

54.—NOTES UPON THE SCOTCH FISH AND FISHERIES.

By JOHN ANDERSON.

SALMON.—Our rivers are not giving half the salmon they used to give. Indeed some do not give one-fourth. In the Tay alone have any artificial fry been placed. I have advocated a public hatchery for all Scotland, but cannot get them to see the necessity of having it. Owing to our net fishing being now stopped so early, too many fish get up to our spawning ground and at once they commence to fight and kill one another, then putrify, and get covered over with fungus. It seems to astonish them, although I have seen it on our river banks for the last 60 years, only on a very small scale, according as the quantity get up before spawning.

I send you a few particulars of the run of our salmon, grilse, and trout up our river Forth during the season. I do not know what your views are as to grilse; by many they have always been considered as the young of salmon; but I am happy to say I have now convinced hundreds they are not. Our salmon and grilse are just as different as our geese and ducks. The young salmon approaching our rivers weigh from three-fourths of a pound up to 1 pound in December, and are seen again in February to weigh 3 to 6 pounds. Every spring tide finds them half a pound heavier. They just follow our winter salmon, while our first grilse are never seen before May and then they weigh from 1½ to 3 pounds, and in July 5 pounds and up to 12 pounds. The youngest salmon and the largest have the same distinct marks on them, an oval scale and a crescent tail, while the youngest and largest grilse have a nice diamond scale and mackerel tail. In the third year I have found and pointed them out 20 to 25 pounds each, but our fishermen call them salmon as they obtain a higher price. In writing I only speak for the Forth.

About twenty years ago, when the hatchery was established for the Tay, the old keeper, Peter of the pools, as they called him at Stormontfield ponds, wrote the inspector of the river Tay, saying he could not understand his numerous family of 200,000, for one-half seemed quite inclined to go to sea and the other half or perhaps one-third seemed disinclined to go near the outlet of the pond while the others were leaving by the thousands. Mr. Buist, my worthy friend, wrote me asking if I could enlighten him on such a queer and interesting matter. I at once explained the true cause, namely: The bailiffs when capturing the fish to abstract the ova, as it happened in winter, often during the time ice was on the water or a storm of snow was lasting, had little time to make investigations and might have taken the ova from a good-sized grilse instead of a salmon. Indeed, as they all considered it only a

young salmon, they thought it all the same in mixing them together, therefore they saw the difference only when the salmon were ripe for the sea. The following season they paid more attention and spawned only salmon, and in the spring every one in the ponds left within two days—not one was left. The following season they spawned, as formerly, salmon and also grilse, and next spring again only part wished to get away; proving what I had said.

The government of New Zealand has ten times asked parties to obtain salmon ova and send out to them for their fine rivers in that country. It has cost them thousands, but they never yet received one alive. The government was again thinking of trying to get them out once more when a friend of mine, Mr. Farr, secretary for the Acclimation Society of Christchurch, volunteered to come home and see the friends in England which he had left thirty-five years before, and then to come to Scotland and endeavor to obtain salmon ova. Being introduced to the chairman of our fishery board, he got permission to obtain them from the river Tay. We went, but we were too late. We could obtain ten females, but we could not obtain one milter. Being too late for the river Tay I then set off for the Tweed, and succeeded in obtaining over 140,000 fine ova. I then adopted a plan of my own, and instead of at once packing them up for shipment I conveyed them 60 miles in jars to my son's trout hatchery at Linlithgow, and laid them in the troughs until they became eyed; then, instead of packing them up in fog or moss direct from the boxes or troughs, I caused 48 bottles to be made of a flattened shape, and I placed a small tube through the bung or cork, so as to allow bad air out and fresh air in, and in each bottle I put about 4,000 ova, and had these again hung in boxes with the most easy springs I could procure, and by such I was able to convey them 400 miles by railway to Portsmouth without one dozen being killed.

Mr. Farr then placed them in trays I invented for him—a chest with shallow drawers, into which I make the water to flow from a cistern. It can be regulated as to heat or cold all the way out and the draw or shelf can be examined daily. The drawers are also divided in order to prevent the lurch of the steamer affecting them or disturbing them at all. It will be a wonderful undertaking if such a quantity can be so taken out alive after all their failures. The greater quantities packed before in moss or fog and ice, with the frightful shaking by the railway killed part if not the whole before they even reached the ship.

A number of gentlemen propose getting up, in a park of 35 acres, a grand international exhibition close to our city. As they have asked me to take charge of the fish department and all concerned, and as I see there is plenty of fine water, I propose to lay out several large ponds and have a large hatchery erected for salmon, grilse, and trout. I hope to be able every season to stock every river in Scotland with fry as well as all our burns with trout, at the same time stocking the ponds, say, of a few acres each, with Loch Leven and other trout to allow our youth some

nice angling. Already I have offers for next season from parties willing to send me any quantity of lake salmon and trout ova, so as to give us a good start and have millions of fry brought out. Perhaps you may be able to help us with some of your favorites.

I have one son in Auckland, New Zealand, who has taken a great interest in the hatcheries there. I am now entirely out of business, so I have plenty of time on my hands. My son who succeeded me has no less than 25 salmon fisheries at rentals of £10,000, and has 200 men employed. This season at one of his fisheries in February he succeeded on the river Tay in capturing 1,300 fine salmon.

THE MIGRATION OF SALMON, GRILSE, AND TROUT ON THE FORTH.—From important and lengthy investigations it appears that we have every season five runs of salmon, two of grilse, and four of trout. The first run, or what is called our winter salmon, commences in December with the first spring tide. This is a large, coarse fish, 16 to 30 pounds weight, very lively in the net and bold on the rod. The second run is the first of our young salmon or spring fish. This is a finè-made and delicate-looking fish, and also very lively, which puts in its first appearance in February, weighing 1½ to 6 pounds and rising 1 pound every spring tide. The third run is our summer salmon, a short-made fish, very sluggish in the net or on the rod, first seen in May, 12 to 30 pounds. The fourth run is our autumn salmon, rather a smart fish, gives great play on the line, appears in July, from 16 to 40 pounds, the milt and roe well developed in August. Males have a long beak. The fifth run fish have a distinct, peculiar appearance, being generally of a dark color, some red and spotted. The males have a large milt and a very prominent beak, while the females have a very large roe. They give great annoyance to anglers, leaping and disturbing the water; they run from 12 to 30 pounds. It was always supposed by the old fishermen that they were the real breeders which stock the river. If the autumn is wet, they appear in September; if dry, not till October.

The first run of grilse appears in May, 1½ to 5 pounds. They are very lively and delicate-looking fish. The second run of grilse appears in July, when they are short and broad, weighing from 5 to 12 pounds each. The following year they weigh from 16 to 24 pounds, and are now often called salmon, as the fishermen obtain a higher price for them when so called.

The first run of trout are called lamesmen; in other rivers they are called whiting or herling. They appear in January and again in August; a very neat little fish, 6 to 12 ounces. The second run of trout is called the sea trout; very green and silvery, and a very smart little fish, seldom caught with the fly, but easily with the minnow. They appear in February, 2 to 5 pounds. The third run of trout comprise two different sorts. One has spots all over; the other below the line. The first is very pale and the second as red as salmon. They run from 1½ to 2 pounds each; are first seen in May, and then in August. The

fourth run is called salmon trout, or bull trout; a strong, coarse-looking fish, and rather dark in the scale. They are first seen in July, 4 to 10 pounds, and some are seen 16 pounds.

The distinguishing marks are as follows: The salmon are known from the grilse or trout by the tail, which is crescent-shaped, and an oval scale, even when seen $1\frac{1}{2}$ pounds and up to .80 pounds. The grilse has a mackerel tail and a diamond-shaped scale, even when only $1\frac{1}{2}$ pounds weight, and continues up to 24 pounds. The trout in general has an oblong scale and square-cut tail, although the salmon-trout tail is nearer the crescent shape.

With every spring tide a fresh run ascends the river, but unless there is a flood they fall back with the tide. The trout spawn first, then the grilse, and then the salmon. The trout fry leave the river first, then the salmon, and then the grilse.

THE MIGRATIONS OF SUMMER AND WINTER HERRING.—The fry of the summer herring on the Forth leave the brackish water, where they have been located all winter, about the month of April, reaching the salmon nets near Queensferry in May, and Largo Bay in June. About this time the old herring leave the deep sea, where they have been all winter, returning to the coast, looking out for a place to spawn, and feeding on the ova of the whitefish which spawn near the shore. The fry meet them along the coast of Fife or Midlothian, and at this time the young herring, being about 6 to 8 inches long, take what is called the dandy-hook. This is a clear hook without any bait on it. From the appearance of sea-fowl the sea appears to be full of them for 20 miles, and well over it. About this time the fishermen try their narrow-meshed nets, and capture a large quantity, but they are unfit for curing. Then towards the end of the month wider nets are adopted, and large quantities of the old or last year's herring are captured. But as too often is the case, the fish, not having gathered into a concise body, get frightened at so many nets, leave the shore, and go out to sea. Then when the fishermen cannot obtain a good capture near the coast they follow the sea-fowl out to sea, and as the nets increase they drive the herring farther and farther out to sea, 20, 30, and often 40 miles, causing a great loss of time and much risk to the fishermen.

This goes on all July and August, and the fish getting ripe are obliged to spawn in mid ocean, and often on so bad ground that fully one-half of the ova is lost. It may happen that a storm sets in and continues a few days, when, few nets being set, the herring seek to get near the land. The fishermen not anticipating such a movement do not use their nets, and therefore a large quantity get near the coast and spawn. But, as too often is the case, some old fishermen, from the experience of former seasons, and by observing the sea-fowls, discover the herring on the spawning-ground, shoot their nets and anchor them over the herring. Then if the herring are strong they lift the nets to the surface. The nets are full of herring, and it has often been seen that from eighty to one

hundred barrels have been secured. Often after the boat was loaded the fishermen had to call on their neighbors to come and empty the remainder of their nets so as not to lose them and the herring. But if the fish are spawning and weakly, so that they cannot raise the nets, then they sink to the bottom, and both nets and fish are lost. The result of this is, the herring remain in the nets until all the meat is eaten off their bones. These lying there all winter frighten the herring next season from coming to spawn. The bones in the nets appear like clouds of phosphorus. This causes the herring to leave the locality for years, as has been found to be the case at many places formerly frequented by herring shoals for spawning, and afterward deserted for many years at a time.

The fry of the winter herring, after feeding from April, leave the brackish water at Culross and Boness and go down the Firth of Forth. When captured in October they are 3 to 4 inches long, with a tough belly, and are called sprats or garvies. In November they are found at Queensferry, and are continually getting larger. If there is very rough weather they get mixed with the summer fry seeking to get up to Culross for the winter, and both are caught in the same net. Often, in December, they are found between Queensferry and Inchkeith. Then they are larger, and some caught measure 6 to 8 inches. In January they go down the Firth, and are found all the way down to the Island of May, then being immature herring. They meet their parents coming in from the sea, where they have been since March after spawning.

My fishermen, while fishing, have traced both the summer and winter herring, after spawning, 40 miles to sea, and found both kinds returning when fishing for them for bait for their large hooks. We have also traced and followed the fry from where they were spawned up the north shore of our Firth, all through the various bays, and up to Boness and Culross, and observed their rapid growth every month as they passed through our salmon nets and otherwise.

DENHAM GREEN, TRINITY,

Edinburgh, March 18, 1885.

55.—ON THE MIGRATION OF BIRDS IN THE SPRING AND AUTUMN OF 1884.

By J. A. HARVIE-BROWN, F. R. S., F. Z. S.

Regarding the unusually extensive migration of gulls to our coasts in 1884-'85, several suggestions as to the influencing causes are readily at hand, but the following appear to have the greatest weight and importance:

As we are informed in "Nature" of February 12, 1885, recent Norwegian explorations in the Spitzbergen seas show that the year 1884 was a very remarkable ice year. "The west side of Spitzbergen was