

exploitation of spat set on cardboard collectors. (5) Ease of transfer from one ground to another.

The most satisfactory artificial collectors were ordinary egg-crate fillers coated with concrete. Directions for coating these fillers are given, together with estimates of cost. Several methods of exposing the collectors for the settlement of spat have been tried, the most satisfactory being the suspension from a float of bundles of coated fillers tied up in wire-netting. The methods of constructing floats etc., and the cost of materials and labour are given in detail. It is recommended that the collectors be exposed a few days after water temperatures of 68° F. or over are experienced. This is the temperature below which spawning is stated not to occur. In Malpeque Bay the settlement of spat averaged about 1000 per collector over a period of years. The spat are removed from the collectors during the late autumn, when the season's growth is complete. During removal the collectors are broken up piecemeal and the spat singled by hand. During the winter the spat is submerged on hard bottoms in shallow crates covered with wire cloth. If ice is avoided the losses are not estimated at more than 5% during the winter months. During the second summer the spat is reared in floating trays holding seven to ten thousand spat, moored in protected bays. The optimum density of spat is stated to be about 1—1.5 per square inch. The trays are of wood, with a wooden cover, and with bottom and ends covered with galvanised wire cloth. Owing to the prevalence of shipworm all wood has to be primed with white paint and painted before use. A mortality of about 5% only should be experienced during the second summer. After the second summer's growth the young oysters should have reached a diameter of 1—3 inches, and 75%—80% can now be planted on firm bottoms without protection. The cost of rearing small oysters by this method is given as 1—1.5 dollars per 1000, while the collection of spat costs approximately 15 cents per 1000. These figures are, however, only provisional and further reduction is possible.

H. A. C.

(Various). "Annual Report Year 1934." Repts. Newfoundland Fish. Res. Lab., Div. of Fish. Res., Dep. Nat. Resources, Newfoundland. Vol. II, No. 3. St. John's, 1935.

Previous reports of this series have been reviewed in this journal, Vols. VIII, p. 274; IX, p. 124; and X, p. 216. The work which Dr. Harold Thompson directs is concerned both with the problems of supply and exploitation of the fisheries and the problems of handling and processing. This unity is rather attractive, all the problems of the industry being considered by one scientific body, but this review is only concerned with the first part of the work in Newfoundland, the fish supply and its capture.

For many years we have known vaguely, from the publications of Beaugé and of Huntsman, that the great cod fisheries of the region were affected by variations in hydrological conditions, which are on a large scale. The workers in Newfoundland are making remarkably fast progress in this enquiry. They express the changes rather simply, as variation in the strength of the cold Arctic Current. They have knowledge, as to the importance of the Arctic contribution, from temperature, salinity, drift bottles, and species in the plankton, which were mentioned in earlier reviews. They now add an interesting series of six species of *Ceratium* and even the eggs or fry of caplin, cod, and dab. The Arctic Current seems to act on cod through temperature, with remarkable effects in detail, both in the

shore and bank fisheries. For example, it affects the potency of the liver oil in vitamin A, because larger fish have more potent oil and larger fish are more affected by warm water than are smaller ones. There is also a depth effect because the deeper water is colder.

We may select from the interesting account of the work on salmon, the theory that the Labrador fishery will stand less fishing than those of southern rivers, because the rate of replenishment is slower, there being 5 years of parr life.

M. G.

(Various). "James Johnstone Memorial Volume." The University Press of Liverpool. Liverpool, 1934.

James Johnstone, late Professor of Oceanography in the University of Liverpool, would have vacated his chair in 1935, had he lived until then. There was a scheme afoot to prepare and issue a "Festschrift" in his honour when he did so. But Johnstone died in 1932, and it was then decided that the contemplated "Festschrift" should become a Memorial Volume. This idea bore fruit, and towards the end of 1934 a James Johnstone Memorial Volume was published.

From many pens in divers lands contributions having a bearing on some aspect of Johnstone's particular scientific interests have come to swell the book. It opens with a short biographical note by Prof. F. J. Cole, a lifelong and intimate friend. For this brief sketch of Johnstone's life, and particularly the history of his early struggles to acquire the necessary training for his life's work, both those who knew and worked with him, and also those of us who belong to a younger generation, will be grateful.

The remainder of the book contains no less than twenty-two papers on subjects so widely separated — a reflection of Johnstone's remarkable versatility — as "Observations on Certain Human Parasites", "The Distribution of Dissolved Oxygen in the Northern Pacific", and "Herring and Water Movements". It is therefore quite impossible, within the scope of a single article, to review in detail all the component contributions. Special mention must be made, however, of a paper by Dr. E. S. Russell on "Johnstone and the Philosophy of Biology". It consists in the main of an appreciative analysis of Johnstone's last book *The Essentials of Biology*, in which are "summed up in compact form his matured reflections upon the nature and evolution of life". As one of the most active and versatile of that small band of scientific workers in England who pay useful attention to the more speculative aspects of modern biology, no one is more fitted than Dr. Russell to review his late colleague's efforts and achievements in that field. Both theoretical biologists, therefore, and that larger company who, like the present reviewer, lack those rare qualities of intellect which induce successful incursions into philosophical realms but nevertheless endeavour not to overlook the wider problems of biological method, will return to Johnstone's "Essentials" with a livelier interest and derive from it an ampler profit after having read Dr. Russell's illuminating commentary upon it.

In short, every worker in those sciences to which Johnstone devoted his talents, whether they knew him personally or not, will welcome this Memorial Volume on their working bookshelves, both as a permanent tribute to a lost colleague and for the intrinsic worth of several of the papers it contains.

G. A. S.