

## North Sea Investigations.

By

**Ernest W. L. Holt,**

Naturalist on Staff in charge of Investigations.

THE reasons which induced the Association to undertake this work, and the nature of the investigations proposed to be carried out, will be familiar to readers of this Journal (see vol. ii, No. 2, p. 88), and need not be here recapitulated. I shall, therefore, confine myself to a brief account of such progress as has already been made.

Grimsby was selected as head-quarters, as being the port from which the largest number of boats work, and, in fact, the head-quarters of the North Sea Trawling Industry. A local body, the Marine Fisheries Society, has for the last few years been carrying on work in Grimsby, principally in connection with the culture of sea fish, and for that purpose has erected an aquarium or hatchery at Cleethorpes, a small watering-place and fishing village on the outskirts of the town. It was felt that it would be of great advantage if the Association could secure the co-operation and assistance of this Society, and communications accordingly passed between the Director and Mr. O. T. Olsen, Secretary of the Society and also a member of the Association, and to whose energy and enthusiasm the foundation and subsequent success of the Society are in great measure due. As a result the Society at once promised every assistance in their power, and furthermore placed their premises at Cleethorpes at my disposal for such work as could be most conveniently carried on there. The hatchery contains glass and slate tanks of various sizes, with apparatus for circulating the water, and its reservoir is connected with the sea pump of the adjacent public baths, so that direct communication with the Humber can be established at any time. There is an ample supply of hatching boxes of various patterns, and machinery for setting them in motion after Captain Dannevig's method. A museum and office are attached, and the Society has further been at the trouble and expense of erecting a small laboratory for my accommodation.

An arrangement has also been arrived at whereby I secure the services of the Society's care-taker for such purposes as they may be required, the Association bearing half the expense of his salary.

I arrived at Grimsby on the 1st of January, and a certain amount

of time was necessarily taken up in arranging preliminaries and settling the method of procedure.

At present it seems advisable to confine my remarks to describing the system on which work is carried out, deferring any report on the results until such time as they shall be complete.

I visit the market every morning in order to obtain fish for investigating the condition of the reproductive organs at different sizes. The quantity that can be got is, of course, regulated by the price, which during the first two months of the year has been remarkably high. It has, therefore, been impossible to devote much attention to soles, but it may be expected that during the next few months the price will become more reasonable, while the incidence of the spawning period will be of advantage. In the case of turbot and brill, which are brought to market ready gutted, it is possible to make the necessary examination without injuring the saleable quality of the fish, and for this purpose Mr. Bulpit, a salesman in the market, has kindly allowed me access to any fish that come to his stall. The removal of a small piece of the testis or ovary, for microscopical examination in doubtful cases, causes no injury. The fish purchased are conveyed by the attendant to the hatchery, where, with the necessary apparatus at hand, careful observations are subsequently made. Details as to the number of fish examined will be found annexed.

Incidentally to this investigation a good deal of information is obtained as to the spawning period of the prime fish on the different grounds, and much can also be learnt by observing the operations at the gutting tables, where the coarser kinds of fish are cleaned for transmission or curing.

Considerable difficulty has been encountered in obtaining accurate statistics as to the distribution and annual destruction of immature fish on the different grounds. The weight of fish captured is accessible, since Mr. W. Hood, statistician to the Board of Trade at this port, kindly allows me to inspect his books, and by this means, from general observations of the fish in the market at different seasons, a computation can be made; but its value is at best doubtful. Obviously statistics, to be reliable, must be collected at sea, and for this purpose I have endeavoured to enlist the assistance of as many skippers of trawling vessels as possible, and have been helped by the influence of Mr. Olsen, Mr. G. L. Alward, and others at Grimsby, and have been promised assistance from other parts of the coast. At first I tried entrusting such skippers as would take them with note-books, lists of sizes, and measures, but soon found that, although in a few cases the results were satisfactory, this method of keeping records was too great a tax upon the time of

busy men. I have therefore had forms printed, which require little beyond the filling in of figures, with the best results. It takes time to extend the operations to a sufficiently large scale, as it is only the most intelligent amongst the community who readily interest themselves in matters of this kind. I am able to collect a certain amount of information myself at sea, as Mr. G. L. Alward has been most kind in procuring me a berth whenever I want it on any of the vessels belonging to the various companies with which he is connected. So far I have only made two trips, as fishing has hitherto been confined to grounds where small fish are not plentiful. The season for the grounds on the eastern side of the North Sea is only just opening.

By inducing skippers to bring me in all the "rubbish" from the last haul of a trip, with careful data as to position and soundings, it has been possible to collect considerable information as to the fauna of the different grounds. Objects of special interest are also usually brought to me.

For investigating the relation of size of mesh to size of fish caught, I have caused a number of cod ends of different sized mesh, braided in different ways, to be prepared. These can be easily laced on to any trawl, and as the cod end is the part of the net in which the opportunity of escape, if any, presents itself to the fish, the object desired can be gained in this way at a great saving of expense. Mr. G. L. Alward has most generously presented the Association with a trawl, 24 feet beam, which can be used in connection with these cod ends. So far no opportunity of testing them has occurred, for want of a boat, but I have now made arrangements for making the first series of experiments at an early date.\*

The following are found convenient limits for dividing large and small fish :

Turbot . . . . .	17 inches.	Cod . . . . .	20 inches.
Brill . . . . .	15 "	Haddock . . . . .	10 "
Sole . . . . .	12 "	Whiting . . . . .	8 "
Lemon Sole . . . . .	10 "	Grass Whiting = Pollack . . . . .	18 "
Plaice . . . . .	17 "	Coal-fish . . . . .	20 "
Halibut . . . . .	23 "	Hake . . . . .	24 "
Witch . . . . .	12 "	Ling . . . . .	24 "
Megrim . . . . .	12 "	Tusk . . . . .	16 "
Sand dab . . . . .	6 "	Cat-fish . . . . .	20 "
Long Rough Dab . . . . .	6 "	Gurnard . . . . .	9 "
Flounder . . . . .	7 "	John Dory . . . . .	14 "

The fish enumerated in the returns are selected on account of their proximity to the size limits.

\* Since this went to press I have made one trial of the nets, with results of some interest.

*Return of Fish examined during Month of January, 1892.*

Locality from which fish derived.	Name of fish.	No. caught.	No. received from other boats.	No. examined.	No. males.	No. females.	No. large.	No. small.	No. immature.	No. approaching ripeness.	No. ripe.	No. spent.
North Sea	Turbot . . .	—	3	3	1	2	0	3	2♂ 5♀	1♂ 1♀	0	0
"	Brill . . .	—	7	7	1	6	0	7	1♂ 1♀	0	0	0
"	Plaice . . .	—	65	65	22	43	13	52	11♂ 31♀	5♂ 4♀	4♂ 6♀	1♂ 2♀
"	Poledab or Witch . . .	—	4	4	0	4	4	0	0	4♂ 4♀	0	0
"	Cod . . .	—	2	2	1	1	1	1	1♀	1♂	0	0
"	Haddock . . .	—	7	7	1	6	7	0	0	1♂ 6♀	0	0

*Return of Fish examined during Month of February, 1892.*

North Sea	Turbot . . .	—	39	39	19	20	26	13	3♂ 5♀	16♂ 15♀	0	0
"	Brill . . .	—	17	17	6	11	10	7	1♀ 10♀	6♂ 10♀	0	0
"	Sole . . .	—	44	44	22	22	9	35	1♂ 11♀	21♂ 11♀	0	0
"	Lemon Sole . . .	—	9	9	3	6	8	1	1♀ 5♀	3♂ 5♀	0	0
"	Plaice . . .	—	51	51	15	36	32	19	3♂ 17♀	5♂ 1♂	9♂ 5♀	3♂ 7♀
"	Halibut . . .	—	7	7	3	4	1	6	2♂ 4♀	1♂	0	0
"	Common Dab . . .	—	16	16	8	8	9	7	2♀ 6♀	4♂ 6♀	4♂	0
"	Long Rough Dab . . .	—	2	2	0	2	2	0	0	0	2♀	0
"	Cod . . .	—	11	11	5	6	9	2	3♂ 4♂	1♂ 1♀	1♂	0

*Return of Fish examined during Month of March, 1892.*

North Sea	Turbot . . .	—	12	12	8	4	6	6	1♂ 4♀	7♂	0	0
"	Plaice . . .	—	4	4	0	4	0	4	2♀	0	0	2♀
"	Common Sole . . .	—	9	9	7	2	4	5	0	6♂ 2♀	1♂	0
"	Lemon Sole . . .	—	32	32	18	14	28	4	6♀	8♂ 6♀	5♂	5♂ 2♀
"	Common Dab . . .	—	36	36	24	12	36	0	0	12♂ 4♀	12♂ 4♀	0
"	Long Rough Dab . . .	—	1	1	0	1	1	0	0	0	1♀	0
"	Whiting . . .	—	17	17	10	7	16	1	1♀	9♂ 4♀	1♂ 2♀	0
"	Tusk . . .	—	3	3	0	3	3	0	2♀	1♀	0	0
"	Grey Gurnard . . .	—	51	51	24	27	50	1	1	21♂ 24♀	2♂ 2♀	0