

## ON THE FOOD OF THE SALMON IN TASMANIAN RIVERS AND SEAS.

[BY MORTON ALLPORT.]

Before leaving the fresh water, in other words, during their parr and smolt stages, the food of the salmon is known to consist of minute molluscs, crustaceary insects, and their larvæ, and other small insects of still lower organisms.

I have heard it gravely asserted, by good observers, that our rivers do not furnish as ample a supply of these various creatures as do the rivers of Great Britain, and in proof of such assertion it was further stated, that our rivers were but poorly stocked with fish. It is quite true that our fresh water fish, with few exceptions, are very worthless, either as food or for sport, but with regard to their quantity, I have been long convinced that this has been much under-estimated, and will give my reasons.

The Grayling (our only conspicuous fresh water fish) are gregarious, and, to a certain extent, migratory; in our large rivers, such as the Derwent, the shoals, containing many thousands of fish in each, are often miles apart, and during summer, lie for weeks together in sharp ripples, unseen except by those who look closely for them, while during winter they rarely leave the deep quiet holes.

The little speckled fish, miscalled trout (*Galaxias* sp. ?), and some allied species, are found in almost every Tasmanian river I have examined, in incalculable numbers, even up to their very sources. Some of our high midland marshes, more than 3,000 feet above the sea, send their waters by tiny brooks into Lake Echo, these brooks are alive with the speckled trout and the grey mountain trout.

On a hot bright day in December or January a stranger wandering on the banks of the Ouse, Shannon, Nive, or other large tributary of the Derwent, would (if he had ever thrown a fly in his life) be as much charmed with the aspect of the stream as disgusted by the apparent absence of fish, an absence so marked that I feel no surprise at the erroneous estimate which many people make of the fish-producing capabilities of our rivers. But let this stranger stand anywhere on the bank of the same river, just after sundown, and throw worms or gentles into the shallow water, a few at a time, at first one or two small fish will make a dart from somewhere, and in ten minutes dozens may be counted coming from under stones, logs, and banks, till the water is dark with them, let him repeat the experiment twenty yards or twenty miles further on, and precisely the same thing will take place. I have many times caught from ten to twenty dozen of these fish in an evening, averaging in weight about 18 to the pound, that is to say, from six to twelve pounds' weight of fish in an evening to a rod, and this may be repeated three or four times a week through the summer, say from 18 to 36 lbs. weight of fish per rod per week.

Having fished in England, Wales, and Scotland, I have quite made up my mind that though there are many rivers in Great Britain in which this could be done, there are many more in which it could not.

The extreme difficulty of judging accurately the fish feeding capabilities of our streams was forcibly impressed upon me on one occasion during the present autumn. All my hearers may remember that at the point where the Sandy Bay Road first reaches the salt water a little brook finds its way into the Derwent after passing down one of the gullies between here and Mount Nelson; in April last my father and I were crossing this brook, close to a hole in its course, which hole was two feet long, 18 inches wide, and contained water to the depth of three or four inches, the bottom was formed of water-worn stones and pebbles, the largest weighing some six or eight pounds, the stream through was so small as to cause no disturbance, in fact, a mere trickle, and I was therefore surprised to notice a sudden curl in the water as I passed. I stooped down to learn the cause, and on turning over the stones at the bottom found to my amazement that the place was alive with fish. I caught with my hands 18 fish, weighing from two to three ounces each, and still left some behind which eluded my grasp; these fish were well fed and healthy. When I reflect that this little brook, not more than a mile long in its whole course, and infested by the most implacable enemy yet known to small fish (I allude to the town boy) is thus stocked, and that hundreds of other brooks are equally well supplied, I am forced to the conclusion that the quantity of food consumed must be enormous, and here is the true answer to those who say our rivers are not so well supplied with insect life as those of Great Britain; if the fish were fewer the insects would be more numerous. The same reasoning



will, of course, apply to molluscs, small crustaceans, &c. A curious illustration of this may be found in the fact that where small fish are met with in our rivulets few shrimps, if any, will be found, but trace the rivulet upwards till the shrimps become numerous and you may rest assured that you are above the fish, and that no more will be caught. With respect to those flies, grasshoppers, beetles, moths, &c., which only tumble into the water, surely I need not say much, except that the individual who wants more of them than I can show him in a warm summer's day and evening must, indeed, be greedy and insensible to the attacks of march-flies, mosquitoes, &c.

Mr. Frank Buckland in his book on fish-hatching says that there is a great difference in the size of the smolts of the same age in the salmon ponds at Stormontfield on the Tay, and that three, of various sizes, having been sent to him for examination, he ascertained that the food contained in their stomachs differed in each. That in the largest consisted entirely of small shell-fish (*limnææ*). Our indigenous fresh water univalves, though numerous in places, are small, and I have, therefore, introduced from England two species of *Limnea* and one of *Planorbis*, the two former are now thoroughly established. I have turned out thousands, and shall be glad to supply either shells or spawn to any Fellows of the Society who have ponds. The quantity of food produced by these shells may be imagined when I tell you that the progeny of one pair, if protected, weighs pounds in the second year, and tons in the third.

It has been over and over again argued that many of the grilse and salmon do not feed at all in the fresh water, but this notion is fast losing favor, and I have little doubt that, though their principal feeding is done in the salt water, still a large quantity of food is consumed in the fresh. Both grilse and salmon are often taken in fresh water, with the minnow, when nothing else will stir them. May we not hope, therefore, that the hosts of small fish, poured into our large rivers by every freshet down the brooks, will prove highly acceptable to generations of salmon yet unborn.

Of the food of the grilse and salmon in brackish and salt water, little was known till recently, partly owing to the difficulty of reconciling conflicting statements, and still more to the absence of scientific research in this direction. If analogy, based upon the comparative anatomy of the salmon, is of any avail, it must lead every thinking man to the conclusion that this handsome swift fish, with his powerful toothed jaws and muscular stomach, feeds principally on smaller fish and crustaceans. The salmon (like many of our sea fish) frequently disgorges the contents of the stomach the instant it finds itself in danger from nets or otherwise; and this habit has induced the popular belief that nothing has ever been found in them to lead to a knowledge of their food. Many theories on the subject have been started, one (for which high authority is quoted) is, that they feed almost entirely on the spawn of certain echinodermata (such as sea-urchins, &c.), and this theory was based on the fact, that though the salmon caught in salt water rarely contained food in the stomach, this food, when present, consisted of minute quantities of the small eggs of echini, remaining tangled in the mucus which invariably lines the stomach. Is it not most probable that the salmon in these instances had bolted echinus and spawn altogether, but that when the shell and other parts of the sea urchin were disgorged, some few ova remained behind?

In an able article on the food of the salmon, written by Dr. W. C. McIntosh, and recently published in the Journal of the Proceedings of the Linnean Society, incontestible proof is given that the vertebræ and other solid portions of fish, of sizes, varying from mere fry to seven or eight inches in length, were taken out of many fresh run salmon.

Believing, as I do, that small fish and crustaceans will form the chief requisites, it only remains for me to show that our brackish and salt waters are well supplied with them.

Everyone who has visited New Norfolk must remember the wide reaches of the Derwent above and below Bridgewater, and that at low tide large patches of a grass-like water weed are there seen covering shallow portions of the river. A considerable part of the river bottom is covered with that same weed, and I once had an admirable opportunity of judging of the vast quantity of animal life bred under its friendly shelter. A small rivulet runs from the hills on South Bruny into Adventure Bay. The sands at its outlet are silted up by northerly gales, and its waters, thus backed up, generally form, throughout the summer, a large brackish lagoon, abounding in bream, mullet, and other estuary fish common at Bridgewater; the bottom of this lagoon is covered with the grass-like weed of which I have spoken, and it is therefore a fair inference that it is inhabited by the same forms of animal life.

When, owing to continued rains, the water in this lagoon rises sufficiently to



flow over the sandy bar, a broad channel is soon cut through, and at low tide a great portion of the bottom of the lagoon is left dry. I was once fortunate enough to be at Adventure Bay when the lagoon burst over the bar, and that which had been a mere trickle in the morning, was, at noon, a river 20 yards across and 4 feet deep, running at a great pace into the bay; such an opportunity for examining the bottom of the lagoon was not to be lost, and though the majority of small fish, crabs, shrimps, and other crustaceans, resembling long woodlice, had no doubt followed the falling water, still so many were left, tangled in the weeds, that it would have been an easy matter to collect bushels of them; that these creatures, numerous as they were, had something to contend with in the shape of natural enemies, may be gathered from the fact, that my three companions and myself caught, with the rod, over 30 dozen of bream in the lagoon in one day, of weights varying from half a pound up to three pounds.

From what I saw at Adventure Bay, I feel certain that there are many hundreds of acres of the bed of the Derwent which can and will keep, in good condition, hundreds of full-grown salmon to the acre.

Lower down the Derwent, the character of the weeds changes greatly, and as might be expected, the animals change with them; the variety of crustaceans (including myriads that are microscopic and phosphorescent) being very great. Naked molluscs and estuary shells both univalves and bivalves are found in great quantity though not numerous in species, and, for the comfort of those who believe in the theory of the spawn of the Echinodermata, I would add that the dredge reveals, from Pavilion Point downwards, vast numbers of a species of spatangus which, in December, are mere boxes of ova, contained in a paper-like shell. Small fish abound in the shallow waters, especially at the mouths of the various rivulets. Still lower down the kelp beds begin, and these, on every part of our coasts, form harbors of refuge for the rearing of untold millions of creatures. Each stem of kelp is anchored either to a rock or stone, by pulling at these stems one may occasionally be found which will bring up its anchor with it. Upon examination, the root proves to be a wide net-work of fine fibres, each firmly fixed on to the stone. If the whole thing be quickly transferred from the water to the bottom of the boat, its wonderful inhabitants will continue to struggle out, from the interstices of the fibrous roots, for hours, although many will have escaped in the passage upwards. I cannot imagine a more interesting subject for a paper than would be furnished by one of these same kelp roots, as representatives of most of the great divisions of the animal kingdom are found there, from the lowest forms of microscopic infusoria up to the vertebrata represented by small eel-like fish.

Amongst all this profusion of animal life, it cannot be doubted that much will prove admirably suited to the wants of the salmon.





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