Lobsters.

The stock of these crustaceans in the ponds on the 19th December, 1916, was seventeen males and seventeen females. On the 31st March, 1918, it was eleven males and fourteen females; and at the end of this year it is five males and twelve females. In the case of the majority if not all of the deaths the cause seems to be injuries received during the act of casting the shell.

The number of larvæ liberated during the past three seasons is estimated at over 350,000 at a very moderate computation. They have simply been allowed to escape, and no attempt has been made to rear them through their free-swimming stages.

No lobsters at any stage of growth have yet been met with in the sea, although it is now ten years since they began to be set free. The Board got large crab-pots made, which were lined with fine wire netting, and have been put out in suitable localities and baited in the hope of securing young lobsters. Plenty of kokopuru and other kinds of small crustaceans were got, but no lobsters. Neither, however, were there crayfish, with which the coast-line swarms. I wrote to Dr. Williamson, of Aberdeen, on the subject, but he said we need not worry, as they never see young lobsters or young edible crabs on their coast.

Fish-marking.

In 1916 the Board was contemplating a scheme for marking fish in order, if possible, to ascertain their coastal movements and migrations. It intended to procure a number of suitable tags, and commence the systematic catching, marking, and liberating of specimens of the common sole (*Peltorhamphus novæ-zeelandiæ*). Up to the present it has been found impossible to carry out this scheme, but a good deal of information on the subject has been secured.

In the first instance we learned from Dr. Allen, Director of the Plymouth Biological Station, that vulcanite tags consecutively numbered were obtainable only from Hamburg. Owing to the war that source was closed, and he could not name any one in Britain who could supply suitable tags. Application was then made to the Commissioner of Fisheries, Washington, D.C., who took some trouble to obtain information. His second letter of April, 1917, states that "the Bureau is just in receipt of advice from Lamb and Tilden, local [Washington] agents for most of the large manufacturers of marking-devices, that they are unable to locate a manufacturer who will undertake to furnish vulcanite, ivorite, or celluloid tags, and expressing their conviction that such materials would disintegrate in sea-water." He adds, "The experience of the Bureau in tagging live fish is somewhat limited, and it does not therefore feel justified in making recommendations. In an investigation that has only recently been suspended, a device made of silver and suitably marked was attached to the opercle by perforation. It may be stated that the fish marked in this experiment were the tunas or albacores. One tag from a marked fish has been recovered to date, and this is supposed to have been in the water about two months. There was no evidence of corrosive action." The cost of these tags was $85·50 per thousand. It was also stated that the Bureau used tags made of pure block tin for specimens preserved in alcohol, formalin, and other preservative, without any signs of attack by the preserving agent. Messrs. Lamb and Tilden offered to supply oval checks, 1 in. by ½ in., with sunk figures 100 to 1,100, and letters "N.Z." thereon, hole at each end, in block tin, for $40·00 per thousand net. They add, "The metal-market to-day is in such a condition that no positive guarantee can be obtained as to its purity." In replying to these communications I stated that the Curator and I were of opinion that a bright metal plate or disk, even if only an inch long, or less than an inch in diameter, might direct an amount of attention to the marked fish which might prove detrimental to it. We resolved, therefore, to experiment with tank fish in the first instance. One difficulty immediately met us: there was no pure tin to be obtained here, or (according to local houses) in Australia. The tin examined by me contained some antimony. We resolved, therefore, to experiment with aluminium, though knowing its unsuitability for marine work.

The attachment of the tags to a flat fish like the sole is a somewhat difficult matter. We found, too, as we anticipated, that as soon as a fish got its bright metal label attached to it it became an object of interest to the other fish in the tank. They soon lost their interest, however, though in most cases they must have snapped a good deal at the tags, as they tore the fins to which they were attached. In the open sea this would be a very serious menace to the fish, and would lead in many cases to their destruction. The base of the pectoral or of the dorsal fins appeared the most suitable position for the attachment of the tags, but in every case the fins were either badly bitten or torn away. Eventually the plan of puncturing the base of the caudal fin was found to be best, and tags so placed have remained attached for several months. They were fastened on by a small piece of silver wire passed through the flesh.

Several tags, carefully weighed, were placed in small jars or bottles and sunk in the tanks to test the action of the sea-water on them. They were examined from time to time, and finally cleared and weighed at the end of eight months. As was anticipated, aluminium, on account of its liability to be attacked by chlorides, was found to be totally unsuitable for this work. Many of the tags split and blistered as if the thin metal was formed of very thin plates, and the space between these split films became filled with a white crystalline mass, which proved to be nearly pure aluminium oxide. All the split tags gained weight from this oxidation of the metal. Those which remained intact all lost weight, varying in each case from 0·16 to 3·67 per cent. The average loss of weight was 1·32 per cent. in the eight months.

Growth of Fish in the Tanks.

The growth of the turbot has already been referred to. It may be mentioned here that turbot are easy fish to measure, although they have never been handled. When it has been necessary to lift them, either for examination or for transfer to another tank, a small flat net on a wire frame has been slipped under each fish, which then allowed itself to be lifted without a wriggle. Round fish under such conditions always tend to jump, but flat fish lie still for a considerable time.