

32.—WHAT WE KNOW OF THE LOBSTER.*

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Within the past five years we have learned much of the life-history of the common American lobster that is new, the most important item being a discovery of its spawning habits, which will simplify our attempts to hatch this valuable crustacean on a large scale. We knew that the female lobster carried a mass of eggs under her abdomen or "tail," as it is improperly called, and that they hatched there, or that we could hatch them under proper conditions of temperature and density of water, and there our knowledge of lobster propagation ended. There are many other things about the life of the lobster that are not popularly known, and without going into a technical description of its anatomy, we may find much to interest us in its habits, development, mode of reproduction, and other incidents, from its emergence from the egg to its capture for market, where we will leave it to the mercies of the *chef* and the lesser deities who preside over our kitchens.

To begin at the beginning is difficult. It recalls the old problem, "Which was first, the egg or the hen?" But in order to break into the life circle we will begin with a small lobster of a few months old, say in September. The temperature is lowering and no more growth is to be made until next year; therefore a gradual movement toward deeper water is begun in order to be beyond reach of the rapidly cooling waters near shore and to get below the influence of frosts, as the tortoises, frogs, and some of our land mammals do. At this time our young lobster will measure from one to two inches, exclusive of the claws, according to the circumstances of food and the date of hatching, the latter being entirely a question of temperature. Living at a depth where there is sufficient warmth to sustain life, but not enough to rouse much of an appetite, our young lobster lives through the winter without making any growth, and in the spring crawls up, as the waters warm, into the shallows and begins to feed on such animal forms, alive or dead, as may come within its reach.

Incased in a hard, unyielding shell which does not grow, it may be compared to a knight in armor, who would be obliged to get a new suit if he should outgrow the old one; therefore, after accumulating a store of material for growth, the shell either splits up the back of the carapace or the latter separates from the first ring or segment of the abdomen and the hinder portion of the animal is withdrawn, and then, with great labor, the forward parts follow and the lobster lies soft and helpless, a toothsome morsel for any predatory fish that may chance along; but instinct teaches the lobster that down among the crevices of the rocks is a sanctuary, and there it remains for several days until the skin hardens into a new shell and it can again fear-

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lessly face its enemies in search of food. It has been my fortune to witness this operation several times while connected with the New York Aquarium, Thirty-fifth street and Broadway, in 1876-78, and twice since in lobster cars in Vineyard Sound, and it is wonderful what a great increase in size takes place at once after the animal leaves its shell. Another wonder is how the great claws are drawn through the very small joints, one or two of which split lengthwise while others seem to soften and expand enough to permit the passage of the claws. When we realize that the lining of the stomach is attached to and cast with the old shell, it will be seen that the change of armor is a complicated and difficult process, not unattended with danger. The new shell is often to be seen under the old one, and then the lobster is in the same condition as the "shedder" crab, so eagerly bought by salt-water anglers for bait, the body being somewhat shrunken from the shell. After casting the shell, the lobster resembles the "soft" crab, which is so esteemed by the epicure that they are sold at many times the price of the "hard" crab. These names apply to the common edible or "blue crab," of the Atlantic coast, at different periods of growth.

There is a singular prejudice among lobstermen against eating a soft lobster, which does not extend to epicures. I have eaten of them when soft, and I think them excellent; surely the animal is fat and in prime condition or it would not shed preparatory to taking on greater size. Just how long it may take for the new shell to harden may depend on temperature or other conditions. One in the New York Aquarium, in summer, became quite hard in about twenty hours, and took food the third day after shedding. There seems to be a provision of nature that the female shall not cast her shell until the eggs are hatched, otherwise they would be lost, as they are greedily devoured by eels and other fish. The law of Massachusetts forbids "berried" lobsters to be sent to market. The honest lobsterman, therefore, puts such a lobster in a car which has holes large enough to admit eels, and in twenty-four hours she can be sent to market in compliance with the law, for she will have no eggs left.

I have purposely skipped from the little lobster that we left foraging on his first spring campaign to the habits of the adult, which are the same, because we know nothing of the rate of growth beyond the first season. We know that lobsters shed their shells at irregular times during most of the year, more frequently in the warmer portions, and that this only occurs because the creature is growing and its armor is not large enough. Just how old a marketable lobster of 2 to 10 pounds may be, no man knows, and such knowledge could only be obtained by rearing them in confinement, and then it might not be conclusive under different circumstances of food and temperature, and the casting of the shell forbids marking individuals.

The female spawns but once in two years. Notes made on the eggs of lobsters in the New York Aquarium show that they hatched before July, or when the water reached a temperature of about 60° F. In 1891 I began the hatching of lobsters for the New York State Fishery Commission, of which I am one of the superintendents, and found that eggs taken from lobsters from the middle to the last of July did not hatch that year. Then it seemed as if the lobster might be a biennial spawner, but I did not dare to say so. A report of my observations sent to Prof. Samuel Garman, of the Museum of Comparative Zoology, Cambridge, Mass., brought a letter dated August 30, 1892, complimenting my studies on the life-history of the lobster and inclosing a report to the Massachusetts Fish Commission, dated December 17, 1891, in which he shows that his investigations proved that the lobster spawned but once in two years. Therefore, I have solid backing in making the statement that heads this paragraph.

Since this I have taken, for the New York Fishery Commission, a large number of lobster eggs and have turned out this year from Cold Spring Harbor, Long Island, 177,000 young lobsters into the waters of Long Island Sound. These were from eggs which otherwise would have been sent to market with the parent and have been boiled and thrown away with the shells, and were therefore just so many saved from destruction and given a chance to struggle for life. There is no law in the State of New York relating to "berried" lobsters, and from what is said above of the Massachusetts law, it does not seem that one would be advisable, unless so framed that the lobsterman should take the eggs from the lobster and either keep them in a place where they would hatch or, better yet, save them for an agent of the fishery commission, who could collect them at intervals and would reward the lobsterman sufficiently to make him interested to turn in as many good eggs as possible.

The eggs, which, as before said, are carried on the appendages under the abdomen, number 15 to the linear inch, and measure 6,090 to the fluid ounce, are attached not only to the swimmerets, but also to each other by threads, and are aerated by an almost constant motion of the appendages, and in confinement many eggs are loosened and fall off, perhaps from the habit that the parent has of poking among them with her legs. In the spider crab this poking is not only frequent, but the eggs are eaten by the parent, at least when in confinement, but I have never seen a lobster eat its eggs. It has been said that lobsters spawn at all times of the year. This is not so, for the reason that they are not as active in winter and do not feed as much as in summer, and also because the young do not hatch until the water reaches a temperature of about 60° F., which in Long Island Sound might occur after the latter part of May, and in that region the hatching season is over by the middle of July, and as the mother has been feeding while carrying her eggs, she can then shed her shell and begin to develop the so-called "coral" that epicures prize, which will form the eggs to be laid the second year. The fact that female lobsters bearing eggs outside while others have the coral inside are taken in winter supports the theory of biennial spawning. August 16, 1893, I took a lobster from a car which the owner told me had spawned two days before. The microscope could detect nothing in the eggs, because the yolk filled them entirely. Four days later the yolk had shrunken and the "mulberry" stage could be seen in the clear space, and by the 25th the eye was visible. The eggs are dark when first laid, and grow lighter in color as they develop. From this until October no change was seen. The water growing cooler, the mother did not take as much food as before, but seemed as pugnacious as ever, showing fight to anyone who approached the glass. At present she is living in a tank about 12 by 18 inches and may live all winter. She had been plugged in the claws to prevent danger in handling, but I removed the plugs, and she can now use her claws as well as ever.

When our little lobster comes from the egg an inexperienced eye might easily suppose it to be a young shrimp or any other crustacean, for, unlike its fresh-water prototype, the crawfish, which at hatching resembles its parent in everything but size, the young lobster is an embryo or larval state, as much so as an embryo trout, which has no resemblance to its parent. It molts perhaps 4 to 6 times during the first ten days of its life, and makes, according to Prof. S. I. Smith, of Yale, three changes of form in this time before getting the large claws and assuming the shape of its parents. They swim throughout all these changes and perhaps long after, which makes it certain that a plant of young made at a particular spot may be repeated many times without danger of overstocking that locality, for as they swim away the tides and

currents scatter them, and when the time comes to settle down to steady habits they are wide apart. Still, as the plantings made by me for the New York Fishery Commission were all made at Cold Spring Harbor, on the south shore of Long Island Sound, some 15 miles west of the middle of that body of water, the varying tides would not take the little swimmers outside its limits, because the returning tide would bring them back again. Therefore there is no doubt about the value of saving the lobster eggs and planting them in the sound. Some New York lobsters may cross the sound and be taken in Connecticut traps, just as New York salmon and shad are taken by New Jersey fishermen, but that is not a thing to be considered seriously.

A very natural question for a reader to ask at this point is: "Why don't you retain the youthful lobster until it ceases to swim and settles down to crawling, and thereby stock a certain district in which your State, that pays for the work, is interested?" To this I should reply that in theory that would be the proper and most correct thing to do, but in practice we find that there is a factor that will not be left out of our calculations, and this factor is cannibalism.

There is, at present writing, no food for a larval lobster known to me that is as acceptable as another larval lobster that has just molted. I have tried to bribe them by hanging flesh of eel, clam, beef, lobster (adult), blue crab, and fiddler crab, but without avail; their love for their fellows which prompted them to take their brethren in out of the wet, lest they might be devoured by small fishes, baffled my efforts, and there was no resource but to plant the fry as soon as hatched. If each youngster could be placed in a tank or even a small compartment by itself, no doubt it would accept any, or all, of the foods named, but at present we are not prepared to feed a million or more individual lobsters in separate stalls for months before turning them out to shift for themselves. They cannot be reclaimed from cannibalism by any known means. They are fighters by nature, and when a lobsterman has a lot of adults in a floating car and a storm comes up each lobster blames his neighbor for any collision that may ensue and they engage in a general fight, which is not only disastrous to themselves but to the lobsterman, for lobsters are not marketable in fragments.

The size of marketable lobsters has been on the decrease for the past fifty years. Half a century ago my father never brought home a lobster for family use under six pounds, and it was often twice that weight. One under six pounds was not thought worth picking the meat out of, for the labor is the same, no matter what the size; but to-day a 2-pound lobster is considered of good size, although an occasional "deep sea" lobster of 20 pounds, or more, is seen on the stands. These usually have large barnacles, oysters or other animals of good size attached to their shells, showing that they have not molted in some years, and their claws are always bruised and blunted as additional evidence that their armor has not been recently renewed. The taste for "chicken" lobster has done much in recent years to kill off the young and to prevent their attaining a larger size, but the canneries are credited with taking in all that may be rejected by law. The State of New York had a law that no lobsters measuring less than 10½ inches, exclusive of claws, should be sold. This excellent law was, I believe, obtained by Mr. Eugene G. Blackford when he was president of the New York Fishery Commission, but was repealed.

That lobsters of 20 pounds weight have been taken within a few years I know, for I have seen them weighed; but the monsters of twice that weight that we read of are not well authenticated, and the story of the judge who, after the manner of

Solomon, decided a bet on the weight of these crustaceans against the man who brought sworn testimony of old fishermen, who remembered lobsters of 40 pounds, by saying "affidavits are not lobsters," has passed into history. A century hence, my statement of having seen a 20-pound lobster may be received in the same way, and some judge, yet unborn, may paraphrase the above decision, and solemnly declare that "statements are not lobsters."

A curious thing about a lobster is the difference in its claws. One is thick and blunt and the other is long and slender. One seems to be for crushing hard objects and its mate seems formed to hold them. This is the case with every individual, but there are right-handed and left-handed lobsters. Some years ago Mrs. Mather painted lobsters surrounded by celery, oil, vinegar, and all the necessaries for a mayonaise, but one of the lobsters had the big claw on its left. When allowed to see it, I remarked that there was either a mistake or her specimen was abnormal. She insisted that the original must have been so, and on my next visit to Fulton Market, where over 100 lobsters were handled for my edification, I found that a lobster might be either right or left handed without violating any rule, and then made my apologies to the artist.

The color of lobsters sometimes varies from the ordinary olive-green, with reddish tints on the claws, to red all over, and a mottled coat is quite often seen. Red ones are quite rare, and the few of this color I have seen have been lighter than the boiled lobster, sometimes with a yellowish cast. The cause of the variations is not known.

The lobster feeds upon animal food exclusively, for its digestive system could not assimilate vegetation. Its stomach is a sac, just behind the mouth, and has no other opening, save the small pores through which the digested portion of chyme or chyle is filtered into the thorax, there being a space of some inches between the stomach and the only intestine, or drain tube, which begins at the first segment of the abdomen and runs without convolution to the cloaca. The stomach is fitted with rough, bony plates to masticate the food, and when opened shows a fanciful figure called "the lady in the chair." All bones and undigested portions are ejected through the mouth. In dressing a lobster for the table, the so-called "poisonous parts" are rejected. They are the stomach, which could not be eaten, and the vein-like intestine spoken of. To remove the latter it is only necessary to split the abdomen, or so-called tail, lengthwise, when it will be seen as a greenish thread. All other parts are eatable, and the tender green "fat" in the thorax, and the delicate, white "fat" lining its shell, should never be lost, as they contribute both flavor and digestibility to the harder portions.

The lobster does not range far south on our Atlantic coast, because it is sandy south of New Jersey, and does not afford protection for them when in the soft state, even if other conditions were favorable. Large individuals are sometimes taken on the coasts of Delaware and Maryland, and they range as far north as Labrador, the best lobster grounds of the Atlantic being Nova Scotia and Maine. They were formerly abundant in Long Island Sound and about New York harbor, but the pollution of the waters, especially with "sludgeacid" from the petroleum works, has driven them away. This abominable stuff does not drift far, but settles on the bottom, and, while it may not disturb the shad and salmon, which are migratory, it kills out the oysters, clams, mussels, snails, and all those forms that live on the bottom, including the lobster, and compels the fishes which seek food in those waters to go elsewhere. The canning of small lobsters in Maine may affect the product there, but the worst of all enemies is man. Of all the destructive agents to animal life of most kinds, man stands at the

head, at once the wisest and most ignorant of all animals. His ignorance is especially in contrast with his intelligence, when he deals with other creatures. And the lobsterman is an instance; he wants to see lobsters plenty, because he finds a ready market for all he can get; but, when he raises a lobster pot and finds that two or three small lobsters of 4 or 5 inches in length have ventured to eat the whole or part of his bait, he is angry, and, instead of returning them to the water to grow, he mashes them on the bottom of his boat. As well might the farmer shoot his young fowls for eating his grain! The lobster will eat fish, clams, mussels, and other animal food, fresh or stale, but in the pots a fresh bait is more attractive, and the lobstermen use almost all kinds named for bait, and could, with small expense, so make their traps that, when a lobster entered the pot, it could not devour the bait, and so afford to let the young go free if the larger ones did not devour them in the pots.

The power of the lobster to reproduce a leg or claw is well known. It is not done until the next molt, when the new limb appears as a very small model of the original, but after a few changes of shell the claw is restored to its normal size and usefulness. The animal can and does cast a claw when frightened, especially in cold weather, probably to satisfy its captor with a portion instead of the whole—a tub to the whale, as it were. The claw is snapped off with a jerk, as if to say, "Take this and let me go." The lobsterman never lifts the animal by its claws for this reason, but grasps it by the thorax, leaving the large claws to hang down or turn up in a vain attempt to pinch his hand.

Our friend has two means of locomotion. When in danger it can go backward rapidly by means of a few vigorous flaps of its tail, but ordinarily it crawls forward on the bottom, holding its large claws well up. If left in a pool by the receding tide, it would stay there and perish before trying to go overland to the sea, even if not 10 feet away.* When taken from the water the lobster is very helpless. Its specific gravity is great; its enormous claws can not be lifted in air, and when laid on the market slabs it remains where it is placed from sheer inability to move.

Just how the eggs are impregnated is not known. It is said that the milt is placed near the oviduct some time before the extrusion of the eggs, and that they are fertilized by passing over it. Of this I know nothing, and merely insert this paragraph to show that this question was not overlooked. The sexes of lobsters can easily be distinguished without the presence of eggs, but it is no part of my purpose to enter into the realm of anatomy or theory, as the title of this paper is "What We Know," etc.† When the pairing takes place and how it is performed no man knows. A study of the reproductive organs has developed a theory, and there we stop.

The increase of population has naturally increased the consumption of lobsters, and the great decrease in the size of this crustacean, referred to above, is an evidence that they are slow of growth, and the marketable lobster of to-day, weighing from one to two pounds, may be from four to six years old, possibly more. In all these estimates of weights a fairly plump, well-fed lobster is meant, and not one that would be rejected by the housewife as not worth picking the meat from, for she has learned to weigh them in her hand, and of several of the same size, to choose the heaviest.

We hope to increase the supply of lobsters by saving the eggs from destruction, but the ever increasing demand for them will prevent their becoming cheaper.

* See Eighth Report New York Fish Commission, 1875, p. 23, tenth to eighth lines from bottom.
See "Fisheries Industries," section 1, pp. 795-809.