

It is clear that many more experiments are needed before we shall know all about the conditions that affect scale structure. In these experiments on Rainbow Trout, temperature had no effect, but the authors point out that temperature may influence growth in several ways, both accelerating and retarding, the net result depending on equilibrium between conflicting effects. It is also, perhaps, well to remember that a species probably has a characteristic critical temperature. To *S. irideus*, for example, a winter temperature of 5 degrees C. (the lowest monthly mean in GRAY and SETNA'S experiments) may not be an effective retarding factor.

It should be noted that these experiments provide another witness to the correlation between growth-rate and circulus-width. M. G.

**P. S. Galtsoff, H. F. Prytherch, and H. C. McMillin.** An experimental study in production and collection of seed oysters. U.S. Dept. of Commerce. Bureau of Fisheries Document No. 1088. Washington, 1930.

This work affords a striking example of scientific fishery investigation which has yielded immediate results of very great value. In the introductory section of this paper Dr. GALTISOFF explains the problem with which it is concerned, and the lines of attack followed during the last few years under his direction in the North Atlantic coastal waters of America. Though still flourishing by comparison with some European countries, production of market oysters in the United States has nevertheless suffered a definite decline during the last 24 years amounting to over 30%, due mainly to overfishing and pollution of natural beds. Two means of increasing production of seed oysters have to be considered; methods of artificial breeding, and methods for increasing the natural set of spat, sometimes referred to as artificial collection of spat. Artificial breeding has been accomplished on a laboratory scale by two methods in the United States, but at present they are expensive and offer little prospect of application to meet the demand for vast numbers of seed oysters on anything like an economic basis. To find methods of increasing production on natural beds is therefore the urgent problem. The present paper deals with experiments and observations between 1925 and 1928 in three localities; Wareham River and Onset Bay (both in Mass.), and Milford Harbor (Conn.), selected on account of regularity in spat production, which in their waters is independent to a great extent of the general alternation of bad with good seasons characteristic of northern waters.

By the use of crates made of lathing, and piled-up bags made of wire netting filled with shells to serve as collectors in place of shells merely scattered broadcast, it has been found possible not only to increase the set of spat over a given area by as many as thirty times, but also to make use for seed collection of soft muddy bottoms, or shifting sandy bars, where shells scattered in the old way would be unproductive. One wire bag collector, for example, may catch from 5,000 to 25,000 spat. Another form of collector proved satisfactory under certain conditions; the cardboard partition filler for egg boxes, coated with a mixture of lime, sand and cement. Full details are given in a separate report (H. F. PRYTHERCH, "Improved

methods for the collection of seed oysters", U. S. Bureau of Fisheries Document No. 1076, 1930). This collector has an advantage over shells in the ease with which the young oysters can be detached and separated by simply knocking or crushing the partitions.

Descriptions of the various collectors with which the present paper is concerned are clearly illustrated. Numerous tables and figures are presented in connection with hydrographic observations, and the large number of counts of spat necessarily involved.

The outcome of this work cannot fail to be of great value to the fisheries concerned, and may well have a wider application. The question naturally arises: can European countries which are badly in need of seed oysters benefit by these new methods? The frequency with which, in England for example, bad spatting years are experienced on many oyster beds would render expenditure every year on special collectors a great strain on the resources and determination of the oyster grower. We have here a case where accurate prediction of good and bad seasons, already attempted in the case of oysters in the States, would be of the greatest value to many a struggling fishery.

H. P. S.

**A. C. Robertson and W. H. Wright.** Investigations upon the deterioration of nets in Lake Erie. U. S. Dep. of Commerce. Bureau of Fish. Doc. No. 1083. Washington, 1930.

The red slime that fouls nets consists of a species of hydra and is harmful only in so far as it harbours destructive bacteria. Gill nets treated with two different dark-coloured preservatives were proved, by practical fishing tests, to catch virtually as many fish as white nets, and to retain their strength longer. Treatment with hot tar is unsatisfactory as the preservative (antiseptic) compounds were soon leached out. Its continued use is due to the incorporation of other toxic agents for which it serves as a vehicle.

Trials were made with various poisons, cuprous oxide, copper oleate, copper resinate, copper salts of naphthenic acids, and mercuric oxide, with petroleum asphalt, coal and wood tars, also kerosene as vehicles. The amounts of copper present, per foot of net, are shown up to 13 weeks immersion in the lake. The period of test was too short. It is considered that copper oleate might be replaced by copper resinate or by a mixture of the two, since the resinate is not slippery. It tends to brittleness, however, hence the value of the mixture. A solution of  $1\frac{1}{2}$  to 3 pounds of copper resinate per gallon of kerosene is recommended as surpassing copper oleate in preservative action and having none of the disadvantages of the oleate. Inasmuch as the nets were not allowed to rot to destruction, such a conclusion appears to be unjustified. Both lost copper to about the same extent, but the naphthenic acid salt (probably "Cuprinol") retained about twice as much, and appears superior, though the authors ruled it out on account of initial cost, which is an economically unsound conclusion if the preservative action lasts much longer, as their table 4 shows to be the case.

W. R. G. ATKINS.