

GENTLEMEN,—

30th May, 1909.

I have the honour to present the following report of the experiments that have been conducted under your direction, with a view to the introduction of the English lobster (*Homarus vulgaris*) and crab (*Cancer pagurus*) into New Zealand waters, with notes of observations made as to their habits in confinement, spawning, moulting, hatching, &c.

THE LOBSTER (*Homarus vulgaris*).

For our own future guidance, for the benefit of those who have so kindly assisted in making the experiment a success, and as some of the facts in regard to the life-history of the lobster that have been brought to light were, I believe, hitherto unknown, I will endeavour to set forth these observations as fully and yet as concisely as possible, and will avoid as far as possible the use of any technical terms that will not be readily understood by all.

Owing to a very marked decrease in the supply of lobsters, a good deal of attention is now being paid to the subject of lobster-culture in the Eastern States of America, in Canada, Great Britain, Norway, France, and other countries. The reports of most of these experiments are in the station library, and have proved most valuable in the present case. In these countries the lobster is indigenous, and, of course, the necessity for keeping a large stock in confinement in such condition that moulting, impregnation, spawning, and hatching will take place in their natural sequence does not arise. In almost all cases the egg-bearing lobsters are caught as near the egg-hatching season as possible, and are placed in suitable ponds or tanks until the eggs are hatched. If the external eggs are not well advanced and almost ready to hatch out when the lobsters are caught, most, and in many cases all, the eggs, for some reason, become detached from the adult, and are lost, and when the time of hatching arrives very few, if any, eggs remain, and of course very few larvæ are obtained.

So far as I can gather from these reports, the artificial propagation of lobsters is admitted by all to be a very difficult matter indeed, even where a plentiful supply of egg-bearing females is available, and I cannot find a single instance in any of these reports of a lobster in confinement spawning and carrying her eggs until hatching took place. Although repeated efforts have been made in this direction, instances of lobsters spawning in confinement are few and far between, only one case being reported from the Marine Laboratory at Port Erin; one, I think, at Peel; and one at Dunbar. Several other isolated cases are reported, but in all cases the results have been the same—the eggs, for some reason, are lost, or nipped off soon after extrusion. Professor Ehrenbaum, of Heligoland, who has devoted a great deal of time to the study of the Norwegian lobster, states in his report, "It is useless to hope for the entire development to take place under artificial conditions, and no station can work so precisely that the eggs will remain quite normal during so long a period of incubation." This period is stated by him to be from eleven to twelve months, under local temperatures. Experiments have been conducted by the U.S.A. Fish Commissioners in confining lobsters that were already egg-bearing in large tidal enclosures; but in this case also the results have proved abortive: the bottom of the ponds soon became foul, and the eggs were soon found to be missing. With these facts before us at the outset of the undertaking, it appeared as if we were about to repeat an experiment which has proved unsuccessful wherever attempted, as, in addition to the difficulties experienced elsewhere, several other most serious problems presented themselves. Not the least of these was the question of transporting the lobsters a distance of some twelve thousand miles through the tropics under such conditions as would allow them to arrive in a perfectly healthy condition. Then there was the question of the effects of the great range of temperature experienced in our shallow ponds consequent upon the small rise and fall of tides. The most serious problem, and at the outset apparently the one least likely of solution in the present case, was their known abstention from spawning in confinement, and their failure to carry their eggs during the long period of fosterage when kept under artificial conditions.

Previous to the introduction of the lobsters and crabs a good deal of time was devoted to the study of the hatching of the eggs of local crustacea, and no difficulty was experienced in hatching the eggs of such forms as the crayfish (*Palinurus edwardsii*), porcelain crab (*Petrolisthes elongatus*), prawn (*Palæmon affinis*), and "whale-feed" (*Grimothea gregaria*). These were, however, only placed in the tanks when the eggs were almost ready to hatch out. Some seven million crayfish larvæ were produced with no further effort than merely to place the "berried" adults in the glass tanks until hatching was completed. There is considerable diversity of opinion as to the frequency of moulting and spawning of the lobster. Most workers are in favour of the biennial-spawning theory—that is, that an individual lobster spawns only once in two years, with an intervening moult. There is also some doubt as to the time coition takes place.

Owing to the great economic value that would result from their successful importation, the Board have kindly allowed me to devote the whole of my time for the past three years to the observation and care of the lobsters and crabs, and it is due entirely to this that so great a measure of success has attended the results of the first year's operations.

Transportation.

Four shipments, each consisting of twenty-five lobsters, have been made by the Shaw, Savill, and Albion steamer "Karamea." On the first three occasions the lobsters were forwarded by rail from Plymouth to London in fish-baskets. They were packed in damp seaweed, and the large claws were securely fastened. They were thus about fourteen hours in transit, and, after being placed on board, the only water available for the first two days was from the ballast-tanks. From the report of the chief engineer, Mr. Naismyth, who had charge of the shipment, the combined effects of these circumstances appear to have given them a very serious set-back, and they began to sicken and die even before the water became excessively warm. The cooling apparatus on these three