

SOME FURTHER NOTES ON THE INTRODUCTION
OF THE SALMON INTO TASMANIAN WATERS.

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On the 4th of December last there was captured in a tide-pool at Bridgewater, a fish which the Salmon Commissioners have decided to be a true salmon (*Salmo salar*) in the grilse stage, that is on its first return from sea, and acting on such decision the Government have paid to the captor, Mr. Joseph Cronley, the promised reward of £30.

As was to be expected, some of those who have persistently expressed doubts as to the possibility of ultimate success have made attempts to call in question the species of this fish, but have failed to point out any feature in which it differs from a true *Salmo salar* in its grilse stage.

It is often extremely difficult, even for a naturalist, to distinguish between nearly allied species of any given genus of animals, because the points of resemblance are numerous and striking, and immediately force themselves on the observer, while the points of dissimilarity are few, and often so obscure that they have to be laboriously sought out. To clear away some of this difficulty before attempting to explain the reasons on which the decision of the Commissioners was based, I must briefly refer to Dr. Günther's introduction to the Salmonidæ in the sixth volume of his most valuable Catalogue of Fishes in the British Museum.

The learned Doctor divides the characters by which the species are separated from one another into two sets, namely, those which vary with age, difference of food, locality, &c., and therefore are of small value for specific distinction, and those which are found to be constant in numbers of individuals, and in which it is difficult to perceive signs of modification due to external circumstances.

The variable characters are:—First, colour; second, size; third, proportions of various parts of the body to one another; and fourth, differences in the fins, such as number of rays, &c.

The constant characters are:—First, form of the præoperculum in the adult fish; second, width and strength of the maxillary of the adult fish; third, size of teeth; fourth, arrangement and permanence or deciduousness of the vomerine teeth; fifth, the form of the caudal fin in specimens of a given size, age, and sexual development; sixth, the size of the scales as indicated by the number of transverse rows above the lateral line—one of the most constant characters; seventh, the number of vertebræ; and eighth, the number of pyloric appendages.

It is clear that the value of the variable characters increases the more the species to be compared diverge from one another. In other words the variable characters will be of more use in comparing the brown trout, which is not migratory, with a migratory form such as the salmon, than they would be in comparing two closely allied migratory species, such as salmon and salmon trout.

The determination of the species of any given mature fish of the *genus salmo* in this colony is divested of much of the complication which has arisen as to European specimens because three species only have been brought to Tasmania, (that is to say), the salmon (*Salmo salar*), the salmon trout (*Salmo trutta*), and the common, or brown, trout (*Salmo fario*).

In ascertaining the species of the fish caught at Bridge-water, which I shall hereafter call "the Derwent Grilse," a very cursory examination is enough to demonstrate that it is not a common, or brown, trout (*Salmo fario*), as it differs materially from that species in both variable and constant characters. The Derwent Grilse is nearly 20 inches long without the caudle fin, and weighs two pounds fourteen ounces. It is a healthy well-fed fish, as is abundantly proved by its small short head and brilliant silvery sides. It is a female with the ova so far advanced towards maturity as to be as large as No. 5 shot. A well conditioned brown trout of the same length would weigh far more, as its depth and thickness would be greater in proportion to its length. A specimen of brown trout now in the museum, which was taken immediately after spawning, and is in the most wretched condition, measures 19 inches in length and weighs nearly four pounds. Another specimen of which we have a plaster cast, measured 26 inches in length and weighed nearly nine pounds.

The difference in colour is most striking, the Derwent Grilse being bluish black on the back, passing gradually into brilliant silver on the sides, which are marked with numerous irregular spots above, and a few similar spots below the lateral line—the spots are none of them ocellated as in the brown trout, but appear to be below the scales. Although many of the large female brown trout caught in the tideway about New Norfolk, are remarkably silvery when taken from the water, they acquire a coppery hue, when dead, utterly unlike the brilliant silver retained by the Derwent Grilse and which is only to be found in perfection on specimens resident in, or fresh run from, the open sea, in which the brown trout could not live an hour. Again the fin rays of the Derwent Grilse agree with Dr. Günther's formula for salmon and differ from that for brown trout.

Turning to the constant characters it will be found that in

the Derwent Grilse all the vomerine teeth have disappeared from the mesial line, a circumstance which never happens with brown trout of similar weight and size, though in brown trout of 10 or 15 lbs. weight from brackish water, these teeth are sometimes absent.

The caudal fin of a brown trout becomes square or truncate when the fish attains a length of 10 or 12 inches. In the Derwent Grilse, it is distinctly emarginate or forked.

The number of scales on the line from the back of the adipose fin, obliquely forward to the lateral line in the Derwent Grilse is 12; in the brown trout it is always 15 or 16.

As confirming the above, it must be remembered that the Derwent Grilse was caught seven miles lower down the river than any brown trout has yet been seen, and where the water is too salt for that species to exist.

It is, therefore, certain that we may discard the one species, *Salmo fario*, from our consideration, and at once proceed to the more difficult task of showing to which of the remaining two the Derwent Grilse belongs.

The formulæ for the number of fin-rays of the two species are given by Dr. Günther as—

	Dorsal	Anal	Pectoral	Ventral
	fin.	fin.	fin.	fin.
Salmon	14	11	14	9
Salmon Trout...	13	11	15	9

It will thus be seen that the anal and ventral fins contain the same number of rays in both species, but that the dorsal fin contains one ray more, and the pectoral one ray less in the salmon than in the salmon trout; in the Derwent Grilse, the dorsal and pectoral fins each contain 14 rays, thus agreeing with the formula given for the true salmon. The weight of a salmon trout in good condition, and of the same length as the Derwent Grilse, would be more than 3lbs., but the difference between salmon and salmon trout in this respect is after all only slight.

In colour the Derwent Grilse agrees better with the majority of specimens of *Salmo salar* than with the majority of specimens of *Salmo trutta*, as it presents none of the purplish tinge so generally found in the last mentioned species, nor has it the greenish hue of the back common to most specimens of salmon trout, but it must be borne in mind that specimens of *Salmo trutta* do occur (especially amongst the females), agreeing remarkably in colour with the true salmon. Specimens of *Salmo trutta* of the size of the Derwent Grilse are usually more densely covered with spots than is the case with the latter fish.

As to the constant characters, the whole form of the gill

cover of the Derwent Grilse, including, of course, the præoperculum, agrees admirably with the figure given by Yarrell, as the gill cover of *Salmo salar*. The Derwent Grilse is not sufficiently mature to make the width and strength of the maxillary of more than doubtful value, as a means of identifying species.

The vomerine teeth are rarely all absent from the mesial line of a salmon trout till after the second or third trip to sea, when it has attained a greater size than that of the Derwent Grilse, in which all these teeth are wanting, as in the true salmon after its first trip seawards.

The caudal fin of the Derwent Grilse is distinctly emarginate, whilst in salmon trout over 18 inches in length, this fin is almost invariably square or rounded. The number of scales in a line from the back of the adipose fin obliquely forward to the lateral line, is in the salmon trout 14 or 15; in the Derwent Grilse, it is 12 as in the true salmon, this, according to Dr. Günther, is one of the most constant characters, and therefore of the utmost importance in determining the species.

The number of the vertebræ and of the pyloric appendages could not be correctly ascertained without disfiguring the specimen which the Commissioners were loth to do.

To sum up then. The Derwent Grilse must be one of the two migratory species, *Salmo salar*, the true salmon, or *Salmo trutta*, the salmon trout. In the variable characters it agrees with the majority of specimens of salmon, better than it does with the majority of specimens of salmon trout. In all of the constant characters in which it has been tested, it agrees absolutely with *Salmo salar* and differs absolutely from *Salmo trutta*. In the face of such facts can there be any doubt that the Derwent Grilse is really that which the Salmon Commissioners have pronounced it to be, a true salmon (*Salmo salar*) in its grilse stage?

And now let us see how the life history of the fish in this colony goes to confirm the Commissioners in their decision.

In April, 1864, the first salmon ova arrived in Tasmania and with them a few ova of the common trout, no salmon trout ova being included in that shipment. In the Spring of 1865, a number of smolts, estimated at about 1,500, from that ova, went to sea, and at the same time 30 common trout were liberated in the River Plenty, the whole of the remaining common trout (about 150) being retained in a breeding pond. In the following spring of 1866, the remainder of the smolts from that first shipment, about 1,000, took their departure, and in February, 1867, the Superintendent at the ponds, Mr. Wm. Ramsbottom, reported that he had seen several grilse, which he estimated to weigh about 5 lbs. each in the fresh

water of the Derwent, four miles above the point to which the tide reaches. At the time Mr. Ramsbottom so reported there were no indigenous fish (except eels) of one pound weight in the fresh waters of the Derwent, and the only common trout which had been then liberated were the thirty fish turned into the Plenty; it follows, therefore, that Mr. Ramsbottom either did see grilse, as there was nothing that he could mistake for them, or that he deliberately stated that which he knew to be untrue. It is unnecessary to tell those Fellows of the Society who knew the late Mr. W. Ramsbottom, and who remember the devoted zeal and ability with which, in spite of severe illness, he laboured for the success of the experiment, that he was incapable of making a deliberate misstatement of even the slightest fact.

In May, 1866, a second shipment of salmon ova arrived, and with them a number of salmon trout ova. From this last shipment some 6,000 smolts were liberated during 1867 and 1868. Of the salmon trout, 496 only were hatched, and and of these more than 100 died before they reached the smolt stage. Of the survivors over 100 were permanently retained in a breeding pond, so that something less than 300 salmon-trout were liberated in the Derwent, with the second batch of 6,000 salmon.

In October, 1869, two *salmonoids* were caught in the salt water estuary of the Derwent. One of these Dr. Günther pronounced to be an abortive salmon trout, on the assumption that no migratory salmon could breed in the colony, and that the specimen was therefore a stunted individual from one of the English eggs.

In December, 1869, a third *salmonoid*, which had been some six weeks longer in the salt water, was caught in the Lower Derwent, and of this fish Dr. Günther wrote, that it presented the usual characters by which the true salmon (*Salmo salar*) is distinguishable from its nearest allies.

Since 1869, many smolts, identical, as I believe, with that last sent to Dr. Günther, have been captured.

As the habits of the two migratory species, *Salmo salar* and *Salmo trutta*, are, so far as can be ascertained, similar, as they inhabit the self-same rivers and coasts, is it not manifest that, all things being equal, the one species is just as likely to succeed in Tasmania as the other? We have seen that about 8,500 salmon have been liberated to about 300 salmon trout, and that of the salmon, 2,500 have had two years start of the salmon trout; and these facts alone would go far to convince any man that any given migratory salmon taken in the Derwent for several years to come, would be a true salmon, and not a salmon trout, and therefore they materially

strengthen the conviction the Commissioners have arrived at, that the Derwent Grilse is a true salmon.

As the last of the smolts from English eggs left for sea in 1868, it is certain that the Derwent Grilse must have been bred in Tasmania, for no smolt could have been four years reaching the grilse stage, and yet have exhibited the appearance of vigorous health which this fish presents, besides which the well-developed eggs found in the ovaries prove that it was fully capable of reproducing its species, as hundreds of others doubtless have done and will do, in the upper waters of the Derwent or some of its numerous tributaries.

Most Fellows of the Society know that disastrous failure of the whole salmon experiment has been over and over again predicted by some of the leading scientific men of England. Some have even gone so far as to prophecy the same for the common trout, of which species 320 fish only were hatched from English eggs; but we hear rather less on the latter subject at present, the perpetual production, from a dozen different Tasmanian rivers, of hundreds of specimens of *Salmo fario*, weighing from one pound to ten pounds, having had a salutary effect in convincing sceptics that they may have been a trifle too hasty in settling Nature's laws for her.

With regard to the salmon, I did not at first share in the extreme confidence of success that some few appeared to entertain, being quite aware of the almost insuperable difficulties to be overcome, and that, after all, the history of the migratory salmon was so little known after it left the fresh water that our coasts might be found to present some physical features fatal to the fish; but since Mr. Ramsbottom first reported the return of the grilse, I have never for an instant doubted our final triumph.

Some of the information gained prior to commencing the first successful shipment might have materially altered the views of those scientific men in Europe who have predicted failure, could such information have been patent to them. The strongest argument ever used against trying the experiment was, that, as our rivers and seas were already tenanted by their own peculiar forms of life, the attempt to force in others by the introduction of a mere handful into waters already stocked would inevitably fail; but the argument was worthless, because for some thirty years our fishermen had been industriously preparing the estuary of the Derwent for new forms by carefully scraping out with small meshed nets every indigenous enemy, and at the same time increasing the food for the new comers by taking away the fish which formerly kept such food down, while the fresh waters of the Derwent, though

swarming with small and harmless indigenous fish, never were tenanted by predaceous species.

Again, the temperature of the water in our rivers and on our coasts is scarcely different from that of similar localities in the United Kingdom, such rivers and coasts being in each hemisphere inhabited by numbers of insects and crustaceans which are identical.

Tasmanians are often accused by the sister colonies of their apathy and want of energy in undertakings likely to prove of national benefit; but which colony of the whole group can point to a work undertaken more than twenty years ago, persevered in with unflinching determination, in spite of adverse scientific opinions, at a cost of many thousands of pounds, through several total failures, and ending at last in thorough and triumphant success?

But if the colony may fairly be congratulated on having succeeded in the grandest work of acclimatisation that the world has ever seen, and the full importance of which is yet but dimly recognised; the part that this Society has taken in the work ought never to be forgotten. Our published proceedings will prove that the idea of the introduction of British fish had its origin amongst the Fellows of the Society; that the subject was again and again discussed at some of our earliest meetings before the word acclimatisation was ever coined. That the Society strongly urged upon the Government the advisability of the attempt; that the whole matter was reported upon by a committee appointed from amongst our Fellows, and lastly, that the Society has furnished the means of keeping a minute record of every stage in the undertaking.