

larger, stronger, and better protected to withstand the approaching winter. But it may not be good policy to plant shells for the very first swarms of larvæ because of their small numbers. The culturist needs to know his grounds as well as to know his oysters. If the locality is one that rapidly reduces the efficiency of cultch there is all the more necessity to play for the quick capture of a great number of spat—i.e., to put out the shells to accommodate the largest brood. If, on the other hand, cultch does not become very rapidly coated it may be safe to risk the chances of obtaining small contributions from successive broods. When once in the water shells are likely to receive fresh additions of spat as long as there are any larvæ left. The cultch supplied for the largest brood also has this advantage.

It may appear that since larvæ are in the water for so long a period there need be no concern about putting out cultch to suit the requirements of the first or any other large brood—that the continual accession of occasional spat from small broods will total a fair set in the end. But this reasoning is not safe. The study of plankton collections shows that the total number of larvæ in the water from time to time is subject to great fluctuation, as is also the total number of full-grown larvæ. It is the latter the culturist should count on in putting out shells. There are times when for days there are scarcely any to be found, and if cultch happens to be put out at such a time there will be next to no spat secured and the cultch will be deteriorating while the younger broods are growing up to the spatting stage. The cause for the fluctuation may have existed a month previously, when the eggs were spawned, or may have happened at any time during the previous month, when great numbers of larvæ have been destroyed. A cold spell of weather, a protracted rain, or a scarcity of food may have operated to prevent the ripening of eggs, the spawning, the fertilization, or the development.

There is still left one method of judging the time to plant cultch, and that is to keep watch on old shells or, better, to put out a few good shells and examine them for spat. Of course, this method is open to the objection that the first good fall of spat may be past before the culturist becomes aware of the presence of spat and before he has the bulk of his cultch planted. The method, however, can be used in combination with the other methods to advantage, in that while the full-grown larvæ are still few in numbers the culturist may capture occasional spat and even recognize an increasing number which will add to his assurance that he is on the right road.

SPECIAL WORK.

The culturist who is in contact with the same areas from year to year is in the best position to detect and follow up the special problems of the district. He should become interested in the subject in other than financial aspects. He may not be able to apply the most technical methods and reach the most accurate conclusions, but he will soon discover whether he is increasing the production or not. Mechanical repetition of a set course of action is not likely to improve his methods. It is quite unnecessary to risk any suggested change on a large scale. A small, perhaps somewhat isolated, area may be set apart for an experiment. He should aim at finding the best grounds for spatting, for growing, for fattening, for keeping over winter, etc. He could make observations on the rate of development and rate of growth, the conditions under which discoloured oysters (black, green, red) are produced, and the local causes of death among the oysters.

A subject of great importance is that of food. The contents of the stomachs of oysters may be withdrawn by means of a pipette and examined under a microscope to see the kinds and quantities of food-organisms that have been swallowed. Search can be made on eel-grass and other seaweeds and in plankton collections for the same organisms in order to learn where they are produced. These places should then be tried by planting oysters on them and noting the growth.

Different conditions of the bottom and of the water may be tested; continuous submersion or periodical exposure, stagnant or flowing water, gravelly or muddy substratum, sloughs, pools, lagoons, artificial ponds, dyked areas, salinity, temperature, etc.

Oysters transplanted from other districts should be observed with a view to determining the best sources from which to draw. Observations having an apparent local value may be found by comparison to possess a broader significance.