profitable. It may happen that they throw some new light on old problems, just as little excursions up side paths off the beaten track often reveal hidden beauties whose claim to recognition the more celebrated and obvious charms of "show places" may have overshadowed. It is possible, however, that when the range of a subject and its kindred subjects covers a wide field, one may be merely lost in the maze without solving any of the mysteries of the labyrinth. It is, perhaps, impossible to wholly dismember angling and treat the infinite variety of parts that make up the pastime as a whole as separate and distinct branches that have nothing in common save a parent stem. The co-relation of all branches of angling is, however, such an obvious fact that it is doubtful whether the minnow fisher, the bait catcher, or the gentleman with a jar seen on the banks of a midland canal on Saturday afternoons do not, mutatis mutandis and to a degree that varies with circumstances, put precisely the same sort of skill in practice, set the same sort of ideas working, reason in the same way from different premises, as does the far and fine "dry fly" angler of guileful method worthy of the Red Indian.

The field of "Lochs and Loch fishing" is, therefore, by parity of reasoning not bounded, qua subject, by the thousands of lakes, large and small, good and indifferent, holding great fish and fingerlings that lie within the territories washed by the four seas of Great Britain. On the contrary the fact that Grassi discovered amidst the swirling tides

of the Straits of Messina that eels spawn not in the river, but in the deep sea may be quite relevant evidence if one desires to illustrate the analogical method of deducing inferences from facts, or even as an absolute fact if it has to be proved that habits are merely conditional opportunities realized through the heredity of long continued pre-disposing circumstances. While this is true of general principles, it is obviously impossible to exhaust the features of lakeland by particular examples that would be guides to lakeland, even as it falls within the observation of a single angler. For my own part I have fished within the last fifteen years in upwards of 200 lakes that are not mere nameless tarns unsung in the prose, that is ever poetry of angling literature as written from week to week, but lakes of some repute. In these lakes I angled in six seasons alone on 279 * days. It is obvious, therefore, that out of this great chain of lakes and this necessarily wide field of experiences, one must eliminate many lakes, and in the matter of experiences condescend only upon generalities that are universal, read and interpreted though "specialities" that may be exceptions to the rules. With a view to limiting my remarks on lochs as homes for trout, and as waters giving them their characteristics as lake fish I may, therefore, confine myself to a selected few types.

An ideal angling loch from all and every point of view does not perhaps exist, because ideals vary from person to person, and the degree of sport a loch yields may not be judged by the same standard by all anglers, namely, the difficulties that have to be overcome to obtain it. Some men, for example, would prefer to angle always in a loch like Roag in South Uist, Loch Stack in Sutherlandshire, and Loch Voshmid in Harris, all sea-trout lakes in which the fish are not only so numerous, but as a rule so accommodating that some measure of sport is assured before the rod is put up. On the same principle some sportsmen prefer the certain shots of a big cover "shoot" to laborious hours spent in circumventing a wild goose, or a solitary day on rough ground on which one has not only to find and kill, but also to carry one's spoil. It is not, however, merely from the point of view of the sport which it yields that a loch is to be judged, because it is an obvious truism that the

* The greatest number of days on which I have angled in lochs in any one season was 65 in 1886. I was then in the happy position of a happy Captain Clutterbuck rather than a Captain Do-little.

more nearly a loch approaches the ideal of a trout-home, the less likely, under certain exceptions, is it to yield sport with too great and too accommodating complaisance to the rod—or to speak by the card, to the fly. It is perhaps a bold assertion to make, but I know very few, if any districts, holding within a comparatively limited area, more thoroughly difficult and "stiff" lochs than the Crinan district of Argyleshire. While, however, certain lochs obtain an undeserved reputation for "stiffness," simply because they are rarely fished "with the head," to use a cricketing phrase, yet on the other hand it is equally certain that there are many lakes in which the trout do not, for reasons that are not wholly speculative, rise at all well to the artificial fly. It sometimes happens that such lakes do not readily admit of the use of methods differing much from the traditional, but it frequently happens that after a day of vain casting with the fly, a minnow spun from the shore close by the weeds will produce a fish every cast and prove that the apparently tenantless lake is really teeming with fish.

There is just such a lake as the one described in the Crinan district, and it is far from being an ideal sheet of water. Curiously enough it lies in close proximity to a lake that as nearly approximates the ideal as any loch in Scotland, with which I have an intimate and not merely a passing and casual acquaintance. The lake in question is called Choil-a-Bharra, a name that by some intricate philogical process has been corrupted into Culiper. It is a lake of singular beauty for the lover of nature, but possesses even greater charms for the student of fish. It lies cradled among hills, whose rocky and wood-clad sides rise steep from its margin, while throughout its whole length, save at either end, the branches weep and wave over its shore waters. Sunken rocks and deep abiding places are everywhere to be found in its waters of swift descent in many places from shallow to comparative deep, but there are no portions so deep that fish may not be seen to rise to the fly, or to use an expressive coloquialism, "to themselves." When surveyed as the angler surveys a lake, it is found to be an epitome of the world of lakeland. It has a few bays in which the depth of water being uniform and the bed stony, fish are always to be found, while here and there up its picturesquely wooded and rocky shores occur stretches of shallow, and a central bed of "below-water" reeds seems to run up its

whole length with ramifications to north and south—the whole affording admirable shelter and food for fish. At its westerly end tall reeds grow in beds and the bottom is more sandy and weed-strewn. Up its length of shore on either side it is practically unapproachable from the land, the cliffs rising sheer, and the trees growing with dense and rank luxuriance right to the edge. In the matter of food, the lake is unique. Its surface larder, if one may use the phrase, is stocked with a lavishness I have never seen equalled on any lake. Under the fretted sunshine of the branches thousands upon thousands of flies dance the mad dance of sun-kissed life, while for quite three weeks in an average year the May-fly appears with an abundance that is almost incredible. On its waves thousands of flies are constantly being washed shorewards, while almost every yard of surface bears a dead water-shrimp. In the shallows amongst the crevices of the rocks thousands of tadpoles make their homes, basking in the generous warmth of the sun and seeking sanctuary from the great lithe enemies of spotted sides of gleaming yellow that move with such incredible swiftness to their undoing. Food in this lake is not only equally distributed, but it is actually too abundant, and much of it is wasted, for though it is impossible to question the general claim of nature to be described as an ideal economist, it occasionally happens that in the world of waters her distribution of the good things of fish-life is not always equal. Where migration is possible nature affords a means of adjusting the balance; where it is not possible—and many lakes are in this position—the lake either holds poor fish or, in terms of the law of the survival of the fittest, fish of quality varying with the excellence of the "pasture" they are able to occupy. The strongest will naturally hold the best feeding grounds, and the difference in quality thus literally grows by what it feeds upon. In Coil-a-Bharra the accuracy of this theory is fully borne out. The food is so equally distributed that there are practically no choice spots, and as a consequence the fish are not only of a large but also of a uniform size, so that if you killed or could secure some hundreds of them, there would be scarcely a fish under 1½lb. and very few over 2½lb.*

Reasoning from the analogy of other lakes where the distribution of food is more unequal, one would naturally look for an occasional heavy

* I revert to these environments and their effects upon angling in a future chapter.

fish and would be almost certain to exclaim after securing a dozen in a day weighing about 20lb. "There must be some very heavy trout in the loch." That there are no fish in it over 3lb. and very few under 1½lb. may, however, be inferred from two facts. I have never heard of a monster being even raised, much less hooked, and though hundreds upon hundreds of fish may be observed during the spawning period, no trout exceeding in size those actually falling to the rod has ever been seen. The conclusion, therefore, to be drawn from this interesting lake is that where food is uniform and abundant—and perhaps also when it is of a particular type—the trout produced by this kind of environment while uniformly large and excellent do not, so long as they are numerous attain an exceptional size. Another and possibly a corrollary conclusion is that they do not develop cannibalistic tendencies —a fact which properly analysed is both an effect and a cause. The fish are under no necessity to prey on their fellows when food is abundant. This may be the cause of their not attaining a great size. On the other hand the effect of the abundant supply of good food is to produce a quick growing race of trout, soon placed beyond any danger of attack from their fellows—an immunity which the physical features of the loch, abounding as it does in hiding holes and places of negative strength help to enhance. There is a last aspect in which the limitation of size may be regarded. The fish are prisoners and there is for them no change of scene, of water and of food.

I may here interpolate a few remarks on certain points that may be controversial and have been raised by my observations on the trout of this loch. In the first place I do not suppose that it will be desputed that an abundant, indeed a superfluous, supply of food equally distributed will fail to produce a quick-growing race. All stockers admit that fry * and very small trout will not forage for food, and justify the narrow confines of their fish ponds on the ground that the fish cannot miss the food. In a lake like Coil-a-Bharra it is "brought under their noses" in a similar manner.

In the second place I presume that it is an equally accepted axiomatic truth that though all trout are cannibals, the trait, when it becomes pronounced, is the result of circumstances special to the environment or to the fish and will vary in degree with the necessity for its exercise. As

* Rainbow fry may possibly be an exception to this rule.

a result of this general theory I presume that I am not wholly wrong in concluding that when other food is abundant, even the omnivorous trout will display a dainty and discreet, if not a pampered appetite, and will prefer delicacies to gross fare. The Rainbow trout, we know, is rarely a cannibal save from necessity, and yet the Rainbow is, we are also aware, a fish of most healthy appetite which, qua gourmand if not gourmet, can give other trout a few worms, flies, etc., "and a beating."

As to the effect of places of shelter upon the fish life of a lake, it must be abundantly manifest that when small trout can find sanctuaries which render them immune from the predatory attacks of their larger brothers, the fact will not only discourage cannibalism, but will also in a loch where the sanctuaries are well provisioned, result in the water being thickly populated with fish of very level size and uniform quality. There are such sanctuaries in all lochs, but it is in lochs where the food supply is uniform that their presence is most beneficial. In Loch Leven, for example, the fry frequent shallows and are, I presume, not only safe, but also decently fed, for the fish in the loch are of fairly level excellence. On the other hand, there is a loch in Orkney in one portion of which alone one kills good fish, and in the rest fingerlings. The juveniles have no real sanctuaries, much less is their daily bread assured. As a consequence the fish of the loch continue, as a rule, small and poor in all save a certain reach, only the fittest of the general body survive to become denizens of this choice bit of "pasture," and the race is slow-growing and dwarfed—a mixture of many pigmies keeping up a frail and feverish being in the regions outside the aquatic "margin of cultivation," and of lusty giants, comparatively considered, battening on the choice reach referred to, and not only driving off invaders but making also occasional predatory invasions when cannibalistically inclined.

To illustrate by an example from another field the effect of sanctuaries upon fish life, it may be noted that at a meeting of the West Cumberland Fishery Board a member told a story of a duel, which he appears from the report of the meeting to have witnessed, between a large salmon and a large eel in one of the lakes of the county. At the end of the duel, the salmon was left dead "on the field" with a big hole in its side. It was added that large numbers of salmon had been killed by eels of late years in the lakes referred to. This story and the

addendum to it can hardly be accepted as they stand. The facts as stated are opposed to my experience. I have frequently observed large numbers of big congers inside the "house" of stake nets in the sea, but I can only recall one instance of a conger securing a salmon—as a matter of fact it was a 3lb. grilse—as its prey. The conger in question was a comparatively small specimen, not more than 8lb. to 10lb. in weight, and it succeeded in swallowing the grilse whole tail first, the only damage the latter suffered being a slight "pulping" just above the wrist similar to the "pulping" an otter will make on the shoulder of a salmon. Even when imprisoned in a stake-net, where the movements of a salmon are slow and somewhat stupid, the conger is no match for the king of fish in agility, and though I have seen over 100 salmon imprisoned with as many congers and have frequently observed the chase of the former by the latter, I can only recall the instance already cited of a successful capture. Another difficulty remains. No fresh water eel—even a specimen of the apocryphal monsters said in the local legends of South Uist to haunt a certain loch and to attack those who venture into its waters—is, as a rule, large enough to tackle a salmon, while even if large enough, the salmon, given space, is far too agile for the eel. Even a small trout is rarely taken save by an ambushed eel. Indeed observation enables me to state that eels never attempt to take trout save by the guile of an ambuscado.*

It is obvious, therefore, that sanctuaries play a not unimportant part in the life of lakeland.

I will now take another type of lake, one whose physical features are different, and in which, though the trout are, as a rule, of the same equal quality they do not display either the same uniformity or the same limitation of size as in Culiper.

Of the type of lake referred to it would, no doubt, be possible to name several, so far as mere variation in the size and quality of the fish frequenting them is concerned. As, however, I am dealing wtih the conditions of existence as affecting the size and quality of fish in the same lake with a view to discussing in another chapter the future of our lakes as fish homes, it is obvious that I must choose the most instructive lakes—lakes, that is to say, containing not only the most, but also the most useful, lessons.

*Vide the chapter on "Habits and Habitats of Loch Trout."

It is for this reason that I choose three lakes which, though they have certain common characteristics, yet differ in essentials, namely Lower Bornish and Loch Bee in South Uist, and Loch Stennis in Orkney.

Taking these in the order named I have already pointed out some of the leading features of Lower Bornish. It differs from Loch Coil-a-Bharra in the following essential characteristics.

It is not, in the first place. cut off from connection with the sea or with other lakes. On the contrary the road to the sea is of the simplest and easiest nature. A ditch, or small burn, runs from Bornish across the narrow neck of land between it and Upper Kildonan, which is only a stone-throw distant. Into this ditch the Bornish trout frequently go to feed, and in it as well as in similar drains falling into the loch they also spawn. From Upper Kildonan to the sea as stated in a previous chapter, the passage is short and of the simplest kind. The importance of this facility for migration is obvious, for though the trout do not, so far as I am aware, avail themselves largely of their opportunities, yet that they do so occasionallv and return refreshed bearing external evidence of their marine din I have more than once had occasion to note in specimens taken, not only in the loch itself, but also in each of the two connecting and larger lakes as well as in the ditch that is the common road to the sea.* This "open door" has, however, far more important effects upon the conditions of existence in the loch. The animal food of the loch is undoubtedly affected by its presence, but I will only condescend upon the most important aspect of the influence thus exercised upon the environment. The sea-trout of the lower lake though spawning for the most part either in another lake or in a more pretentious burn than the little effluent from Bornish to Upper Kildonan occasionally penetrate into Upper Kildonan and spawn in the said small effluent. In the fry and non-migratory stage these young sea-trout haunt this effluent and the lake above, and being less to the manner born than fish destined to be permanent denizens of its waters, they fall a ready prey to the big brothers and sisters of those congenital denizens. As a consequence of this and the fact that Bornish is frequented by large numbers of stickle-backs on which all Hebridean

* This opportunity to migrate is, perhaps, of greatest importance by reason of the fact that the fish do not feel themselves to be confined—a consideration of moment in the case of trout of supposed descent from migratory trout.

trout feed, the fish of the lake, from this difference in the conditions of existence, vary far more in size than do the fish of Coil-a-Bharra, though they appear to be equally numerous. Nor does there appear to be any limitation imposed on their growth, though I have been unable to even hear of, much less see, a specimen over 4lb. in weight. In a loch of similar environment in another part of the island, fish of that weight are, however, common, though curiously enough they are never taken with the rod. As illustrating the effect of this difference in environment upon uniformity in size, I quote the weights of some fish, comprising two small baskets of the same number of fish taken from these lochs: Coil-a-Bharra, 6 trout, 10½lb., 2½lb., and five other fish an ounce or so above 1½lb. each; Bornish, 6 trout, 10¼lb., 2½lb., 2¼lb. 1¾lb., 1½lb., 1¼lb., and 1lb. The weights in both cases are approximate.

In this connection it must also be observed that Bornish, being a lake lying in a plain and possessing a bed of sand and gravel, does not afford the same natural shelters or abound in those sanctuaries with which Loich Coil-a-Bharra is so richly endowed, a circumstance which, other things being equal predisposes towards a greater degree of cannibalism, and hence tends to inequality of growth.

Nor is the surface food of Bornish in the form of flies to be compared in plenty with that of Coil-a-Bharra. There is, for example, no rise of the May Fly, while other flies found on the surface of Coil-a-Bharra in thousands, such as the red ant, are conspicuous by their absence. On the other hand the corixæ or water bettles exist in immense numbers, as do water snails and small shell fish. The fish are, in consequence, more predatory and the competition being keener they also display greater variation in size than, as already noted, do the fish of the other lake. That this difference in character is due to such differences in environment as I have noted, goes, of course, without saying.

Loch Bee is simply a second Bornish with this difference, that it is connected with the sea at both ends, though upon this clear connection man has imposed an artificial barrier in the form of tidal gates. It is much shallower and has a more sandy bottom than Bornish—the latter a legacy of its sea-birth. Fish here can and do migrate, though not to the extent that one would expect, while to a limited, but still a marked, degree they enjoy the bountiful table of the true migrants and grow with a proportionate measure of their marvellous rapidity when

in the sea. Occasionally they become true tidal trout and then attain a large size, assuming with increased weight a silvery sheen over the yellow of their sides thickly coated with large black spots—a colouring, I first observed in the trout of salt-water rivers in the Hebrides, at the same time as another observer was noting it in similar waters in Canada. I have mentioned Loch Bee simply as a stepping stone to the environment of Loch Stennis, between which loch and Bornish it is the connecting link in the chain of environment from Loch Coil-a-Bharra to the Orcadian water. It will be observed that as the environment in one aspect improves, it also in another aspect approaches more closely, what must have been if not the real, at least, the possible environment of the common ancestor from which all the species of salmonidæ are sprung. My principal, though not my only object, being to illustrate by natural environments, the effect of environment upon both the bodies and the minds of trout, or in other words upon their varying size and habits, their specific differences and characteristics, I could hardly have chosen a more happy example than Stennis, the home of the so-called Salmo Orcadensis, closely allied to the black-finned trout when anatomically considered in terms of the principles ruling or misruling the classification of the salmonidæ..

Loch Stennis is in many respects unique amongst British lakes because here we find the common trout in what is really as much a salt-water habitat as a fresh. We find it afforded also as many opportunities of quickly growing big and lusty as is the smolt or grilse when they migrate to the sea. As a consequence of its environment Stennis is frequented by fish of all sizes, which without presenting any specific external, anatomical or structural differences, so far as I have observed or am aware, vary in weight from a few ounces up to 30lb., or to speak by the card to 29lb., that being the largest Stennis trout on record. That this fine fish represented the maximum growth of trout in Stennis I do not suppose, but that it was far above the average to which even the best of its trout attain may be assumed, but not with confidence. It was a beautiful fish, and as instructive as beautiful, if only because it did not present any of those "deformities" of age and great size—from the symmetrical and aesthetic point of view—so frequently observed in abnormally large trout from other waters. In a word the Stennis trout resembled, metaphorically speaking, a perfect female sal-

mon of the same weight, coloured like a trout and naturally fed on a marine diet, or to drop the suggestion of metaphor which I have recognised in the above comparison, it was as perfect a trout as a three-quarter pounder taken from a good loch or river, after feeding on fresh water food. Now the conditions of existence in Stennis differ but little from the conditions of existence which the salmon finds in the best-furnished estuaries that approach in size the dignity of what in Scotland are termed Firths, long lochs, that is to say, of salt water in which some of our larger rivers urge against the ocean their "rival seas of roaring war." Every form of marine fish food and every variety of sea fish are found in these Firths and, with some exceptions, the same may be said of Loch Stennis, so that while you are angling for trout with the fly, a lobster fisher may be lifting his creels, another fisherman may be taking herring, and a third may be catching cod, saithe, laithe and flounders. Nay more. Fresh water forms of food from flies downwards* also abound in it, so that, like certain other waters of a different and more confined type, Stennis is a sort of "No Fish's Water," the debatable land of the great world of waters, that stands and divides the empire of sea fish from the kingdom of fresh water fish. A minute study of its environment I do not undertake. I simply desire to point out that it completes the ascending scale in environments from the true fresh water environment of Loch Coil-a-Bharra to the most marked example of the mixed environment—more salt than fresh, which it affords.

In its didactic aspect the Stennis environment is of but little utilitarian value because practically incapable of imitation unless one were bent on creating an artificial lake or founding a fish hatchery, with Stennis as a model, by the sea. Indirectly, however, Stennis is in itself an object lesson in environment since it proves conclusively—as certain Continental lakes also prove, that, given anything like the same conditions of existence, the trout can attain almost as great a size as the salmon, and that, too, with a rapidity which if not equal to that of the salmon, is certainly unknown in confined waters or in waters affording only a limited dietary—a rule that will, of course, so far as rapidity of growth is concerned be subject to exceptions. I base this conclusion as to rapidity of growth, rivalling, if not equalling, after a certain

* No flies are hatched out in Stennis but many are blown on to its surface.

period of existence that of the salmon, on the apparent lack of any signs of old age in the large trout of Stennis and particularly in the largest recorded specimen to whose beautiful symmetry of form I have already referred. That this rapid growth and attainment of a large size in a suitable environment, capable of creating what men of science have with a charming inconsistency called new species in some cases and not in others, is not confined to the operation of what I may term the blessings of a quasi-marine home, is proved by the growth of British trout in the waters of New Zealand, where statistics seem to show that the rate of increase, varying in this country from one-third of a pound as the minimum to half a pound per annum in adult specimens, actually doubles, quadruples, or becomes even six times as rapid in the rich and generous waters of the Britain of the South. The cause of this rapid growth in both the Stennis and the New Zealand cases is the same. It is simply the difference in food and in the general conditions of existence. These great facts may be best left to "tell their own story greatly."

Loch Stennis finally is a loch in which we might look for specific abnormalities or developments in contour such as occur in sea fish and give them a far greater variety of appearance than fresh water fish present. So far as I am aware, however, Stennis trout do not differ in this respect from other trout, and are no more affected in the direction indicated by their quasi-marine home than are salmon—a fact which, when one compares the "many-formed" and variously shaped sea fish with the "uniformed" fresh water fish—lampreys, eels, sturgeons, and flounders being all migratory fish—seems to assign to the common ancestor of the salmonidæ a fresh water origin. Like all well-fed fish Stennis trout are remarkably fickle and the larger specimens, so far as I am aware, never, or very rarely, rise to the fly—a peculiarity shared by the so-called salmo ferox of other lakes, though the latter do not carry their objection to fly food to anything like the degree of aversion to it shown by the big trout of Stennis.

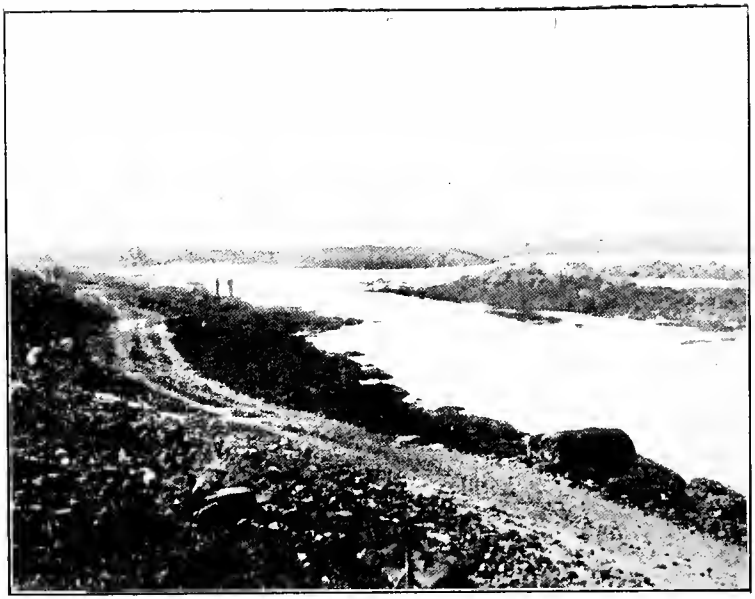
As this fickleness is a trait of all trout in most brackish waters that are well supplied with food, I may here serve a double purpose by a description of two somewhat similar and yet different environments in South Uist, those of the famous Howmore River and Loch Roag, and of the no less famous Strome Dearg—one of the few salt-water rivers

in this country. To these, as their description involves a slight digression, I shall give a separate chapter by way of break in the continuity, so that the reader, if he pleases, can skip it or read it as a study interesting in itself, but possibly rendered dull by my handling of it.

CHAPTER VII.

The Salmonidæ in Brackish Waters.

Hamlet speaks of "the fruitful river in the eye," and the phrase always suggests to my mind's eye a river, if it can be so called, whose anomalies, not only as a fish holding, but as a fish yielding water, have often afforded me food for conjecture and speculation. It could only exist under its own peculiar circumstances of land configuration. The Obbe and the tidal pools of the South Lacisdale in Harris, some of the Ythan in Aberdeenshire, and of the Kyle of Sutherlandshire, the Wester in Caithness-shire, and a few of the voes of Shetland, and the bays and creeks of Orkney and other the like places, may have some resemblance to it; but in its outstanding features, and in many so to speak, personal idosyncrasies the Howmore is unique. Rising away up in the hills beneath the shadow of Ben Mohr and another mountain with an Icelandic name, it is for miles merely a dry mountain torrent bed, rocky and stony, with only a trickle of water in ordinary weather from basin to basin in its steep descent from mountain and moor to the green of a level plain; when in flood, however, it comes down with the impetuous "Wha' dare meddle wi' me" fierceness so characteristic of all mountain torrents. As soon as it enters the plain it subsides, when in flood, into a smooth-sliding stream; and when low, or even in its normal state, is broken up into currentless and almost isolated pools. After a mile of this canal-like, reed-fringed water (save for its colour it might be a canal in the Midlands, but the peat saves its Celtic character), it expands into a small shallow loch of about two-thirds of a mile in length by 500 yards across, of surpassing excellence for sea-trout, sandy bottomed, rocky-sided, and absolutely free from weeds and reeds. From this loch again there runs up another ditch, with lochlets here and there, in its course to another and larger loch, into which, again, a fair-sized burn flows, and so to other lochs. At the extreme right-hand corner of the lower loch, looking seawards, the so-called river emerges once



SOURCE OF A SALT WATER RIVER.

ON A SALT WATER RIVER

more. When the tide is out (the pools are only fishable then), the superfluous waters of the loch pour seawards beneath two bridges with no great force or depth of water in normal weather, while, immediately below, the river expands into a fine pool, with green banks, sandy bottom, and dark water, with ramifications here and there, of no use for fishing, which is confined entirely to the main stream. The river then twists and twines in such a way as to make five pools, which though at no place of much depth are shallower at some places than at others; then comes a long stretch of sand and shallow water, three small pools,* a shallow over sand, and finally a very large pool indeed—the Atlantic!

When the tide glides up these sands the brown river vanishes, the water becomes deep green and swirling, the pools disappear, all is uniform, and the water pours into the loch with great force. To see a high tide bring up hundreds of large sea-trout sporting and splashing, and the new life which it puts into the old denizens is a sight worth some travel; but it is not of invariable occurrence. Formerly there was a sort of gate between the loch and the river to keep the fish in the tidal pools, but as it was not specially efficacious, it was removed.

This curious water is manifestly ideal for sea-trout, though it has a strange effect on their moods. In the tidal pools the fish either take with an alarming avidity, and you get a rise or two rises every cast, or you might as well emulate Simple Simon and angle in a pail so far as success is concerned. Incredible as it may appear, I once killed 28lb of sea-trout in twenty minutes in one of the pools (beaching all the fish), and never got another rise the rest of the day. Eight fish were beached with the first four casts. The very first cast I ever made in the river I rose a large bull trout, with my second cast I rose, hooked, and lost an eriox of perhaps 12lb. Not another bull trout did I afterwards rise. These curious circumstances shows how extremely fickle fish can be in brackish water.

There are more fish in the river than in the loch; there is, in fact, no comparison between the numbers in each, their respective areas considered, yet as long as they are in the river, so long are they fickle. Once in the loch, their fickleness vanishes, and though on some days they

* There is a tributary ditch, leading to another chain of lochs, near the mouth of the Howmore. The influence of this on the angling of the river is noticed in a later chapter when dealing with a special aspect of topographical environment and its effects upon the habits of sea-trout in lakes.

take better than others, yet an angler would either need to be very unskilful, or hit on a very bad day, if he did not do some execution. My average of all days, long and short, good and bad, over four seasons on the loch, was twenty-seven sea-trout, 37¾lb. per occasion,* in the tidal pools it was only fourteen sea-trout 14lb. 10z., a strong disparity both in number and in size; yet a draft of the net in the pools, with reverence be it said, would fully have deserved the title of miraculous. Restlessness and high feeding, combined with the regularly recurring invasions of the salt tide, are no doubt the reasons of this fickleness, yet the tide always invaded the loch strongly, and there was no period (especially in spring) during which the fish took better than just before the tide came into and when it was leaving the loch. The constant food supply in the river and its comparative absence in the loch account for the different behaviour of the fish, while it is extremely probable that the invasion of the salt water into the loch, by its enlivening effect and its suggestiveness of food makes the fish rise freely.

In all brackish water sea trout are apt to come short; this was a marked feature of these pools. One also loses a large proportion of fish after hooking, for their mouths are invariably very tender. Though in swift running brackish water, or in wide expanses of it, the minnow, sand eel—et hoc genus omne of lure—are very deadly, no fish was killed save with the fly. If one tried bait (worm) one caught nothing but eels and flounders, or perhaps a few small yellow trout, of a particularly pretty colour, fine flavour, and shape, peculiar to the river. The prawn was offered in vain. Small flies alone persuaded the fish to their doom, a daintiness in the salmonidæ under certain circumstances to which I recur in a later chapter.

There are two other kinds of fish in this river, namely, the estuary, slob or tidal trout and a remarkably beautiful hybrid—apparently either between the said tidal trout and the sea trout, or between the latter and the common trout. An occasional large common trout has been killed in the loch above up to 4½lb., but slob trout are rarely taken in the river, where they are said to attain the weight of 10lb. and over. The extremely heavy loch trout occasionally killed in Lochs Baa and Assapool in Mull, are probably of this family, and though in these lochs they have been reported up to 15lb., the other islands have not

* I only once devoted a full day to the loch and killed 52 sea trout—104½lb.

produced a specimen over 6lb. They occur occasionally in the lochs under tidal influence, but, as a rule, are killed either in the sea itself, or in those peculiar "stromes," or salt water rivers, which one occasionally meets with round the Hebridean coast.

The other fish is presumably a hybrid. It reaches occasionally the weight of 1lb., but is rarely over, and generally under, ½lb. This fish does not appear to spawn, but is numerous. What goes on at the bottom it is impossible to say, but when the sea-trout, etc., are off the feed, these fish take greedily, and vice versa. The fact that these hybrids are strongly gregarious in their habits may to some extent account for this, and immense shoals of them, comparatively speaking, will suddenly invade a shallow, clear pool in some disorder, as if driven thither by powerful enemies. These hybrids, without being specially pink in the flesh, are the most delicately flavoured fish of the salmon kind which I have ever eaten. To complete the peculiarities of the whole place, and the eccentricities of the inhabitants, there is no month throughout the whole angling year during which the pools do not contain fresh fish, though some months are, of course, superior to others.*

Now here we have a type of environment which has undoubtedly some of the effects noticed in Stennis, but which, as it is for the most part in the tenancy of migratory salmonidæ, does not, of course, produce the same large specimens of non-migratory trout. Moreover the area of rich feeding is practically limited to the river, and the loch above could not, it is certain, in spite of the invasions of the tide, carry anything like the same number of non-migratory trout as it can accommodate of migratory trout to whom good feeding in a loch is not, as we know, so essential. Finally it will be observed as an effect of environment that in the tidal pools where "bottom" food is not only plentiful but greedily devoured, the fish are as a rule indifferent to the angler's lures, whereas in the lake, where similar food is scarce and surface food is fairly plentiful, they are as keen risers as one could desire.

"There is a river in the ocean" are the opening words of a standard work on physical geography, but it is not to rivers of this class that the salt-water river called Strome Dearg, in South Uist, belong. The Strome —a name-survival of the old Norse days—is about 2½ miles from Loch-

*A similar charteristic distinguishes some of the other lochs in the Uists and a few in Harris and Loch Dhu, near Inverary, the two last in a less mark d degree.

boisdale Hotel, and may be fished by residence there. Its general configuration and character may be thus described. From a most admirable loch for yellow trout, Loch Hallan, there runs down a ditch some 15ft. to 20ft. in breadth, with an average depth of 3ft. and a clear sandy bottom. This ditch is practically currentless, and would be invaded strongly by the tide at each recurrence were it not for a strong wooden tidal gate, which bars further progress. The consequence of this barring of the ways is that the tide expands over a natural basin or hollow, and so forms a salt-water loch, about 300 yards long by, say, 100 yards across, gradually narrowing down at the point of entrance and exit of the tide. The basin in which the river has its source would naturally receive the superfluous waters of the ditch when the loch above is too full, but in the normal state there is no current, and this fact, combined with the barrier, enables the tide to pour up and down a narrow rock-bound channel as it ebbs and flows, filling the large basin with its inward rush and emptying it with its outward flow, pouring in mad tumult back to the parent sea. These salt-water rivers are thus peculiar; they flow, as it were, both up and down their channels. As a consequence of the configuration of the land, which slopes towards the sea, while the inward rush by reason of the resistance to its oncoming is generally the more tumultuous, its outward flow is invariably the more rapid. The loch never entirely disappears, even in the lowest of low tides; it is absolutely salt save after very heavy rain. After leaving the loch for some 50 yards the water moves swiftly along past high rocks on one side, and a shingly shore on the other. It is here from 6ft. to 10ft. deep, according to the state and the nature of the tide. At the end of this smooth portion, rough water has been created by a unique and most curious tidal dyke or bridge, according as one regards it as intended for a barrier or as a means for crossing the stream. The intention of its builders was that it should serve the dual purpose of checking the tide and transporting people across it, and to some extent it fulfils its double mission. It is a concrete structure some 20 ft. high above the water, and solid save for two holes (with movable tidal gates), which, however, the strong rush of water now upwards and now downwards (but more especially the latter) has much enlarged and rendered of irregular shape.

The barrier bridge to which I have already referred is a solid con-

crete structure raised many feet above the roaring tides below, and as it is only some three feet wide, ends at both banks in a rock up which one has to scramble, or down which one has to slide and hit the bridge, it is a trying place for one not used to it. To cross it is, moreover, a matter of peril, for it has neither rail nor parapet to assist the wayfarer over its ridge-like summit.

Farewell, a long farewell to him of the unaccustomed step who, dazed by the altitude at which he stands and the ceaseless din of the water below, loses first his head and then his feet and falls headlong into the swirling tide. If he escape injury from abutting rock or buttress of the bridge, he would need to be a strong swimmer to win his way safe to the rocky sides of the stream, which, like a second Orinoco,

> "Against broad Ocean urges far
> A rival sea of roaring war."

It is just below where the tides pours fiercely and strongly through the arches of this bridge, and in the smooth running water above and the broken run below that the very cream of the fishing is obtained. From the dizzy height of the bridge enormous sea-trout can nearly any day be seen lying with their heads turned towards the descending tide apparently waiting for coming food, though no one has ever seen them feeding. To fly and minnow, sand eel, or any form of lure, they are, as a rule, quite indifferent, and when the rare event has occurred of one taking either fly or minnow, the battle has been short and fierce, the whole drama consisting simply of the rise at the fly or seizure of the minnow, followed by a wild rush through one of the holes with jagged edges, a breakage, and an angler on the bank excited over the possibilities of the place and lamenting its sad realities. Some little distance above the bridge it is, of course, possible to land a good fish, but even there, owing to the abundance of long trailing weed and tangle, and the excessive strength, activity, and tender mouths of the fish (these three features being specially pronounced by reason of the water being salt), it is a matter of extreme difficulty, though not of impossible accomplishment. The ordinary sea-trout in the loch and river weighs about ¾lb. Even these small fish give ideal sport; they are never in the water, so to speak. I have seen one of 1lb. jump seventeen times in succession with incredible rapidity. The rush of a big fish, anything from 5lb. up to 8lb. or 9lb., in the rough water below the

bridge, is one of the very finest things in angling. It is true that, so far as is known, no fish over 6lb. has ever been landed on the fly, but at the same time some magnificent sport, so long as it lasted, has been obtained from these giants. No doubt the man who will be the first to successfully combat one of these monsters has yet to come. Below the bridge the river runs for a few hundred yards between high, rocky banks, finally losing itself in Loch Boisdale. From about thirty to forty yards below the bridge, however, it is very difficult to fish. The rod for this sort of place should be about 14ft. in length, and the reel should carry a good supply of line, say seventy or eighty yards. The gut should be strong, and carefully washed in rain water after use, as salt-water occasionally rots gut. Though one fly should be used, having regard merely to the advantage thereby gained when playing a trout, yet as two flies raise more fish, and, as the angler must make up his mind beforehand to get more sport than fish (the ambiguity will be readily understood), the advantage is more apparent than real. Small flies are commonly used flies, that is, of the size employed in South Uist lochs. Ordinary sea-trout patterns kill best. Double hooks are preferable to single, as they hold better. The fish usually rise low and require no striking. When playing them, they should be kept "high" and landed as speedily as possible, and at the first opportunity.

Besides sea-trout this salt-water river is frequented by a species of yellow trout with extremely large spots, a feature observed in similar waters in the Far West. These fish, it may be stated, have been caught as heavy as 5½lbs., and generally belong to the slob or tidal variety. A marked characteristic of the fish is that it grows dark, almost black, after it has been some time out of the water.

These salt-water rivers are certainly interesting and novel. Though big baskets are not often made in their weed-haunted and tumultuous waters, yet they almost invariably afford sport if not amongst the sea-trout, then amongst the brown; if not from the brown trout, then, may-hap, from the grey mullet; and if the mullet be not present, or "dour," then certainly from the lythe; but there the line must be drawn, for though there is a local legend that a flounder was once taken on the fly, the possibilities of the place are sufficiently satisfying without exacting further demand on our credulity.

I have, it will be observed, in treating of the salmonidæ in brackish

HALF TIDE ON A SALT WATER RIVER.

SALT WATER SEA-TROUT LOCH: HALF TIDE.

water as exemplified by the fish of the two environments resembling Stennis sufficiently closely in certain respects to be, mutatis mutandis, analogous, allowed myself much more latitude than I did in my remarks on that famous, interesting and peculiar sheet of water. I was tempted to do so by reason of the fact, already stated in the case of the Howmore, that the environment is so good in both these waters, that, as in Stennis, it makes the fish most fastidious. Further as the Strome is frequented by yellow trout originally from Loch Hallan and other lochs the peculiarities of its environment have practically succeeded in producing a new species—or at least a variety of the trout of the loch referred to. This new species or variety attains a recorded size of at least 6lbs., or three times the size which the trout, from which it is a specific environment-born off-shoot, is known to attain. I cannot conceive of any object lesson in the influence of environment that would be more instructive, nor of any illustration, borrowed from my own experience that could better demonstrate the important position environment occupies as the chief producer of size and quality in fish.

CHAPTER VIII.

More Lakes and Further Lessons.

Leaving such great, dignified and aristocratic waters as Stennis, the Howmore, and the Strome, let us stand for a little by the shores of a lakeland gem set like a jewel rich and rare to flash back the sunlight on the grim hills amidst which it lies embosomed far up in the solitudes some 1,500 feet above the sea.* Its clear, shallow and limpid water flashes green against its granite bed as its waves roll shoreward and it looks, and in a measure is, a cold and hard dwelling-place for the trout that call it home. Yet in some aspects it is an oasis set in the sterile rocky desert of the grim peaks of Arran. It is true that its people are but pigmies, but it is also true that they are beautiful pigmies, their dwarfed condition being due to a too generous response to the great command "Be fruitful and multiply." If, however, a race of very small anglers happened upon their lake and angled with rod and gear so proportionately small and fine as to make these fish 2lbs. or more, they would declare that they had lighted on a trouting paradise. The flesh of the trout is distinctly pinkish in hue in spite of their small size, and they are, as I have said, unsurpassed in beauty of contour and richness of colouring. They are, however, incredibly numerous, and though the loch lacks but little to make its environment capable of carrying a large head of good fish yet it is obviously capable of improvement, and has equally obviously produced this dwarfed race while preserving their beauty and sustaining its own character for being equal to the requirements of much better fish if they came in companies and not in battalions. This lake, small and unpretentious as it is, is in this aspect as full of instructive matter as are its larger brethren of greater name and fame. It suggests apart from the general problem of environment, the enormous importance of proportion as a question of environment. By proportion, I understand, the head of fish a lake, pond, or stream

* One of the most elevated lochs in Scotland is curiously named Loch Brandy. It is 2,070 feet above sea level.

should carry relatively not only to its area, but what is more important, the quantity of food it holds. It is this lack of proportion between head of population and the food-producing powers of a country that in human communities is the cause of emigration or of colonisation. Whenever, that is to say, the number of people requiring food—leaving labour and other problems out of account—exceeds the food-producing capacity of an isolated country, ipso facto you have, a priori, emigration or colonisation, or, as an alternative, a race that is physically dwarfed into what the poet called "dwindled sons of little men." Human beings can, as a rule, avoid this final catastrophe, but in Africa, as we are aware, they have not always done so and pigmy races occur. Trout, however, are not always their own masters. They cannot always migrate and are often the slavish ministers of circumstances which preclude migration. When, therefore, under such circumstances this lack of proportion between their number and the food supply becomes pronounced, they at once begin to grow smaller and smaller in size and poorer and poorer in quality, adapting their persons by a beautiful example of specialised evolution to the requirements and possibilities of the conditions of their existence.

This is precisely what has happened in Loch Tanna, the loch to which I have been referring. It is a bright, brisk, cheerful loch which seems to have given such a measure of the same characteristics to its fish that boon nature, taking pity on their decaying condition, has sent just enough food in the form of flies, beetles and so forth to save the "character" of the race.

A student of environment would suggest the adoption of means to restore the proper proportion, or, in other words, the balance of nature. It is not improbable that some would recommend decimation. Personally I urge the claims of a study of environment and of environment-cultivation and thus avoid the slaughter grim and great for which it may be shown there is no necessity. Amelioration of environment seems a plan more in keeping with our boasted modern knowledge than the cutting of the Gordian knot of this and other lakes—by the sword. However, I do not desire at this stage to anticipate the succeeding chapters, and will content myself with merely indicating the remedy.

As the antithesis of Loch Tanna, a few lochs could be instanced in which the trout, without any change in environment in the strict sense,

have nevertheless suffered such a change in the conditions of their existence that from being numerous and small, they have become scarce and comparatively large, thus indicating that when the proper "proportion" of food to population is restored "by the sword" the fish respond to the change. A typical example of this change is afforded by Loch Fraochie in Perthshire. Some forty years ago Fraochie was a lake in which it was possible to kill trout by the dozen. Indeed, a near relation, who used to fish it with the late "Rorie" Anderson, of Dunkeld, and a minister, whose name I have forgotten if I ever knew it, informed me that he and the two other "rods" took some 120 dozens of very small trout in one week. Pike shortly afterwards were introduced or found their way into the loch, and my earliest recollections of the lake, dating as they do from about 1870, carry me back to a stiff and cheerless water which, on the first occasion I floated in a boat on its surface, did not yield either a single fish or a single rise, but produced interminable stories of its past glories from both the near relation already referred to and the boatman. Being a small boy I became a confirmed laudator temporis acti so far as Fraochie was concerned, and voted angling on it but little removed, in these days of decay and pike, from the inglorious condition of a fraud. Now I believe the angling is better, but the fish are still comparatively few in number and of a much larger size than in the old days that ante-dated the pike. Here, then, we have an excellent example of the effect of the law of proportion, though, as I have said, decimation is not the means by which the law should be recognized.

Before passing to consider the future of our lakes, I shall briefly notice some other indirect causes operating on the environments of to-day—one of too common, the others of as yet infrequent occurrence so far as lakes are concerned.

Most authorities are agreed that there is a large and wasteful destruction of winged insects and their larvæ, which has been brought about by draining swamps, hill sides, and moors, all of whose surplus water of old found its way on the surface into our lakes and, of course, rivers. Now, as most of the drains are underground such insects as they sweep down are staid by the earth, and few or none of them reach the lakes. That this is of some importance goes without saying, and as there is no diet so good for trout as flies it must adversely affect the fish. The growing of abundance of trees and bushes by the banks is

the most natural solution of the difficulty, which is one aspect is part of the problem of proper proportion.

The prevalence of poaching in England, Ireland and Scotland and the absence of a close season in the last-named country, are powerful deterrents to the improvement of our lakes and active agents in the destruction of their fish. Whether the somewhat arbitrary rule by which the close time for trout in Ireland is the same, with power to alter but not to shorten its duration, as for salmon is, or is not, a wise regulation, I do not pause to discuss, but will content myself with pointing out that long or short, arbitrarily or judiciously fixed, the blessings of a close time cannot be over-estimated. From the absence of such a close time and the peculiar character of the Scottish law as to the right to take trout, the lakes and rivers of the country suffer to an incalculable degree. The personal, rather than the topographical, "environment" of the poacher could easily be remedied, if our legislators could only be brought to see the immense moral and political influence angling is able to exercise over the community. The fishing rod is the best policeman, as Nottingham and Sheffield know, and Solomon were he now alive would alter his famous dictum "Spare the rod and spoil the child" to "Spare the rod and spoil the people." In Scotland the absence of a close season conjoined with the fact that the right to take trout is a pertinent of the land has nowhere borne more baleful fruit than in the Orcadian lochs, which now hold very few trout compared with the immense numbers that used to jostle one another in the race of life in their bountiful waters. An Orcadian innkeeper lately wrote me a letter in which he stated that poaching was a thing of the past. As a matter of fact "poaching" is only less rife, because there are fewer trout to "poach," if one can apply the term to men who as owners of a square foot of territory on a loch side have, in Scots Law, the right to fish all over its waters. A few years ago one could take baskets of from 35lb. to 40lb. on Loch Harray. Its deterioration began with the institution of poaching by set lines and nets, and has been steadily maintained. In one season a single Orcadian sent 1000lb. of trout to Billingsgate, and there are some hundreds of nets—the number is by some placed at 1000—on this lake alone! So far is poaching from being at an end in Orkney, that enquiries made at Billingsgate while these pages were in the press, elicited the information that thousands of

trout still come from the islands to the great London fish market. The fish have sadly deteriorated in size and are now rarely larger than a hand's length. Finally, the depopulated Harray is no longer able to supply the London market, and the demand is met by laying all the lochs on the various islands of the Orcadian group under contribution. The destructive trade in trout if it has reached its climax in Orkney is assuredly not confined to that region. It exists all over Scotland to the detriment alike of lakes and rivers. That this state of affairs should be endured for a single day is a social and political crime and a standing reflection upon the narrowness of the horizon of legislative life as it appears bounded to those who make our laws. A two clause act, or one a clause longer than the Eels Act of 1886, would remedy the evil. All over the United Kingdom a legal size limit of sale is sadly needed, similar to that which sends annually thousands of helpless lobsters from the market and over the quay end to be devoured in their defenceless condition by the waiting crabs. Lobsters appear in the financial returns of our sea fisheries, but trout do not. Hinc illae lachrymae. It is, therefore, the irony of fate that the lobsters rejected by law should nominally be saved because returned to the sea, but really perish because so restored when "snicked" and unable to defend themselves. This, however, is legislation on a par with the lack of it, which denies a legal size limit of sale to trout and procrastinates the granting of a close season to Scottish trout, and the making of the sale of trout absolutely illegal in Scotland, as it is in England and Wales, during certain periods of the year. Until this close season is established and the other necessary steps are taken to protect Scottish trout, we strive in vain to realize the ideal of Burns and apply it to loch trout:—

"Shame fa' the fun, wi sword and gun
To slap mankind like lumber!
I sing his name and nobler fame
Who multiplies their number."

Finally, there is the question of pollution. A few but not many of our lakes suffer directly from this; all must in a measure when the drains already referred to carry down not food but injurious mineral matter. The kind of pollution to which I refer is, however, that from which Loch Lomond suffers.* I mean the pollution after it has left

*That our ancestors fully appreciated the effects of that other form of topographical environment—the dam—curse of the Don and other rivers, may be gathered from the

the lake of the effluent that connects it with the sea. Happily the case of Loch Lomond is as yet exceptional, but how long it will continue to be so I do not care to contemplate when I remember Kelvin, Clyde, and Cart, the inky Irwell and hundreds of other English rivers, of which many of the streams of Yorkshire, once fair and pellucid, but now black, greasy, evil-smelling, and foul, are not the least saddening examples.

So far as the stream is concerned that sweeps from under the shadow of the Ben with all the clearness and much of the grace that the lordly Tay bursts from the confines of its parent lake, I have no hesitation in saying that if "Turkey Red" ceased to be an object of commercial desire and the Leven were restored to its pristine sanitary glory, Loch Lomond would be the finest sea-trout and salmon loch in the United Kingdom. There is, it is true, the Clyde to consider—that polluted river which bears the black burden of the dark sea-born city's foulest product. Still, even that difficulty, great as it is, salmon and sea trout would overcome. Possibly unless the Clyde poured as clear a tide as it did in the days of when "Richard Franck, Philanthropus," wrote his "Northern Memoirs" as a rival book to Walton's "Compleat Angler," the glories of the Leven and the Loch Lomond* of the seventeenth century might not be completely restored. In any view, so far as lakes are concerned, we have happily only for the most part to deal with the prevention rather than the cure of pollution as a means of bettering environment. Prevention, as a rule, is much easier than cure, and this is truer of the sanitation of lakes and rivers than perhaps of anything else in the cosmic order. I leave the subject with reluctance, but must pass to the more or less practical application of certain of the lessons which the waters I have mentioned should have been able to teach, unless I have wholly failed, as I feel to some extent I have failed, to state these lessons clearly.

following extract :—"It is said that the raising of the dam head at Partick Mills, upon the Kelvin, is the sole cause why the fish come not up in rodding time to the Glagert."—P. Camps: Statis., xcc., xv. ; 321.

*These glories are referred to in a later chapter. When the Glasgow sewage works which now deal with about one-fifth of the sewage of the city are completed, there is not merely a possibility, but a reasonable probability, of the Clyde being sufficiently purified for salmon to ascend. In any case the Clyde must affect the Leven and Loch Lomond less adversely than it does at present.

CHAPTER IX.

The Future of our Lakes.

"There were giants in those days" is the natural thought of the man with memories, whose tendency, indeed certain fate, is to become a laudator temporis acti unless he keeps his admiration of the glories of the past within due bounds by taking an optimistic view of the possibilites of the future and ignoring some of the sternly sad realities of the present.

Those whose patience has enabled them to read the all too hastily-penned generalizations and ancient and modern instances, not always relevant and but ill-arranged and worse digested in the previous chapters, will now be in possession of the views I hold with regard to environment and its effect upon fish. I have endeavoured to show that species is nothing and that environment is everything, and is in fact the cause of specific differences.

The importance of this position is very obvious when one comes to discuss the future of our lakes, since it is clear that the theory of environment as stated makes the question of what fish our lakes, as they are, can carry of even less importance than the problem of what fish they can be made to carry, when, by the exercise of a wise and reasoned study of the conditions of lake existence, the "standard of comfort" is appreciably raised.

In the old days, before the march of events and the force of circumstances called the fish-farmer into existence and the demand for fish to re-stock naturally barren, unsuitably populated, or decimated waters had not arisen, anglers were content to let nature work out her own ends and did not seek either to improve upon her or to come to her aid by artificial means. Anglers have, however, so increased in number of late years that, the water area remaining constant, it is no longer possible to rely solely upon nature for repeopling waters that have been decimated or overfished.

The causes of this increase in anglers are not far to seek. The means of communication have been so improved in every way that people are now encouraged to go a-fishing who formerly would have stayed at home. Angling grows by what it feeds upon. If a tourist pure and simple be carried, through the agency of modern conveniency in travelling into an angling region which in the older days he would not have visited, and finds himself in an angling hotel, with its fish-flavoured atmosphere and its constant buzz of enthusiastic angling gossip, if not too far gone in cynicism for recovery, he will reason from effect to cause and, in many cases, will turn angler, in the belief that there must be something specially enjoyable, something peculiarly attractive, in a pursuit which seems to stir up such enthusiasm and to afford food for such endless speculative discussion to its votaries.

True, there is your out-and-out ignoramus—your cynic of the "malignant" type—who, never having even essayed to wean himself from his abstemious folly, accepts as satisfying the time-worm definition of the great lexicographer; but this class is nowadays in a hopeless minority.

Many anglers have become so by force of example, and there is no doubt that angling fever is strongly infectious. This unpremeditated meeting of non-anglers with anglers when in angling and "angling-talking" vein is certainly one of the principal causes of the great increase in the number of anglers, especially of those coming from large towns and non-angling centres.

With another generation the thronging of the ways will be even greater, for an angling father is likely to have angling sons, on the very same principle that one rarely finds in thorough angling centres—such, say, as Tweedside—a native who is not more or less enthusiastic over the sport. It is the same, of course, to some extent, with regard to every sport; but there is this difference between angling and most other sports—one must be an active participator, not merely a spectator. There are thousands of ardent supporters of cricket and football who never handle a bat or kick a ball; but angling's categorical imperative is, "Thou shalt fish thyself or know not my true joys."

Fashion has no doubt, at least in the case of wealthier anglers, a good deal to do with their becoming anglers. When fashion is the cause of a man turning angler it has had this effect: it has made angling waters more valuable, therefore more to be desired, and hence

has increased the number of exclusive waters, and thronged more closely what one might term the open and non-exclusive watery ways.

Whether the angling Press—papers entirely devoted to angling in all its branches, and those which give it a more or less prominent place in their pages—has been born of the increase in anglers or has caused, to some extent, the increase is a question admitting of a double answer. The increase in anglers primarily, no doubt, gave birth to the angling Press, and the angling Press again multiplied the number of anglers.

At first sight, this thronging of the ways would seem to mean ruin to angling through the depletion of the steams and lochs; but, on the contrary, it may confidently be asserted that it may ultimately have no such effect. The selfish angler, who hates to see a brother of the craft fishing his favourite stream and so on, is a being with whom most of us have no sympathy, and whose interests need not be regarded. The very size of the army of anglers has called attention to the importance of fish preservation and culture. Pollution has been guarded against; wholesale and unreasonable destruction legislatively forbidden; illegal methods of capture have been defined; boards of conservators guard the interests of the fish; while scientific fish culture provides the assurance that the supply, even if naturally exhausted, may be artificially renewed. The thronging of the ways with anglers is thus not a subject for fear or for doleful plaint, but one for congratulation, for there is no department of sport which has such an influence for good amongst the masses, none which engenders so much benefit socially, physically, and morally, amongst all classes of the community.

While all this is very true, yet it is at the same time only too clear that many of our lakes have by the severe and continuous castigation by rod and line to which they have been subjected fallen away from their high estate, while the efforts that have been made to remedy the evil by the introduction of artificially reared fish have not always been directed on proper principles. It is indeed almost a platitude in these days to urge that to put good fish in an unsuitable home is not to secure any improvement in the fishing, but to tempt further deterioration through the operation of a law of nature taking vengeance on its outrage. Though the law of environment is, however, thus recognised in theory, it is to be feared that either wilfully or by way of experiment, it is frequently ignored in practice. It is for this reason that I venture to

urge not the re-stocking of our lochs, but an enquiry into the conditions of existence they offer, and the means of improving these conditions. That the production of first class environments by artificial means is always possible, I do not assert, but that there are few environments which cannot be improved goes without saying. The relatively greater importance of improving environments to merely breeding strong trout for whom a naturally suitable environment must be found, or who must be placed in angling water irrespective of its suitability to their requirements, may be illustrated by an imaginary but conceivable case. If we take a certain water that is an admittedly bad environment and by comparing its possibilities with the actualities of a water that is a good environment, formulate a specific plan of improvement which when carried into effect produces such an amelioration in the natural conditions of existence in the water which places it, quoad environment, almost on the same level as the water which we took as the standard to be attained, what is the obvious result? Not only can we, if we please, introduce trout of almost the same quality as the standard water will carry into the amiliorated water, but we may even leave the improved environment to work out the salvation of its original denizens.

It is true that if we adopt the latter plan, we shall have to exercise patience and cultivate the contentment of abstention until the change in size and quality has been slowly but surely accomplished, but this fact does not alter the general accuracy of the principle involved either in its theoretical or in its practical aspect. The axiomatic truth remains the same, whether we artificially stock or leave the natural law of environment to operate its own vindication, the only difference being that in the former case we secure the desired end certainly with greater rapidity, possibly with greater certainty, seeing that we have anticipated the specific change that nature would have brought about, and do not have to wait for the law of evolution to afford one of the most speedily accomplished examples of its operation.

That our fish farmers are fully alive to the importance of the truth just enunciated goes without saying, but that they always give it the recognition it merits in practice is, I am afraid, a proposition that cannot be urged with the same degree of confidence. Our fish farmers are, after all, men of business, and may urge the very same excuse for their neglect of this aspect of fish culture—the culture of fish homes—as do

our theatrical managers for submitting a certain class of plays, which they admit are poor stuff, with pernicious tendencies, but for which there is a popular demand. As a matter of business, therefore, the theatrical manager does not sacrifice his banking account at the shrine of art, and for this surrender to expediency calms his conscience by the reflection that he is merely the involuntary and compelled source of supply that meets a demand. The fish farmer argues in very much the same fashion and though he protests against the unfairness to his "goods" of placing them in circumstances that do not tend to show off their good qualities, yet in the main his efforts are directed to the production of these good qualities and to the breeding of good fish that will sell and meet the demand. Within his own ponds, however, be it observed, he recognises how much more important environment is than "quality," which is not inherent but acquired, and a result of environment dependent for its endurance upon the continuation of the conditions producing it. He supplements nature by artificial means—an aspect of the question which requires separate treatment—and while thus emphasing the importance of environment, makes but little more than a half-hearted protest against its almost total neglect by his customers, as something possibly as capable of artificial production as the finest breed of trout that ever cut with their golden oars the silver stream or the dancing waters of the lake. My position is this, that what is recognised as possible, and indeed as necessary, in the fish pond, is equally possible and by parity of reasoning equally necessary in the lake. If we can, by a study of good environments—of good conditions of existence in certain lakes—formulate a theory of "lake farming" that when practically applied, will improve the standard of environment in our lakes, then not only will we improve the fish already inhabiting them, but we will have solved a problem that is a corollary to the problem of how to produce fish of good quality, and one which, within the limits of "the fisheries" has already been solved.

I am, of course, aware that all our fish farmers have devoted considerable attention to the study of aquatic plants suitable for the production of water-insects and flies on which fish feed, but so far as I am aware, none of them have placed the general question of the cultivation of environment in natural waters before every other question, or have conjoined the study of that aspect of fish-farming within their

own ponds, with the study of what I may term "comparative environmentology."

If, for example, a complete survey of the conditions of a natural lake affording an ideal environment resulted in either the reproduction of that lake, with all its physical features on a small scale for experimental purposes, such as the cultivation of its many forms of living food, and of the vegetarian growths that in turn foster that living food, or, failing such reproduction, in a theory of lake-farming, then I am assured, that the future of our lakes would be even more hopeful than it is.

That we possess the means of ensuring the future of our lochs goes without saying, and the problem in the aspect in which, up to this point I have regarded it really resolves itself into the question of how these means are to be applied. My contention is that we shall have to study the creation of good environments, and that until we do so, we can only partially avail ourselves of the means which science has placed at our command. The botanist and the entomologist must come to the aid of the fish-breeder pure and simple, while he cannot dispense with the services of the lake architect who studys the best and not the worst of nature's models. Happily in the case of lochs we have not the sanitary difficulty to face and overcome. As yet our lochs, like the sea, are practically unpolluted, and though there are a few lakes, notably Loch Lomond, which suffer as homes for the migratary salmonidæ through their pure effluent waters being polluted and poisoned in their course to the parent ocean, yet all or nearly all the lake-homes of trout that have to be ameliorated possess the first essential to fish life and good environment, the blessing of pure water appreciated by none more fully than by those living in a beautiful county of once fair but now fœtid streams on whose pellucid waters commercialism has put the imprimatur of its black and inky curse.

CHAPTER X.

Fish Farmers and Nature.

"Great Nature spoke,—observant man obey'd."—*Pope.*

Head-lines, as the sub-editor understands the art and science of using them, are designed either to attract the eye by indicating the nature of the copy or matter which follows them, in which case they are apposite, or they are designed to excite the curiosity, in which case they may be the opposite of apposite. A similar rule applies to titles whether of books or of chapters, and I therefore make no apology for the above heading, other than is contained in the context, which deals with the effect of early environment on hand-reared fish, especially when descended from hand-reared fish whose little and easy life has been bounded by the narrow horizon of the fish pond.

Before proceeding to discuss the problem—which might be otherwise entitled "Memory in Hand-Reared Fish"—some preliminary observations are necessary. Certain fish-farmers, as business men and otherwise, have taken exception to my views, as expressed in the angling press, and have maintained both in the columns of the papers referred to and also in private correspondence, that trout when once beyond the fry stage (they except, as already indicated, rainbow trout fry from the helplessness of other trout fry) take anything and eat anything when hungry irrespective of environment, and irrespective of the conditions under which their early days have been passed, or the ancestors from which they are sprung. This, it will be observed, is a mere petitio principii. It ignores the finding of food, the earning of bread and butter, so to speak, by the wag of the troutish tail and the questing of the troutish eye. All men we know can eat, when hungry, if food be placed before them, but men reared in the lap of luxury, and unused to earning their daily bread, find it much harder to adapt themselves to conditions necessitating such toil, than do those used to it from their youth upwards. I waive the question of "standard of comfort" in the

quality and quantity of food, though it is a concession that, strictly speaking, no Materialist, in the best and proper sense of the phrase, can be called upon to make.

I point out further to avoid initial misconstruction that the most helpless of animals are those which receive most attention, the most dependent, those in whom the quality of dependence is cultivated by materialistic agencies, and that what is true of the individual is true of the race to which he belongs. A baby, when it survives being born, is the most helpless and dependent of all young animals, though sprung from the king of animals, and after birth would as often as not die did medical skill not forcibly beat it into life. The physiological or material causes of this are so clear that they need not be stated, and there are numerous analogies. The pampered, useless pet dog is one example; an over-fed pointer is another. Once the latter is fed he loses his sense of smell and becomes, pro tanto, less of a gifted hunter, whose power as a food-searcher is impliably dependent on the sense of smell. I do not desire to labour the point, but merely to indicate that certain faculties may, a non utendo, become rudimentary attributes, just as certain muscles may become, and have in man become rudimentary organs by the same long prescription. Further I should point out that my theory of fish life as I have already, I trust, made sufficiently clear, is that of the Sensationilist or Materialist. Sensationalism and Materialism may, it is true, present some subtle doctrinal differences, but as the discussion of these differences is a question of moral philosophy and not of physiological moment, there is no necessity to debate the problem of freedom of will and responsibility as applied to our friends the trout. Whether therefore, Sensationalism or Materialism is a satisfying theory of the cosmic order as a whole it is certain that in the narrow world of fish life—in its mental as well as its physical aspect—Materialism is a whole truth. Fish are governed by two great impulses of purely sensational origin which rule their being—the impulse to reproduce their species, and the impulse to feed and claim the right to continue to be as a postulate of their being. The gratification of these appetites, the one an occasional but regularly recurring impulse, the other a constant motive, are the autocratic dictators of their habits, conditioned only in their law-giving and will-imposing categorical imperative, by the circumstances of their environment as favouring or hindering, rendering

easy or difficult the due satisfaction of the great ends of the lives of fish as sensational entities.

It is to those differences in environment and in the degree of reproductive facilities, that to a large extent must be attributed the specific differences, the varying manifestation of the migratory tendency and other habitual characteristics shown by the different members of the great family of the salmonidæ. Finally I would point out, by way of introduction, that fish are said to have no brain cortex—the place where "memory holds her seat." Nevertheless we hear so much in these days of "educated" trout that if the Act of 1870 does not apply to our fario, through the saving grace of the dry fly and the entomological angler, Sensationalism, as already indicated, must know its very highest development in the trout, whose really wonderful memory for things that are good must be attributed to the association of sensations, if not of ideas, conjoined with an optimism that enables him to see something good to eat in all things. Of course the purist will say that our friends the trout—most interesting because most humanly companionable of all British fish—in a state of educated nature have reversed the ordinary sociological rule, and have proceeded from contract to status. At one time, in other words, they took any kind of lure wholesale, by contract so to speak, now, as a rule of their social order, they stand, examine, and doubt, until they reject under normal conditions every fly that is not an exact imitation of nature or behaves in a way that is not according to "Cocker." A leg beyond the number boon nature has provided, or one that gives an extra kick or kicks with a muscular action foreign to the mechanical anatomy of the real Simon Pure in flies, is said to be at once rejected as a lusus naturæ that contains a hook. The ghost of Colonel Hawker would find, says the purist, if he rode on horseback from the Shades and essayed to wile a Test trout with one of his flies, that Cocytus held no more shadowy fish than those which his antiquated feathered fancies would lure to their doom. Whether this cunning of the fish is due to reasoning or merely to some form of neurosis that has attacked the trout, as the other form of neurosis has the men and women of the age, it might be inquiring too curiously to ask. The fact remains, and seems to prove that fish in a state of nature can develop a sort of neurotic or sensational* memory which is only less

* This theory is developed in the chapter dealing with the "Philosophy of the Fly."

remarkable than the singular power tame fish in captivity or hand-reared fish in ponds develop of recognising persons and of associating for very long periods after their release to freedom and the conditions of a wild environment the presence of a human being with something good to eat.

Personally I do not wholly accept the educated trout theory. The most "educated" of trout, I am aware, lose all or nearly all their so-called cunning when the May fly is "up and down" (which should be the technical phase to express its birth, brief course and death), simply because appetite overcomes every other sensation from the visual shadow that carries with it, as it falls on the water, the terrors of the unknown,* to the substance of that shadow which catches the sharp troutish eye at other and less exclusively sensual seasons than the May fly festival, and drives the trout away, whether he be a denizen of the limpid water of a chalk stream or a roamer in the shallows by the untrodden shores of some lonely lake in the West.

I will here cite two most curious examples of this effect of appetite upon what one may term the sensational timidity of trout. I was fishing a very sporting loch in Argyleshire and observed a fish feeding, as is their wont, over a range of some ten yards of shore. In the dead calm I made several long and light casts in the endeavour to bring my flies under his notice. This I could not succeed in doing. As I was finally withdrawing my flies to rest him, he suddenly charged out after them, every fin in his body and his body itself quivering with unsuppressed eagerness. He was a big fish and I saw him as clearly as if he had been in a stream. He came straight for the boat and reminded me of a certain adventure with a torpedo I survived in foreign seas. But that is another story. Involuntarily I raised my hand to turn him. Whether it was my hand or whether it was a sudden memory of the substance he was leaving for the shadow, the fact remains that he turned and swam back as quickly as he came until lost in the fretted sunshine under the boughs. I cast in his line of march and he at once took my fly and was duly landed. The whole operation which I have described occurred in a second. He was a 2½ lb. fish that should have been 4 lbs. The other case occurred on the Hebrides. I was taking a boat from one loch to another up a short and shallow ditch and the

* Sea-trout show at times precisely the same distrust in a fly.

task was a matter of some difficulty. When it was nearly accomplished I disturbed a trout of about 2 lbs. that had evidently been feeding in the ditch and he ran out over some shallow sandy water that stretched for some distance on either side of the point of exit of the ditch. As the trout went slowly out I seized my rod and made a long cast over him. To my astonishment he took the fly and was duly landed He was a fish of 2¼ lbs. That it was hunger made both of these fish indifferent to the terrors of my presence I do not doubt, precisely on the principle that grouse on stooks and even wild geese in April among potatoes (certainly Hebridean wild geese) throw their natural wariness and suspicion to the winds. Otherwise the cases are instructive examples of the effect of feeding habits upon fish and afford another remarkable example of the sensational aspect of fish life, which in dealing with the effect of artificial feeding on fish cannot be wholly ignored and is certainly of some didactic value.

I have found it necessary to make these preliminary observations to prevent misunderstanding as to my theory, while the problem initially raised as to the effect of the habits of the fish pond upon the habits of artificially-reared trout set free in a lake or river, lead me to ask the following questions: Do hand-reared fish retain for any length of time the memories of their comfortable sojourn in the fishery ponds, when they sweep through the spreading waters of a lake or dash through the thousand runs of some brimming river? Does the fierce and sharp thunder plump lashing the surface of their new habitat awaken by association memories of their first home and the spluttering fall of chopped liver and longings for the vanished hand that fed them? Or does the hissing of the hail-kissed water no more affect the troutish brain than it would stir the emotions of some animal low placed on the scale and boasting a system of nerves and ganglia as its only claim to intelligence?

We hear continually of so many hundreds or thousands of artificially hatched and reared trout being put into our waters yet, so far as I am aware the question has never been raised as to what effect, if any, the fact that fish have for the first period of their lives been hand-fed, has upon their subsequent habits, or to put the matter colloquially on what we term their "tameness?" Authorities are dumb on the matter. At the same time, it is clear that, if two-year-old trout (and some hatchery-

reared fish of that age may by many be esteemed takable) retain the greedy and confiding habits of the pond in which they have been reared, a single day of angling slaughter might easily decimate a stock of 1,000 fish.

The answer to these questions may, perhaps, be found by a consideration of the subject of this chapter "Fish Farmers and Nature," which as a title covering and implying an important problem in pisculture so far as the future of our lakes, and also of our waters in general, is concerned, will now be better understood.

It is a curious fact, but is for the writer a matter of observation, that hand-reared fish turned out to enjoy the freedom of commoners of water in some broad spreading mere that dwarfs to insignificance the confined area of their old and original home, will yet crowd into some narrow bay and gather in their tens and hundreds at the approach of a man to its shores, especially if by chance he can happen on some of their number and excite them to rise as decoys to their brethren. Nay more. Even after long years of sojourn in spreading waters the fifth or sixth generation sprung from hand-reared trout—particularly from trout whose wild ancestors were of a migratory tendency or showed to an uncommon degree the traits of the great common ancestor of all the salmonidæ—will travel in shoals, as brethern and kindred may, ready to rise obsequious to the fly if only the leader or "king" fish shoves up his shoulder to show how trout may be done. Stranger still, though this applies only to hand-reared fish not long released to enjoy the laws of liberty, a hail shower flashing amongst the swirl of the waves or tearing the calm surface with its countless spluttering boils will often excite such fish to a ready activity, as if they associated with its fall, not, indeed manna from heaven, but the old sound of the chopped meat scattered broadcast on their former home.

As to the first of these tendencies if I am to draw any inference from a recent experience in a thirty-acre reservoir stocked with exactly 500 fontinales, the inference would necessarily be that even in such a large reservoir relatively to the number of fish in it, a skilled angler fishing diligently and with intent to kill could in the course of a couple of days practically depopulate any water of moderate size of its artificially-imported and artificially-reared inhabitants. He might, it is true, fail to locate the fish, but once he had found their favourite haunt I have no

hesitation in predicting that the imported would soon become the departed, for they would practically be at the exterminator's will, and decidedly "within his danger." Nor would other circumstances, not of a fortuitous but of a reasoned nature, fail to assist the wilful agent in such a slaughter grim and great as this massacre of the innocents would assuredly prove. I do not state it as a speculative inference from this isolated experience in the reservoir, but as a deduction from the whole range of my observation during an experience which has been both wide and keen, that artificially-reared trout of every kind imported into strange sheets of water invariably display such strongly gregarious habits that it would be a matter for surprise if the capture of one such fish were not at once followed by the capture of others, the number actually taken depending upon the direction of the shoal, the ability of the angler to judge this direction, and the continuation of the fish in a taking mood. Gregariousness is, of course, a characteristic of less moment, but its value as indicating the retention of the fish pond "habits" is obviously of considerable importance when the question of dependence and all the consequences of its presence and absence are considered. I am also aware that it is sometimes a specific characteristic, but as specific characteristics are the result of environment, the fact so far from being inimical to my theory actually strengthens it as the necessary theory of the Sensationalist.

If then this gregariousness, which I have repeated proved in loch fishing, be a characteristic of imported artificially-reared trout, even after a few years' sojourn in such large sheets of water, as many of the Highland lochs are, how much stronger must the tendency be in small reservoirs and lakes amongst fish fresh from the nursery? This leads me, naturally, to point the moral so far as stockers, and particularly stockers of public and "corporation" waters, are concerned. It is obvious, to take the latter case, that if a corporation goes to the expense of introducing say 2,000 two-year-old trout into a reservoir, and places no restrictions either of time or size upon their capture, the ungrateful angling lieges may in a week depopulate the reservoir and levy upon the ratepayers a charge of 3d. for every fish! Most corporations recognise this possible extermination of the ratepayers' fish, and place a size limit on their capture. They do not, however, prohibit all angling for a period of sufficient duration to accustom the fish to their

new life with all the responsibilities of freedom which it brings, much less to attain that size which may prove their best protection against the angler's wiles. When a size limit alone is fixed and angling is allowed, some fish are always taken and many fish are injured. Anglers, when a time limit is imposed, are apt to grumble, but when the prohibition is regarded in a philosophical spirit, and anglers remember that if the fish were not there they could not angle, forbearance for one year is cheerfully agreed to and is rewarded the next.

To resume the general argument, it is obvious that the retention of the old memories of their "tame" days is a bad trait in fish from a stocker's point of view, and I doubt if it has ever been satisfactorily proved whether trout that have been hand-reared develop the same wariness as wild fish, and give, therefore, the same sport—the more difficult it is to persuade a fish to rise the greater is the sport, being an angling paradox that is self-explaining—as fish born in natural surroundings that have fought the battle of life, learned its lessons of prudence and wisdom, and possess as well those hereditary, as distinct from acquired, faculties of suspicious caution which descent from a long and noble train of savage ancestors can alone confer.

We have here a suggestion of two qualities—the qualities of independence and self-support which together give that strength to fish and all animals summed up in the famous adjective the "fittest."

The absence of habitual independence and of reliance for food on their own exertions which distinguishes hand-reared fish, may be complementary to their tameness, but it is the cause rather than the effect of that tameness, and being habitual is, therefore, of far greater moment to the stocker than is the personal trait of merely sensational familiarity that has bred contempt of danger, and trust in all men as like Nathaniel without guile. At the same time the line of demarcation is faint, and the distinction is so subtle, that it may be safer to ignore it and simply to accept even hand-reared trout as fish with natural powers—instincts if you will—somewhat diminished in strength by non-use.

That these powers—the ability chiefly to "do" for themselves—must be diminished to a greater or less extent is clear when we consider the usual environment of a hand-reared fish as well as his descent. Taking the latter first, the fish may be sprung from wild fish who have sojourned for so many years in the narrow confines of their pond that not the fish

of Lethe itself could be more oblivious of the free and unfettered dash through stream and lake, of the old days when food had to be sought even by wide-ranging to the kindly sea, by midnight prowling on the dangerous shallows and by many a moonlit foray or sunlit raid of incredibly daring conception, and still more dauntless and dashing execution.

Hand-reared fish, again, may be sprung from parents that have never known any home but the fish pond, whose egg stage and alevin existence were passed amid the roar and tumult of the rushing water of the hatching house, whose earliest hours of conscious being saw them forming an integral portion of that kaleidoscopic life of perfect sanitation and well-guarded immunity from the perils of troutish babyhood, whether of temperature, of flood, of storm, or of things great, greedy and hostile that love to prey on things small and helpless in the ever-raging battle of chance and change, whereby nature preserves the balance of the powers that make and never mar her rule; whose yearling world was bounded by the narrow horizon of the straight-banked pond, and whose dependence, until their second year, was fostered from alevin to mischievous youngsters of lusty growth, by the hand that never omitted to feed them, and was watched over by the eye of a providence in tweeds and tall boots, who never failed them in the hour of danger, of sickness, or need of every degree and kind.

Fish sprung from such parents, and themselves reared in a similar environment of easy peace and plenty, of familiarity with man as a bountiful food-producing machine, guide, philosopher, doctor and friend, all rolled into one great benevolence of masterful but kindly purpose, who have never had to seek board or lodgings in the cold streets of the brimming river, who have never seen a pike or the shimmering sheen of an otter passing like a shadow of black purpose through their pools, to whom the hand of the "guddling" youngster would be a sign manual of kindly faith, the long-legged heron—sentinel poacher of the reed-girt pool—a playfellow of clumsy movement, until the treacherous lance of his beak shot like muscular and feathered lightning to awaken doubt, merging into the darkness of death, to whom a fly had never borne a sting, nor a worm held a steel back bone,—such fish are but poorly equipped either for fighting the battle of life or for giving that sport of which wariness against wile is a condition precedent.

Yet these are the kind of fish with which we are stocking our rivers and lakes in the hope that they will thrive and multiply, and give as much sport as the congenital natives that have fallen victims to the march of events.

Fish farmers may maintain, and indeed have done so, that these arguments are based on partial assumptions, but they do not wholly deny the accuracy of the premises and, naturally, cannot do so, so far as very young trout, but little removed from fry, are concerned. As to yearlings and two-year-olds, they declare that fish of these ages—I cannot say fish of these "sizes," since all "lots" are not level and age is, in trout, a most deceptive guide to size, yearlings varying from one inch to six inches in length—eat when they are hungry and can get food. I presume that the contention is that given a suitable environment they cannot fail to find food, and that one of the two great impulses of their life will drive them to seek it. I do not doubt it. I question, however, their ability to find it, and I fear that it will be as a hungry, voracious, gregarious, quarrelsome crowd that they will give a new form to the miracle of the fishes without the loaves. I observe, too, that even fish farmers are not quite so confident in practice as they are in theory of the truth of their contention that one year of dependence has a more deteriorating effect upon a trout's ability to "do" for itself than have two years of the same pampered life* on fish sprung from aristocratic ancestors that have lived lives of such luxury and easy plenty as never to weigh less than 6lb.

Feeding yearlings for a month or two after being turned out into a pond has been recommended, but a pond is not a lake, as fishes coming from a small home even with natural food at their elbows, so to speak, will speedily discover. Morover, it is not easy to see, unless a suitable environment be presumed, why fish not merely descended, but actually the sons and daughters of great lusty well-fed, well-cared for fish are likely to thrive in environments usually inferior to those which gave their fathers and mothers the right to feel as bloated and as proud as any fish may feel with a clear conscience who have been fed on an "unearned increment" of peace and plenty.

*The contention here is that two-years-olds, because they are two-year-olds, and therefore are more experienced, are better fish than year-olds. The questing habit is more fully developed because the fish have been hand-fed for a year longer than the year-olds!

I am here endeavouring, it should be explained, to put certain theoretical suggestions before fish farmers, and my object is, if possible, to ascertain how great or how little is their practical value. In the preceding chapter I urged the cultivation of the study of environments in lakes as of the first importance. The problem I am now discussing is complementary to, and, in fact, a corollary of the other problem. It is really the problem of "set back" in its relation to environments—new and old. No one would rejoice more heartily than myself, were it satisfactorily proved that the so-called "set back" of imported fish suddenly placed in a new environment merely entailed a conquering of its conditions by familiarity with them, and the active exercise of latent habits, powers, and instincts, which a few short "generations," departing by force of circumstances from atavic characteristics "in being" and capable of recrudescence have rendered only dormant and not dead. The term "dead" is, I am aware, a highly improper one, and I do not defend its application, save in so far as the stocker may find that though theoretically a faculty is a possession for ever, practically its temporary aberration may mean its death in use.

This last position is of great moment, and, as a rule of animal existence, is, I venture to think, in accordance with the best thought on the subject.

That artificial feeding and an assured supply of food which has not to be sought for engender dependence, and must necessarily be destructive of the power to gratify the impulse to feed, which at the same time, it leaves in unimpaired, if not enhanced, strength, is a proposition that can scarcely be disputed, when the strongest of all materialistic arguments,—the "standard of comfort"—is not only recognised as a natural law of cosmic existence but is also realized "in time and circumstance" as jurists understand the phrase. I have already indicated that the cultivation of good environments and the general bettering of the conditions of existence in lakes on approved models of lakes with good environments, is of more importance than the production of fine breeds of trout or specimen yearlings that are of no value without suitable environments, and are certainly in unsuitable environments of less value than indifferent fish. Though the improvement of environments may thus solve the problem under discussion, yet even under the best of new conditions, the effect of the dependence begot of

old conditions cannot be ignored. It is in consideration of this fact that in the succeeding chapter, read of course in relation to this chapter and the one preceding it, I propose to offer a theoretical answer to the whole question so far as it has not been already answered.

CHAPTER XI.

The Theoretical Solution of the Problem

Certain fish farmers have been pleased to term much of what is contained in the two preceding chapters, mere theorising, because it is clear that if not dismissed as inaccurate "theorising" by sound arguments, it may, by the use of that vague and flippant word, be temporarily "scotched."

I have, however, shown that it is a law of nature that specific and individual differences are the result of environment, and hence that not only is environment more important than "species," as produced by artificial environment, but also that the effect of artificial environment must necessarily be, ex lege, to produce species bearing specific characteristics due to that environment.* If evolution means anything, this conclusion is inevitable unless to suit the purposes of our fish-farmers, fish are to be exempt from the operation of natural laws because they have been artificially reared—an arbitrary assumption that destroys the declaratory character of all natural laws. The object of all fish-farming is to perfect nature in the sense only that is implied by the giving of what would be perfectly natural conditions by artificial means. Unfortunately fish farmers have gone beyond nature, and by ceasing to imitate her best moods merely, have produced unnatural fish, on which the self-avenging laws of nature take revenge for their outrage whenever once more the fish come within the jurisdiction of the Great Mother and pass out of the protection of their human owners.

Many of our fish farmers are ready enough to lay down the great natural law of environment and to give it a limited recognition within their fisheries in order that they may, like other merchants, be in a position to offer to the public fish which can be truthfully described as not wholly fed on artificial food, fish, that is, accustomed to feed on the natural food that is purposely cultivated in the ponds. So far as

*Another and important effect is to produce specific necessities which only a particular and special kind of environment can satisfy.

natural food within the limited area of a fish pond can teach a fish independence, the power to do, the will to dare in the battle of life fought on the wider field of nature, fish-farmers by the very recognition of its importance place themselves in a position of approbate and reprobate with regard to the principles I have been enunciating. They give a limited recognition to the great natural law of environment and then they describe as "theorising" the application of the law in its entirety to hand-reared fish bred in conditions of existence wholly different to those natural conditions under which the law will enforce its recognition.

Do our fish-farmers recognise the great truth, as true of the moral as of the physical order that natural law, as embracing all positive law or laws, is absolutely inviolable? Do they recognise that logic was used and abused in the Garden of Eden, before Aristotle was born or Wheatley gave it formal life, that houses fell by the law of gravity before Newton watched another pippin drop that rivals the apple of Eve in fame? Do they not know that arbitrariness gives to all human law and all human justice its essential weakness, and that all human law that is just or approximately just is declaratory of great principles that are eternal and merely vary in realisation with the circumstances under which they receive that concrete realisation which we call positive law? Do they not recognise that the laws ruling fish life are older than the fish farm, and hence that the fish farmer cannot arbitrarily ignore them without suffering these very consequences of their violation, which are as inevitable as that two and two make four?

The theory of fish-farming has not, indeed, run counter to the great principle to which I have been referring. Applied to trout the law of environment is the great natural law that must be clothed with a declaratory character and realised in circumstances, if fish farmers would produce races or species of fish equal to the races or species of fish produced by the unfettered operation of that law in the realm of nature.

The nearer fish-farmers approximate the conditions of existence on their farms to the best natural conditions found to produce a race of strong healthy fish, the more closely will they approach the declaratory realisation of the great law of environment. The mere crossing and re-crossing of species to produce better breeds of fish within the farm as a solution of the difficulty is but a petitio principii. It ignores the law of environment and assumes that the best traits of species will be

repeated in progeny, and is, therefore, not declaratory. The traits of environment remain, as we know they remain in sheep and stock generally. That they should remain is a consequence that is inevitable, unless we ignore principles that are laws of nature, wisely left by the Creator to slowly evolve chaos out of order and species out of protoplasmic life. This is a truism accepted equally by the jurist and the geologist, the physiologist and the metaphysician, the physicist and the physician, and yet the fish farmer would rise superior to it and would maintain that those students of fish who are not in the trade, merely "theorise" when they urge its full recognition as the first principle of scientific fish-farming. So assured do I feel that the fish-farms of the future will be great natural nurseries on a scale hitherto unattempted, and certainly unrealised on any fish-farm, that I venture to assert that in a few decades fish-breeders will be able to produce, by a study of environments, fish of specific characteristics suitable for all environments that are capable of amelioration. A movement in this direction has already set in. How it must eventually culminate I have already indicated.

Environment is the cause of all specific difference, the source of good qualities and bad, of racial excellencies and racial defects. The proper study, therefore, of fish-breeding mankind is environment, and not how to produce good fish by selecting sires and dams and placing their progeny in an environment of assured excellence, that is within the arbitrary control of their owners.

The practical problem, in other words, which fish farmers have to solve is to construct homes that afford their fish, after a certain period in their existence, perfectly natural conditions of life framed on the most educative models fashioned by nature. The conditions arrived at must necessitate hunting for natural food and must be calculated to cultivate in the fish independence and the power of being self-supporting. Living under such conditions not only will the trout which breeders supply be sprung from practically wild fish, but will themselves be wild fish that have lived a life as nearly approximating that of freedom and nature—of commoners of water—as it is possible to secure without sacrificing protection or running those risks to which capital sunk in absolutely free fish living under absolutely natural conditions would be always exposed.

If the truths which I have been enunciating were mere idle speculative theorising, I should delete the qualification which the last sentence introduces, for, strictly speaking, I have insisted upon absolutely natural conditions which would include certain perils of juvenile troutish existence highly educative to the young fish.* At the same time as the endeavour of the fish farmer is to realise a civilised ideal of communal life in the fish life of his farm, it is possible for him to reconcile the reign of law with the reign of liberty. The apparent anarchy of nature is in reality a cosmic order resulting in what we properly term the preservation of her balance. Within the fish pond the circumstances under which the law of nature is recognised vary, and therefore the imposition of order is merely the recognition of the same law in terms of the difference between the circumstances, which may, when specialised to the case in point, be termed the conditions of existence.

Finally the study of environment in nature and its application to the conditions of existence in the fish farm, does not exhaust the problem of the future of our lakes and rivers. It only solves one half of it. "Environment-farming" must be made complementary to fish-farming, for it is as certain that environments can be improved, as it is that the existing bad environments in many of our lakes and rivers have produced the inferior races inhabiting them. If environment can produce specific differences, it is clear that the study of and consequent improvement in environments can, without stocking at all, result in the production of superior races. In lakes, however, in which trout are already too numerous, the process of amelioration in the fish would be a comparatively slow one, in spite of the example of Loch Lossit. On the other hand, in such a lake as Loch Fraochie, the introduction of fish would have to proceed pari passu with the betterment of the environment in all its aspects, the disturbing causes hindering the amelioration not being quite the same in all respects. In any case it is obvious that until fish-farmers and their customers give to environment in both its aspects the recognition it deserves, the future of our lakes in the fullest sense cannot be assured. Compared with the task of restoring our rivers to their pristine excellence, the problem of securing the future excellence of our lakes is comparatively simple. The area of pure water is prac-

* Let a two-year-old fish get into the yearling pond and the lesson he could teach is not suffered by the fish-farmer to be taught.

tically unlimited, and the question of pollution scarcely arises, though examples of its disastrous effects have occurred and been duly quoted.

It is when one considers what is involved in the solution of the problem of ameliorating environment, that its importance becomes of almost appalling significance.

The fallow lakes of this country that have run to seed and are either weed-covered and almost unfishable, or have, through lack of cultivation of their natural capabilities, become the home of "feeble peoples" like the conies of Scripture, are so numerous, their neglected condition so obvious to the eye even of the chance wayfarer who visits their not always desolate shores, that one wonders why the "cultivation of environment" within their waters has been so long postponed. In the case of some districts this neglect may be traced to the abundance of other waters to which boon nature has been kinder than has man yet found himself under the necessity of being to their sister lakes. But the thronging of the angling ways is the shadow of the coming Nemesis. Lakes that used to yield full creels are being slowly but surely robbed of their denizens, and even if these are re-peopled there is still the thronging of the ways with an ever growing crowd crying aloud for more water in which to relieve the cacoethes "anglendi."

In South Uist alone there is one acre of water to every ten of land; in Benbecula the proportion is one to seven; yet on both islands the hundreds of acres of water, whose environment could be cultivated are allowed to lie fallow and to become the prey of natural decay. In Islay, Jura, Harris, and all the Northern and Southern Hebrides a similar state of affairs prevails. In Sutherlandshire, Caithness-shire, Argyleshire, and in fact all over the mainland it is the same. What we do for our land we decline to do for our waters. That good crops cannot at once follow "breaking-in" we recognise so far as land and the extension of the margin of its cultivation are concerned, but we decline to extend the recognition of the principle involved to fish-farming in the widest sense of the phrase. Without first cultivating the environments of these fallow waters, to stock the majority of them would be a waste of money; to cultivate and improve their environments would, in many cases, render subsequent stocking unnecessary. In any case the breeding of good fish for stocking purposes is of secondary and supplementary importance in some cases, and can only be of complementary utility in all.

How true this is has often been borne in upon me, when on visiting a fish farm I have spent an hour or two in the nursery amidst the roar of waters and have noted the eggs of the great Bavarian trout, of crosses between the sea-trout and the fario, of Loch Levens and of the common trout all hatching out, or in the alevin or fry stage, and have from thence followed these fish of varied parentage and descent to their environment in the fish pond, which, for one and all is to be practically identical. When I have pictured these fish being turned out into environments that may or may not suit their racial and acquired characteristics without any previous acquaintance with their new environment or with a "wild environment" of any kind, the theoretical and practical difficulties of proper stocking have assumed enormous proportions. When I have further considered the many species of trout of scientific and popular classification that occur in European waters, or even in the lakes and rivers of England, Scotland, and Ireland—each and all of which are the growth of environment, and if not separate species then assuredly geographical or topographical varieties of species —surely I am justly entitled to ask whether all these varieties or species born and reared in the same environment will adapt themselves to any environment; much more will they all find environments suitable, not merely to their common and acquired habits, but to their separate and racial characteristics? When I find that smolts born in the hatchery and reared in the ponds are turned out in the estuary of a river in the belief that such a river will see these, its adopted children, return as grilse, and when I read this example and other examples of sublime faith in chance, in the light of the general theory of environment, it is no matter for wonder that I am forced to regard the cultivation of environment as the only sure means of securing permanently the future well-being of our lakes.*

On the commercial and moral aspect of the problem I will scarcely touch. I will content myself with pointing out that there is a good deal of capital sunk in angling hotels the owners and lessees of which cannot afford to neglect the broad issues involved in the problem of

*The Utopian scheme, recently mooted, which proposes to convert the Thames into a river frequented by the migratory salmonidæ will not abide discussion. A study of the topographical environment of the Thames is sufficient to convince any student of fish acquainted with the Trent, and the causes of its decline as a salmon river, that the Thames scheme is premature and must result in costly failure.

the future of our lakes, as I have stated these issues and suggested their solution.

As to the moral aspect of the problem angling is one of the few sports that must do a nation good, and cannot possibly do it any harm. Its proper pursuit ensures hygienic conditions that are excellent alike for mind and body as the medical faculty both by precept and example are constantly urging. In its political aspect, in the widest sense, it is obvious that the problem of how to obtain wild, strong, natural, healthy, and sport-giving fish is only a part of that wider problem of innocent substitutes for injurious pleasures whose solution will help to solve the great problem of the age—the satisfaction of that discontent by material agencies to which the raising of the standard of comfort has given birth. The tendency of the best legislation of the age is to reconcile the reign of law with the reign of liberty, and there is no doubt that the providing of angling, as a compensation for the curtailment of individual license in other directions will eventually be recognised as a means of saving grace which will not only improve the moral well-being of the people, but will also, by the necessity it entails of securing the purity of our rivers and preserving that of our lakes improve their material well-being and aid a sanitary reform of incalculable benefit.

CHAPTER XII.

British Lakes and Foreign Fish: Rainbow and Fontinalis.

British pisciculturists in their search for good species and with that enterprise, which distinguishes them and which competition fosters, have not confined themselves to the denizens of British waters. Amongst foreign fish on which they have cast the eyes of speculative love are the rainbow trout and the fontinalis. It seems necessary, therefore, that I should devote some of my space to both these fish and their possible future place in the economy of the lake. Of the two, the rainbow trout is, I need hardly say, by the far the more interesting fish, and the question of its introduction into British waters is such an obviously important one that I make no apology for summarising the discussion to which its attempted naturalisation has given rise. Though originally a river fish the suitability of the rainbow for lakes, I may premise, is not, under reservations, disputed, but it is impossible at the same time, to discuss its future in our lakes without having regard to its alleged imperfections. It is for this reason that I state the practical issues at stake from the general standpoint before dealing with the fish as a future denizen of our lakes.

The opponents of the rainbow trout have a two-fold objection to urge against its introduction into British waters. They allege (1) that the fish is a cannibal of lusty appetite, whose primest condition is contemporaneous with the spawning time of our common trout; and (2) that the fish is of such strongly marked migratory habits that it disappears from all streams in which it is placed if any road of escape is left open to it, whether to the sea or to the more confined waters of lakes to which the streams are tributary. It is, of course, obvious that these pleas are what lawyers term alternative, and are not, therefore, necessarily contradictory. At the same time, it may be pointed out that if the fish do not take up their permanent abode in streams from which they can escape to the sea or elsewhere, their introduction into such streams is a perfectly safe experiment, for the injury they can do to

the native trout must be as evanescent and passing as their cohabitation with them is temporary, being, in fact, measured by its duration.

Presuming, however, that the case against the rainbow depends upon these alternative pleas, it is clear that the question of its introduction into British waters—lakes, ponds, and rivers, as distinguished from rivers merely—must be conjoined into two issues. In streams, for example, with a sea or large lake connection, already frequented by the common trout, either in such numbers or of such a size as to warrant their being described as trout streams, it is obvious that either of the objections would, if substantiated by satisfactory evidence, be fatal to the rainbow's claims to recognition as a desirable fish in British waters of this class. If a cannibal in a worse degree than that stigma attaches to all or nearly all of the Salmonidæ, and to most fresh water fish, the only justification that could be urged in favour of the rainbow would be his superior intrinsic merits as a sport-giving fish. Into the discussion of that wide problem it is not necessary to enter in a mere statement of the propositions which embrace the practical issues to be decided. Such a side issue can only arise as a dernier ressort if the main issue had been decided against the rainbow. By parity of reasoning, if the main issue were decided in his favour the side issue referred to would not arise at all. In the second place, it is obvious that if the fish can be proved to be of so restless and migratory a nature that they never take up their permanent home in waters from which they can escape, or in other words, if our waters do not afford a suitable environment, then the first issue will not arise, and the advisability of their introduction as a problem in practical pisciculture solves itself on grounds that are at once economic and utilitarian.

In streams, again, that cannot be called trout streams in the strict sense of that phrase, the decision for or against the rainbow will depend to a very large extent upon the degree to which these streams are frequented by the young of the migratory salmonidæ, presuming always that one of the main issues is the existence or non-existence of what may be termed a super-cannibalistic tendency in the fish. The destruction which the rainbow may cause to the spawn of the migratory salmonidæ in such streams will be a question of less moment than in the case of trout streams, though still a problem of considerable gravity, for the spawning times of the rainbow and of the migratory salmonidæ

are divided by a minimum period of five weeks—a fact which cannot be overlooked when the possible depredator is a fish of such admittedly keen appetite as the salmo irideus. The second of the two main objections, namely, that the rainbow will not stay in streams from which he can escape, may, however, in the case of streams of this class, be fairly stated as the principal issue to be decided. It is only necessary, therefore, to repeat that if his nomadic instincts in our waters are established beyond doubt, his introduction into such streams would be a mere waste of money, unless he were artificially confined. This is a particular and not a general issue, the answer to which would depend upon the sporting value and quality of the stream as a salmon, sea-trout, or mixed river. It does not, therefore, fall within the scope of the broader issue, and is, in fact, a side issue of relative intrinsic importance.

The adaptability and suitability of the rainbow to lakes and ponds is, as I have already pointed out, scarcely disputed, even though the fish in its original home is essentially a river fish. At the same time, as natural lakes—these, as a rule, being the only waters of this class in which the public are interested—are of different characteristics, it may serve a useful purpose to state the practical issues at stake. Mutatis mutandis, they scarcely differ, either in degree or kind from those to be decided in the case of rivers.

Lakes may be divided into several classes, the advisability of introducing the rainbow into each of which will depend upon the answer given to the two main issues already stated in the case of streams. In a few exceptional instances, neither issue will arise, at least in their direct aspect. Presupposing, therefore, the same main issues, lakes may be divided as follows:—

(1) Trout lakes with no effluent.

(2) Trout lakes with an effluent.

(3) Mixed lakes frequented by either (a) salmon, sea-trout, and brown trout, or (b) sea-trout and brown trout, or (c) "sea-trout and salmon," or (d) "sea-trout," or (e) "salmon"—all of which must necessarily have an effluent.

(4) Lakes holding few or no trout, and having no effluent.

There are, of course, other kinds of lakes, those, for example, holding coarse fish, but to take such lakes into consideration would be irrelevant to the issues.

To discuss the practical problem to be decided in the case of each

of these varieties of lake seriatim would involve, it is clear, a repetition of much that has been already stated in the case of streams. It is obvious, for example, in the case of trout lakes with no effluent, that the question of migration does not arise, and that the only issue to be decided is the cannibalistic and spawn-destroying tendency of the rainbow. If the common trout and the rainbow can be proved to be mutually destructive or the latter can be proved to be inimical to the interests of the trout, then we are once more confronted with the side issue of their relative merits and advantages. To follow, therefore, the application of the two main issues to each and all of those different kinds of lakes would be merely to reiterate with a greater or less degree of appositeness the points already indicated as falling to be decided in the case of streams of different characters.

There is, however, an aspect of the question, not yet stated, which can scarcely be overlooked, but which nevertheless is of minor importance. The rainbow appears to be able to conquer the common trout, and like a strong invader it can either reduce the common trout to a state of subjection or drive it forth from its old haunts to seek new quarters. In a later chapter I describe a duel, which I had the good fortune to witness in a stream, between a female rainbow and a female brown trout—a combat in which the former held the upper hand—but in the meantime I will content myself with quoting a single example of the apparent superiority of the rainbow over the common trout, when the possession of water is put to the dread arbitrament of the sword.* The example of the rainbow's might of right is afforded by an interesting experiment recently made by Sir Peter Walker on his Osmaston estate, Derbyshire. Two years ago he placed 5,000 yearling rainbows in a trout stream just above a couple of small lakes. Now these yearlings appear to have entirely displaced the native trout and to be in the position of beati possidentes, not only of the two lakes, but of the whole of the stream below. In the course of two years they have attained an average weight of ¾lb., and as already indicated seem as they grew in size and strength, to have gradually overpowered and finally to have driven away the native brown trout.*

*I could have here quoted a recent Tasmanian case, but prefer the Derbyshire instance as more relevant to the issues to be decided in British waters. The Lancashire, Argyllshire, and Perthshire cases, subsequently quoted, more than counterbalance the Derbyshire case.

This may or may not be considered strong evidence against the rainbow. The facts of the case are singular. An army of 5,000 rainbows is a host of dread power, and I have no doubt that 5,000 Loch Leven trout, if the conditions had suited them equally well—and to judge from the rapid growth of the rainbows the conclusion is irresistible that the conditions would have suited them—would have effected precisely the same clearance, if the law of the survival of the fittest has any meaning. The only inference, therefore, that can be drawn from such cases is that they are typical examples of the operation of the law referred to. In view, moreover, of the instructive Islay case on which I have already laid such emphasis, the case quoted, is simply an example, mutatis mutandis, of a strong people and a finer race displacing a weaker people and an inferior race. Finally, and on the last analysis, the question resolves itself, from an angling point of view, into one of comparative utility. If the rainbow be the conquering fish, he is, ipso facto, the better fish from the absolute standpoint. Relatively, when sentiment intrudes and the stream ripples to the tune of "Auld Lang Syne," he may be the inferior fish, but the only moan we can make or are justified in making is based on the patriotic sentiment of old association—the mournful music of the laudator temporis acti, summed up in the famous triad, "old wine, old books and old friends." Ignoring, therefore, this special aspect of the question as really included within the two main issues, I content myself with stating these main issues, which are:—

1. Is the rainbow trout of such cannibalistic and spawn-destroying habits that, his prime being contemporaneous with the spawning time of the trout and almost contemporaneous with the presence of the maximum quantity of trout fry in various stages of growth in our streams, his introduction would prove the means either of (a) practically exterminating our trout, or (b) seriously diminishing their numbers?

2. Does the rainbow trout develop such strongly marked migratory habits in the unsuitable environment of British waters that unless confined by artificial barriers it will descend to the sea or elsewhere never to appear again, and, if so, is its failure to return voluntary or involuntary?

In the absence of sufficient data from the experience of stockers, it is clear that these issues can only be decided by experiments carried on in waters where very peculiar conditions exist, if, that is to say, the

experiments are to be undertaken without serious risk to streams of existing sporting value and sport-yielding excellence. In other words, some water adapted by Nature to sustain a good head of lusty and fair-sized trout must be found, which is practically without trout or a large head of fish of any kind, whether migratory or non-migratory salmonidæ, or coarse fish. A stream absolutely fulfilling these conditions, and having the further qualifications for an experiment of this kind, of being situated near an established fishery and having a clear and unobstructed connection with the sea, does not, perhaps, exist in the United Kingdom. If such a stream did exist and were divided into two portions, the upper of which could by an insuperable artificial barrier be entirely cut off from the sea in such a way as to bar the descent of all fish placed in it, while the lower portion remained an open door to "old ocean," an ideal water for the experiment in both its branches would be furnished. If an equal number of ordinary and rainbow trout were placed in the upper and lower portions referred to, the contest, if any arose, between the confined fish in the upper water would settle the first issue, while both issues—particularly the second—would be helped towards solution by the result of the co-habitation of the two species in the lower portion with the open road to the sea.

I have stated the problem and formally suggested an experimental solution simply because both the problem and the suggested solution are equally interesting.

In the meantime I need not pursue the subject further, but will merely state my own impressions of the rainbow and a few facts concerning the fish that appear to be of moment in the matter of his future status amongst the denizens of our lakes.

If the rainbow were all his traducers have painted him there would be considerable danger in introducing the fish into our lakes, and it would be as mistaken chivalry as that which may have lost Flodden, to grant salmo irideus a fair field and no favour. We can at least keep an open mind on the subject and await results in certain waters which will prove whether the rainbow is a fish to be trusted in British waters in general.

Since, however, he is not all his traducers have painted him, I may say from my own observation of him in tanks, ponds, and streams that the salmo irrideus is a masterful fish, and a keen fighter. He is also blessed

with an abnormally keen appetite, but he is not a cannibal,* and is a fish of a somewhat frank and trustful nature. Possibly this simplicity may be due to his belly being an imperious cupboard-ringer; but in any case the fact remains that the rainbow is a gentleman, a fish of aristocratic appearance, of Bayard's mood, who loves fighting and puts faith in man, scorns to prey upon his fellows, and is more of a gourmand and less of an epicure than the common trout, omnivorous though the indigenous dweller in our streams may be.

In the fish ponds the big rainbows win many hearts. No sooner does the visitor take up his stand than the great handsome fish congregate at his feet. When a handful of food is thrown in, they make the water boil, cutting it with their silver oars dashed with red, and displaying an activity that might make even a sea-trout green with envy. They are truly magnificent fish, these four and five pounders, and come of a race for whom a great future may be safely prophesied if only British waters prove kind. They are lithe and eel-like in their quick and graceful movements as pisciculturists know, and the average fish-farmer would rather rob one hundred ordinary fish of their spawn than help to exude the ova from a single rainbow; they will never submit with gravid passivity to the restraining hands, but wriggle and fight to their own danger during this important operation. Finally, as the rainbow is in season when the trout is out, is a better and truer riser than the grayling, suits either lakes or rivers, grows to a greater size, and is a better fighter and a hardier fish in every way, one may safely venture to say that in time, if all goes well, he may drive the fickle, flirting thymallus out of popular favour.

I hear good accounts of the rainbow in streams from time to time. If these came only from fish-farmers, I might view them with the eye of a gentle sceptic, and might doubt the accuracy of the information without questioning the veracity of those submitting it to me. They come, however, from quite independent as well as from naturally prejudiced

*An extremely interesting experiment lately fell within my observation. A certain number of yearling trout were placed in a pond containing large brown and Loch Leven trout. They were eaten up to a yearling promptly and voraciously. Of a similar number of yearlings placed amongst large rainbows not a single one was touched I have frequently seen small trout consorting with perfect confidence and trust with large rainbows. The rainbow is a masterful and imperious, not a cruel and cannibalistic, fish. Force him to cannibalism and his healthy appetite does the rest. It is, however, his poverty and not his will which consents.

sources, and are therefore evidence of a most unimpeachable character. They prove, it is true, nothing definite, and will not admit of being generalised into a conclusion for or against, and simply amount to this: that in certain streams into which a good head of rainbow trout were introduced the fish have remained and thriven, and not migrated or disappeared. What is perhaps more important, I hear that in one stream in particular, a Lancashire water famous for its trout, the rainbows have not only thriven (the evidence does not warrant adding, and multiplied), but have in no way injured or even interfered with the original and imported common trout in the stream. The trout is not a "short-generationed" animal like the rat or the dog or the felis domesticus, and you must therefore give a fish plenty of time before he can establish himself and obey the scriptural dictum: "Be fruitful and multiply." It may, therefore, be quite a decade before the rainbow bears fruit, though it may not be quite so long before we shall be in a position to forecast the nature of the harvest.

His future in our lakes as distinct from our streams seems now, however, to be practically assured, and the good news slowly accumulating as to his naturalisation in our lochs must be for all anglers very welcome tidings.* I addressed a number of enquiries on this subject to Highland landlords, and in all cases in which they have had the courtesy to reply the answer has been favourable. Mr. MacFadyen, of Cuilfail Hotel, whose good example as a "stocker" many lessees of Highland inns are now following, tells me that in his lochs the rainbow is flourishing and is growing fast, though curiously enough he did not condescend upon any particulars as to its increase in numbers. In suitable lakes, (which are, I may say, lakes in which they can be confined until acclimatised), Mr. MacFadyen tells me that the fontinalis is quite at home and grows as fast as the rainbow. From Perthshire I have equally favourable replies in the case of the rainbow, and indeterminate answers in the case of the fontinalis. Most of the Perthshire lakes have effluents, and this facts may easily account for the disappearance of the fontinalis. This evidence not only shows that the rainbow is capable of being

*No prudent lake owner would dream, in the light of our present knowledge, of introducing rainbows into a loch holding fine large trout, unless he desired to ensure winter sport from quick-growing and free-rising trout and were willing to risk his summer sport. I say "risk" advisedly, for though the rainbow is at home in lakes, it is not yet proved that he is a fit consort for our loch trout.

acclimatised in our waters, but also that all that is necessary to his acclimatisation is a suitable environment.* It is just possible, indeed it is highly probable, that his restlessness—real or assumed—in our streams may be largely due to the fact that the winter life of those streams does not afford the rainbow a suitable environment, and hence awakens, on grounds already formulated, the migratory instinct. The fish is undoubtedly a fish of mixed and even of indeterminate descent, and as some of his ancestors at least were assuredly migratory, that trait, long latent by compulsion and "scotched" by environment, is naturally liable to recrudescence when environment calls it into being and opportunity for its display is not lacking. In some, at least, of our lakes, the rainbow has, however, found a congenial home and has certainly thriven if he has not multiplied, for on the last point statistics, as already pointed out, are not forthcoming. It would appear, however, that just as the best rainbows for stocking purposes are those sprung from the ova of British-reared fish, so the tendency of the fish is towards assimilating its period of spawning with that of the fario of our streams. This, however, is as yet only a tendency, though it is a perfectly natural evolution from the somewhat altered conditions of existence, from those to which its ancestors were accustomed, which the rainbow in our waters has to endure. It is, of course, from some points of view not wholly desirable that the times of spawning of the rainbow and the fario should approach too closely, even though the approximation caused one of the alleged objections to the former—that which urges its vices as a spawn-eater—to vanish. The question is one of compensation. As a fish who is in his prime season when the trout is at his worst, the rainbow is, apart from the comparative value of trout and rainbows as sport-giving fish, most to be desired as an addition to what are called our game fish; on the other hand if his spawning season were the same as that of the trout, would we gain more by the security against his destruction of trout-spawn which this assimilation of spawning time might imply than we would certainly lose by the sacrifice of a

*Loch Katrine, to quote a "lake" example, affords precisely the sort of environment that is assuredly suitable for the rainbow. The trout of this romantic and beautiful loch though numerous are, as a rule, of singularly poor quality. If the proposal to further raise the water level, contemplated by the Glasgow Corporation, be carried out, the suitability of Loch Katrine as a "rainbow" home will be enhanced, while it will probably have an injurious effect upon the sport which it yields amongst the common trout to the fly fisher.

winter sport-giving fish which it would necessarily entail? As it is highly probable that the temperature of our lakes will in time alter the spawning season of the rainbow, this question of compensation cannot be overlooked. We must, however, await until the passage of time answers this and other questions of a similar kind.

Whatever be the doubtful demerits of the rainbow, on his absolute merits as a bold, brave Bayard of the lake, a sport-giving fish that yields only with his last breath, an aristocrat at once in shape, in colouring and stateliness of being, a gentleman in all his instincts, no one, not even his most bitter and prejudiced foe can cast the shadow of slander. Possessed of that superabundant activity that is the chief charm of the sea-trout, he has none of that fish's wayward fickleness, and when he rises in a blaze of living and swirling red, his intention to take the fly is never in doubt. When hooked, he gives play that the sea-trout cannot surpass, while he never acknowledges defeat until on the very threshold of death itself. When one adds that he attains a great size, is a rapid grower, a fish of a hardy constitution, and even in the fry stage shows independence and the questing instinct, the merits of the rainbow make him a fish to be desired. That he may adapt himself to British waters and refute the timorous calumnies of his traducers is the earnest wish of all those who admire great and good fish, and to whom the sounding swish of a taut line is as the song of the bow of Odysseus when battle was in the air.

The salmo fontinalis, as most anglers are aware, is called by courtesy the American brook trout, but it is really not a trout at all. It is a true char with the habits of a lake or pond trout. That appears to be a satisfying definition of the fish so far as its habits and sport-giving qualities to the fly-fisher are concerned. The char, as we know him in English and Scottish lakes, is by no means a free riser to the fly. Indeed, when he does take the fly with any degree of avidity he is either rather out of condition or he takes it when the angler indulges in a mongrel kind of fly-fishing—the trailed or sunken style which necessitates the use of a couple of dozen of close strung flies weighted with a few shot, for all the world as if a Clyde angler had suddenly gone mad and attached sinkers to the horse hair on which are mounted the dozen flies of his reelless line, tapering from the rod point to the tail fly of his long drawn out troutish peril. For a time it was feared that the

salmo fontinalis would not develop the "rising" faculty but would display the characteristics of his English brother and remain rather a useful and ornamental fish from the gastronomic standpoint than a sport-giving denizen of our lakes.* As a matter of fact the fontinalis has proved himself to be in lakes a fish of quite "another kidney." He rises as boldly and as truly as a tarn trout on a fine June evening, and when he comes he means business, just as the tarn trout does. Still he is a charr, not a trout, though after all there is nothing in a name.

In appearance he is, on the whole, a very pretty fish, though his rather ugly head, with its long, pikey look, and square level under-jaw, as often as not overlapping the upper, and giving him the "smug" appearance of an attenuated tench or surly carp "reconcentradoed" to a shadow, rather prejudices his claim to the added glory of being also described as handsome. An Irishman might say, "Cut off his head and is he not an illigant beauty?" but I prefer not to indulge in such a Gordian-knot style of piscine aestheticism; and will content myself with calling the fontinalis a fish with a beautiful body and an ugly head, like the veiled prophet of Moore's poem. When he rises he either gleams a bright silvery white dashed with green, or flashes back the sunlight in wave rings of pale whirling red, the difference of the hue of his rise depending upon the light and to some extent upon the colouring of the fish, which varies with the bottom, though not in the same marked degree as does the colouring of our native trout. For the rest he is a pretty fish of light green and grey, flecked with rich red spots, while over him all is that suggestiveness of burnished dull metal, to use a contradiction in terms, which is the badge of all his tribe. He attains a large weight (many pounds) speedily, and is essentially, in this country at least, a fish only suited for lakes, reservoirs, and ponds, for in British rivers he has hitherto proved and is likely to continue to prove a failure.

The friends of the fontinalis do not, I think, desire to place the fish on the same pedestal as the common trout or the rainbow, but it may safely be said of this foreign char that he is a game, sporting, and free-rising fish† well worthy of cultivation, and of the attention of the angler

* I have killed over 100 fontinalis with the fly in a day in an English lake.

† When the fontinalis grows thus large, he ceases like all big fish of the non-migratory "salmon kind" to rise. His strong jaws and big head argue descent from a race that has indulged in predatory habits. The recrudescence of this hereditary trait will be conditioned by his environment.

in suitable waters, to wit, lakes and ponds that are not so well adapted for ordinary trout. Further than that, as a prudent man, not ashamed to confess the present imperfect state of my knowledge, I do not venture to go in praise of the fontinalis.

We can, in the meantime, afford to ignore the other varieties of foreign sporting fish that may yet find a home in British waters and a warm place in the hearts of British sportsmen. If I am to judge, as already stated, from certain letters I have received, while these pages were in the press, from Highland landlords who have stocked some of their lakes with rainbow and fontinalis, the results are eminently satisfactory in so far as no complaint as to the lack of adaptability shown by the first of the two species has been made, and the complaints in the case of the fontinalis are due to defects in the homes provided, and not in the fish themselves. It may, therefore, be assumed that the fontinalis, that pretty, gamesome fish, whose main artistic defect is his somewhat ugly head, redeemed by his colouring of red-spotted, green-grey, lacking something of the variety of the parti-coloured trout, and the lordly rainbow, that fish of exquisite hues, of graceful form, dashing courage and superabundant activity, are destined to delight the hearts of anglers in certain Highland lakes and other waters of a similar nature, whether the former ever becomes a permanent denizen of our streams or the latter endures each dire inclemency to become the successor in sporting office of the "fickle flirting grayling," when October leaves are sere and the grip of winter is over all the land.

CHAPTER XIII.

Further Lessons of Lake-Land: Some Salmon and Sea-Trout Problems.

"Nature abhors a vacuum," facetiously interpreted is a phrase that does not apply to sea-trout and salmon in lakes in which, by a wise provision of nature environment, so far as it means food, does not appear to be a matter of moment to the migratory salmonidæ, though in certain of its other aspects, namely, the topographical and the sanitary, environment is of as much importance to salmon, sea-trout and bull-trout as it is to the most confirmed non-migratory trout acting in whole-souled defiance of the Shakespearian dictum "Home keeping youths have ever homely wits." I have used the phrase "by a wise provision of nature" advisedly, for it is to be supposed that we must now accept the dictum as true which our scientists have laid down, that if salmon, and ex hypothesi sea-trout, do feed in fresh water, nature has provided certain anatomical changes in their digestive organs, which practically render the mastication and swallowing of food a mere useless formality, a jaw exercise on Father William's plan that argues a dog-in-the-manger stomach. Now though the problem of salmon and fresh water feeding is a very ancient, it is also a very interesting, problem. This, therefore, must be my excuse for here dwelling very shortly upon it and stating one or two theories on the subject which, so far as I am aware, have never before been formulated. In the first place I presume that it is not disputed that salmon do feed in fresh water. If, however, proof were needed, a remarkable rise of salmon I once observed in an Islay river and chronicled in the "Field" at the time of its occurrence would, as that paper remarked in noting it, be sufficient in itself to disprove the statement that salmon never do feed in fresh water. I quote the following extract from the article referred to:—

"I had been lucky enough to obtain leave for one day on a fairly good West Highland river of the smaller class, but, as the stream had

been for weeks running clear and low, and crystal waters are more beautiful to the eye than calculated to satisfy the cacoethes, my title to fish seemed doomed to be as empty of advantage as the river of water. Two days, however, before "my day," down came the rain, and my spirits rose as the drops fell. One can get too much of even a good thing, and so it seemed likely to prove, for the river, when the morning of the auspicious day dawned, was in such a dirty and flooded condition, that angling with any hope of success seemed as vain a task as that of the builders on the plain of Shinar. Sadly I sat me down to dream of the death of kings of the salmon race; but ten o'clock saw my patience exhausted, and myself close by a long, still pool, in which I knew, from personal observation, that before the spate came, there were, at least, fifty-four salmon. The pool in question was about 100 yards long, and, in any ordinary flood, was too "dead" for fishing unless a strong breeze ruffled its surface. To-day the current was pacing its lazy way through it with many oily swirls, and there was a fair ripple; so, despite its discoloured condition, I determined to give it a trial. Suddenly I noticed salmon rising in all directions, like trout, and my spirit of heaviness vanished. The fish were apparently rising and feeding on the small flies swirling on the surface. My 12ft. rod up, I dropped my flies (a teal and red, and turkey and yellow) over a fish which was rising close by the bank at my feet; he came at once, but missed. However, the next cast I was fast, and after a merry bout of five minutes I landed a nice little fish of 6½lb. In his mouth was a ball of small flies. I was certainly excited, and whilst playing him wished I had as many arms as Briareus to wield fifty rods—the two hands for the pipes and one for the sword for which the Highland piper yearned would never have satisfied me—for fish were rising everywhere."

After chronicling the raising, hooking and landing of fish after fish and the escape of others, I then described how the "rise of salmon" came to an end. "I had been at the pool for only an hour, and a phenomenal day seemed in store for me, but just as my last victory was secured, the sun burst through the clouds and a rich gladness filled the air. The long trailing shadows through the woods; that indescribable sweetness of nature during the first hours of sunshine after rain; the green glories of the meadows; the autumn tints of russet that clothed the feet, and purple that crowned the summits of the distant hills, were

for once wasted in vain on me, for the rise of salmon was over for the day, and in the bright beams of the "all-seeing cycle of the sun," which, like a second Prometheus, I invoked to take pity on my woes, my efforts were only rewarded by a few sea and yellow trout of no great size, though that hour in the morning was worth many hours of profitless toil by unyielding pool and stream, and made me in my dreams struggle the livelong night with salmon so great and mighty that not even the wildest waking fancy could conceive their immensity."

This testimony, it will be observed, is quite unique. It raises no question of mere playfulness on the part of the salmon, no doubt as to taking the fly for a whim and so forth. The fish were feeding precisely as trout feed. Nay, more. During the rise I killed them with trout flies as fast as I could raise, hook and land them, the rise lasting for an hour and being terminated as stated by the sun bursting through a cloudy sky, routing the dense battalions that had obscured him and pouring his victorious rays on land and water.

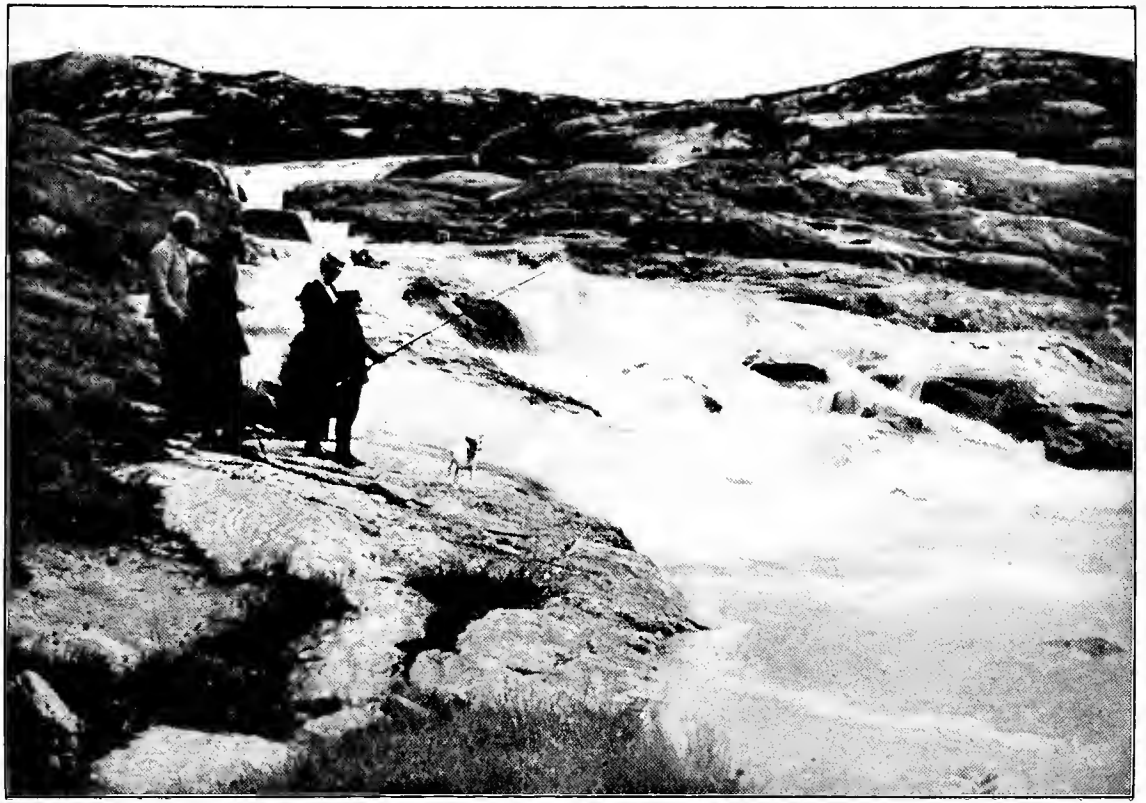
Without further supplementing this remarkable example, which many modern instances of similar, if not identical, occurrence prove to be no exception to any rule, I may, in stating my theory of salmon and fresh water feeding, enunciate as a preliminary the broad principle that the salmon is, as a rule, not only under no pressing necessity to feed, but also is scarcely tempted to feed when in fresh water, particularly when in rivers, for the niggard table spread on the bed of streams or carried down as a running feast on their currents, must after the thrice glorious feasts, the incomparably rich banquets of the teeming and kindly deep appear to salmo salar as prison fare on a deal board. One cannot wonder, to put the same idea in another way, at him scorning the crumbs that fall from the table of a river Lazarus, when he has been an honoured guest and eaten of the fat, and drunk of the strong salt wash at the table of a marine Dives, companion at cup and board to Neptune himself.

Presuming that those digestive changes which really amount to a closing of the orifice of the stomach, though strictly speaking, this is not quite what happens, we have here, read in the light of the "rise" just cited, a marvellous example of the economy of nature. To fully explain, however, what follows I would very briefly recur to a circumstance I have detailed at more length when dealing with "Fishing

as the Handmaiden of Science." In that chapter I referred to the feeding of barbel in winter and explained how I came to the conclusion that though the commonly accepted belief that the barbel did not feed in winter was in the main correct, yet that from the fact of the barbel and the lamprey frequenting the same kind of water at the same period of the year, the inference was permissible that barbel feed on lampreys.

This surmise, I pointed out was verified by experiments. I have mentioned the circumstance again because the analogy is extremely instructive in the matter of the problem of salmon feeding in fresh water. It suggests that the salmon though not feeding regularly, may like the barbel not decline food placed in tempting or even tantalising juxtaposition to his nose, especially if the temperature of the water be calculated to make him "hungry." I have naturally read most carefully the report of the experts on the changes which occurred in the digestive organs indirectly, and in the alimentary canal directly, of certain salmon examined by them, and after comparing it with my own experience of the feeding habits of the fish, I have come to the conclusion that the facts do not prove that salmon do not feed in fresh water, but that nature has provided in her own inimitable way for the temporary disuse of organs which the circumstances of the situation do not render imperatively necessary for the salmon's safe survival during its sojourn in fresh water. I base my conclusion first of all on the general principle that nature is an ideal economist and never confers upon an organ what lawyers term a jus nudum, which may be physiologically interpreted as a function whose exercise would be a waste of energy. Salmon in fresh water have, as already pointed out, little to feed upon, compared with the boundless wealth of food borne for their delectation and fattening by the teeming sea. Therefore, says Nature, I will suspend the digestive organs and preserve them in the beauty of their perfect strength against that time in the sea when assimilation failing, a severe tax may be put upon their digestive and excretive powers.

Again, I argued, assimilation of food being the first law of sanitary digestion, the suggestion is irrestible that at no time in its life does that prince of assimilative digesters, the salmon, exercise the excretive function with the frequency and marked quantativeness of the gross-feeding but by no means so rapidly assimilative trout. I recall, in



HARRIS "SALMON RUN": HER 'PRENTICE HAND.

proof of this, that in few or none of the many salmon I have taken out of nets—not after meshing but after calmly swimming round the "house" of a stake net, has excrement been present, and I surmise, therefore, that it is to conserve the digestive and assimilative powers of the fish rather than to prevent it feeding in fresh water that nature suspends partially or wholly the function of the most imperious of all organs.

Falling back from this conclusion (and it is by no means based on a priori reasoning, though I have used the word surmise) on the facts of experience as well as of observation, what do I find? Precisely such instances of actual feeding as that to which I have already referred. More important, perhaps, than such cases and the commonplaces that salmon are taken with worm and prawn, known foods, both stationary and moving, is the analogy of trout and eels, fish that can endure, and are forced to endure, long periods of starvation.

It is, in fact, no usual thing for an eel to be long confined in an eel trap, when eels are scarce, awaiting without food a sufficient number of his fellows to make the lot worth sending to market. It is, moreover, not merely usual, but absolutely necessary to confine and starve trout for from ten days to three weeks, according to the weather and their condition, before dispatching them on a journey in fish cans. That animals can exist for long periods without food is also a commonplace of knowledge, and that they can store the energy that means life, as the camel, in a limited kind of way, stores water against the desert march is another matter of common knowledge.*

Nature, as I have said, is an ideal economist, and knowing that the salmon must necessarily for the purpose of propagating his species enter rivers where food is scarce, she has contrived means as part of her constructive economy whereby the fish can withstand the period of deprivation without losing that exciting cause towards assimilation called appetite, or if the phase be preferred, that sensational mnemonic impulse of habit which makes him occasionally feed, and what is more important rise with keen obsequiousness to the fly. The conclusion, therefore, is that the salmon, if he does not feed from necessity in fresh water, can claim no virtue by reason of his abstention, for his appetite and its display are merely conditions of environment arrested in their

*Strictly speaking the camel is not the travelling reservoir he is supposed to be.

action by the retroactive force of a temporarily suspended function, and the subtle mutual reaction of a mental impulse upon its material gratification. Nature alone understands the physiological mystery of this strange suspension of a function while the animal retains the instinct to gratify it, but surely nothing could better illustrate her beautiful balance than the conservation of an instinct by use to preserve a function from abuse against the day when that instinct must know its fullest activity, and the corporeal garrison must, after Dalgetty's plan, be provisioned against the state of siege and starvation of the river? Instead, therefore, of expressing surprise at the order of things, we should throw up our hands in wondering amazement at the simple wisdom of nature's masterly plan, based as it is on the conservation of energy principle, and an economic ideal such as man can only imitate, and can scarcely hope at present to initiate in solving certain social and sanitary problems that vex the public mind of to-day.

As a corollary to this theory of salmon and fresh water feeding—and the theory appears to me to reconcile the two schools of thought on the subject—I would point out that the salmon in lakes far more closely resembles the salmon in the sea, both as to food and space environment, and possibly temperature,* than does the salmon of the river. This resemblance of the lake-salmon to the sea-salmon will, of course, cease, pro tanto, when the lake is a small lake and one of inferior quality in the matter of food. The consequence of such a diminution in the space-quantity and the food-quality of a lake environment is a remarkable prima facie vindication of the accuracy of the general contention. It reduces the salmon in the matter of feeding habits to the same level as when in the river, for it is a truism of angling experience that, exceptis excipiendis, salmon in the small and poverty-stricken peaty tarns of the Western Islands rise with greater avidity to the fly than they do in any of the larger lakes of the mainland. Moreover they take, though not with the same avidity and in a far more limited number of lakes, the worm and are not, as a rule, partial to the prawn—which, by the way, I regard as a deadly bait through the suggestion of sensational memory—or the minnow.

On the larger lakes of the mainland and indeed in most lakes on the

* It is a known fact that salmon feed or at least "take" better in certain temperatures of water than in others.

mainland, it is the exception and not the rule, to find salmon rising with any degree of avidity to the fly, and in certain lakes there is not a recorded case of their having done so. Properly interpreted this theory contains what is, at the very least, a feasible explanation of a mystery which has long agitated the minds of anglers. From time immemorial the problem why salmon in Loch Tay and other lakes will take only the "phantom" or other spun lure and will not take the fly, has vexed the ingenuity of ingenious and accurate students of such questions. This "sea-suggestiveness" contains, as I have said, at the least, a possible solution. In the particular case of Loch Tay it works itself out with most plausible persuasiveness. Loch Tay is large and deep. Like many lakes of its class it affords feeding infinitely superior and more easily come by than do most Scottish salmon rivers. The salmon do not take the fly, but they do not disdain a very large phantom when brought under their notice—a phantom reminiscent of the dashing sprat, in fancy suggestive of the still more glorious herring, a fish which the salmon loves with such an intense stomachic passion that I have known him in the sea gobble up a piece of it on a flounder line and fall an ignominious victim. These same fish on their passage up the Tay would take the fly; when they leave the Tay and enter the River Dochart the habit is resumed, and when they enter Loch Dochart it is still in evidence, only Loch Dochart being a small sheet of water with not over rich feeding, the salmon take the same small flies that tempt them to their doom in Hebridean tarns.* Nor, in this connection, is it possible to ignore the strongly corroborative proof afforded by the pronounced partiality for the fly displayed by the salmon of Loch More, in Caithness-shire—a lake which may be called a very over-grown pool of the Thurso river and one which used to afford, and will yet again afford better sport amongst salmon to the fly than any loch on the mainland of Scotland. A few years ago when the Thurso was a better river than it is at present, and yielded a dozen salmon in a day to a single rod, Loch More during April, and certainly during May, was frequently equally prolific of sport. Indeed, so keen were the salmon frequenting Loch More for the fly, that the ordinary number of flies

* I state the problem in this aspect as it is usually stated. Up to their entry into Loch Tay, and as long as they are in Loch Tay, the salmon are Loch Tay fish.—Vide supra the chapter on "The Habits of the Salmonidæ in Lochs."

mounted for loch fishing, namely three, were occasionally used, and a case is on record of two salmon being hooked at one cast and finally landed. Now Loch More is a small, shallow loch nowhere more than nine feet deep when in its best fishing condition, and is, therefore, in every way the exact counterpart of all the small Hebridean lakes which afford the best sport amongst salmon to the fly. No evidence could be more emphatic, especially when read in the light of the fact that other larger and deeper lakes in the same district frequented by salmon, such as Loch Naver, yield sport only to "spun" lures.

That there is something more than mere plausible theorising in the suggested inference from these facts goes, I venture to think, without saying, but that the theory advanced exhausts the whole truth I do not pretend. It, at least, illustrates one way, and that a most important way in which enviroment affects the salmon.*Whether it applies to sea-trout is another matter. In fact it may be said that it does not apply to sea-trout, as will appear from the conclusions I will shortly draw from certain sea-trout problems I am about to state, and to attempt to answer.

It has always struck me as a somewhat singular, but not wholly inexplicable circumstance that while a very great deal of attention has been given to and much ingenuity and labour have been expended upon salmon problems, but little energy of a similar kind has been devoted to inquiring into the haunts, habits, life-history and utility in the world of fish economics of the sea-trout. The reason of this neglect, possibly more apparent than real, is two-fold. It has been assumed that in the solving of the mysteries of the salmon is contained the solution of the mysteries of the sea-trout, while it has been taken for granted that if the interest of the salmon are regarded, then ipso facto, those of the sea-trout are rendered secure. Neither premise is wholly wrong. On the other hand neither is quite right; they are both half-truths. In their habits and life history the salmon and sea-trout have much in common, and up to a certain point and within the river or lake itself to which both migrate "from the sea," the interests of the two fish in the matter of environment, in the widest sense of the phrase,

* I have purposely refrained from enlarging upon how the temperature of such lochs, possibly approaching more closely the average temperature of the sea than does that of most rivers, may affect the salmon frequenting them. Our knowledge on the point is too indeterminate.

are practically identical. Their habits, however, diverge with the estuary while their environment, keeping in view the retroactive influence of life conditions on habits and of habits as qualifying through heredity the relative and not the absolute conditions of existence necessary, postulates certain requirements for the sea-trout with which the salmon can afford to dispense. It is by no means a mere wild conjecture, whether we regard the trout or the salmon as the first or last link in the short evolution of specific divergences in the salmonidæ, to assume that the salmon, sea-trout, bull trout, estuary trout, and common trout form a chain with the links in the order named, each species being evolved in terms of the theory of environment from conditions special to a series of ancestors and continued for a sufficient period of years to produce its species with its specific habits and specific characteristics whether of a structural or other kind.

I was some years ago forced to observe a very patent fact, namely, that in some districts the salmon and the sea-trout are set in a strange antagonism while a peculiarity of this apparent matching of mighty opposites was that the "baser nature," as represented by the bull trout, was permitted to pass between the fell incensed points with apparent immunity.

The general conclusion at which I was forced to arrive may be thus put in axiomatic form. Wherever the salmon is found in numbers and of a large size, the sea-trout is not numerous, or if numerous is not of a large size; the converse axiom is still more striking and is in the main much nearer the truth; wherever the sea-trout is large and numerous, the salmon is either not numerous, of if numerous, is of a small size.

There are, of course, many exceptions to both rules, but it is the lessons of localities approaching the possible life conditions of the primeval order which are on this point by far the most instructive and not the exceptions of which one could quote so many. Let me cite only two. In the river Laxford and in Loch Stack, both salmon and sea-trout attain to a large size; but the sea-trout rarely reach the high standard attained by the fish in those purely sea-trout localities which teach the lesson referred to. In the Tweed, again, monster sea-trout are from time to time killed; but in the Tweed, that is prcisely what one would expect.

It is to the Outer Hebrides, those strange islands whose land is ever

at war with water, into whose shores the deep has bitten far and left many gaping wounds washed by the salt tides, and into whose many basins the fresh water from a thousand springs has poured, until they are a strange medley of fresh water lake, salt sea and pools that are tributary to both—it is to these islands of estuaries, tidal lakes and salt water rivers that we must turn, if we would discover what appears to be the truth.

Now what are the conditions we find prevailing in these islands? In Harris, large sea-trout and small salmon exist side by side, notably in South Lacisdale, Lochs Scurst, and Voshmid; of the last two there is a tendency for salmon to prefer the one, and sea-trout the other. Thus, though Loch Voshmid is a good salmon loch, it is much better for enormous sea trout, which run heavier than the salmon, while Loch Scurst, again, is more affected by the salmon, and the sea-trout suffer thereby. South Loch Lacisdale is, however, equally good (though only a tarn of very small dimensions) for both kinds of fish, the sea-trout reaching, comparatively speaking, fabulous weights. In the Lews, again, sea-trout run very small, salmon having a most pronounced ascendancy while it is an exception for the sea-trout ever to approach the salmon in weight, low though the average weight of the latter fish may be. The results of the fishing in the Grimersta river for some seasons clearly show this to be the case. North Uist again ranks midway between South Uist and Harris so far as the commingling of salmon with sea-trout is concerned.

Salmon do ascend into various lochs in North Uist, but they are not nearly so numerous, nor do they run so heavy as the sea-trout, which seem to gain the mastery, or to have the field left to their undisputed possession, as we approach South Uist. That island shares the unique distinction with the Orkney and Shetland group of containing the only waters in this country of any angling importance entirely given over to the sea-trout; for though an occasional salmon may be killed in the lochs of these places, it is such an exceptional circumstance that it may be entirely overlooked. It has always appeared to be a singular and important fact that it is in South Uist, and in Orkney and Shetland, that the sea trout attains its largest size in this country—that is to say, it is in those islands that the greatest number of large sea-trout are found, and certainly by far the greatest number fall to rod and line. Some

curiosity on the point led me to investigate statistics so far as obtainable, and the result was as follows: In six seasons' fishing, the capture of sea-trout, by the comparatively few anglers out, in the somewhat limited sea-trout water attached to the Lochboisdale Hotel was 4,195. Of these 4,195 trout, no fewer than 259 were 3lbs. or over in weight, the average size of fish over that weight being 4½lbs. (nearly); their aggregate weight was 1,161¾lbs., while the largest trout weighed 10lbs. These fish, with one or two exceptions, were killed with the fly. The total number of alleged salmon captured during that period was only sixteen, averaging about 7lbs.; and I have very good grounds for thinking that these so-called salmon were in reality only bull trout, which had been "up" for a very long period. In a later season, during which 1,036 sea-trout were killed, the number of fish over 4lbs. was increased relatively to the statistics just quoted. A comparison of these figures with those of the Waterville river and lake in Ireland in a certain season during which they yielded respectively 3,257 sea-trout and 3,810 sea-trout and 736 salmon and 126 salmon, is instructive.

The largest sea-trout killed in the Waterville lake and river in that season was 4½lbs., while it may be pointed out that if the number of salmon killed in the lake, namely 126, seems small, it is because most of the salmon running up the Waterville river are killed at the weir, 736 falling up to July 15, and 3,810 sea-trout, so that both lake and river are "salmon and sea-trout" waters, and not sea-trout or salmon waters exclusively. In South Uist one fish in about sixteen killed reaches 4½lbs.; in Waterville lake and river one in 7,067 reaches 4½lbs. This seems to me to point to the conclusion that the one fish suffers, in size at least, if not in number, from the presence of the other. Why South Uist and Orkney and Shetland should be the exclusive possession of the sea-trout is a question more easily put than answered; but there can, as I hope to show, be no doubt that some very natural explanation exists. Mere volume of water has nothing apparently to do with it. If a 10lbs. or 12lbs. sea-trout, or even a 7lbs. or 8lbs. fish, can find ample scope in every way, the smaller class of salmon should certainly be able to do so also. The analogy of the co-existence of the two fish (the retention of comparative size supremacy by the sea-trout being understood) in certain of the Harris lochs darkens, rather than elucidates, the mystery. Further round the coast

of South Uist, salmon of the largest class regularly travel, and have been from time to time captured; but so far as I know they never ascend into the lochs.

There is here, therefore, a problem which, if incapable of a solution that will satisfy all students of fish, is not wholly insoluble if one is content to accept a theory, that is sufficiently reasoned to be something rather more than merely plausible.

We have from the Lews to South Uist as will be seen from the facts stated a gradual mastery of the salmon as we travel north, and of the sea-trout as we travel south, so that on the interesting battle field lying between the Butt of Lews and the Sound of Barra we have, if not an actual conflict, then the results of specific distribution that have followed specific war and for aught we know a specific pact. Possibly, however, environment has acted as a sort of arbitrator and solved by its more peaceful and less sharp, but none the less decisive methods, the mastery of those territories that might have been the cause of ceaseless war or the prize of its victorious waging. The latter alternative is certain the more instructive and to optimists who love the peaceful assertion of cosmic order, it is also by far the more acceptable.* In its physical aspects the Lews—and this applies also to Harris, is much less of a divergence from the normal or an approach towards the presumed primordial than are the more southerly islands, North Uist, Benbecula and South Uist. It seems possible, therefore, to find a more or less satisfactory solution of the problem in the differences in topographical environment. In Harris, for example, there are practically no tidal lochs save the Obbe, a sea pool which can only by courtesy be termed a true

* It is interesting to note that so far as South Lacisdale, Harris, is concerned a recent experiment, initiated by Lord Dunmore, seems to verify in the most complete and satisfactory manner the theory here advanced as the result of my personal study of Hebridian waters as formed by nature. Near the mouth of the tidal waters of the Lacisdale an artificial lake has been constructed in such a way that the old sea wall of rocks is one of its confining boundaries, while the loch is, strictly speaking, only fully tidal at the very highest tide. Up to this point—and the loch is about a year old and is called after the Earl of Dunmore's heir, Viscount Fincastle, V.C., who so distinguished himself on the Frontier—the sea-trout seem to have made the loch their own, to haunt it at all seasons of the year, and to have compelled the salmon to continue to seek the small tarn and deeper pools above, as they have done ever since the lake and the burn that connects it with the sea have had an angling history. The case is most instructive and intensely interesting for a topographical environment similar to those common in South Uist has been artificially created with a result similar to that produced by the natural topographical conditions prevailing in the more southerly island—the home of the sea-trout.

A SOUTH UIST SEA-TROUT "RUN."

[This semi-artificial ditch is tidal.]

tidal loch. On the other hand most of the roads connecting the lochs with the sea, if amazingly small and narrow paths for the crowds of ascending fish that throng them, are, nevertheless, in all cases, and most markedly so in some instances, examples of the true burn or river type of connecting effluent.* A picture of one of the Harris burns is here figured. It represents the short link which connects three lochs, known as the "Ladies Lochs" near Amdhuinnsuidh Castle, with the sea. Lady Farquhar figures in the picture, and the juvenile lady angler with the rod is essaying her 'prentice hand with the fly on the hundreds of salmon that must be running the flooded burn, if one is to draw any inference from the immense shoals of fish showing in the sea just below, but not, of course, visible in the picture. Now though all the Harris burns are not of this size, yet all are, with one or two exceptions, of this nature, and are larger streams than, and of a totally different character to the tidal ditches or tidal pools connecting the Uist sea-trout lochs with the sea. It is obvious, therefore, that the topographical character of South Uist differs from the topographical character of Harris to a degree sufficient in itself to account for the sea-trout preferring to make the lochs of the former an exclusive, the latter a joint, possession with the salmon. By way of contrast and of emphasising this truth two pictures of a South Uist tidal ditch are also figured.†

Moreover there are no common trout lakes of any note either in the Lews or in Harris—a fact, which in considering a problem of this nature, cannot be overlooked. Small trout are not "enemies of environment" to salmon, but allies of a humble but useful kind, when the right of might is considered in relation to the utilitarian aspect of environment. Moreover there are few or no tidal trout in Harris and the Lews, if only because the physical conditions are not such as induce the evolution of that variety of the common trout. The principal point, however, to be remembered is that salmon and sea-trout ascend rivers both in Harris and in the Lews and are not tide-carried, at least to the same degree as are the migratory trout of North and South Uist.

*A similar remark applies to the Inner in Jura. The first time I visited that connecting link between the sea and Loch Knockbreac—a fair salmon lake—I stood on its banks and asked "were the river was"? It was hidden by high heather and one might easily have stept across it at places.

† The tidal pools and estuary of Loch-na-Bharp in South Uist might perhaps have better illustrated the estuary habits of the sea-trout, though they would not have shown so clearly the differences in topographical environment.

To the lochs and connecting estuaries of North Uist, South Uist and Benbecula, on the other hand, the road is as free to the sea-trout in most cases from the sea to the loch, as it is from the loch to the sea to the loch trout. Nay more. For this very reason there is a constant suggestion of the sea borne in upon the loch trout by each rising tide while each ebbing flow from the loch carries to the sea-trout an invitation writ in the fair round hand of nature to visit the loch above. In North Uist this exchange of suggestive force is less pronounced than in Benbecula and South Uist, and we have seen that the mastery of the sea-trout proportionately corresponds to the degree of the difference. The inference appears to me to be irresistible. The sea-trout is essentially an estuary fish—and this fact alone in the case of polluted estuaries differentiates his interests from those of the ocean-ranging salmon—coming and going with its tides, sweeping up with a great and frolicsome joy when the green and swirling water brings back to parched weed and thirsty whelk, greeting its advent with a hissing kiss of love, the generous moisture that is their life, now pushing on through the gateways of the loch, now halting at its portals to turn with the turning tide but where he can—and in the chosen land of saltwater rivers and lakes that are vassal to old ocean the power is a possession for ever—ever maintaining his character as an estuary fish. Nor does he lack stout allies, the allies of a common birthplace and ancestry in holding this chosen home of his race against his greater kindred by descent, the lordly salmon. The estuary trout, fewer in number than his own silver clad warriors vie with him as brethren-in-arms, but rivals in renown. Both increase in size and number by the ideal conditions of existence that have made them the fish they are, until the salmon, conquered as much by nature and the great law of environment as by force of arms, have abandoned the field on grounds that are expedient in relation to their own interests and cosmic in relation to the physical order.

In the matter of the evolution of the species of salmonidæ, the facts that have led to this explanation of the triumph of the sea-trout in South Uist are equally instructive. In the first place the salmon of all the Outer Hebrides are small fish—a circumstance which may either be attributed to a poverty in diet or what is the same thing, ex hypothesi, a more limited ocean range than the larger varieties of salmon cover. In either case assuming that the conditions of life in Hebridean waters

THE END OF A TIDAL DITCH, SOUTH UIST, AT LOW WATER.

[At high tide, their running "period," the sea-trout ascend through a drain pipe.—Vide Environment and Migration, p. 13—16.]

approach in their mixed character the primeval order, the relatively small size of the salmon, and the large size of the sea-trout indicate an extremely interesting assimilation in this direction as much the result of environment as is the structural differences which remain constant. When we add the connecting links, the bull trout and the estuary trout, both of which approximate to this level quality of size we get a chain of connected species, which read in the light of the conditions and whole circumstances of their existence, cannot for instructive pregnancy be excelled in the whole range of piscine being. My reasoning may be based on speculative premises, but they are speculations that have been borne in upon me by the Hebridean breezes. Often, as I have passed from lake to sea and from sea to salt-water river overcome by the mysteries of weird land and water, thoughts have come on the green tides, ideas have cleared the tangle and floated up from the limpid depths that seemed whole truths when fresh from the hand of nature, if idle speculations in the colder and more artificial air of the city where dwell the critics who do not feel the inspiration which the mysteries of fish life give to the student and to him alone who studies them in their very home and most ancient and secret places.