

33.—REMARKS ON THE MAINTENANCE AND IMPROVEMENT OF THE AMERICAN FISHERIES.

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In opening this session of the Fishery Congress devoted to the commercial fisheries, the apparatus and methods of fishing, and the utilization and handling of fishery products, I desire, in the short time I shall occupy before proceeding to the business of the meeting, to invite your attention to a few thoughts regarding the general field which lies open for our consideration, and to point out some of the important questions with which those interested in the prosecution, maintenance, and regulation of the economic fisheries have to deal. I shall speak chiefly with reference to the preservation of our fisheries and to certain benefits which may be expected from changes of methods and means of capture and utilization.

Conspicuous instances now exist of the general or local decline, failure, or threatened exhaustion of some of our important river, lake, shore, and ocean fisheries. Among the river fishes whose present extent is markedly less than at an earlier period are the sturgeon and the Chinook salmon; of the lake fishes which are notably scarcer than formerly are the whitefish and sturgeon; lobsters and terrapins, among the shore fishery objects, have undergone a serious diminution in abundance; and the ocean fisheries for whale and mackerel are, as is well known, much less valuable than they were a few years ago. In nearly all these cases the decrease is undoubtedly due to unwise and wasteful methods, and it is an open question whether the decline in many of our sea fisheries may not be at least partly attributable to the same cause.

In view of the increasing importance of our fisheries as a source of national wealth and food supply, it is not especially remarkable that the present period should be characterized by a deeper appreciation of the necessity for preserving our natural fishery resources, a more determined effort to ascertain the conditions prevailing and the influences operating, and a fuller realization of the urgent need of more definite knowledge regarding many of the phases of the fisheries than have existed at any previous time in the history of this industry.

The present time is also marked by a wonderful spirit of progress in fishery methods and an assiduous search for improved appliances. Forms of apparatus, types of vessels, methods of capture and utilization, which a very few years ago were employed are giving place to improvements directed to an increase of the catch, a reduction of the labor, and a mitigation of the hardship and danger of fishing.

The entire aspect of our fishing industry to-day, in its protean manifestations and multitudinous relations, warrants the earnest consideration of all those engaged in its prosecution, intrusted with its regulation, or concerned in its welfare, in order that such action may be taken as will preserve this great source of wealth for the present generation and transmit it unimpaired to posterity. This idea has been well brought out in the interesting paper presented by Dr. MacCallum at the opening of this congress.

As to the ultimate success of the measures for the restoration and preservation of our lake, river, and shore fisheries, I entertain no doubt. The history of our black bass, shad, and oyster fisheries, for example, shows the possible influence that man may exert on the abundance of our economic water animals by adopting positive or direct methods for the increase of the supply, rather than by placing sole reliance on legal restraints on the capture of the products.

As an offset to the degeneration of some of our prominent fisheries through the influence of man, stands the unquestioned improvement that has been effected in other fisheries through the same instrumentality. I think the facts bear out the assertion that the decrease in the value of those fisheries which to-day present a decline as compared with the most prosperous period of their existence is less than the increased production of other fisheries as the direct result of artificial methods employed for their maintenance or improvement. The oyster alone, owing to the adoption of plans for its active cultivation and preservation in nearly every oyster-producing State, in contradistinction with the do-nothing policy that formerly and so long prevailed, has increased in value as an economic commodity to an extent that almost overbalances the combined decrease of all other fishery products.

There is reason for great satisfaction with the results achieved in behalf of the commercial fisheries by artificial propagation. There seems little doubt that the most important river fishery of the Atlantic coast, that for shad, is almost wholly dependent for its present existence and future prosperity on the means taken by fish-culturists to aid nature in securing the fertilization and hatching of the largest possible percentage of ova. The noteworthy results accomplished on the Pacific coast by the experimental introduction of relatively small numbers of shad fry into a few of the rivers afford an invaluable basis for determining the influence on the abundance of shad in native waters of enormous annual plants of fry and yearlings. The recent inauguration of a shore cod fishery on parts of the New England coast where cod were previously scarce or almost unknown is unquestionably attributable to the hatching operations of the U. S. Commission of Fish and Fisheries, and has proved conclusively that, even in the case of such an eminently pelagic species as the cod, man may be potent in influencing its abundance.

Few subjects connected with the commercial fisheries are more important than the relations which exist between the kind and quantity of apparatus used in a given region, on the one hand, and the supply of fish, on the other. Unquestionably, certain modes of fishing are more destructive than other modes, and some forms of apparatus are more harmful than other forms, independently of the quantities of fish that may be taken. Paradoxical as it may seem, it is nevertheless true that two different kinds of apparatus, taking exactly the same quantities of fish at the same time, may be very different in their effects on the maintenance of the supply; and, again, two

similar devices operated under the same conditions and taking the same quantities of fish, but at different seasons, may also have widely different influences on the ultimate abundance of the species captured. In other words, the character of the apparatus does not necessarily afford a basis for determining its effects. A number of modifying causes and circumstances are to be taken into consideration in determining the actual and relative effects of apparatus, among which are: (1) the season when the fish are caught; (2) their condition with relation to the spawning process; (3) the fishing-ground, especially with reference to the shore or the spawning beds; (4) whether the fish are taken in schools, singly, or in straggling bodies.

One of the most vital questions now before the fishery interests of the Atlantic coast is the effect of the purse seine on the abundance of mackerel and menhaden. The failure, year after year, of the mackerel fishery has, to many persons, seemed a positive demonstration of the injurious influence of the purse seine. Granting the present relative scarcity of mackerel on our coast to be due to the effects of unrestrained fishing, the fact should not be lost sight of that many more fish were taken in the old days of hook-and-line fishing than have been caught with the purse seine; and even conceding that the purse seine is responsible for the conditions now prevailing, care must be exercised in ascribing to that apparatus its particular influence in reducing the supply of mackerel, especially in view of the easily verified statement that less fish have thus been directly sacrificed than by the methods pursued prior to the introduction of the seine. The question does not seem to be, Has the purse seine caught too many mackerel? but, Has it taken them under conditions that were unfavorable for the continuance of supply? The apparent maintenance of the supply of menhaden on our coast, in the face of an exceedingly large annual catch, even in a circumscribed area like the Chesapeake Bay, is an argument on the opposite side of the question. Similar references might be made in the case of certain other fishes obtained with pound nets, trap nets, and other forms of apparatus which take large quantities of fish and are, in the opinion of some, responsible for the decreases that have occurred, while other fishes captured under the same conditions and in as large, or even larger, numbers, are apparently holding their own.

While no one attempts to deny that by the reckless use of fishing apparatus in many of our rivers, lakes, and shore waters certain fishes have decreased very noticeably in abundance; and while it is entirely possible, by the abuse of appliances, to effect almost irreparable injury on the fish supply of more or less circumscribed bodies of water which years of rigid protection and extensive artificial means may not be able to overcome, still it is far from being an easy question to determine to what extent the capture of free-swimming fish in the open waters of the ocean may go without producing a perceptible diminution in the supply or vitiating the natural fecundity of the species.

I think we have reason to expect that the studies of the life-histories of our economic marine and fresh-water fishes now going on, when taken in connection with investigations of the fisheries for these species, will do much to solve many of the problems and explain many apparently contradictory phenomena now presenting themselves in connection with our economic fisheries.

The necessity for restriction in certain lines having been determined by competent authority and proper means, the reform should be promptly and efficiently car-

ried out; and I believe that no one will be more ready to accede to rational measures for the preservation of a fishery or the perpetuation of a species than the commercial fisherman. But sentiment and prejudice, unsupported by facts, should not be allowed to abridge or destroy a long-established industry.

In an able paper, which every one interested in the fisheries, from whatever standpoint, should read, presented to the International Fisheries Exposition in London in 1883 by Prof. E. Ray Lankester, the author laid stress on the importance of scientific study and knowledge as a basis for legislative restrictions; his remarks are so timely that they may well be quoted in part:

Legislation is continually demanded, and has been from time to time carried out, in reference to such matters as modes and seasons of fishing and pollution of waters. But it is undeniably true that, in most cases, the accurate knowledge as to the life-history and circumstances of fishes is too small to justify legislative interference. No doubt zoologists have suggested some valuable restrictions which have been adopted by the legislature in regard to some fisheries, and it is to Linnæus, the great Swedish zoologist of the last century, that Sweden owes important fishery laws. But if we are to have effective legislation at the present day in regard to our sea fisheries, we must, before proceeding any further, have *more knowledge*. Those (and there are many) who earnestly desire additional restrictive fishery laws should do their utmost to enable zoologists to carry on researches which will provide that accurate knowledge of fishes and shellfish, their food, reproduction, and conditions of life—which must be obtained before legislation can reasonably be proposed. The only mode of deciding between the conflicting opinions which have so often been expressed during this congress, as to the necessity for this or that legislative enactment, is by bringing new knowledge to bear upon the questions at issue. That new knowledge is nothing more nor less than a part of zoological science, and can only be obtained through the exertions of those who are already acquainted with the actual condition of that science, and with its methods of minute and thorough investigation.—(The Scientific Results of the Exhibition.)

Next to an abundant supply of fish, and of probably greater consequence from some points of view, is the importance of having the fish reach the consumer in the best possible state of preservation. Improvements in the construction of fishing vessels, the more general use of ice, and the more ample facilities for transportation which exist, have already done much to improve the quality of the fresh fish landed from the high seas and the Great Lakes, but the interests of the fishermen and of the public urgently demand further reforms in this direction. The very rapid deterioration of fish which ordinarily ensues upon their capture, owing to the large percentage of unstable albuminoids entering into their composition, requires more serious consideration on the part of fishermen and dealers than is usually bestowed.

Certain modes of capture are responsible for placing on the market an inferior article of food which, under other conditions, would be all that is desired. Fish that are caught by the gills and are left to die in the water by slow degrees undergo a rapid decomposition which quickly unfits them for consumption. The pernicious practice, especially prevalent in Lake Erie, of setting such long lines of gill nets that they can be lifted only at intervals of several days, results in the destruction of enormous quantities of whitefish which have to be thrown away and of very large numbers that are of poor or doubtful edible value. If there is one line of fishery legislation for the Great Lakes more demanded than another, it is the prohibition of the use of gill nets that are not drawn daily.

The generally observed custom of permitting fish that are landed alive to die slowly is also to be condemned on hygienic and economic as well as humane grounds. The longer the time occupied in dying, the softer and less wholesome the flesh becomes.

Fish that are killed immediately on being caught retain a firmness of body and bear shipment better than those which are permitted to die a lingering death, a fact which is well known.

While the extensive use of ice during the fishing operations and in the transportation of fish greatly reduces the impairment in quality, still the present generally pursued method of applying cold for the preservation of fishery products is far from being satisfactory. A person witnessing for the first time the unloading of a vessel engaged in the market fishery for cod and other ground fish, is bound to be forcibly impressed with the soft, slimy, and uninviting appearance which the catch presents when taken from the hold, notwithstanding the evisceration of the fish soon after being caught, and the use of large quantities of ice applied directly to them.

This is one of the lines along which improvements are to be suggested, in the interest of a better quality of fish, as well as for the pecuniary benefit of the fishermen. Vessels often arrive from distant fishing-grounds during the warm months with thousands of pounds of soft and stale fish in their holds, and with little or no ice. The moisture which the melted ice imparts to the fish favors the development of putrefactive bacteria and accelerates decay. The impairment of the quality of fish which ensues when insufficient means for their preservation are taken can never be dissipated by secondary attempts to stay the deterioration, and the most careful efforts to maintain the freshness of the fish should be made at the time they are caught and pending their arrival on shore, and not from one to ten days after being taken, as is now too often the case.

Among other things that seem to be demanded in the interests of fresher fish is the construction on fishing vessels of dry-air refrigerators. Much good will also accrue to the fisheries by the use of steam fishing vessels and steam carriers in the offshore market fisheries, not only by permitting the discharge of the catch in a better condition but also by enabling the fishermen to visit more distant grounds. The successful efforts of dealers to properly handle fish on shore, prior to and during shipment, by the adoption of modern refrigerator and rapid-transit facilities, fix on the fishermen the necessity for making further improvement in the quality of the fresh-fish supply.

Much, I believe, may be done indirectly for the protection and preservation of some of our fishes now decreasing in abundance by devoting attention to other fishes now rarely or imperfectly utilized, in order to keep up the supply of fish food. The history of the sturgeon, eel, and other species in the United States affords ground for the belief that many fishes now considered worthless may be brought into favor and thus reduce the destruction of other more valuable fish. Already the much despised skates are becoming a factor in the food supply of the Middle Atlantic region and are materially contributing to the income of the fishermen, as they have long done on the west coast; but there are numerous excellent fish in our waters, some of which exist in almost limitless numbers in certain places and at certain seasons, that are scarcely utilized. Among these, and deserving of special mention, are the sea-robins (*Prionotus*) and the whiting or silver hake (*Menticirrhus*). Sea-robins, which are taken by thousands of tons on the southern New England and Middle Atlantic coasts and are almost invariably thrown away, are very similar morphologically and scarcely, if at all, inferior in food value to the highly esteemed gurnard of our English brethren. The whiting, one of the *Gadidae*, in a perfectly fresh condition, is superior to the cod, and when pickled is a valuable article of food; yet only a few thousand pounds are annually

consumed on our coasts, while in Cape Cod Bay alone over 100,000 barrels are turned out of the weirs some seasons and left to decompose on the shores or drift out to sea.

The increased attention paid to the utilization of refuse products of fish in some parts of the United States, especially New England, where not many years ago they were generally thrown away, marks an advance in our industrial life. Every waste product of fish and other aquatic animals resulting from their cleaning, curing, and canning has a commercial value in a crude state or after further manipulation, but in most regions no regard is paid to anything but the actual flesh; and many thousands of dollars are thus annually lost to a class that is least able to afford it. As one instance of the loss our fishing interests are yearly incurring, mention may be made of the economic value of the roe of fishes as an article of food. Practically, the eggs of only two species of fishes—the sturgeon and mullet—are utilized in this country, but there is hardly a fish whose roe is not suitable to be made into a valuable caviar, which could meet with ready sale abroad as well as at home, and would be an important addition to our fishery output, in that it would represent the expenditure of little time and money and the sacrifice of no additional fish. In the utilization and appreciation of our resources we can emulate the Chinese to decided advantage.

Akin to the foregoing topic is the advantage which will accrue to our fisheries through the occupation of new fishing-grounds and the adoption of new appliances for the development of latent resources.

The recent establishment by Texas capitalists of an extensive fishery for red snappers and groupers on the distant offshore banks of the Gulf of Mexico is an important event in the history of our southern fisheries. The advanced policy displayed in having a fleet of sailing vessels remain on the fishing-grounds and in employing steam vessels to take the catch to market affords a suggestive example to the entire country.

The practical experiments made within two or three years and the explorations by the vessels of the U. S. Fish Commission have demonstrated the existence of vast deep-water areas on our coasts which are suitable for the prosecution of beam-trawling and which will yield an almost unlimited supply of excellent fishes which now seldom or never appear in our markets, including a number of flatfishes similar to the most highly esteemed fishes of the European seas.

The adoption of steam propulsion in our ocean food-fish fisheries, as already suggested, may be expected to have a doubly beneficial influence by enabling the fishermen to develop the more remote grounds where fish are likely to be more plentiful, and by relieving the present drain on the inshore waters.