
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

<https://books.google.com>



F
GG49
70

HD WIDENER



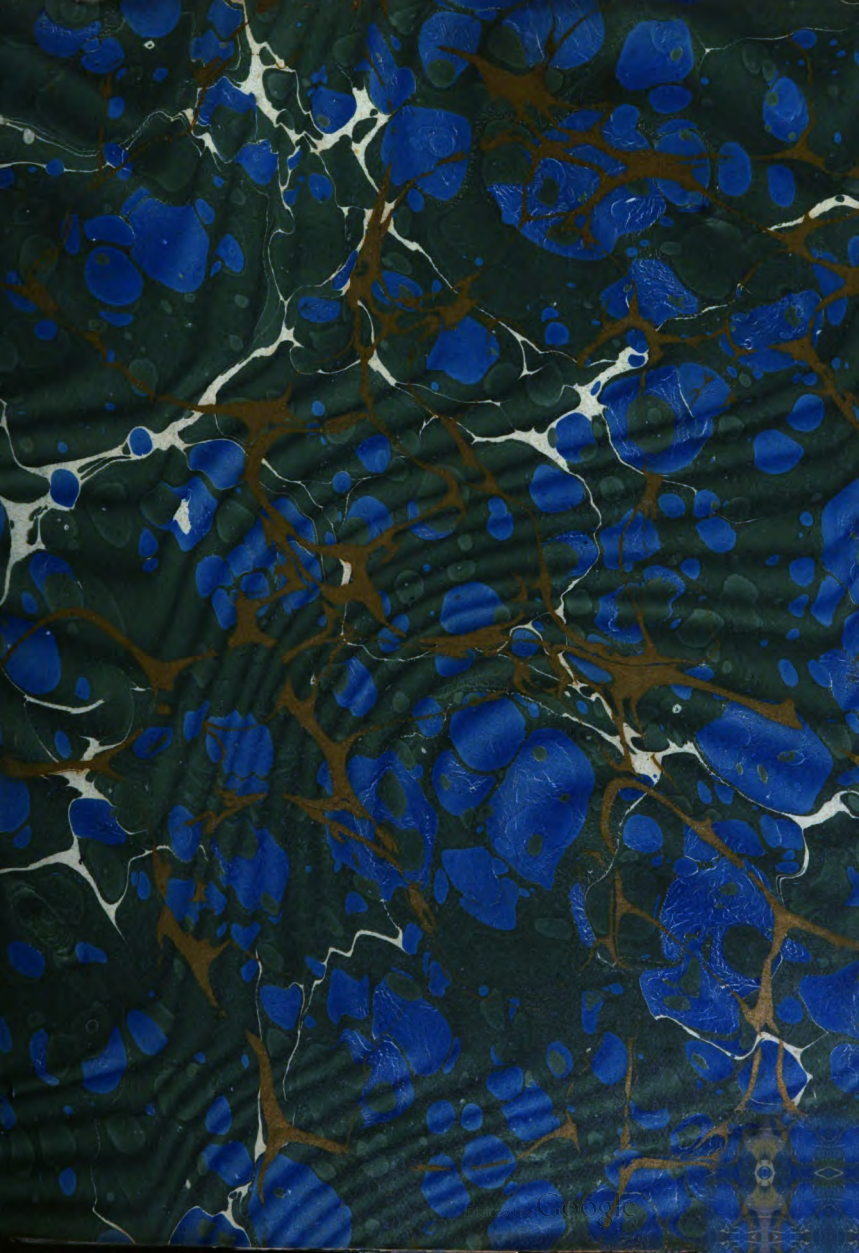
HW HU4Q /

WISH VS THE WIND SOUTH.



DANIEL B. FEARING
NEWPORT R. I.

52-5-317 1899



Catalogued.
Oct 4. 1900.
R.B.F.

cat. m. l. Jc. 1911

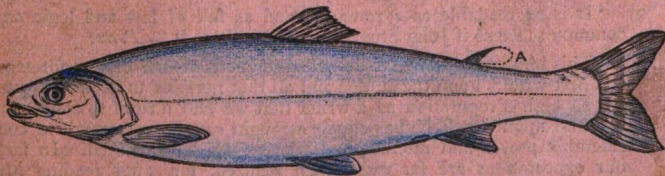
Pisc.

The Stormontfield
Piscicultural Experiments.

1853-1866.

BY ROBERT BUIST,

*Superintendent of the Experiments, and formerly Superintendent of the
Protection of the Tay Salmon Fisheries.*



A.--THE DEAD FIN CUT.

EDINBURGH:
EDMONSTON AND DOUGLAS.
1866.

THE SALMON:

Its History, Position, and Prospects.

By ALEX. RUSSEL.

CONTENTS :—

- I. VALUE OF THE SALMON.
- II. NATURAL HISTORY OF THE SALMON.
- III. DECAY OF SALMON.
- IV. SALMON LEGISLATION.
- V. FUTURE SALMON LEGISLATION.
- VI. NON-LEGISLATIVE REMEDIES.

In One Vol. Demy 8vo. 7s. 6d.

‘Every one who is interested in salmon—and who is not?—should read this capital book. In rather less than 250 pages of clear type, and very lively writing, Mr. Russel has given us more information about the natural history of the salmon, the antiquities of salmon literature, the causes of the late decrease in the breed, the legislative remedies adopted and their merits, with suggestions for future legislation on the subject, than can be found anywhere else. The book is also singularly free from the empirical theories, fabulous facts, and (as Mr. Russel too truly calls it) nonsense, which unhappily have formed, till very lately, the staple of the Bluebooks on the subject.

‘He is, moreover, a person entirely qualified in every respect for the work he has undertaken. He is a veteran writer, the editor of the *Scotsman*, a veteran angler, and is believed to have had a leading share, in company with the Duke of Roxburghe and the present Lord Advocate, in the recent amendment of the Scottish fishing laws.’—*Saturday Review*.

‘It is as readable as a romance, and as full of law and logic and common sense as if John Stuart Mill had written it.’—*Press*.

‘This important work is the greatest effort of one of our foremost and best writers upon the salmon and all that pertains to it. Mr. Russel has so high a reputation as a writer that we had a right to expect (on a theme upon which he has clearly wrought *con amore*) a work of considerable power and interest, and we are not disappointed. In fact, our expectations are far more than realized, for, after reading Mr. Russel’s work, we put down the book, feeling that there is really no more to be said on the subject, that the author has seen through every phase of every argument that bears upon it, and has fairly exhausted them. No book has ever yet appeared which so entirely and thoroughly deals with the subject. We most strongly commend its perusal to all our readers, of whatever section, who are interested in the salmon. The general reader need fear no dry polemics and weary wading, for the book, though on a special subject, is written in such a pleasant and lucid manner that the public at large can hardly fail to be deeply interested in its perusal.’—*Field*.

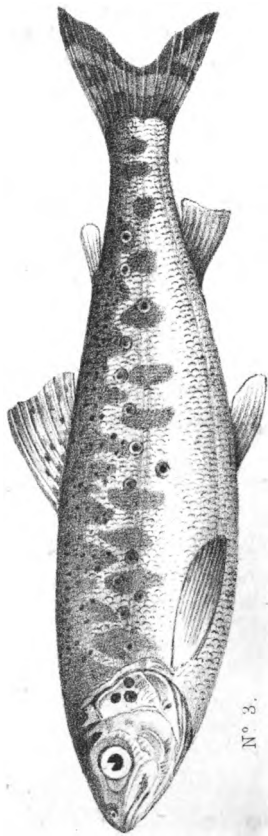
EDMONSTON & DOUGLAS, 88, PRINCES STREET, EDINBURGH.



N° 1.



N° 2.



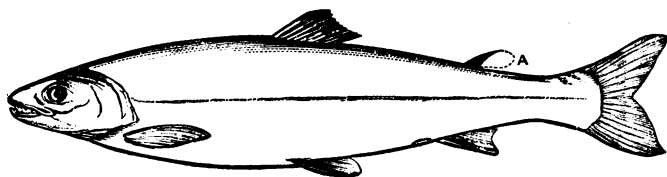
N° 3.

Nos 1 & 2 were spawned between the 14th November & 20th December 1865 & were hatched between the 20th March & 20th April 1866.
N° 3 spawned in November or December 1864 & hatched in March 1865.

WALTON & BELL, LITHOGRAPHERS, EDIN^g.

THE STORMONTFIELD
PISCICULTURAL EXPERIMENTS.

1853-1866.



A.—THE DEAD FIN CUT.

BY ROBERT BUIST,

*Superintendent of the Experiments, and formerly Superintendent of the
Protection of the Tay Salmon Fisheries.*

EDINBURGH:
EDMONSTON AND DOUGLAS.
1866.

F. G. 4 3. 110

**HARVARD COLLEGE LIBRARY
GIFT OF
DANIEL B. FEARING
30 JUNE 1915**

Edinburgh: Printed by Thomas Constable,

FOR

EDMONSTON AND DOUGLAS.

LONDON, HAMILTON, ADAMS, AND CO.
CAMBRIDGE, MACMILLAN AND CO.
DUBLIN, M'GLASHAN AND GILL.
GLASGOW, JAMES MACLEHOSE.

THE STORMONTFIELD PISCICULTURAL EXPERIMENTS.

IT was in 1853 that the Stormontfield operations, or rather experiments, were commenced. They should, I think, be termed experiments merely, because what has been done has scarcely been on such a scale as would justify the appropriation of a more pretentious title. Looking to the great extent of the river Tay and its tributaries as the field on which it is intended to operate, the Stormontfield undertaking has hitherto appeared as but a speck; as only about an acre of ground has been occupied by our breeding-boxes, canals, and feeding-ponds,¹ and even this limited area is only now beginning to be taken up fully. Up to the year 1864 we had no more than one feeding or rearing pond. This prevented us spawning the fish oftener than once in two years, as we discovered that only one-half of our brood of fish went off in about fifteen months after spawning, or thirteen months after the eggs were hatched; so that the half of the fry which remained would have devoured the young of the following year, which, had we spawned yearly, we would have been obliged to turn into the feeding-pond amongst them. In such circumstances we were necessitated to spawn only once in the two years. There was also another difficulty with which we had all along to

¹ See Appendix A.

4 *The Stormontfield Piscicultural Experiments.*

contend, namely, the uncertainty of procuring eggs to fill the hatching-boxes ; for sometimes there was an actual want of ripe fish, and sometimes heavy floods on the Tay carried forward the salmon from their usual breeding-grounds. These difficulties, however, are now in a fair way of being removed. In the first place, a fine large, additional feeding-pond has been constructed this season (1864), and the old breeding or hatching boxes have been removed, and larger and more convenient ones are now ready for the reception of the eggs. In the second place, the Earl of Mansfield, who kindly granted the piece of ground originally required, and who has hitherto taken great interest in the experiments, has given leave to insert small fences or gratings into the lade supplying the water to the ponds, which will enable us to retain a number of salmon there till they are ripe for manipulation, and that without in the least obstructing the run of the lade. It is, therefore, to be hoped that the undertaking will now be prosecuted under far more favourable circumstances than ever it was before.

The propriety of attempting salmon propagation by artificial means, in this quarter, was first suggested by Lord Gray, who being in France had seen experiments of this nature going on there, under the auspices of the French Government, and the personal superintendence of M. Coste, Professor of Natural History in the National Institute of France. Dr. Esdaile of Calcutta was in Perth about the same time, and wrote a letter to the local newspapers on the subject, suggesting that the proprietors of the Tay fishings should try something of the kind. A general meeting of the proprietors was accordingly called for 19th July 1853, and it was numerously attended. It so happened that Thomas Ashworth, Esq., who had just begun similar operations on his fishings in Galway, Ireland, and also Professor Quekett, Resident Curator of the College of Surgeons, Lincoln's Inn

Fields, London, were present at this meeting, and stated their opinions and experiences. The meeting unanimously agreed that the experiment should be set on foot forthwith. A committee was appointed with sufficient powers; and the proprietors resolved to assess themselves for all expenses that should be incurred. I was appointed as one of the members of committee. Shortly afterwards I accompanied the committee, along with Mr. Ashworth and Dr. Quekett, to look out a proper site on the banks of the Tay for the proposed ponds; and a spot at Stormontfield, admirably situated for the peculiar ends in view, being fixed on, an able plan, prepared by Mr. P. D. Brown, civil engineer, Perth, was adopted, according to which the ground was immediately laid out to the best advantage. The works having proved to be on a scale too limited, have now been re-constructed by Mr. Ritchie, civil engineer, Perth, who has entered into the task with ability and hearty good-will, and there is every appearance of the various improvements being completed with success. To Lord Mansfield we are indebted for the use of the ground, for the deep interest he has manifested, and for the many valuable hints he has given as to the proper conducting of the undertaking.

As I held the office of Superintendent of the Tay at the time when the Stormontfield experiment commenced, the management of the ponds came into my hands, a duty with which I am still intrusted, though Mr. Gordon, chief-constable of the county, has now the superintendence of the police department of the river. I must confess that I entered into the experiment with the feelings of a sceptic, but seeing fact after fact developed directly in the teeth of all my previous prepossessions, I became an ardent disciple of the science of pisciculture. I saw the seed of salmon deposited in our boxes like peas sown in a garden, and I saw it come to life in like manner. With

feelings of delight, I traced the young fish from the egg to the smolt state. I saw them take their departure for the sea, and part of them return, during the same season, as grilses. But it would be superfluous to go further into matters of mere detail, as my friend, Mr. W. Brown of the Perth Academy, has published an excellent little work on the subject, to which I beg to refer.¹ During the progress of the experiment, much interest as to the results was excited amongst naturalists and parties connected with fisheries. The late lamented Prince Consort evinced a strong interest therein, and directed Professor Quekett to make preparations for him of our Stormontfield fish in all their stages, from the egg to the full-grown salmon taken with our mark upon it. For some time I was inundated with letters from all quarters of the three kingdoms, and also from the Continent of Europe, asking for information about the progress of the experiment. Finding that to answer them would entail a great loss of time, I adopted the easier and equally efficacious plan of answering them generally, by communications to the *Field* newspaper, under the *nom de plume* of 'PETER OF THE POOLS;' and the editor supplying me with slips of these, I forwarded a copy to each of my correspondents.

We may now take a retrospective glance of the years that have passed since our experiment was commenced, and of the light that has been cast on the natural history of the salmon. Till Mr. Shaw began his experiments at the Duke of Buccleuch's seat at Drumlanrig, the darkness that prevailed on the natural history of the salmon was astonishing, considering that the fish had been under our eyes for hundreds of years as a source of national wealth. The experiments of Mr. Shaw created a spirit of inquiry in the country which was

¹ *The Natural History of the Salmon as ascertained by the Recent Experiments at Stormontfield on the Tay.* Glasgow, 1862.

very much needed; and they, as well as our own at Stormontfield, have satisfactorily shown that man may as successfully cultivate the waters as he cultivates the land. To leave everything to the operations of nature, as some philosophers contend, is just about as reasonable as to say that we ought to leave our fields to sow themselves. Such a doctrine is utterly unworthy of these days of stupendous progress in science and art. So far back as 1832, I wrote a paper in the *Quarterly Journal of Agriculture* in answer to one by James Hogg, the Ettrick Shepherd, in which he propounded the novel and startling doctrine that the parr was the young of the salmon, and that consequently it was most prejudicial to the rivers to allow so many young salmon, under the name of parrs, to be destroyed. Unable to adopt such a view of the question, I took up the popular dogma that the parr was a distinct fish by itself, and in proof of this assumption argued that the parr was a little, hardy, complete fish, having no visible affinity to the salmon; whereas, on the other hand, the young salmon or smolt was a tender, delicate fish, bred in the month of March, and going down to the sea in May following. In further proof, I stated the curious fact that, in the month of November that year, a male parr was brought to me with the milt flowing from it. The sentiments which I then entertained were just in accordance with the general opinion of the day, but the discoveries noticed above have shown that the Shepherd was right, and that I, and nearly all the world besides, were wrong. That very instance which I adduced of the parr with the milt flowing from it, has, by the recent experiments, proved the identity of the parr with the salmon. The parr in question was really a young salmon of the second year, which had not then gone to the sea. At Stormontfield we have repeatedly seen a young salmon which remained in the rearing-pond till the time of migra-

tion in the second year, though only the size of a man's finger, get into such a state of milt in the salmon-breeding season, that we have impregnated the eggs of full-grown salmon with it, and thereby produced young fish. Such is not the case with the sister fish of the second year in the pond, as not even the rudiments of roe can be traced in them. This fact shows incontestably the great benefit that may be gained by the strict preservation of the parr, as previous to this discovery it was taken in thousands in small-mesh nets in some salmon rivers in England, from which both salmon and parr have now entirely disappeared.

The amount of good derived by the Tay fisheries from the Stormontfield undertaking cannot be estimated. Probably, from the small extent of our operations hitherto, the benefit obtained cannot be presumed to bulk largely in a commercial point of view. But this is a very striking coincidence, that since the commencement of the experiment, and the shortening of the period for net-fishing—both of which events were contemporaneous,—the rents have progressively increased from about £8000 per annum to £16,000. I am certainly much gratified to find such results from the doctrine, which I persistently advocated from year to year, of the destructive character of the Act of 1828 as regarded fishing from 26th August to 14th September, whereby more breeding fish were destroyed *legally* than by all the poachers put together. Protection of the fishings was of comparatively little use until the old close-time, beginning 26th August, was restored,—first voluntarily by a majority of the Tay proprietors in 1853, and afterwards by the Tay Act, 1858.

I shall now give an account of the proceedings at the Stormontfield ponds from 1861 to 1864.

In 1861 no orders were given as to the filling of the breeding-boxes till the annual meeting of the proprietors in

November. From the middle of that month to the end of December the Tay ran so high with spate that no fish could be got for spawning. The greater proportion of the fish were led up the Almond, and the remainder up the Tay, so that no supplies could be obtained from the ford at the junction of the Tay and Almond to which we were accustomed to resort, in consequence of which state of things the spawning for that year turned out an almost total failure.

In 1862, however, we were more fortunate. We began taking the fish on 11th November, and continued to do so till 2d December. During that period we netted 119 salmon and 231 grilses, out of which number we obtained 18 salmon and 22 grilses, male and female, ripe and fit for our purpose, and spawned from them 270,000 ova, which we safely planted in the boxes.

The young fish of this planting began to burst the egg on 12th March 1863, and were generally hatched in about 115 days after being deposited. From barrenness and other causes not above a fifth egg failed in producing living fish. The season was an open one, which had accelerated the hatching, whereas in former years it took an average of 130 days to bring the deposit to the same state. As mentioned before, the spawning of 1861 being a failure, there remained such a small produce of that season's breed in the feeding-pond, that it was resolved to turn the whole of it into the river as soon as the smolts gave indication of their strong natural instinct to proceed to the sea. Accordingly, the keeper of the works got instructions to report to me when the smolts had moved off, so that I might see the plug of the discharging pipe drawn, and the pond emptied, in order to the latter being cleaned out and repaired for the reception of a more plentiful crop. The intimation being given me, I, along with Mr. Brown of the Academy, Mr. Watson Lyall of the *Perthshire Journal*, and

Dr. Macintosh, then of Murray's Royal Asylum, now chief physician of the County Asylum at Murthly, a gentleman who has written a good deal in scientific journals on the structure of fishes, proceeded, on 24th May, to examine the state of matters at the ponds. On arriving there, we ordered the plug in the bottom of the feeding-pond to be withdrawn, that all the water and every fish in it might be run off. Mr. Brown, who is very neat-handed, selected 64 of the best grown smolts of the few that remained, and made a peculiar cutting in the dead fin of each, so that there might be no mistake as to the identity of the fish should they afterwards be caught as grilse or salmon. Of the smolts thus marked¹ on 24th May, the largest was about the size of a man's finger, yet on 16th August following, a grilse so marked, of 9 lbs. weight, was reported by Mr. Speedie, a large lessee of Tay fishings (to whom Mr. Brown had described his mark), as taken on one of his fishings; and on 20th August he reported another of 5 lbs. weight. Both fish were shown to Mr. Brown and myself, and declared by him to be undoubtedly of his marking. On 23d August a marked grilse of 3½ lbs. weight was caught; and on 26th August, the last day of the fishing season, there was another. On 19th September, twenty-five days after the nets were removed, Mr. Marshall, of Luncarty, caught by the fly a grilse of about 7 lbs. weight, and sent me a cut of the fish with the dead fin bearing the same mark. I have further to add, that on 9th July 1864, Mr. Speedie caught a salmon of 21 lbs. weight, and on the 10th another of 18 lbs., both of which bore Mr. Brown's mark; and on the latter date he likewise caught a salmon of 10 lbs. weight, which had the keeper's mark on it, namely, the dead fin entirely cut off. Whether these three fish had returned to the river as grilse in the season of 1862, or had been in the sea ever since they left the pond, we are unable to say; but at all events their

¹ See woodcut on title-page.

growth was astonishing. Another remarkable circumstance has transpired in connexion with the fish marked by Mr. Brown. When the men were hauling fish for spawning, on 12th November 1864, at the mouth of the Almond, in Mr. Brown's presence, a female fish, of about 12 lbs. weight, was caught, bearing his mark. This fish appeared to have spawned immediately previous to being taken. It is much to be regretted that, except Mr. Speedie, none of the tacksmen of the Tay have evinced any interest whatever in the progress of the experiment, all of them invariably abstaining from giving us notice when any fish of our marking chanced to come into their possession. But certainly it is an important and curious fact that so many of those sixty-four marked fish have been accounted for in the produce of about one-third of the entire fishings of the Tay.

About 10th May 1864 the first division of the crop of young fish of 1862 began to leave the pond as smolts, and the migration continued till about the 25th of the same month. As the new rearing-pond was only then in process of construction, the fish, whose instinct led them to go off for the sea, were allowed to depart through a pipe of pretty large diameter, as they could not go by the common course, which was taken up by the formation of the new pond, and on this account, moreover, they could not be marked. The smolts having thus moved off, the parrs still remained. There was a pretty large number of the latter, which were proposed to be transferred to the new pond as soon as it was ready. We intended that the newly-hatched fish of 1864 should be let into the old pond immediately on the former crop departing for the new one. When the newly-hatched fish were able to swim they were confined in the canals leading from the breeding-boxes until the old feeding-pond was ready for their reception. As soon, therefore, as the keeper thought the new pond ready he ran the parrs

into it; but unfortunately it turned out that this was done rather prematurely, the embankment not being then properly consolidated. Part of the embankment giving way, the water ran out, and we were obliged to allow the parrs to go off to the river, where they would be fully exposed to all their enemies. The keeper, however, had a pretty good excuse for what he did, as the newly-hatched fish, having their umbilical bags absorbed, were in a fine swimming state, and thousands had dropped down from the breeding-boxes to the canals, where they formed a tempting bait to sea-gulls, which were taking them in scores. As a specimen of the voracity of these gulls, I may mention that the keeper, having shot one of them, took out of its maw upwards of fifty of our young fish! Mr. Crockford of the *Field* newspaper, who was then on a visit to the ponds, had the gull stuffed, and exhibited it in the window of the *Field* Office, Strand, London. On another occasion the keeper trapped a hen gull with two young ones busily feeding in the stream leading from the ponds to the Tay; but none of our fish were found in these birds, as plenty of small eels were then ascending the river. This year (1866) a long-legged heron was seen stalking about among the fry and gobbling them up. The keeper got out his gun and brought him down on the rising. On dying he vomited upwards of 50 of our fry. What must the young fish in the river suffer by such depredators flying about in hundreds, and picking them up to feed their own young ones at that season?

I have much satisfaction in reporting on the present state of the new works at Stormontfield. The old breeding-boxes formed in 1853 having become totally rotten, have now been removed, and an entirely new set, on an improved plan, and of a more durable wood, erected under the able superintendence of Mr. Ritchie, civil engineer. By the new plan we shall have at least one-third more space for our

breeding operations. A plentiful supply of water has been let into our boxes by the re-touching of the filtering-pond, which is at the head of our works ; it contains a deep bed of gravel, from the bottom of which pipes rise and convey the water into the canals and hatching boxes. Thus mud, the seeds of other fish, and of insects, are prevented from getting into where the salmon eggs are deposited, or to the fry after they are hatched. The canals below have been much improved, and also the issue of water into the old and new ponds, through both of which a current is made to flow, in which the young fish delight, having ample room to play about, besides being well protected from all their enemies of river, earth, or air. Moreover, as mentioned above, we have got a space in the mill-lade shut in by gratings, in which we enclose a number of fish till they are perfectly ripe, when they are taken out, spawned, and returned to the river. This space we call the 'Lying-in Hospital,' because there the fish must remain till they are ripe for being spawned. In December 1864 we had in the 'Hospital' from 30 to 40 fish, the largest and finest of which, weighing from 20 lbs. to 30 lbs. each, we spawned there, obtaining 400,000 ova for the boxes—a far greater quantity than ever we had before. This adjunct to our works, if successful—and I have little doubt of its success,—will prove of the greatest advantage, as in place of our having so many men to employ in fishing till we get ripe fish, and hauling about 350 fish of which only 40 could be found fit for our purpose, we will, in future, have no more to do but to confine about 50, which can be got close by the establishment without our having to go miles for them. Altogether the Stormontfield works are now in a most satisfactory condition—the lade supplying the water, the breeding-boxes, and the feeding-ponds being models of their kind. I may be permitted to say that from what I observe,

parties who are attempting the artificial propagation of salmon on other rivers appear to be proceeding according to totally wrong principles. They seem to think that all is right if they bring the fry to the swimming state, and then they turn them into the river. But there the young fish will be exposed to a host of enemies, and I fear that few, indeed, ever get to sea at all. But the superiority of our mode of operations may be seen from the fact of so many of the 64 marked smolts being accounted for by about one-third of the Tay fishings.

In reference to the mode of marking the fish, it is well known that we tried various experiments, such as by fixing light silver wires in different parts of the smolts, and also by a slight perforation at the edge of the gill-cover, but that no such marks could trace the fish from the smolt to the grilse state. No wonder that wire, ring, and perforation marking failed, when we consider the rapid growth of the fish. The wires and rings must have been torn out in the weak state of the smolt, or been burst out as it rapidly grew into the grilse. So with the gill-cover perforation. Nature would fill it up, and, of course, it would become invisible in the grilse. The only other plan, therefore, which we could adopt was *excision*, and the only part that we could sever, with safety to the fish, was the dead fin, as the part of the body which we thought the fish could spare without injury, and which we have proved is not renewed. Accordingly we adopted excision, and have found it prove highly successful, as already recorded.

The Stormontfield experiment is certainly on a small scale at the best; but considerable good has already resulted from it. I have alluded to the light which has been thrown on the natural history of the salmon, and particularly to the discovery of the identity of parr and salmon, as a great step in advance of former ignorance. I might point to other

instances, but my present limits forbid. Since we began our experiments we have had to labour under many disadvantages; but now that we have got our works improved and extended, we have every reason to expect that the operations will tell beneficially, in after years, on the produce of the river. It is, I must repeat, a most absurd thing to say that Nature should be left to herself as regards the river. I was not a little astonished to find that the learned Dr. Gray propounded such a doctrine at the late meeting of the British Association in Bristol. From what I have read and studied, and from discoveries which I have made from actual experiment, I am thoroughly convinced that the science of pisciculture will yet become a most important and valuable pursuit, and that man, by the proper mode of cultivation, will increase the produce of the waters as he has done the produce of the land. We can already descry the dawn of another and better day. What has been done in France in regard to the increase of oysters and the cultivation of fish, will give a mighty impulse to the prosecution of pisciculture, and add to the food of mankind in an amazing degree. To show the fallacy of the learned doctor's theory, I shall shortly glance at the salmon when left to propagate in the natural state. First, let us turn our attention to the spawning-beds in the rivers. There we see the female fish working away at what is called the *redd*, and digging a trench to deposit her eggs. She is surrounded by two or three male fish, who fight with one another, and when the strongest gets near to her he has to fly away incessantly to drive off the others. At the same time a number of trouts hover around the bed, and at every movement of the female they snap up as many eggs as they can possibly catch, so much so that 700 or 800 eggs have been taken out of a trout's gullet in a morning. Thus, few of the eggs are impregnated; and from the loss of ova in this way, as

well as from their being scattered by spates, or left till they dry in shallows, it has been computed that scarcely one egg in a thousand, or even, as some say, in six thousand, ever comes to life. Other causes aid in producing this result. In the spring, previous to and immediately after the hatching of the eggs, you will see hosts of insects making sad havoc amongst them ; so that the calculation of only a single egg in a thousand coming to life must be held to be an ample enough allowance. When the young fish come to life and burst the shell, they lie in a helpless state for five or six weeks, during which water-beetles, shrimps, and other insects prey unceasingly upon them. After they get into a swimming state, they are devoured by fish of all kinds, and also by sea-gulls and other birds. In the next stage, as fine lively parrs, they are exposed to the ravages of pike, trout, eels, and even salmon themselves. From the stomach of a yellow-trout I have seen not fewer than ten full-grown parrs cut out—the specimen may be seen in the Perth Museum,—and we have cut parrs out of the stomachs of every one in a shoal of from 40 to 50 pike captured in a net. Such is a slight sketch of the sad perils which the young salmon have to encounter in a state of nature ; and hence, even allowing a female salmon to produce 12,000 eggs, the numbers of adult salmon taken in the river can scarcely be kept up. We thus see what an immense waste takes place in the river when fish breed in the natural way, and what a very great saving might be effected were artificial propagation, or, in one word, pisciculture, fully adopted. That science is still in its infancy ; but were it prosecuted by men of genius it would prove of incalculable advantage to the country, by producing as a wholesome diet to the general population what is now an exclusive luxury to the rich.

The fall of an apple from a tree, and the raising of a tea-kettle lid by the steam of boiling water, gave hints which,

on being followed out, eventually produced the mighty discoveries of a Newton and a Watt. So in the science now before us, the sperm of an oyster floating about and fixing on a stake in the sea, gave a hint to a French philosopher, who, following it out, has created a considerable branch of public revenue. One field of operation in that line is producing a revenue of £80,000 sterling per annum, and other fields are rising in other quarters of the country. Such cheering results have naturally turned the attention of the French Government to the cultivation of all sorts of fish, the salmon among the rest. The department of pisciculture has been committed to the care of M. Coste, Professor of Natural History in the Institute of France, and M. Coumes, Chief Engineer of the Rhine, and Director of Pisciculture under the French Government. I had the honour of meeting both gentlemen here at different times, and spending two days with each in conferences on the subject, and in visiting our Stormontfield establishment. They both expressed their satisfaction with what we were doing, and had not the slightest doubt of our ultimate success in largely increasing the produce of our river.

I have also had the benefit of the experience of my much-respected friend, Mr. Ashworth of the Galway Fisheries, who has energetically followed out the policy which I have advocated for many years, namely, a lengthened close-time, artificial propagation, and the removal of all obstructions to the salmon making their way to the upper streams and tributaries of a salmon river. In this policy he has been most successful, having increased the rental of his river more than tenfold in the course of as many years. Another gentleman in Ireland, the late Mr. Cooper, of Markree Castle, M.P. for the county of Sligo, formerly a correspondent of mine, pursued the same course with success. By removing obstructions, and blowing up rocks

adjoining the sea, he admitted salmon into several of his rivers, creating valuable salmon-fisheries where not even a single salmon had been seen before. Previous to his death he derived considerable revenue from the fisheries, to which he had got the sole right confirmed to him by Act of Parliament.

Such are the benefits which may be obtained from assisting nature in giving forth her abundant supply of food for mankind.

I do not here enter into details concerning the course of legislation for the Tay. The voluntary agreement between the majority of the proprietors for closing the fishing on 26th August, and the institution of the Stormontfield experiment, were simultaneous. The two measures, acting together, seem to have been attended with the best results, as the rents began to rise, and continued to do so every year. But it is somewhat strange that several of the minority of lower proprietors, who would neither cease net-fishing on 26th August during the currency of the agreement, nor subscribe towards the construction and maintenance of the Stormontfield Works, have reaped more benefit from the Tay Act, in proportion, than any other proprietors on the river. Thus, in 1852, Lord Zetland's fishings produced only £100 of rent, and have since progressively risen, till they were let at £667. In 1852, Mugdrum fishings produced £293 of rent, and are now leased at £1150. But taking the whole Tay fishings together, the rental has progressively increased from £7973 in 1852 to £14,080 in 1862, and in 1865 to £17,618; thus having more than doubled since the lengthening of the close-time in force previous to 1853, and the establishment of the Stormontfield works. I think it but justice to state here, that Sir John Richardson of Pitfour, who has very valuable fishings in the lower part of the river, heartily joined in, and cheerfully contributed his

share to the Stormontfield experiments, although his neighbouring proprietors refused to do so; and also, when they would not give up their net fishing on 26th August he did so, and abstained from fishing while the adjacent fishings were making large profits by his forbearance.

Sir John was also a most active promoter of the Tay Act, which shut the river on 26th August in place of 14th September, and it must be a pleasing thing for him to view the fruits of such measures.

These are facts, deduce from them what conclusions you may. Some parties may allege that the rapid carriage to market by railway has done much to increase the rental. This, indeed, may be an element in the question, but certainly not to a large extent. The railway carriage was in existence for years previous to 1852, and yet the rental was gradually going down. No other river in Scotland, with railway facilities, has improved in anything like the ratio of the Tay, though some, it is admitted, found the benefit of early closing previous to the last Act of Parliament regulating the Scottish Fisheries,—such as the Spey, belonging to the Duke of Richmond, and the rivers running into the Dornoch Firth, belonging to the Duke of Sutherland.

Before concluding this part of my paper, I may be allowed to notice the excellent locality of our field of operations as regards the easy and safe transit of our fry to the sea. The works are situated about five miles from the head of the tideway, and from thence to about twelve miles downwards the fry get, as it were, prepared for residing in the sea, and their feeding-ground, where they grow at such an amazing rate. When the strong instinct comes on them for departure from the pond, they seem to be seized with an extraordinary impulse, and from what the keeper states, they muster in divisions, which go off daily. They first swim round the pond, and then dart over the edge of it

into the trough which leads them to the river. We have an artificial tank, where part of them are retained for the purpose of marking, and there every day a number of them may be obtained by the shutting of a sluice. After they are allowed to get to the river, the same instinct leads them to go directly downwards to their destination. In the first place, they have the five miles of the natural run of the river before they catch the tide, which at its ebb takes them quickly down to meet the salt water,—thus, as it were, acclimatizing them for their residence in the sea. On reaching the salt water they seem to disappear, as was proved in the ‘Great Stake-Net Case,’ wherein it was alleged by the upper proprietors that they were killed by myriads in stake-nets. This, however, was found not to be the case, as numbers of men were employed to fish that part of the river with small-mesh nets, but few or no smolts were got. It is a remarkable fact that the new silvery scales of the smolts form, as it were, an armour against the effects of the salt water; and though apparently a much softer and less hardy fish than the parrs which remain, the smolts live and thrive when once they get to the sea. On the other hand, the more hardy parr, when put into sea-water, changes its appearance, and speedily dies. My friend Mr. Brown has tried that experiment with the parrs by placing them at once in sea-water, where they at first became restless, as if suffering pain, changed their colour, languished, and died. This accounts for why they remain in the pond while their contemporaries show such a strong desire to leave for the sea; and it has been found that if kept in a pond whence there was no egress, the smolts would throw themselves out of the water, and die on the banks. As has been said above, the door is at all times open for them to leave the feeding-pond; but until the sea-instinct comes upon them, not one will of itself depart. Thus man has the fish completely

under his eye, to observe and watch over them till they leave for the sea, where, from being out of his sight, he has not traced as yet the great change that takes place on them in their new habitation. But it is not thought that that habitation is far away. From certain glimpses which I have obtained, they probably go no farther than Lunan Bay, near Montrose, where I have received from strangers (who did not give their names, but who appeared to be connected with the fishings there) specimens of our marked smolts growing into grilse. From that locality, also, a number of the late Duke of Athole's marked salmon have been got; and from having many years ago fishings in that quarter, I have observed that the salmon taken there more resembled those of the Tay than did the South Esk fish, a river almost close at hand.

There is another circumstance in connexion with the question of railway conveyance to which I may allude. Towards the end of August 1863, in consequence of a great spate in the Tay, an immense run of fish took place from the lower to the upper waters, and many hundreds were captured between Perth and the Linn of Campsie. Such an occurrence takes place very seldom, and on looking back through my books, I could find nothing similar to it since 1835, when I held both sides of the Linn of Campsie, and the two fishings at the Muirton, upon all which four stations 539 salmon and grilse were captured in three or four days, which were fully as many as were got in 1863, during the same space of time and about the same dates. On comparing notes, I find that I obtained better prices in 1835 than were obtained in 1863; a fact which shows pretty decisively that railway conveyance has not been of such importance to the fishings as some hold out.

And now to conclude. The works at Stormontfield are at length placed in a position whereby fair scope will be

given to our operations, and the fruits of our attempt to improve the fishings be more clearly seen. After the expenses of the new works are defrayed, the annual outlay will not be higher than it was before, and the matter of from £70 to £100 will be sufficient for carrying out all the purposes required. Fortunately, the new Act authorizes a general assessment, which, however, is but a mere trifle when levied on a rental of £17,000, and which rental I have no doubt our improved works will tend materially to increase in after years. Finally, from the experience of upwards of fifty-five years on the Tay, and several years on other rivers, I would strongly recommend to all proprietors of salmon-fisheries to follow the example now set by the Tay proprietors in regard to pisciculture, the outlay being trivial, and the benefits that may ultimately accrue being very great.

While recommending to others to try such operations as at Stormontfield, I would urge them to do so to a much greater extent where ova could easily be got. We have acted merely as pioneers in this undertaking, which has so far proved successful, but to carry it out with complete success would require a much larger field than ours at Stormontfield; and I have no doubt that in the course of time we shall have millions in place of thousands of eggs planted there, and, of course, our works enlarged more extensively in proportion for the purpose. The French have many acres devoted to the culture of fish, while we, as stated above, have only half an acre, and we have such a command of breeding fish in the Tay, that we could supply our wants to a much greater extent in the propagation of salmon than at present, having yet nearly three acres unoccupied.

Our countrymen in Tasmania have entered heartily into the experiment, and laid out a great deal of money in obtaining eggs from Scotland for the rivers in that country, and they have now got the produce the length of smolts.

The authorities there are taking measures for giving the young fish safe access to the sea, from whence, if they return as grilse to the rivers, the salmon will have passed the Rubicon, and will become 'monarch of the tide' in Tasmania, as it has done in its parent rivers in Great Britain.

In 1864 we began our operations in spawning on 8th November. It proved a wet season, and the rivers swelled so much, that if we had been without any other resource, we could not nearly have supplied our wants from the usual place; but by collecting a number of female salmon, which were not nearly ripe for spawning, and putting them and a few males into the 'hospital' named before, we were enabled to fill all our boxes with upwards of 400,000 eggs.

What has already been written applies to the operations at Stormontfield during 1863 and 1864. I shall now proceed to give a short sketch of what has taken place in 1865 and 1866.

In 1865 we began our artificial spawning on 14th November. We got plenty of fish, and on the first day we landed 70 salmon, upwards of 60 of which were males, and apparently ready to spawn. We only found 1 female salmon and 7 female grilse fit for our purpose, and out of their produce we filled 50 boxes. From 14th November to 20th December we got, from time to time, as many as filled our boxes till the last 24, which we supplied from our reserve in the lade, noticed above as the 'Hospital.' Each of our boxes contained upwards of 1000 eggs, so that in the 370 boxes we had upwards of 400,000 eggs. Making full allowance for barren eggs, young fish dying in the birth, and other casualties, four-fifths of the ova planted came into life.

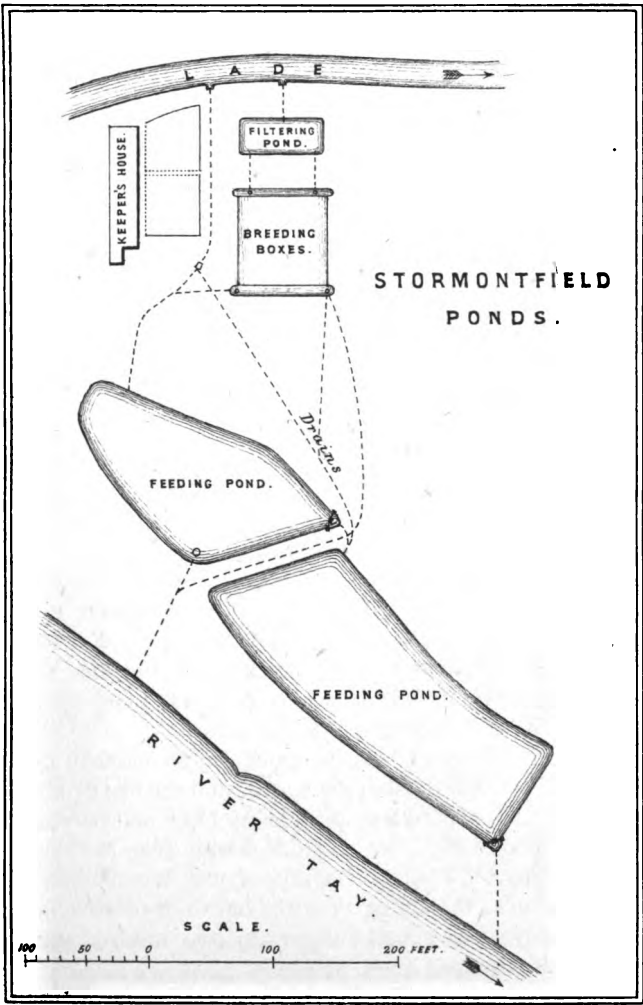
This season (1866), from the middle of February to the end of April, was very cold and ungenial, so that it was the 20th of March before the eggs began to hatch, and they

continued to do so from that date till the 20th of April. We have had a very good crop of young fish; and on the 25th May the breeding-boxes and adjacent canals were swarming with them. It was a beautiful sight on a fine sunny day, to see the young salmon, completely formed, swimming about in shoals in the most lively manner, while the bottom of the canal was quite blackened with them.

I went out along with Mr. Brown on that day in order to empty the old pond of the crop planted in December 1863. The young fish had then all left except a few smolts, which we required to turn out in order to prepare that pool for the reception of the newly-hatched crop of November 1865. We accordingly had the plug at the bottom of that pool drawn, and thereby let off the water, with the smolts that were in it. While the latter were passing out, Mr. Brown marked between fifty and sixty by bisecting the dead fin, as was so successfully done in 1864. The pool being emptied, it was completely cleared out of all refuse. After the fry have left the breeding-boxes, the gravel on them will be carefully taken out, cleaned, and dried in the sun, so that the eggs of larvæ of the May-fly or any other insects that prey on the eggs of the salmon may be destroyed. The water was then allowed to flow into the pool, and also the newly-hatched fry, which are now (end of June) quite lively, feeding and disporting themselves in it.

The new rearing-pool, being a much larger one than the first, was in May quite full of young fish, and the first exodus then took place of what was planted in 1864, and hatched in the spring of 1865. In accordance with what has been formerly observed, about two-thirds of that brood remain in the pond until the spring of 1867, one-third only having gone off this year, on account of the very cold and backward nature of the season.

I shall now sum up what has been stated in the former



STORMONTFIELD
POND S.

KEEPER'S HOUSE.

FILTERING
POND.

BREEDING
BOXES.

FEEDING POND.

Drains

FEEDING POND.

RIVER
TAY.

SCALE.

100 50 0 100 200 FEET.

Widener Library

part of this paper. It was in 1853 that the shortening of the fishing season and commencement of the Stormontfield operations took place. Up to that time, from the passing of the Act of 1828, the rental of the Tay remained almost stationary. Since then it has advanced regularly and progressively, and for the encouragement of the proprietors in other rivers to adopt such measures, I shall give below a statement of the yearly increase of rental in the Tay since 1853. To what extent this prosperity may be ascribed to either or both of these measures, or other causes, I shall not take upon me to say; I only give the facts that have taken place. Let these be compared with the results in other rivers during the period from 1853 to 1865. I regret much that I cannot give the increase in the number of fish, as the tenants now do not disclose what they take, but it would be a desirable thing for the fisheries could measures be taken for making up such statistics of the produce of rivers.

| | | | | | | | | |
|-------|---|---|---|---|---|--------|----|---|
| 1854, | . | . | . | . | . | £9,269 | 6 | 5 |
| 1855, | . | . | . | . | . | 9,977 | 13 | 5 |
| 1856, | . | . | . | . | . | 10,199 | 10 | 4 |
| 1857, | . | . | . | . | . | 10,772 | 0 | 5 |
| 1858, | . | . | . | . | . | 11,487 | 2 | 5 |
| 1859, | . | . | . | . | . | 12,884 | 14 | 0 |
| 1860, | . | . | . | . | . | 13,827 | 10 | 7 |
| 1861, | . | . | . | . | . | 14,109 | 15 | 7 |
| 1862, | . | . | . | . | . | 14,080 | 12 | 0 |
| 1863, | . | . | . | . | . | 14,232 | 16 | 6 |
| 1864, | . | . | . | . | . | 16,742 | 5 | 2 |
| 1865, | . | . | . | . | . | 17,618 | 0 | 7 |

Just as I had concluded this paper, I received a copy of the *Field* of 23d June, containing the following curious communication from George Anderson, Esq., Glasgow, a gentle-

man who is a keen observer of the habits of fish, and who, at great pains and expense, has successfully introduced the grayling of England into our Scottish river, the Clyde :—

‘SIR,—I sent you to-night, by the Glasgow and South-Western Railway, from Lochwinnoch Station, a parcel, carriage paid, and which, I hope, will be delivered to you to-morrow. It contains a very interesting fish, and one which, I think, will set at rest all the nonsense that has been written about salmon living in fresh water without visiting the sea.

‘Four years ago, I informed you that I had got from Stormontfield some salmon parr which had not put on the smolt dress and gone down with the rest of the two-year-old migration. This is one of those fish. He is long enough to be 3 lbs. weight, and he only weighs 1 lb., and yet has been in a pond where two-year-old grayling weigh $\frac{3}{4}$ lb., showing that he has not suffered from want of feeding.

‘There may have been many instances of so-called parr being confined for years in fresh water, but I think this is the first well-authenticated case of fish that were, beyond possibility of doubt, “salmon parr,” being kept confined to fresh water for six years. He was only killed to-day at five o’clock, and ought to reach you in good time for testing his edible quality, which I expect will prove very poor.

‘I hope Mr. Francis is at home to see the fish ; if not, that you will submit it to some expert in fish, and have its weight, length, and girth accurately chronicled, as I had not the opportunity of doing it before sending off.

‘GEORGE ANDERSON.

‘WESTERN CLUB, GLASGOW, *June 20.*’

[‘The length of the fish is $14\frac{1}{2}$ in., the largest girth $6\frac{1}{2}$ in., and the weight 15 oz. The head, which is large enough for

a 5-lb. fish, is $3\frac{1}{8}$ in. from the snout to the extremity of the operculum. The specimen is so remarkable a curiosity that I could not decide upon testing his edible qualities, and have put him in spirits, and left him at the *Field* office for the inspection of the curious; and I beg to thank Mr. Anderson very much for affording me an opportunity, which I have long desired, of seeing what sort of condition a fish so kept would be in.

‘FRANCIS FRANCIS.’]

Now, luckily, I can supply an answer to the edible quality of such a fish. The late Robert Graham, Esq. of Redgorton (an estate which lies on the opposite side of the river Tay from our ponds), told me one day when I was out with him and beside a small pond on his property, that he had placed some of our first year’s parrs into that pond, and in the course of two or three years had taken out one or two, which he described to me in the same terms as Mr. Francis has done the one sent him. He said they had a big head, a small body, and a clear skin like a trout, and were of about a pound weight each. He added that he had them cooked, and found them tasteless and insipid, or rather something of the taste of mud. This seems to put to rest the question as to the growth of salmon when confined to fresh water. What a contrast to a fine plump grilse, of about 5 or 6 lbs. weight just returned from the sea, after having entered it as a smolt only three months before!

POSTSCRIPT.

IN the foregoing pages I have only noticed the apparently good effects to the Salmon Fisheries of the Tay from the lengthening of the close-time and the Stormontfield Ponds.

But there is much yet to be done in encouraging the propagation of the salmon in the natural way, by clearing away all obstructions to the fish getting access to the natural spawning-beds from which they have been hitherto in a great measure debarred.

1. Thus, in the Ericht, at Blairgowrie, the fish have been wholly obstructed by mill-sluiques, etc. ; but the river could easily be made accessible by slaps or salmon stairs.

Some years ago a most obnoxious barrier was removed from the Isla at Bridge of Ruthven—no fish whatever being able to get forward to the best spawning-grounds in that river. On paying my official visits to the upper districts, I used to see the salmon vainly struggling to get through this formidable barrier, which was constructed of stones and boards, and stood ten or twelve feet high. I frequently reported this matter, and at last the Tay proprietors ordered legal proceedings for the removal of the obstruction. Captain Wedderburn Ogilvie, the proprietor, after some preliminary proceedings with his tenant, gave orders to have the obstruction removed, and this being done, the fish had free access, which I have no doubt contributed to the prosperity of the Tay fishings. As to the Ericht obstructions, they were fully reported on years ago, by Mr. Leslie, C.E., still nothing has been done to remedy the existing evil.

2. The Falls of Tummel ought also to be dealt with, so that a fine range of river to Loch Rannoch might be opened up for the salmon.

3. Something should be done with the Almond, a fine spawning river, but from which few fish, either salmon or fry, ever return, owing to dam-dykes, but especially the poisonous matter thrown in from bleachworks and mills.

4. The Earn is also an excellent spawning river, and should be kept completely open to the fish during close-time by access through cruives, dam-dykes, etc.

5. According to the new Regulations, the net-fishing closes on 20th August, and rod-fishing is allowed till the 10th October. This arrangement, I think, is productive of a beneficial effect. It interests our upper proprietors in the Tay and its tributaries where spawning in the natural way takes place, and gives them a strong inducement to preserve the spawning fish and put down poaching. They and the anglers form, as it were, a strong *moral* police, much more efficient than that of a few paid watchers, to protect the rivers. This is done with little or no loss to the river, as all that the anglers take is a mere trifle compared to the mischief that was done by protracting the destructive net-fishing to 14th September. The increase that has taken place in the rents since the lengthening of the close-time, both to the collective and individual river proprietors, is a pretty clear evidence that the measures now in operation are a benefit to all.

I merely notice these things in the meantime ; but they are more fully treated in a paper which I have drawn up giving a sketch of the history of the Tay Salmon Fisheries for the last eighty years, the rise and fall of the produce and rents, and the causes of such variations, with a glance at the sea-coast fishings, etc., and which will appear shortly. Though mainly applicable to the Tay, I flatter myself that it will be found useful with respect to other rivers in the three kingdoms.

APPENDIX A.

STORMONTFIELD PONDS' BREEDING-BOXES.

PERTH, 31st July 1866.

MY DEAR SIR,—The size of the boxes, inside measurement, is the following—5 feet 10½ inches long, 1½ feet broad, and 1 foot deep.

There are 12 boxes in each row, and 30 rows in all, therefore the number of boxes altogether is 360, each box being of the above dimensions.

The boxes are placed in double rows in the breeding-pond with an 18 inches wide footpath between each double row.

The water passes through each row of boxes, from the canal stretching along the upper end of the pond, by gravitation; this canal is copiously fed with water from the filtering-bed; the boxes are laid with a fall of 2 inches on each box, or 2 feet in the row of 12 boxes, and the water passes from box to box by openings or notches 4 inches by 2 in the middle of the divisions between the boxes. The boxes are formed of 2-inch wood.

I think these are about all the particulars you are likely to find of any use as regards the breeding-boxes.—I am, yours very truly,

JAMES RITCHIE.

ROBERT BUIST, Esq.

| | Ac. Imp. |
|---|----------|
| Area of Filtering-Pond, | '042 |
| „ Breeding-Boxes, | '118 |
| „ old Feeding-Pond, | '371 |
| „ new Feeding-Pond, | '565 |
| „ open Canals, | '023 |
| | ----- |
| Total area under water, | 1'119 |
| | ----- |
| Area of ground occupied by whole Works, | 2'556 |
| | ----- |

APPENDIX B.

ARTIFICIAL SPAWNING OF THE SALMON.¹ SPAWNING OF 1853.

ON the 23d of November 1853 this operation was commenced at a ford on the Tay, near Almond-mouth, by Mr. Ramsbottom of Clitheroe, who is so well known as a successful manipulator. We were present, but will let Mr. Ramsbottom explain his own method, which we take from his pamphlet on *Artificial Breeding at Outerard*:—‘So soon as a pair of suitable fish were captured, the ova of the female were immediately discharged into a tub, one-fourth full of water, by a gentle pressure of the hands from the thorax downwards. The milt of the male was ejected in a similar manner, and the contents of the tub stirred with the hand. After the lapse of a minute the water was poured off, with the exception of sufficient to keep the ova submerged—this must always be attended to, even when the ova or milt is flowing from the

¹ As regards the safety of this fish in spawning, I may refer to what is stated in a former part of my paper, that while we have to haul forty or fifty fish in a day, out of which we can find only four or five fit for our purpose, all found not ripe are carefully returned to the river, and the tact of the man who has charge is such that he knows at first glance the fish that are not ready, and lets them go out of the net without landing them, or very partially doing so. The ripe females are carefully spawned by gently stroking down the belly of the fish with the vent in the water, and out of which the eggs run almost as freely as lead out of a shot-bag. The rest of the process is the same as mentioned in Mr. Brown’s work. As stated there, the milt of one male is sufficient to impregnate the ova of several females; and to keep him alive till he is required, he is put into an oval tin case about the length of a large salmon, where he has just as much water as permits his lower fins to keep him afloat, but prevents the use of his powerful tail, by which he would at once spring out of his confinement. The females are at once let off, and take the water very briskly. The male, after we have done with him, is also restored to the river, and in no case have we known any of them to die in consequence of our operations. On the contrary, one year we had a very fine male fish of 24 lbs., which we marked with a wire, and two years afterwards we spawned him from the same ford a few pounds heavier. Had the fish been spared to return again to the river, it would have appeared as a clean fish of not less than 40 lbs. weight. Few indeed of the salmon kind are allowed to see so many days, or to grow to such a size.

fish—and fresh water supplied in its place. This was also poured off, and fresh substituted, previous to removing the impregnated spawn to the boxes prepared for its reception.' We observed in this, the first manipulation, and in all the others afterwards, that a very small quantity of the milt was sufficient to impregnate the ova of a large salmon, and that always a few of the ova, after receiving the milt, turned white; these were injured, and would prove addled. We also noticed that the salmon colour of the ova was heightened when the milt came in contact with it. Round tin pans, with as much in them as covered the ova, were used to carry them to the hatching-boxes. On the 23d November 1853, the first stocking of the boxes commenced, and by the 23d December 300,000 ova, in very fine condition, were deposited in the 300 boxes. The spawned fish were returned to the river, and went away after the operation quite lively.—MR. BROWN'S *Natural History of the Salmon*, p. 36.

APPENDIX C.

IN reference to the plate of the three fish, it may be stated that they are undoubtedly pure salmon parrs. The large one, if a male, may be in the same state as the one noticed in page 7, and from the milt of such small fish we have impregnated the ova of full-grown salmon, and produced young fish. His brethren of the same age, having had their mottled coats covered with silvery scales, left the ponds in April and May last, and no doubt, from former instances, we had several of them in the river this season as grilse.

I.—AN ANGLER'S RAMBLES AMONG THE RIVERS AND LOCHS OF SCOTLAND.

By THOMAS TOD STODDART,

Author of The Angler's Companion.

One Vol. Crown 8vo, 9s.

'The poetical and the practical, are in Thomas Tod Stoddart so justly commingled, that anglers might stand up 'fore all the world, and say, This is our representative man. He is no mere fishmonger, with no thought all day but how to slaughter, and with eyes that ought to be often dwelling on land as well as on water, viewing

" Hill, dale, and shady woods, and sunny plains
And liquid lapse of murmuring streams,"

shrouded with scales; he has a poet's vision, and eke the accomplishment of verse. He is no mere dreamer, thinking and talking about what he cannot do,—he would be hard to beat with any lure on any Scotch river.'—*Scotsman*.

II.—BY THE LOCH AND RIVER-SIDE:

FORTY GRAPHIC ILLUSTRATIONS BY A NEW HAND.

Oblong Folio, Half Morocco, 21s.

'Showing the various fortunes, good and evil, which attend the pursuit of Trout and Salmon under difficulties; the difficulties, that is, of the punt, of wading, of rock-scrambling, and of playing with and (of course) of losing your fish. The author preserves the anonymous. He is a worthy rival of Leech in his famous *Briggs' Fishing Adventures*.'—*Saturday Review*.

III.—NATURAL HISTORY AND SPORT IN MORAY.

COLLECTED FROM THE JOURNALS OF THE LATE CHARLES ST. JOHN,

Author of Wild Sports in the Highlands.

In One Vol. Crown 8vo, with Illustrations, 8s. 6d.

'Like the scent of heather-bells, like breezes freshened from the wave, this volume will come to all that multitude of the city-pent or desk-pinned in whom base custom has not extinguished the natural love of dwelling out of doors, and the no less natural passion to hunt and slay. It is of the heather, heathery; it carries us away from the smoke and din of this drear spot which men call town, to the hill-side, the mountain-tarn, and the wild sea-shore.'—*Scotsman*.

IV.—LIFE IN NORMANDY:

SKETCHES OF FRENCH FISHING, FARMING, COOKING,
NATURAL HISTORY, AND POLITICS, DRAWN FROM
NATURE.

Edited by J. F. CAMPBELL,

Author of Popular Tales of the West Highlands.

*Second Edition, Two Vols. 8vo, with Maps and numerous
Illustrations, 24s.*

'The writer had qualities that are very charming, and very far from common. He lived some years on or near the sea-coast of Normandy, and when there he used his eyes, and saw what went on in the animal and human world around him. He lived with the peasants and fishing-people; he noticed all their contrivances to gain, and to make the most of a hard life; he watched the birds, and insects, and fish that nature showed him every day. Nature or art has guided the writer into several rare excellences. He knows how much to tell of a thing; how to be minute without being tedious, and how to make general reflections without being wearisome.'—*Saturday Review*.

V.—MY INDIAN JOURNAL.

By Colonel WALTER CAMPBELL.

Containing descriptions of the principal Field Sports of
India, with Notes on the Natural History and Habits
of the Wild Animals of the Country; a Visit to the
Neilgherry Hills and the Andaman and Nicobar Islands.

One Vol. 8vo, with Illustrations, 16s.

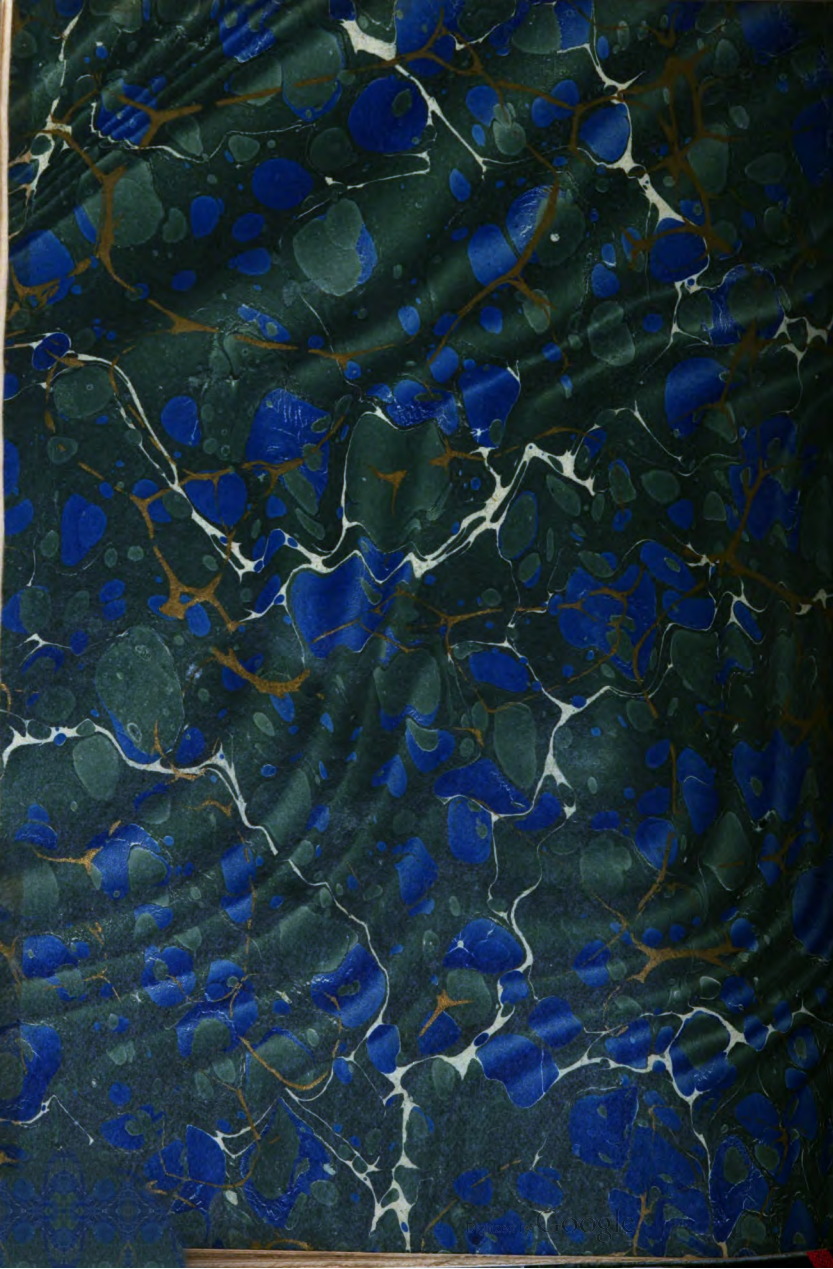
'All who have read the *Old Forest Ranger* will hail with delight another work on the wild sports of India from the pen of Colonel Campbell. Few men are better qualified for rendering such a work interesting and instructive. He is not only a keen and daring sportsman, but also a persevering and observant naturalist, and a devoted admirer of beautiful scenery; while he possesses a clear and picturesque style, which enables him to bring his adventures before the reader with singular vividness and reality.'—*Edinburgh Courant*.

VI.—FOREST SKETCHES:

DEER-STALKING AND OTHER SPORTS IN THE
HIGHLANDS FIFTY YEARS AGO.

With Illustrations by GOURLAY STEEL, R.S.A.

One Vol. Demy 8vo, 15s.



HARVARD · COLLEGE · LIBRARY

GIFT OF

DANIEL · B · FEARING

CLASS · OF · 1882 · · · · A · M · 1911

OF · NEWPORT

· 1915 ·

THIS · BOOK · IS · NOT · TO · BE · SOLD · OR · EXCHANGED

