

205.—NOTES ON THE DECREASE OF LOBSTERS.

By RICHARD RATHBUN.

[A paper read before the American Fishcultural Association.]

One of the most important of our sea-coast fisheries is that afforded by the American lobster, the *Homarus americanus* of naturalists. This interesting crustacean, the largest of its kind in North American waters, ranges from Labrador in the north to Delaware in the south, but is most abundant and most sought for along New England and the southernmost of the British coast provinces.

Its great abundance and rare flavor are not unfrequently mentioned in the early annals of New England, and it probably formed an important element in the food supply of the sea coast inhabitants of colonial times. As a separate and distinct industry, however, the lobster-fishery does not date back much, if any, beyond the beginning of the present century, and it appears to have been first developed on the Massachusetts coast, in the region of Cape Cod and Boston, although some fishing was done as early as 1810 among the Elizabeth Islands and on the coast of Connecticut. Strangely enough, this industry was not extended to the coast of Maine, where it subsequently attained its greatest proportions, until about 1840. Concerning the history of this unique fishery but few authentic records of any kind exist, nor was any attempt ever made to estimate its extent and value prior to the census investigations of 1880. We are, therefore, left without much reliable data for comparing its past and present conditions, and for solving the many problems which now, in the minds of many, seem to threaten its continued prosperity.

The great question at issue, and one which demands the earnest attention of every lobster fisherman and dealer, is whether lobsters are decreasing in abundance and will eventually become rare and difficult to obtain, or whether they are still as plentiful as ever and show no indications of approaching extinction. While we hope for the latter, we are forced to acknowledge that a careful study of all the materials at our command inclines us to the belief that the abundance of lobsters has very perceptibly diminished within comparatively recent times, and that, unless some active measures are instituted to prevent continued decrease in the future, a great and irreparable injury to the fishery will ensue.

Although, as we have just said, the lobster-fishery is without a carefully recorded history, we have been enabled, through the assistance of many intelligent fishermen and dealers, some of whom have shown themselves to be very capable observers, to trace back the conditions of the fishery through a number of years. The results so obtained have been embodied in a report prepared for publication by the United States Fish Commission. It has been suggested that a short statement of some of the facts bearing upon the supposed decrease might be of interest to the

members of this association, and it is for that purpose that the following brief notes have been prepared:

Concerning the distribution of lobsters, it may be stated that a few stray individuals have been occasionally recorded from the extreme northeastern corner of Virginia, but the Delaware Breakwater may more properly be regarded as the southern limit of their range. On the New Jersey coast they are somewhat more abundant, and give rise to a limited fishery in the neighborhood of Atlantic City and Long Branch. Though formerly quite plentiful and extensively fished for in New York Bay and Hell Gate, they are now nearly exterminated from that region, due to overfishing combined with the pollution of the waters by the refuse from large factories. Along the Connecticut shores they are moderately common, while at the eastern end of Long Island and in the region of Block Island, the outer Elizabeth Islands, and Martha's Vineyard they afford a very profitable industry.

The entire coast line of Massachusetts abounds in lobsters wherever the character of the bottom is suited to them; but overfishing has nearly depleted some of the shallow-water areas which were once prolific, as at Provincetown. The sandy shores of New Hampshire furnish only a moderate supply, but on the Maine coast they are much more abundant than anywhere to the southward, and the yearly fishery greatly exceeds in quantity and value those of all the other States combined. This State is, in fact, the main source of supply for all the principal markets of the United States. Contrary to the belief of many persons, the lobster is not a migratory animal in the common acceptation of that term as applied to fishes. On the approach of cold weather it leaves the shallow areas near shore and retreats into somewhat deeper water, where the temperature remains milder and more uniform during the winter. As the spring advances it returns to its summer haunts. These spring and fall migrations vary as to time and extent on different portions of the coast, occurring earlier in the spring and later in the fall at the south than at the north. During the summer they often approach very close to the beaches, and in some favorable localities, especially on the coast of Maine, the traps set for their capture become partially uncovered at low water. The more usual depths for the summer fishery are, however, those of a few fathoms. The winter grounds are in depths of twenty to fifty or sixty fathoms, and generally not far from those of the summer, especially in regions where the water deepens rapidly.

In so far as it has been possible to make the observations, it is supposed that the different schools of lobsters, if we can so define them, return to about the same shallow places every spring, and do not journey northward or southward along the coast to any very great extent, although there may be a gradual interchange of ground in the course of time. If this supposition be correct, as appears most natural, and there are many facts to substantiate it, each geographical region is more or less independent of all others, and not influenced by large and frequent

migrations from them. This division into distinct schools, and defined geographical regions, while an arbitrary one, not strictly existing in nature, serves to simplify the argument which we desire to make, and which is to this effect: That continued overfishing in any one region will tend to eventually reduce the stock of lobsters in that region, without the hope of its being replenished by early accessions from neighboring regions, and that the almost total depletion of that region is, therefore, quite within the bounds of possibility. This is not the case with such truly migratory fishes as the mackerel, menhaden, and herring, and the laws which govern the movements of the latter cannot be applied to the lobster. In support of this proposition there are several well-authenticated instances of the almost entire extinction of lobsters in what were formerly regarded as exceedingly rich regions, and since lobster fishing has been more or less abandoned in those regions, the abundance of lobsters has never perceptibly increased.

Another strong proof of the continued decrease in abundance of lobsters has been the gradual decrease in the average size of those brought to market. It is not rational to suppose that lobsters grow less rapidly now than in former years, or have in any way become dwarfed in size. On the contrary, it has been overfishing, restricted by legislation which protects the young, and influenced by the higher prices paid for the larger individuals in the fish markets which has caused the greater diminution in the supply of large lobsters. A strict observance of existing laws may prevent the total extinction of the species, but it cannot maintain the average size of those taken for market much, if any, above the limit prescribed by those laws. This limit in nearly every instance is, moreover, about the size of the young female just beginning to spawn, and, therefore, with absolutely no protection for the spawning female, excepting in the close season, during which there is but little spawning, it is doubtful whether existing legislation is of much avail. A careful consideration of all the facts available certainly indicates that a marked decrease in the size of lobsters is proof of an equally great, if not a greater, diminution in the supply.

It is not possible within the scope of this short paper to strengthen our conclusions with a long array of facts, but the brief statement of some of our evidence must here suffice.

One of the best illustrations of the great decrease in the abundance of lobsters is furnished by the once famous fishing grounds of Cape Cod. The lobster fishery was first started in this region about the year 1800, by Connecticut lobstermen, who carried nearly their entire catch to New York city. As early as 1812, the citizens of Provincetown began to entertain fears that unless some restrictions were placed upon the fishery, the extermination of the species would be speedily effected. Protective laws were at once passed by the legislature of Massachusetts, and from that time to the present they have been continued in one form or another, but all without avail unless it may have been to somewhat

prolong the fishery which might otherwise have been much earlier destroyed. The fishermen of Provincetown did not themselves engage in lobstering until about 1845, but between then and 1850 the fishery was greatly expanded and a large trade started with New York city. In fact about this time the latter market received nearly its entire supplies from the vicinity of Provincetown. A great many men engaged in the fishery, using the old style of hoop-net pots and catching from 100 to 200 lobsters each every night. These were prosperous times, and yielded the inhabitants of the town a profitable income. The carrying smacks obtained large fares and were kept busy. No marked diminution in the supply was noticed until about 1865, since which date there has been a rapid decrease in abundance from year to year, obliging the lobstermen to resort to other occupations for a living. In 1880 there were only eight men engaged in lobstering, and although they used the most improved appliances, their annual gross earnings were only about \$60 each.

On the coast of Maine, although the fishery is of much more recent date, it has already exhibited many unfortunate changes, and in numerous places there has been a marked decrease in the average size of individuals caught. The shore fisheries have also, in some cases, been well nigh exhausted, and the fishermen forced to resort to more distant grounds. When the fishery first began, hoop-net pots were in general use, but soon after the introduction of lath pots competition caused them to be universally employed. From year to year the fishermen increased the number of pots they used, and the custom of setting them trawl fashion rapidly came into vogue. These changes were due to the competitions of trade, the desire to obtain larger catches and for one man to perform the work of two. The fishing grounds were strained to their utmost, and there was no fear of an overstock, as the canneries were ready to buy all that were not taken by the market smacks. More recently the fishermen have begun to return to the old method of setting their pots singly, and why? Because they say the lobsters are more scattered over the bottom, and that by altering the position of the pots every time they are set they fish better. But why should they be more scattered now than formerly unless they are more scarce? In 1864 lobsters were so abundant at Muscle Ridges that three men tending forty to fifty pots each caught all the count lobsters which one smack could carry to market, making a trip once in eight days. In 1879 the same smack was obliged to buy the entire catch of fifteen men in order to obtain full fares, and at times required to visit other localities to complete the load.

Regarding the Booth Bay region, very nearly the same may be said. As late as 1856 lobsters were very abundant about the islands of Booth Bay Harbor, and the fishery was carried on close to the shore in slight depths of water. The season lasted about six months, and each man setting fifty pots could make about \$500 during the season. By 1869, the number of fishermen having increased, however, the season's stock

was reduced to about \$175 per man, and the average size of lobsters had greatly diminished. This caused the fishermen to try farther out from shore, and the fishery is now mainly carried on in depths of 25 to 35 fathoms. The facts of these changes were furnished from many places in this section between Cape Small Point and Pemaquid Point.

The canneries have undoubtedly largely influenced this result on the coast of Maine, as all sizes of lobsters large enough to pay for the handling are consumed, and the ready market thus afforded has tempted the fishermen to save every specimen that enters their traps. It is unquestionably this extensive destruction of the young that has hastened the decrease; but that the decrease is not solely due to the presence of canneries is evidenced by the statements we have already made regarding other sections of the coast.

In the Saco district, although there are no canneries located nearer than Portland, a smack trade between the fishing grounds and the canneries to the eastward has recently been started, and several witnesses have testified to a marked falling off in the proportionate catch since it began. The average catch per man is now about one-third what it was twenty years ago, and while in 1876 a barrel of lobsters averaged 65 by count, an average of 80 lobsters is now required to fill a barrel.

On the New Hampshire coast the decrease for twenty years is stated to have been from 50 to 75 per cent.

From Rhode Island and Connecticut we have complaints regarding a decrease in abundance and size of lobsters similar to those already noted from the more Northern States; but the statements we have given constitute but a small proportion of the evidence we have obtained.

That this evidence is unimpeachable as to a general and lasting decrease we would not now affirm, but to our minds it has been conclusive. To press a definite and unfavorable opinion, however, regarding so extensive and valuable a fishery after the meager returns of a single investigation, extending through only one or two years, would scarcely be justifiable, but it has seemed to us that public attention should be now attracted to the subject, as it appears in the light of the Tenth Census.

The fishery has had such a rapid growth, and the demands upon it have so exceeded its capacity, that the problem of weighing evidence has been somewhat difficult. The total catch of lobsters has increased from year to year, but so has the number of fishermen and the number of traps used even in greater proportion, and the grounds have been enlarged until they now cover an exceedingly broad area, and extend into deeper water than was ever dreamed of formerly in connection with this fishery. The decrease in the average catch per trap and man, in the yearly earnings and in the average size of lobsters, has kept pace with the increase in the fishery; the inshore grounds in many places have been nearly depleted, and in some of the deeper areas the lobsters are so much scattered that it is no longer profitable to set the traps in trawls. If a continuous and rapid decrease should be proved,

what can be done to stop it and insure the future prosperity of the fishery? The task of remedying the evil will be much more difficult than the proof of its existence, and the question is one regarding which we have as yet no definite ideas.

Past legislation has certainly not been very effective, nor can any laws avail much until the true character and extent of the evil has been determined; neither are laws beneficial unless they can be enforced; an exceedingly difficult task in the case of any fishery.

The question of artificial propagation has been raised, and a few unsuccessful attempts have already been made to carry it on. But the failures have not been without cause, as we do not yet even know the rate of growth of lobsters, or whether they require six or a dozen years to attain the adult size, which is about ten or eleven inches. Immediately after hatching they swim freely about at the surface of the water, and continue their erratic ways of life during most of the first season, after which they settle down upon the bottom and assume their future habits.

The first task, therefore, which we suggest for the would-be benefactor of the lobster fishery is a most thorough investigation of all points bearing upon the natural history of the species, upon the changes which have occurred in the fishing grounds, and upon the relations of the total catch for each section to the number of fishermen and traps set, and the average size of the lobsters taken.

With the census returns, soon to be published, as a starting point, a plan of the work can be easily sketched out, and the figures there given may serve as a basis for future calculations.

206.—REARING CARP IN ALKALINE WATER.

By E. S. STOVER.

[From a letter to Prof. S. F. Baird.]

Your request for specimens of young carp raised in alkali water and sample of the water is received, and I shall take great pleasure in complying.

I received this lot of carp from Mr. Menaul at Laguna, N. Mex., in the spring of 1883, he having received them from you the fall before. As it was the first in this part of New Mexico I gave them some very severe tests, simply to see if they were hardy and would do well in alkali water. I dug a small hole in the ground that was full of alkali, the whole ground about being incrustated with it, and in this hole which filled itself from the surface water I put two of the carp, really expecting that it would kill them. But to my surprise they flourished in it, and, if anything, did better than those which I put in the basin of my fountain which contained pure water from the well.