

careful never to miscrop or overcrop, and is alive to the value of the practice of fallowing. Scientific and provident farming afloat will in time equally recognize the imperative need of these rules of good husbandry.

In several important respects the aquaculturist has advantages over the agriculturist. He has a free hand to sow and to reap where he wills. He is under no lord of the soil, and knows nothing of "Coercion" Acts or legislative vexations of any kind. He is hampered by no private rights. His husbandry exacts less personal attention, and his crops do not suffer from atmospheric influences, and, when obtained, they are quickly realised. And, above all, he sits, or rather sails, rent and taxation free.

But what use have we made of these bountiful oceanic provisions? Have we taken advantage of them as we have in these later times of the fruitful qualities of the land? Clearly not. Though we go far afield for bread and beef adequate for our teeming and ever-increasing millions, we have hitherto strangely overlooked or neglected the possibilities of relieving the demands of subsistence by a better cultivation of our marine food farms. We have been strangely passive under the ever-growing difficulty and cost of procuring sufficient supplies of fish, while it has been known that by the adoption of rational and adequate methods of fish culture and of fish capture we may indefinitely increase and consequently cheapen our national fish supply.

It may be asked, What are these rational and adequate methods? The reply is, that artificially aided fish culture is capable of increasing fish supply to a practically unlimited extent. There are four known methods of fish culture, viz. :—1. By pond culture; 2. By transplantation of sexually mature fish; 3. By transplantation of naturally deposited spawn; and 4. By artificial extraction and incubation of spawn. It has already been shown that by the last-mentioned means complete control of the reproductive functions of fresh water and anadromous fish, such as the salmon, has been acquired. In the present day these kinds of fish can and are being multiplied to any required extent on many inland fish farms with all the certainty of a science. The remainder of our space will be devoted to a short review of the other methods of pisciculture above stated.

Necessarily, the cultivation and increase by artificial means of migratory and pelagic varieties of fish is attended with greater difficulty than is the case with non-migratory fish. Our knowledge of the life-history of many ocean-going fishes, and even of the salmon, when it repairs to the sea, is still far from complete. Many of these wandering fish do fortunately, however, once every year approach the land or enter into sounds and shallows, for the purpose of breeding, and opportunity is thereby given to aid or protect the generation of these species. Some other kinds, which literally cast their seed upon the waters, are much less amenable to piscicultural control, but with regard to these nature has herself provided a safeguard against extermination. Their fecundity is so inconceivable that were it not for wholesale destruction of their spawn from natural causes, as well as the depredations of species upon species, not only all the arts of man would fail to make any practical inroad on their numbers, but the sea itself would cease to give room for them. It has been calculated that of some kinds of fish not more than one in 500,000 reaches adult life, and that for every full-grown oyster upwards of 1,000,000 die.

Thus it is that though the fertility of many kinds of oceanic fish surpasses comprehension, they are, nevertheless, so reduced in numbers by the operation of various natural causes—the predatory instincts of other species—and the wasteful arts of capture practised by man, that great difficulty is often experienced in obtaining an adequate fish supply for human needs. Some species would seem, indeed, to have been really exterminated, and others have narrowly escaped the same fate. The salmon itself, though now better protected, not so long ago seemed in danger of extermination, and has actually been completely destroyed in many places where it formerly abounded. Such, also, has been the fate of the oyster, lobster, and other mollusca.

In considering the best remedial measures for decayed fisheries, and the economic extension of the whole fishing industries, a controversy has arisen among experts as to the necessity or value of protective legislation. In Great Britain the positive side of this question is led by Dr. Francis Day, who is a strenuous advocate of close times and legal control generally; while the negative view is as firmly held by Professor Huxley, who sees no good in protective Acts of Parliament, or, as he puts it, "keeping the wolves off during the lambing season will afford not much protection if you withdraw shepherd and dogs during the rest of the year." In the United States of America, which at the present time leads the van of fishery matters, the Chief Commissioner of Fisheries, backed by public opinion, is averse to restrictive laws, and no such enactments there exist. We take this to refer to sea fisheries, however, and must assume that none of these authorities are wholly opposed to protection of non-migratory fish during the fish-breeding period, the local habits of which would expose them to the danger of extinction. Fishes of anadromous and pelagic habits, however, could not be caught at all if not when they enter our rivers or approach our coasts to spawn. Nor can it matter at what season a fish is killed if it is killed, at all before it spawns. Here, however, pisciculture steps in and says all such considerations are superseded by its intelligent practice.

Our own nation cannot yet be quoted for the best illustrations of the power and value of public fish culture. On the contrary, we are, with respect to national recognition of this great question, almost at the foot of the scale, though by means of private enterprise, as has been shown, considerable progress has been made in one branch of the subject. We have been left behind by more than one nationality, but as the United States of America have outdistanced all others, a short account of what has there been done may be the best means of describing what may and should be done for national encouragement of pisciculture.

In America, as elsewhere, long neglect and improvident methods of fishing had seriously diminished the yield and value of many of the public fisheries, and the outlook was sufficiently gloomy when, in 1871, Congress appointed a Commission of Fish and Fisheries, whose duties were thus defined: "To prosecute investigations with the view of ascertaining whether any and what diminution in the number of food fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes the same is due; and, also, whether any and what protection, prohibitory or precautionary, measures should be adopted in the premises." The late Professor Spencer Baird, secretary of the Smithsonian Institution, a biologist and scientist of the first rank, and the author of many learned works, was appointed Chief Commissioner. To Professor Spencer Baird, it may here be mentioned, the grand prize of the International Fisheries Exhibition at Berlin; in 1880, was awarded, as "the first fish culturist in the world."