

In my report last year reference was made to Captain Hayes's discovery of the spawning-places of whitebait on the banks of the Manawatu River. During the past year this work has been continued, and the inspections have been extended to other rivers. The details of this work will be referred to later (see p. 24). I must refer here to the practical lesson to which these discoveries point. It is very evident that among the losses which have been caused by civilized man and his works to the stock of *Galaxias attenuatus* in its various stages, including that which is commercially known as whitebait, the destruction of the spawn and the deterioration of natural spawning-places by the presence of grazing animals must hold an important place. Now that this factor is clearly understood it is very desirable that no time should be lost in taking steps to obviate it. It is therefore greatly to be desired that, wherever the spawning-beds of whitebait are known to occur, arrangements should be made to protect these strips of herbage along the river-bank from the access of four-footed animals.

Captain Hayes has further pointed out the possibility of increasing the production of this species by preventing the drying-up or complete drainage of those swamp-pools in which it lives during its pre-adult and adult feeding stages.

SCIENTIFIC INVESTIGATIONS.

OYSTER INVESTIGATIONS.

A scientific understanding of the biology of rock-oysters is necessary for the rational exploitation of the existing "fisheries," and also to enable cultivation methods to be developed and carried out to the best advantage. The work that is being done with this end in view consists of (1) direct observation of the naturally occurring oysters and of their environmental conditions, and (2) experimental work in which the effects of different environmental conditions, artificially provided, are studied. The first is a matter of making periodical observations of the natural or established beds, and keeping systematic records of their productivity and varying conditions and of the observable factors which may possibly be correlated with the oyster phenomena. Water-temperature and other conditions depending on location are the environmental factors which would appear to be of most importance.

In Appendix II is given a comparative table of average monthly temperatures taken at three different stations in the Hauraki Gulf and Bay of Islands for the last three years, and at one station in the Kaipara Harbour for the last two years. The records for these particular "stations" are selected out of many because temperatures have been taken there with greater frequency. Each of them is in a rock-oyster area, and the averages represent the conditions, so far as the temperature factor is concerned, by which the oysters in the vicinity are affected. It is not proposed at this stage to make any detailed correlation between temperatures and oyster phenomena, but it may be pointed out that an average temperature of at least 20° C. (60° F.) appears to be necessary before successful spawning can take place. It will be noticed that during the year 1930-31 this temperature was reached in each of the four areas one or two months earlier than in the previous year, and there is evidence of more successful oyster-spawning this year, which may be considered to be a direct effect of this warming-up of the water earlier in the season.

In the Kaipara Harbour there was, as usual, a copious setting of young oysters during the summer of 1930-31. It will be noticed that the water-temperatures in this area are generally appreciably higher than on the eastern side of the province.

Besides making periodical inspections of the established cultivation work, Mr. Young has in hand various experiments with a view to exploring possibilities of developing new methods of cultivation, as well as of eliminating the elements of chance from the cultivation operations already adopted.

Trials of the Australian methods of "tray cultivation," begun in 1929, are being continued. The method consists of taking small or poorly nourished oysters from places where they do not grow into marketable oysters and putting them on trays of wire netting set up where the conditions are suitable for oyster-fattening. The results so far obtained go to show that greatly accelerated growth takes place on the trays, the development of shell being the earliest and most conspicuous effect of the transplantation. Fattening eventually takes place, but it occurs later on the trays than on the natural rocks, and such tray oysters are not ready for sale in the usual marketing season, June-September.

The drawbacks and difficulties to this method appear to be—

- (1) Corrosion of the wire and collapse of the frame through attacks of "ship-worm" owing to the long period during which the oysters require to be held.
- (2) The tendency for mud to collect under and around the trays, with consequent smothering of the oysters. (Many losses resulted from other causes, some of which might have been prevented if more frequent surveillance had been possible. The main problem is in the location of the sites. It is necessary to keep the trays clear of any channel that may be used by boats; but where there is not a good current of water, or where the flow is appreciably checked by the trays, there is an increased tendency to collect mud.)
- (3) The oysters on trays are subject to disturbance by wave-action. This can be minimized by fitting splash-boards on the weather side, and is not a serious difficulty when the oysters can be kept under fairly frequent observation.

As a result of the tray-cultivation experiments so far carried out, the Marine Biologist prescribes the following points as essential to success:—

- "(1) Adequate and constant supervision is necessary, so that defects in the tray may be remedied (piling up of oysters due to weather, netting carrying away, provision of splash-boards, &c., picking of oysters as soon as marketable).