

present juncture would, I am confident, be highly experimental, and involve costly plant being placed in any steamer fitted up to try the experiment.

What I would suggest is that in the first instance the Fisheries Board for Scotland be requested to ask some of their scientific experts to make experiments at their marine stations, with a view of determining the best and most economical method of procedure before the colony authorises the fitting-up of the necessary tanks and apparatus and the payment for skilled attendance during the voyage, all of which probably means a considerable outlay. I should like to see the question of transport reduced by experimental work at the hatcheries to the same level as that of salmon- and trout-ova before a shipment is authorised, so that we may be able to say that, under certain conditions, and with proper care on the voyage, the fish or ova should arrive in good condition. It would be an interesting study, both from a scientific and practical point of view, and a study which I feel sure would be undertaken *con amore*.

The necessary plant for receiving the consignment would have to be provided in this colony, and it would be wise, I think, to have observations as to temperature and conditions out here recorded and sent to the experts trying the experiments. If a marine scientific station is established here all this could be carried out by correspondence, and much valuable information might be noted. Once a marine station is established out here I think crabs and lobsters should be brought over and kept in captivity for breeding purposes, Mr. Purvis, the late chief engineer of the "Ionic," having brought some out from England some time ago in tanks fitted up for the purpose.

I attach some interesting letters and remarks bearing on the subject, which will be useful for reference:—

LETTER FROM PROFESSOR MCINTOSH, M.D., LL.D., F.R.S., F.R.S.E., ETC., ST. ANDREW'S MARINE LABORATORY.

DEAR SIR,—

Gatty Marine Laboratory, University, St. Andrew's, 17th September, 1898.

In reply to your inquiry concerning the possibility of transmitting the eggs or examples of the herring, plaice, turbot, haddock, and cod to New Zealand, I beg to make the following observations:—

In the first place it is taken for granted that the local experts have satisfied themselves that the conditions of marine life and the environments are such that a reasonable prospect of success would attend the arrival of living examples of the species mentioned; secondly, that they are assured that the manipulation of the native forms—with all the help science can give—would be less advantageous than the introduction of the northern species. Considerable experience is necessary to determine these problems.

1. *Herring*.—So far as my experience goes, there should be little difficulty in transporting this species. Thus in an early report of the Scotch Fishery Board it is recorded that Baltic herring were acclimatised to fresh water, and then transported in an ordinary sailing-ship to the Marine Laboratory at St. Andrew's. They lived in fresh water there for more than a year, their loss being due to their activity, for, by leaping out of their own vessel, they fell into a tank of sea-water, and were killed. The hardihood showed by these acclimatised herrings could not be surpassed, and when further explained that the sailors simply put them (in the Baltic) into their ordinary hogshead of drinking-water, and used it for drinking as usual on the homeward voyage, the strength of the case is increased. They did not give the herrings food on the voyage to St. Andrew's, as such would have been inconvenient to their drinking-water. Moreover, they caught the herrings with peas on hooks. We fed them on earthworms. I am of opinion that this method would be far more successful than by attempting to keep the eggs at low temperatures, though it is true the latter are comparatively slow in development (much quicker, however, than the eggs of the salmon and trout). Of the five forms mentioned, however, the eggs of the herring are alone worthy of further experiment. I am not sanguine of success with them.

2. *Plaice*.—Two sizes of plaice (kept in separate tanks) should be experimented with—viz., (a) 7 in.—8 in. plaice, and (b) adult plaice of 14 in.—18 in., the former being of the small race. The former—(a)—should be fed on crustacea, &c., caught in tow-nets, and on small mussels in stock; the latter—(b)—on mussels, lobworms, &c.

3. *Turbot*.—Specimens of 11 in.—12 in. should be taken. Food: Mussels, young sand-eels, and shrimps. Both these and the plaice are extremely hardy, and would live for a long time without food.

4. *Haddock*.—I doubt whether this form could be successfully transported, though 8 in.—10 in. specimens in a "welled" ship might be tried, and the temperature carefully regulated. Acclimatised examples should be taken. Food: Mussels, shrimps, lobworms, and earthworms.

5. *Cod*.—Two sizes of cod should be tried—viz., (a) 10 in.—12 in. acclimatised in tanks, and (b) adults in a "welled" ship or similar arrangement. Food of (a): Mussels, shrimps, lobworms, and earthworms. Food of (b): Shore-crabs, Norway lobsters, whelks, mussels, limpets, and anemones. First experiment should be with (a).

Large concrete tanks should be ready at a suitable locality in New Zealand for the arrival of the specimens. An ample supply of pure and cool sea-water should be arranged in connection with the foregoing. It will be observed that I do not recommend experiments with the eggs of the plaice, turbot, haddock, or cod.

Lastly, failure at first should not discourage the Government. A careful and experienced scientific man should accompany the ship, and accurate records should be kept. From these deductions could be made for future improvements. I am, &c.,

L. F. Ayson, Esq.

W. N. MCINTOSH.

N.B.—When at my instigation the Scotch Fishery Board transported English soles to Scottish waters we used closed tanks, aerated by pipes and bellows. This was the most successful method.

SOME REMARKS ON THE POSSIBILITY OF INTRODUCING EUROPEAN SEA-FISHES INTO NEW ZEALAND WATERS. (By H. C. Dannevig, Cam. Philos., Sea-fish Culturist to the Fishery Board for Scotland.)

THE unquestionably great benefit to the colony in general which would attend a successful introduction of European food-fishes is of sufficient importance to justify attempts being made in that direction were the prospect of success ever so faint. But in the following I shall explain why, in my opinion, the prospects in reality are very encouraging, and that success is bound to follow judiciously planned and carefully attended experiments. The desired result is conditional to two points of equal importance, viz.: (1) Whether it is at all possible for European sea-fishes to live in New Zealand waters; and (2) whether it is possible to transport the species out there. As to the first question, it cannot, of course, be definitely answered until positive proofs are established; but, as a comparison of the physical conditions—temperature, &c.—show a considerable similarity between the New Zealand and European waters, no justifiable doubt can be entertained on this point. There is no apparent reason why our sea-fishes should not thrive out there equally well as the trout, although the success with the latter does not necessarily prove anything in relation to the former. The second condition, or the possibility of transporting the species out there, is next to be considered. As already suggested, this may be attained in two ways—(1) By taking out the eggs, or (2) by taking out the fishes. These modes have both advantages and disadvantages, and in the following is shortly referred to what I consider the most important features.

(1.) *The Transport of the Eggs.*

It is well known that the duration of the incubation of fish-eggs is influenced by the temperature of the water. The extent of this influence is very considerable, as will be seen from the following: Eggs of the cod will develop in about eight days and a half in water of 14° centigrade (57.2° Fahr.), in about fifteen days and a half in 6° centigrade