

A third and important point is that all the individuals of a species do not spawn at the same time. Hensen himself thinks that each fish spawns several times within a short period, and besides the spawning season of each species varies from place to place. At a definite moment it is thus impossible to find all the eggs in the earliest stage, for as a matter of fact in the Norwegian coast waters the same haul includes eggs in various stages as well as larvæ and more advanced young. As regards Norwegian waters it is therefore, as far as I can see, at present impossible to realise Hensen's idea of counting the fishes of the sea, or to cope with the problem of calculating the stock arising from the developed larvæ.

Artificial fish-hatching.

It is well known that in many countries a considerable amount of work has been devoted to so-called artificial fish-hatching, which consists in keeping the eggs until the minute larvæ have escaped. Hopes have been entertained of increasing the fish-supply by means of this hatching, the idea having prevailed that these larvæ had a better chance of growing up than the eggs. But when these minute larvæ are placed in the sea, where there are already great numbers of them, they disappear from view in a few minutes, and their subsequent fate is entirely unknown. All calculations as to how many of them grow up must be based on unknown and uncontrollable factors, and become all the more doubtful considering there is now ample proof that the abundance of different annual classes varies enormously in nature.

Quantitative investigations on the sea-floor.

Quantitative investigations of an entirely different kind have in recent years been started by C. G. J. Petersen,¹ who constructed a bottom-sampler, or kind of gripper (see Fig. 575), which, like a dredging apparatus, brought up a large sample from the surface of the sea-floor. The bottom-sampler is intended to cut out a sample of one square foot from the bottom, which is passed through sieves, the sand and mud being sifted off, leaving the animals to be classified, measured, counted, weighed, and finally submitted to chemical analysis. These investigations on the abundance of bottom animals are simpler than those dealing with the pelagic organisms, which move so freely in a horizontal as well as in a vertical direction.

Petersen has also attempted to solve the problem of the quantity of fishes by experiment.² He captured great numbers

¹ *Report of the Danish Biol. Station*, No. xx., 1911.

² "The Labelling of Fish in the Sea," *Fishery Report for the Years 1888-1889*, and *Report from the Danish Biol. Station*, No. iv., 1893.