

## PRESENT STAGE OF THE SALMON EXPERIMENT.

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Though grilse weighing from 3lbs. to 7lbs. have during the last four years been taken in the Derwent, how is it that no mature salmon, that is, fish weighing from 15lbs. to 30lbs., have been captured? This is a question frequently asked both here and in the neighbouring colonies, but it will be necessary before attempting to answer it to refer to what is known of the early life history of the salmon in Europe and Tasmania.

It has been calculated by able British authorities that in specially good salmon rivers, such as the Tay in Scotland, not more than one egg in every 1,500 deposited ever becomes a salmon, the diminution in number taking place chiefly during the earlier stages of life, and especially during the journey of the smolt to the sea, and the first few weeks of their residence there, though even the grilse appear liable to have their numbers considerably decreased by the attacks of marine enemies before their return as veritable salmon.

The limited number of mature salmon we can yet have in the Derwent might therefore alone account for their non-capture, but we must add to that disadvantage the want of adequate appliances to ensnare large sized fish. The chance of taking one with the rod is infinitesimal while the fish are scarce, the fishermen scarcer, food very abundant, and the difficulties with which the angler in the Upper Derwent has to contend great. The one or two fine meshed seine nets worked down the river, though well adapted to scrape out smolts, are quite unfitted for the capture of salmon, as they are shot so as to leave a considerable space between the net and the shore, and take so long to haul that the wary old salmon would, before the ends of the net reached the land, pass round one or the other, and so escape.

The majority of the 18 or 20 grilse caught have been taken in an ordinary grab-all net, having a mesh of such a size that only the fish of from 3lbs. to 5lbs. weight can mesh themselves, and no larger salmon is at all likely to be taken by the same net, as in this method of fishing it is essential that the fish should be able to get the gill covers through the mesh or by backing it can at once free itself. If a grab-all net, having a mesh of two and a half inches from knot to knot, was used, the chance of catching a mature salmon would be largely increased, provided only such mature salmon are there to be caught, which has yet to be proved.

We know that in our own waters the capture of sea-going

salmonoids was at first, that is in the year 1869, confined to a few smolts only, and these were taken in the small meshed seines after strong freshes had come down the Derwent in the end of October and the beginning of November. In subsequent years, and always in the same months, many of these fish came to the hands of the Salmon Commissioners till the river was very properly closed to the seine nets above Hobart Town, and many more of the same fish were doubtless taken of which the Commissioners knew nothing. The capture of these smolts was in several seasons followed by the taking in December, January and February of salmonoids intermediate in size between smolts and grilse, that is, weighing from three-quarters of a pound to one pound and a half, and it was one of these fish taken in December, 1869, of which Dr. Gunther wrote that it presented all the characteristics usually found in the true salmon (*Salmo salar*).

Time passed on and one grilse was taken in December 1873, followed by two or three others in subsequent years, and in the beginning of January, 1876, between two or three hundred of the salmonoids, intermediate between smolts and grilse, were taken at a few hauls of the seine nets on the open sea beaches some distance below Hobart Town, since which the river has been wisely closed still lower down.

Eight of the last-mentioned fish taken at random were carefully examined and dissected, and of these eight six proved to be unmistakably true salmon (*Salmo salar*) while the remaining two exhibited characteristics common to both the true salmon and the salmon trout (*Salmo trutta*), so that their species could not be positively determined. We next come to the comparatively frequent capture of grilse this season in one place, and by one small net, ill-suited for the purpose. And, so far, therefore the sequence of events has been marvellously regular, and exactly what was to be expected if all went well. Yet it is not absolutely certain that this regular sequence will be followed by the crowning triumph in the shape of the capture of a thirty-pound salmon, though the probabilities are greatly in favour of such a capture being soon made, if proper means are used to effect it.

It is certain, from the life history of our salmonoids, as already detailed, that the smolts descending the Derwent find ample food and sufficiently salt water in the estuary immediately below Hobart Town to carry them on to the stage referred to as intermediate between smolts and grilse, after which stage we altogether lose sight of these fish for a time, during which they probably go with the floods of autumn and farther out on to the open coast, for when we next see them it is as grilse in early spring (Autumn and September), and they then appear to be working their way up the Derwent estuary, and

following the myraids of indigenous small fry, which are then constantly hatching out. As the female of these grilse taken in early autumn invariably exhibit the ova considerably more matured than when taken in the spring there can be no doubt that they are finding their way to the freshwater spawning beds, and would reach them in the early floods of winter, though amongst the wealth of suitable streams running through scores of miles of uninhabited, mountainous, and inhospitable country we have never yet (except, perhaps, in one instance) been able to ascertain the exact locality of such spawning beds.

It is quite possible that the grilse after spawning, and on its return with the last of the winter floods to salt water, requires some greater change and a longer journey seawards than when it was passing from the smolt to the grilse stage. And if so, it may have to encounter more formidable marine enemies than on its first journey, or some unfavourable physical features of our coast of which we, as yet, know nothing. Unfortunately, the most scientific Ichthyologists and the most practical fishermen are still equally ignorant of the precise habits of the mature salmon when at sea and experience can alone prove whether the final stage is to be successfully reached, and if so, when?

During the last few years, and since the commencement of the salmon experiment, large numbers of specimens of our coast fish have been forwarded to and examined by Dr. Albert Gunther, of the British Museum, whose determination of the species proves that many of our fish are not merely representatives of but identical with British forms, such for instance as the John Dory (*Zeus faber*), the horse-mackerel (*Trachurus trachurus*), the dog-fish (*Acanthias vulgaris*), the sprat (*Clupea sprattus*), and the Conger (*Conger vulgaris*). And this fact goes far to show that there can be no vast difference between the physical features of the Tasmanian and British coasts.

If, therefore, there is any truth in the doctrine of natural selection and survival of the fittest, we may rest assured that as the grilse are rapidly increasing in number, some few out of the thousands sent time after time to sea will be able to adapt themselves to their altered circumstances, escape their foes, and find their way back as salmon. After the second migration is accomplished, the increased speed and cunning of the fish will materially improve its chance of successfully overcoming the dangers of all subsequent journeys.

For each of the grilse which have been taken in one minute spot of the wide estuary of the Derwent, by a net ill-suited for the purpose, there must be hundreds, and more probably thousands, passing of which we hear and see nothing; and if this is true of the grilse after the manifold risks to which

they have been exposed on our coasts, what must be the number of smolts that have passed down the Derwent, and what the still greater number of fry in the earlier parr stage on the gravelly rapids of some tributary or tributaries of the Upper Derwent? Can we set such numbers down at less than hundreds of thousands? And yet marvellous to relate, not one single parr has yet been seen (so far as the Salmon Commissioners are aware) in the fresh waters of the Derwent, or any of its tributaries. And this is the more amazing, because these fish take the worm or artificial fly with the greatest readiness, and would have been almost certain to make their presence known to any angler in their immediate neighbourhood.

A writer in Queensland, a few months ago, also referred to this extraordinary absence of the parrs, and used it as a powerful argument against there being any salmon in Tasmania—but he went rather too far, and used the same argument to prove that the migratory salmonoids, which he admitted were taken in the lower Derwent, were only salmon trout, ignoring the fact that the parrs of the salmon trout (identical in appearance and habits with those of the salmon) were equally remarkable for their apparent absence.

If amongst the dozens of suitable tributaries of the Upper Derwent, we are unable to find a trace of these hundreds of thousands of salmon parrs, which it is impossible to doubt must be there, we need scarcely be surprised at our inability to light upon the mere handful of mature salmon, which we are yet likely to have in the wide waters of the deep Derwent estuary. Some day an errant fisherman on one of the small streams about or beyond the lakes, such as the Clarence, the Pine, the Nive, or the Cuvier, where nobody ever thinks of fishing now, will probably drop on such myriads of these parrs as will enlighten us as to the supply of grilse below,—and the knowledge so gained may lead to the obtaining fresh supplies of ova for the stocking of our Northern and Western rivers, because the parrs never move far from the original spawning place before assuming the smolt dress; and their detection would enable us in the following winter to watch for and take the parent fish on their certain return to the same spawning beds.

Before concluding it may be as well to refer to the one instance in which it is just possible we have hit upon the spawning bed of a true salmon. In the early part of the past winter a pair of large fish were observed spawning in the Plenty, and were netted by the Bailiff in charge at the Ponds after the bulk of the ova were deposited.

The female after having parted with the greater part of her ova weighed more than twenty pounds, and the male weighed nearly nineteen pounds. Mr. Read, one of the Salmon Com-



missioners, examined these fish carefully, and both he and the Bailiff are of opinion from the external appearance of the fish that they were true salmon, or at any rate belonged to one of the two migratory species.

After stripping the remaining ova (almost one thousand in number) from the female, and applying the artificial process of impregnation, both fish were returned to the river.

Subsequently a few of the naturally deposited ova were with judicious forethought taken from the rid, placed in one of our hatching boxes mentioned, and then kept carefully separated from other ova. The artificially impregnated ova failed, but that so prudently taken from the rid has hatched out; and an examination of both the eggs and the newly hatched fry has very materially strengthened the impression in my mind that these fish were salmon, for the eggs were not only larger than any we have yet taken in the colony, but had exactly the pink tinge which characterised the salmon eggs received from England. The umbilical sac attached to the newly hatched fry is longer in proportion to the width than that of the trout, and this was a marked peculiarity in the fry hatched from the imported salmon eggs. It is quite true that there is considerable diversity both in the size and colour of the eggs of the brown trout (*Salmo fario*), but the size of the eggs in that species by no means depends upon the size of the fish, as large eggs are often found in small fish; and no cause can yet be assigned for this diversity in size, but the difference in colour clearly depends on the quality of the fish—the red-fleshed fish invariably producing red eggs, and the white-fleshed fish the pale straw-coloured eggs. As an actual fact, none of the originally imported salmon trout or trout eggs approached in size either these eggs taken from the rid in the Plenty or the imported salmon eggs; and very great interest will therefore attach to the subsequent stages of the fry now hatched, because if they are true emigrants that fact must be made manifest when the deciduous, silvery scales which first hide the parr marks are put on, and the young fish assume the smolt stage, though it may even then (as long since pointed out) be difficult, if not impossible, to determine accurately to which of the two migratory species the smolts may belong.

A few days after the foregoing was written—namely, on the 15th day of October last—a strong fresh came down the Plenty, during which a school of about a dozen salmonoids found their way into the water-course which supplies the ponds, being evidently bound seawards. Mr. Read was so much struck with the difference between these fish and trout fry of the same size, that he preserved two of them in spirits,

and forwarded them to me for examination. Externally both fish presented the characteristics of true salmon, and upon dissection the number of pyloric appendages was found to be 62 in one and 65 in the other, numbers which prove these specimens to have been salmon and not salmon-trout. This capture, therefore, lends additional force to the presumption that the twenty-pound fish taken in the Plenty was a salmon.