

- H. C. White.** "Age determinations of Salmon Parr by effect of Rate of Growth on Body Proportions." Journ. Biol. Board. Canada. Vol. 2, No. 4, pp. 379—382, 4 Fig. Toronto, 1936.

This short paper records the results of measuring the head length and eye diameter of salmon parr of various ages from various rivers in Nova Scotia. It was found that rapidly growing fish, as shown by scale readings, have short heads and small eyes. If the eye diameter be plotted against the length of the fish, each year-class, with very few exceptions, will be found to fall into a separate zone. This is obviously a very useful check on the age determined from the scales, and the author indicates that this feature may apply to other species of fish, so it may have a wide application in fishery research. These problems of relative growth have, however, a wider biological interest and in this connexion, whilst we recognize that tables are expensive to print, it would have been an advantage to have Mr. White's data in full.

F. T. K. P.

- A. L. Pritchard.** "Factors influencing the Upstream Spawning Migration of the Pink Salmon (*Oncorhynchus gorbuscha* (Walbaum))." Journ. Biol. Board. Canada. Vol. 2, No. 4, pp. 383—389, 3 Fig. Toronto, 1936.

In this paper the mathematical correlation between the height of water and the run of salmon into fresh water is investigated. The work was carried out in McClintock Creek, Masset Inlet, British Columbia, where a counting weir enables the daily run into the creek to be enumerated. The author finds a positive significant correlation between this number and the maximum daily height of the water and also, as one would expect, with the daily rainfall, in spite of the fact that a very high flood may reduce or even entirely stop the run, obviously owing to the fish being unable to breast the current. This relation has, in a general way, long been known, but it is a distinct advantage to have it measured scientifically.

F. T. K. P.

- (1) **H. C. White.** "The Homing of Salmon in Apple River, N. S." Journ. Biol. Board. Canada. Vol. 2, No. 4, pp. 391—400, 4 Fig. Toronto, 1936.
- (2) **A. G. Huntsman.** "Return of Salmon from the Sea." Biol. Board Canada, Bull. No. L1, pp. 1—20, 10 Fig. Ottawa, 1936.

The investigation of the Atlantic salmon of the east coast of Canada is a comparatively recent development of the work of the Biological Board but it has already proved fruitful, and these papers are very welcome for the light they throw on the habits of salmon in Canadian waters. The first is concerned with the freshwater life of the fish and the second is a non-technical summary of the work already accomplished.

(1). The Apple River in Nova Scotia is formed by the confluence of two tributaries, the East and West Apple rivers. Salmon enter the river to spawn but until 1921 they were denied access to the East Apple by a dam, but even after the removal of this dam, the run was confined to the West Apple. No salmon were recorded in the East Apple until 1932,

when fry from the Restigouche river in New Brunswick were planted in it. When these fish were ready to migrate to the sea in 1934, there was a good opportunity to test the theory of a "homing instinct" in Atlantic salmon. All the smolts migrating down the East Apple were therefore marked by the removal of the adipose fin, whilst those in the West Apple were unmarked. In 1935 these fish were returning to the river as grilse and, with very few exceptions, all those entering the East branch were marked, and those the West branch, unmarked. The few exceptions, it was noted, occurred at the end of the run, when the fish were ripe for spawning. The author rightly concludes that this experiment shows that "Atlantic salmon have some means of selecting the stream in which they were reared," though, on the basis of the exceptions, he elsewhere suggests that when the spawning urge is very strong, this instinct may not operate. These anomalies are, however, so few that the work may be regarded as convincing confirmation of the popular theory of a "homing instinct" in salmon, a theory for which there is a good deal of other, though less direct, evidence.

The paper also includes valuable data on the movements of adult salmon in fresh water, which shows that they have a tendency to return to the stream, or even the pool, in which they previously spawned.

(2). Dr. H u n t s m a n reviews the work on the salmon of the St. John's and Apple rivers of Nova Scotia, the Minas Channel and Basin at the head of the Bay of Fundy, and the Margaree River of New Brunswick. He gives some interesting data on the life of salmon in Canadian rivers, including experiments which show that the nature of the run (whether it be composed of grilse or older fish, and the time at which it occurs) is not a hereditary characteristic, and that the presence of young salmon in a stream appears to attract adult fish to that stream, but the most important part of the paper is concerned with their return from the sea. Whilst he does not deny that salmon may possess some kind of homing instinct, he suggests that it may play little part in their return from the sea, for he points out that their known distribution in Canadian waters indicates that they normally do not travel very far and may not go beyond the influence of their own river. He further suggests that those fish which do go a considerable distance may become "lost" and that the large salmon of the Minas Channel fishery (which are quite unlike any salmon found in the rivers of that region) are those which have been unable to find any stream to ascend and consequently have remained growing unchecked by the ravages of spawning.

It is difficult to correlate the return of salmon from the sea with the development of their sexual organs, for some enter the rivers a long time, even a full year, before they spawn, whilst others come in fully ripe. If we understand him aright, it appears that Dr. H u n t s m a n believes that salmon in the sea become active in the warmer months of the year and if, during this period, they come within the influence of fresh water, they congregate at the mouths of the rivers and eventually enter them. If this is so, and if salmon do not normally travel very far, we should expect the majority of them to return as grilse, as they do in the rivers upon which this paper is based. We should also expect that fish which do not return in their grilse year, would be less likely to find their own river, but on this point there are no data from American waters.

This theory is obviously a most important contribution to the study of the salmon. Dr. H u n t s m a n does not claim that it is of universal application and there are clearly difficulties in applying it to the salmon

on this side of the Atlantic. For example, it does not seem likely that if smolts from the rivers of the east coast of Great Britain went only a short distance into the North Sea, their whereabouts would have remained so long unknown. Again, most salmon enter these rivers as small spring or summer fish, having spent two or more years in the sea, yet they appear to return to their own river with as much certainty as grilse. Nevertheless our British data will clearly have to be re-examined in the light of Huntsman's theory, though it must be realized that this may be no test of its validity for the area discussed in this paper, for the habits of salmon are exceedingly variable and it may be that no single theory will explain them.

F. T. K. Pentelow.

A. E. Warren. "An ecological study of the sea mussel (*Mytilus edulis* Linn.)." Journ. Biol. Board Canada. Vol. II, No. 1, pp. 89—94, 1 Fig. Toronto, 1936.

The distribution of the mussel (*Mytilus edulis*) in Passamaquoddy bay is almost exclusively intertidal. Mussels are very rare below tide level. It was suspected that the superabundance of starfish, sea-urchins, whelks, and other natural enemies of the young stages might be responsible for this scarcity in what must be regarded as their natural habitat. In order to determine whether young mussels, fully protected from their natural enemies, would thrive when continually submerged, four lots of young mussels were exposed in wire cages, three submerged below low-water mark, and the fourth exposed for approximately four hours daily. The mussels selected were 1.5 cm. in length. The three cages continually submerged were situated at depths of 4 and 9 feet below low-water mark, and just below the water surface attached to a floating barge. Growth in length, depth, and thickness was measured over a period of three months. The most rapid growth was obtained in the cage suspended just below the surface; while slightly better growth occurred in the cage anchored 4 feet below the low-tide level than in that 9 feet below tide level. However, in the latter the density of mussels was considerably greater, a factor which is known to influence the rate of growth of commercial shellfish, and should have been eliminated. In all three cages growth was superior to that shown by the mussels in the cage exposed for a few hours daily. It seems likely, therefore, that the exclusion of mussels from what must be regarded as their natural habitat, *viz.*, from low-tide level downwards for a few fathoms, is in this area due to the superabundance of the natural enemies of the spat. Other factors have, however, to be eliminated; e.g., it is not yet established that mussel spat settles equally well above and below tide level.

H. A. C.

R. W. Dodgson. "Shellfish and the Public Health." British Medical Journ. Vol. II, pp. 169—182. London, 1936.

Polluted shellfish are a proven threat to the health of the community that consumes them, and the sources of pollution are increasing. Any large-scale undertaking to prevent shellfish pollution by deviation of sewers and sterilization of effluents is impracticable, would be too costly, and might fail to give security. Further closure of fisheries — and two-thirds of the mussel beds of England and Wales are already closed — must cripple