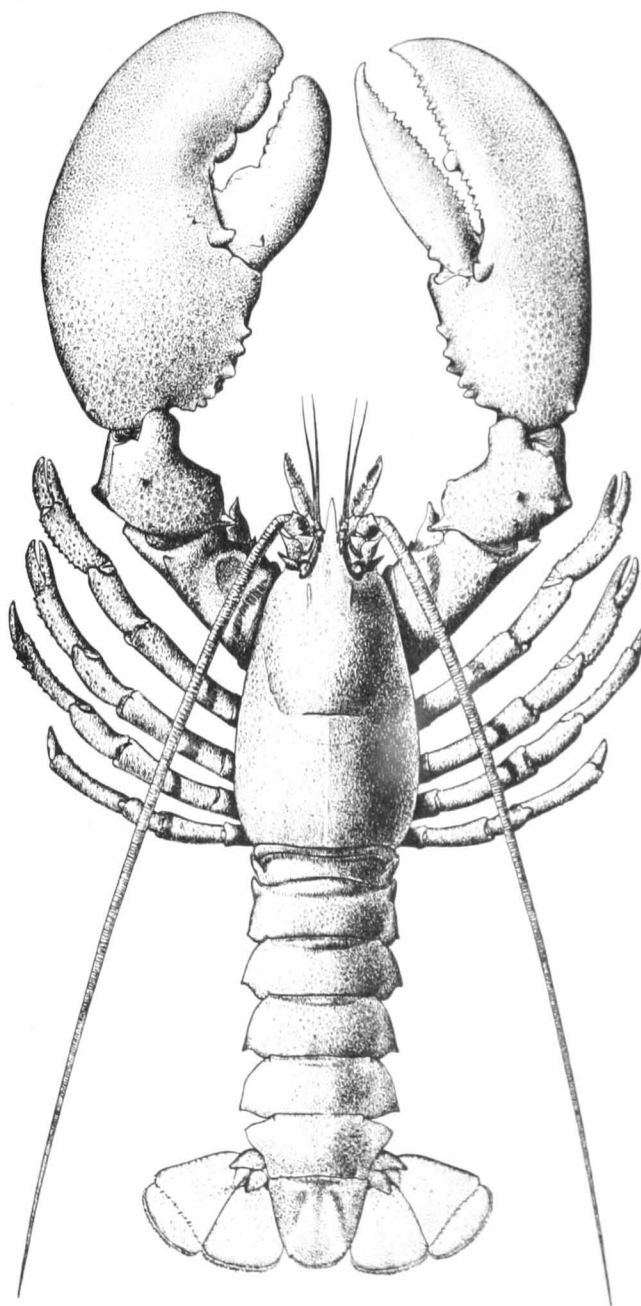


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THE AMERICAN LOBSTER

Homarus americanus



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THE AMERICAN LOBSTER, Homarus americanus

by

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Classification.--The American lobster is a crustacean belonging to the order Decapoda, which includes also the spiny lobsters, crayfishes, shrimps or prawns, and crabs. The American lobster belongs to the family Nephropsidae, which includes only true lobsters. This family is represented in the marine fisheries by three species: the Norwegian lobster, Nephrops norvegicus; the common lobster, Homarus gammarus, of Europe; and the American lobster, Homarus americanus, of our Atlantic coast. True lobsters differ from spiny lobsters by having large well-developed claws on the first pair of legs and a strongly developed rostral spine, and by lacking both a profusion of spines on the body and large heavy antennae.

Range.--The American lobster is found only on the eastern coast of North America, where its range includes a strip of coastline some 1,300 miles long but generally not more than 30 to 50 miles wide, although off Cape Cod this strip broadens to nearly 200 miles on Georges Bank. The most northern point from which the capture of a lobster has been recorded is Henley Harbor, Labrador; the most southern is the coast of North Carolina. Although prior to about 1910 the lobster had been reported only four times from this southern portion of its range, it has been taken numerous times in the otter-trawl fishery that developed in the 1930's off the Virginia and North Carolina capes. The depths inhabited by the lobster range from a fathom to more than 200 fathoms. Its rather restricted migrations consist chiefly in an offshore movement into deeper water in the fall and a return toward shore in April and May; there are in addition random coastwise movements which are not of great extent. It appears from rather limited observations that the large lobsters on the offshore grounds in Maine show a greater tendency to migrate than the smaller individuals of the bays and coves. The results of tagging experiments indicate that none of the migrations of the lobster are extensive. In Maine and New Hampshire, the average distance between the point of recapture and the place where the tagged lobster was released was a little more than a mile after a period of a year. In Rhode Island, Connecticut, and New York, the lobsters moved slightly greater distances; however, not enough lobsters have been tagged in southern New England to permit accurate tracing of their movements. The lobster is more abundant in the northerly parts of its range--New Hampshire, Maine, the Maritime Provinces of Canada, and Newfoundland.

Importance.--The value of the American lobster catch is over \$11 million (1958). The lobster fishery is the most important fishery in the United States North Atlantic region. In 1958, there were 27 million pounds landed by about 8,000 fishermen, most of whom used lobster traps or pots. About 100 fishermen occasionally employed otter trawls in the lobster fishery.

The United States production of lobsters is not great enough to supply the demand. Consequently, great quantities are imported from Canada, which sends about 24 million pounds of live and canned lobsters to our markets each year.

Attempts to transplant.--A number of attempts have been made to establish the American lobster on the Pacific coast. In the years 1874, 1879, 1888, and 1899, some 104,000 larvae and 355 adult lobsters were planted in California waters, and 233 adults were released in Puget Sound and off the mouth of the Columbia River in Washington. Also, two lobsters were released in Great Salt Lake, Utah. All of these transfers were unsuccessful. Between 1906 and 1917, efforts to transplant lobsters were intensified. A total of 24,572 lobsters were planted in Puget Sound, Washington, and 1,532 in Yaquina Bay, Oregon. It is evident that these lobsters also failed to survive and reproduce. In 1954, however, introductions of American lobsters to waters near Prince Rupert, British Columbia, met with some success. Several lobsters have been caught 2 years after being released. One individual was taken 20 miles from where it was planted. Thus, it has now been shown that the lobsters can be transplanted to Pacific waters, but the ultimate success of this transplantation is yet to be determined.

Size.--Lobsters are measured in several ways. The usual legal measurement is from the rear of the eye socket to the end of the carapace or main body shell. Another measurement is that of total length, from the tip of the rostral spine to the end of the tail. The average size of New England lobsters in the legal catch is about 3 1/8 to 3 1/4 inches on the carapace or 9 to 10 inches total length. So intensive is the fishing in most areas that few lobsters are able to grow to a large size. A few specimens in excess of 40 pounds have been caught along the Middle Atlantic coast of the United States; these were taken by otter trawlers in deeper water offshore where fishing is relatively light.

Habits.--Like all other large and heavy crustaceans, the lobster is an inhabitant of the ocean floor. Although its powers of locomotion are considerable, it seldom leaves the sea bottom, where it moves nimbly about on the tips of its slender legs. The large claws are usually directed forward while the long sensitive feelers or antennae continually sweep back and forth to sense the presence of enemies or food. When alarmed, the lobster may swim rapidly backward by rapid flexion of its muscular tail.

The lobster is an animal of essentially nocturnal habits as it explores the bottom in quest of food mainly after sundown. In shallow waters, lobsters can be seen moving about at night; during the day they live in burrows. Heavier pot catches of lobsters at night than in day indicate that such nocturnal activity is also marked in deeper water. Often the lobster captures its prey by stealth, lying hidden in seaweeds, rock crevices, or in its burrow in the mud to await the approach of a victim. The food of the adult lobster consists principally of fish, alive or dead, almost all kind of invertebrate animals that inhabit the bottom, and small quantities of algae and eel grass. While lobsters are notorious scavengers, it is probable that they usually prefer fresh food to stale. They are very fond of clams and other mollusks, and, when kept in storage pounds, are constantly exploring and digging up the bottom in search of them.

Reproduction.--The size at which sexual maturity is attained varies in different areas. In certain parts of Canada, spawning may occur in females as small as 7 inches long; while in the United States egg-bearing females below 9 inches are seldom found. In Maine and New Hampshire the average size at maturity is 11 1/2 inches or more, while in Long Island Sound and Rhode Island, maturity is reached at 10 to 11 inches. There appears to be a relation between the summer water temperature and the size at maturity. The size at first maturity is much less in warmer water areas than in colder regions.

Mating occurs in summer during the molting season; actual spawning generally takes place in the following spring. The female is impregnated or supplied with the sperm by the male immediately after a molt, while her shell is in a soft condition. The hard-shelled male transfers the sperm to a receptacle that lies between the bases of the female's fourth and fifth pairs of legs. The sperm is held in this pouch until the female molts again, and is available to fertilize any eggs that she may extrude.

Generally, two years elapse between periods of egg laying. The spawning period for the majority of lobsters is June to September. In Canada, it has been noted that June and July is the time when most of the old-shelled lobsters that have not molted since the previous summer lay their eggs; new-shelled lobsters that have molted earlier in the summer generally lay most of their eggs in August.

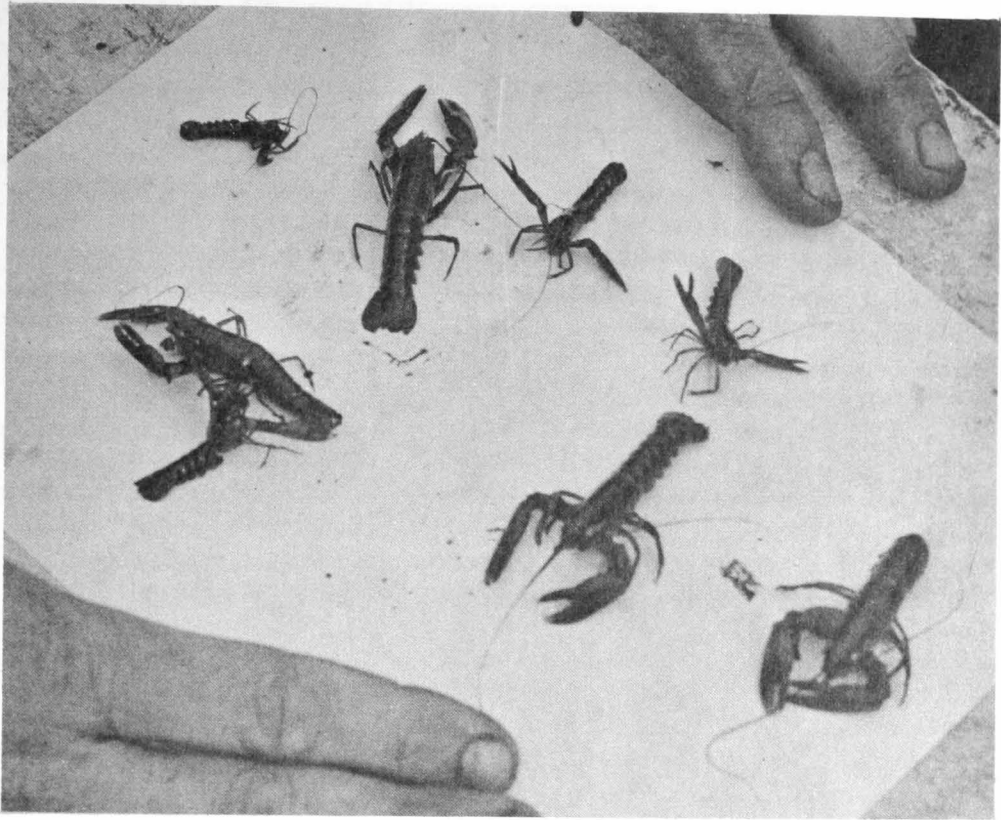
To perform the spawning act, the female turns on her back and flexes the abdomen into a pocket. The eggs then flow from the genital openings at the bases of the third pair of walking legs in a steady stream into the pocket, passing over the sperm receptacle on their way. At this time the sperm cells leave the receptacle and fertilize the eggs. The eggs adhere to the abdominal appendages of swimmerets where they are carried by the female throughout the period of incubation.

The number of eggs laid varies with the size of the lobster. For example, a 7-inch female lays about 3,000 and an 18-inch female about 75,000. In a Canadian Maritime area where the eggs of a large number of females were counted, the average lobster was 9 3/4 inches long and had 11,000 eggs.

Care of the eggs.--The period of incubation is 10 to 11 months. The egg-bearing lobster folds her tail, thus securely enclosing the eggs in the abdominal pocket when in danger from enemies; at other times she extends her tail at intervals and moves her swimmerets back and forth. In this way the eggs are aerated and cleaned. As a result of this care, the eggs pass through the storms and stress of winter with remarkably little loss. Hatching occurs at night or on cloudy days, and the newly hatched young are dispersed by the violent agitation of the mother's swimmerets.

Development of the young.--The young lobster emerges from the egg as a free-swimming creature whose powers of locomotion, however, are not strong enough to prevent its being carried by currents. The habits of the larval lobster in nature are not well known, but from the results of capturing them in nets, it appears that they are often attracted to the surface by strong sunlight. The young are extremely active, and have strongly developed fighting and preying habits. Their voracious appetites result in cannibalism whenever the food supply is insufficient or unsuitable. During the course of development, the young lobsters pass through a number of distinct stages, the first of which commonly lasts for 1 to 5 days. Low water temperature or insufficient food supply delays the molting. In habits, color, and general appearance, the first three larval stages show no striking differences. With the attainment of the fourth stage, however, the lobsterlings for the first time have the characteristic form of the race. Toward the end of this period, the young usually sink to the bottom and begin to display their racial instincts of fear and caution. Rarely, descent is delayed until the fifth or sixth stage. The general habits and movements of the young thereafter are the same as those of the adults.

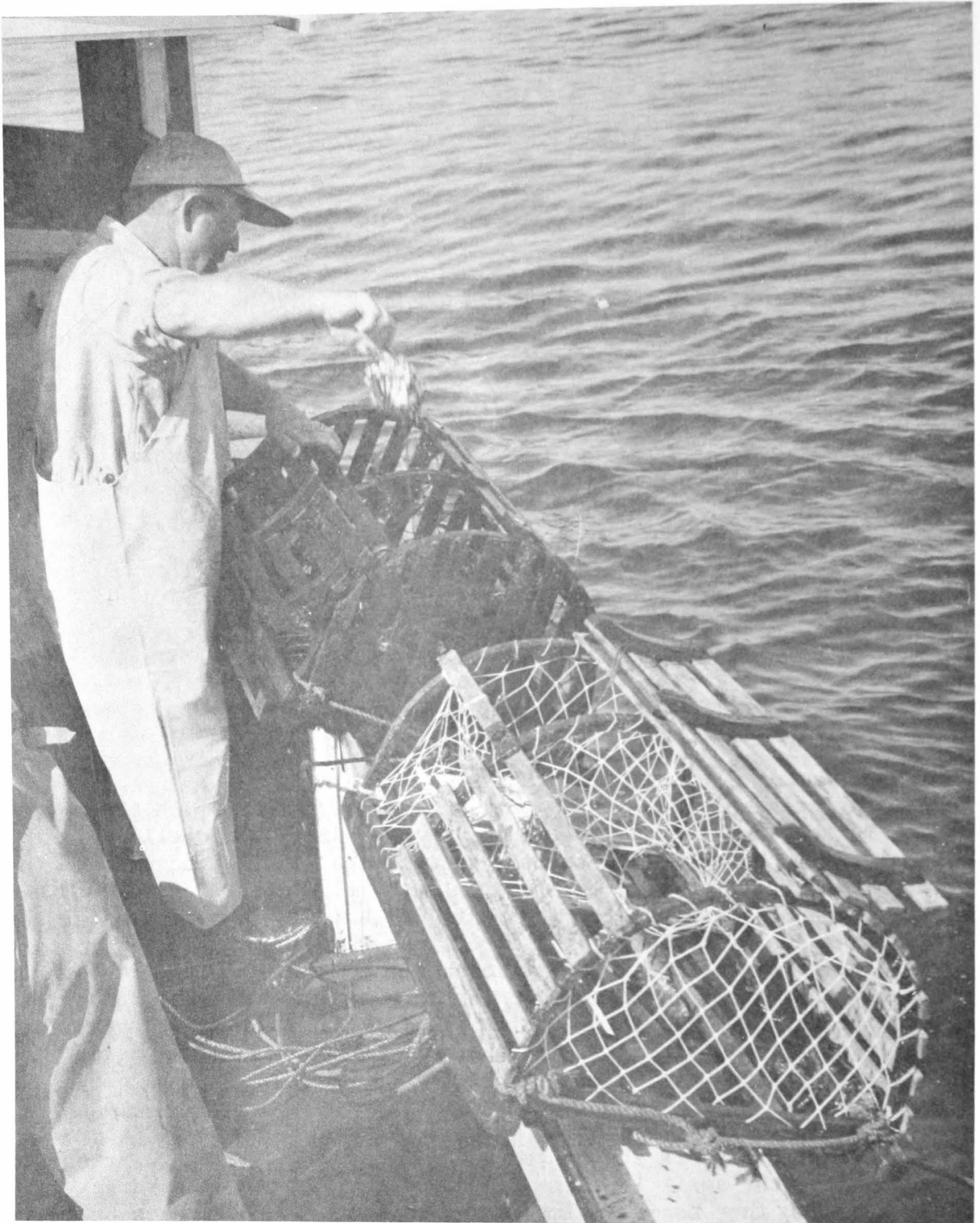
Growth and molting.--Lobsters can only grow by shedding their old, hard shells. Among the lobsters that are more than a year old, this molting occurs principally during June to October. The time, however, varies considerably; for example, some seasons the peak of molting may occur several weeks earlier in western Maine than in the eastern section of that State. Certain noticeable changes occur before the molting. The carapace begins to soften along the midline of the back and along the edges over the gills; there is a similar softening along the inner sides of the large claws. There is a slight swelling at the joints and under the tail. Internally, a new, soft shell is formed and becomes separated from the old, hard shell. When molting, the lobster lies on its side; the membrane joining the body and tail splits; and the lobster gradually works itself out of this slit. About 5 to 20 minutes is



Small lobsters in their first year of life

necessary for completion of the act, immediately after which the lobster begins to absorb water and swells to its new size. The shell is quite soft at first, but calcium from the gastroliths (limy structures in the stomach) and from the food the lobster eats is incorporated in the new shell, which becomes firmer. The meat, which is quite watery after shedding, is gradually replaced by firmer flesh. The young lobster molts several times a year, but when it reaches a commercial size, it usually molts but once a year. The larger lobsters may molt only at intervals of several years. The growth per molt is about 15 percent in length; this ranges from 7 to 20 percent. The age of a lobster cannot be determined accurately; for example, a 9-inch lobster may be 4 to 7 years old.

Enemies.--There has never been an intensive effort to determine to what degree lobsters are preyed upon in nature. During their early, pelagic life, the small lobsters are undoubtedly eaten by a variety of fish, and when they begin living on the bottom, they are taken by bottom-feeding fish, such as cod, skates, and dogfish. When the lobster reaches commercial size, man is then probably its greatest enemy. During confinement, lobsters prey upon each other; newly molted and soft-shelled



Baiting lobster traps

individuals are attacked by their harder shelled companions. Sometimes the victim is killed and consumed; at other times claws or legs may be lost. Fortunately, regeneration of the appendages occurs, and within several molts, another equal-sized claw or leg has been developed.

Lobsters are subject to several diseases, none of which are harmful to man. One species of bacteria sometimes destroys parts of the shell, and another, the so-called "red tail," weakens the lobsters and may contribute to their death. These ailments are most severe when captive lobsters are held under unfavorable conditions, such as warm water, crowding, or poor water circulation.

Holding lobsters.--Most lobsters are marketed alive; a live lobster brings a much better price than a dead one. Special efforts must be made to insure that the lobsters do not suffer heavy mortalities between the time of capture and sale to the consumer. The lobsters must be kept damp and cool while out of the water; in the water, they will survive only if the sea water is relatively cold--40° to 50° F., well-aerated and free of toxic chemicals including chlorine, copper, zinc, and lead. When lobsters have new, soft shells, they are relatively weak and die rather quickly if exposed to unfavorable conditions. These "shedder" lobsters are often held in live cars or pounds until the shell becomes more rigid. There is a great need for research into the optimum methods for holding and shipping lobsters; some of these techniques have not been improved for several decades. Recently, considerable progress has been made in developing a holding tank in which lobsters can be held in recirculating, filtered, and cooled natural sea water or artificially made sea water. These tanks can be used in areas far from the sea and are of value principally as a means of display and thus stimulating the sale of lobsters. Considerable care must be exercised in the operation of the tanks, for the lobsters are quite sensitive to contamination of the water.

Conservation measures.--Wherever lobsters have been fished, regulations have been enacted with the intent of preventing serious depletion of the populations. The value of such regulations has not been easy to demonstrate, because of the lack of intensive research on the factors that influence the size of the lobster populations. In the lobster-producing states and provinces, there are minimum size laws designed to allow small lobsters to escape the fishery. In Maine, it is illegal to capture the larger lobsters, which are prolific egg producers. Other regulations that are in effect in some areas are the protection of egg-bearing females, closed seasons, and minimum slat spaces on lobster traps.

Artificial propagation was once a widespread practice but it has been abandoned except in the State of Massachusetts. Early efforts involved the collection of egg-bearing females from which the larvae were hatched and released in the sea. In later attempts, the larvae

were held and fed until they reached the fourth or bottom stage. The percentage survival was low; and the cost per fourth stage lobster was quite high. Nothing is known about the survival in the sea of either the newly hatched larvae or the fourth stages that were released by the hatcheries.

Production.--As with most fisheries, there have been fluctuations in the production of lobsters, both in the United States and Canada. Lobsters were caught by the early colonists, but there is little available information concerning the magnitude of the fishery in the seventeenth and eighteenth centuries. A large-scale industry developed rapidly in the United States after about 1840 when Maine began to be an important supplier of lobsters. In Canada, a large expansion of the fishery occurred in 1870. The first years of intensive fishing were the most productive. Statistics on the catches were collected irregularly during the period of the fishery's rapid growth in the late 1880's. From the available records, it appears that the New England lobster production reached a peak in 1889 when over 30 million pounds were caught, and the Canadian catches were at a maximum of almost 100 million pounds in 1885 and 1886. By the 1920's and 1930's, the New England lobster catch had declined to a level that varied from 9 to 12 million pounds. During the 1940's, the New England catch began to increase, principally because of a greater Maine production. In the 1950's, this catch has been ranging from 22 to 27 million pounds, over twice that of the level of the 1920's and 1930's. In Canada, the production also declined after the peak years. During the past 35 years, the catch has averaged about 36 million pounds. No recent increase, similar to that of Maine, is apparent in Canada. The reasons for the greater recent yields of the Maine lobster fishery are not clear. Greater fishing effort, with better equipped boats that regularly visit more distant grounds, is partially responsible for the increase. A greater abundance of lobsters is another possibility.

In the early days of the Canadian and United States fishery, the catches were predominantly of large lobsters that averaged 2 or 3 pounds in weight. These large lobsters became scarcer as the fishery continued. Now the average size is near the minimum legal standard, which in the United States and most parts of Canada is equivalent to about 1 pound.

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