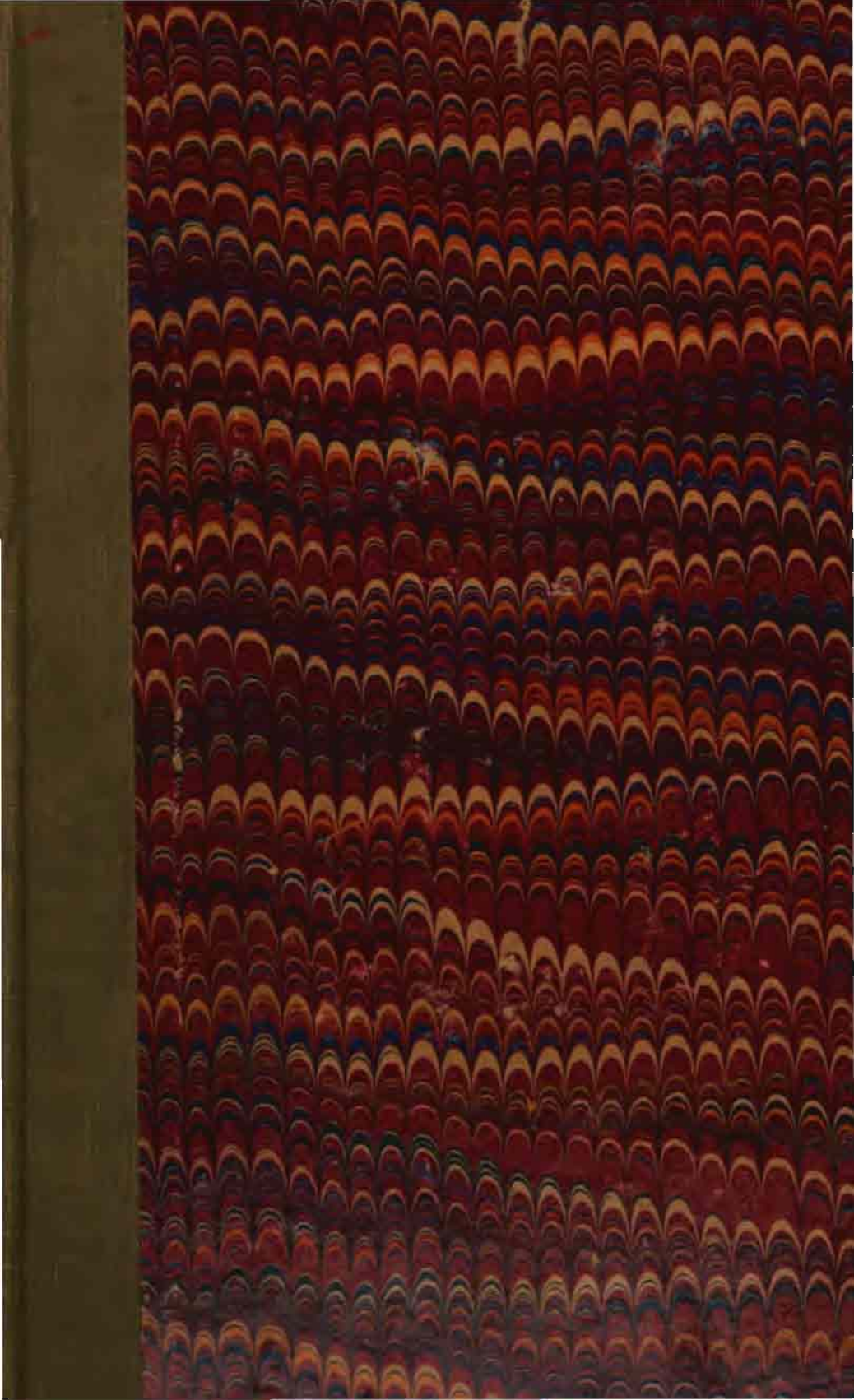

THE LOBSTER FISHERY

A SPECIAL REPORT

INCLUDING

SUGGESTIONS FOR UNIFORM LAWS

MADE TO THE LEGISLATURE OF
MASSACHUSETTS

BY THE

COMMISSIONERS ON FISHERIES AND GAME

1911

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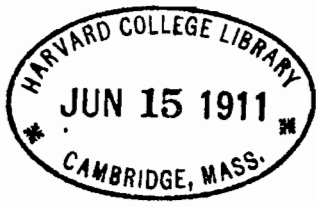


HOUSE . . . . No. 1600

The Commonwealth of Massachusetts.

To the Honorable Senate and House of Representatives.

We herewith respectfully transmit our report, as directed by chapter 74, Resolves of 1906, and chapter 96, Resolves of 1910, upon the lobster industry of Massachusetts, with special reference to the conservation of this important fishery, together with a draft of uniform laws relating thereto, adopted at a convention held at Newport, R. I., Dec. 16, 1910, by the commissioners representing the States of Connecticut, Rhode Island and Massachusetts.

Respectfully submitted,

GEORGE W. FIELD,
Chairman.

THE LOBSTER INDUSTRY OF MASSACHUSETTS.

In accordance with the provisions of chapter 74, Acts of 1906, your commissioners undertook a series of investigations to ascertain the feasibility of propagating lobsters in a large enclosed area of sea water. The Powder Hole at Monomoy Point, an enclosed area with a small outlet, was secured. We attempted to use this enclosure of approximately 13 acres, with a maximum depth of about 20 feet, as a large aquarium, in which lobsters in considerable number might be placed, in the expectation that here, protected from enemies, natural reproduction would be rapid and the young would thrive. Shifting sands and current, however, rendered the control of unconfined lobsters difficult and expensive. Observations, however, demonstrated the great loss of eggs and of adult lobsters when confined to cars for long periods (two weeks to six months); and the fact that predatory fish gather around pounds and cars where lobster eggs are hatching, and there destroy the young practically as fast as they are carried outside the pound or car. It was found that the sea perch or cunner, the "mummichog" (*Fundulus majalis* and *F. heteroclitus*), and the various species of "sticklebacks" (*Gasterosteus,* sp.), were so numerous that it did not appear practicable to so reduce their numbers as to ensure even comparative immunity to young lobsters.

Observations and records were made of the practicability of restricting the catching of large lobsters by the use of traps having funnel rings of various known sizes, from 2½ to 4½ inches inside diameter.

In addition, records were made of the daily catch of the best lobster fisherman, by our Mr. F. C. Lane, who for thirty days accompanied Capt. G. W. Bloomer, and carefully recorded the size, sex and other details of every lobster found when the

traps were hauled. Similar observations and measurements have been made by the writer and by his agents in Gloucester, Boston harbor, Cohasset, Scituate, Plymouth, Woods Hole, Gay Head, Cuttyhunk and elsewhere.

On account of the very extensive and complete observations and experiments (based upon the embryological work earlier done by Prof. F. H. Herrick and Prof. H. C. Bumpus at Woods Hole) which were then well under way to successful culmination at Wickford, R. I. (more extended reference below), it seemed wise not to enter into what would necessarily be a duplication of this work; therefore, most of the time and money available was devoted to the scallop fishery, of which the report has issued.

Inasmuch as much has been published concerning the life history of the lobster, and as intelligent legislation must be based upon such biological facts, we are inserting here a brief summary of the life history of the lobster, and the method developed in Rhode Island for rearing the young lobsters.

Brief Summary of Important Facts in the Life History of the Lobster.

1. The American lobster (*Homarus americanus,* M. Edw.) is found from the Straits of Belle Isle to the Capes of Delaware. No north and south migration, but in spring those off shore come to warmer waters to hatch their eggs among the rocks and to moult in the sands, returning to deeper water in autumn.

2. Largest authentic record, 23¾ inches from spine to tip of tail; weight, 34 pounds, caught in 1897 off Atlantic Highlands, N. J.; shell now in American Museum of Natural History, New York City. Fourteen largest specimens recorded are males.

3. Growth at first rapid. Bursts shell (moulting) fourteen or fifteen times during first year. Each year the rate of growth slackens, during the fourth year moulting perhaps three or four times. Males moult more frequently than females, chiefly from June to September.

4. Eats both living and dead animal material. Notoriously

cannibalistic at all ages. Regurgitates the indigestible portions.

5. Female spawns once in two years, possibly oftener when approaching full growth (16 to 20 inches), when moulting becomes infrequent. While it is probable that any given male fecundates more than one female, and that mating takes place at random and without obvious reference to the periods of egg laying, very extensive observations upon the natural ratio of the sexes indicate that to ensure proper fertilization of the eggs the number of males and females must be approximately equal. Sexual maturity is reached in from four to seven years. Smallest observed by us was 7¾ inches; Herrick found that the size varied from 8 to 12 inches. Eggs are laid chiefly during July and August, but also the later months. Carried by the female attached to the rudimentary abdominal legs. Period of incubation, ten to eleven months, hatching in June and July.

6. First litter of eggs, lobster 8 to 10 inches long, 5,000 to 10,000 eggs; second litter, two years later, lobster 10 to 12 inches long, 20,000 eggs; third litter, two years later, lobster 12 to 14 inches long, 40,000 eggs; fourth litter, two years later, lobster 14 to 16 inches long, 60,000 to 80,000 eggs; fifth litter, two years later, lobster 16 to 18 inches long, 80,000 to 100,000 eggs. Although no observations have been made, it may be inferred from facts general throughout the animal kingdom that the lobster might be expected to remain at its maximum reproductive capacity for at least ten to fifteen years before senile decline begins. Each lobster therefore, to do the work nature designed, must produce from 600,000 to 1,000,000 fertilized eggs, in order to maintain unimpaired the numbers of the race.

7. The hatching period of a litter of eggs extends over about a week; therefore the young are not all liberated at once in large numbers, as is the practice in artificial propagation. On hatching, the young measures about 7.84 mm. (about ⅓ of an inch), and increases about 15 per cent. at each moult. During the first two weeks it moults three times, changing slightly in appearance at each moult (compare illustrations); but on the fourth moult it resembles the adult, and, swimming strongly,

it seeks the bottom, where, taking on the habits of its parent, it hides among the rocks and burrows in the sand.

8. Its enemies are many species of fish. The cod destroys lobsters even up to 10 or 11 inches long. Man, however, is most destructive.

9. Young lobsters feign death. Old lobsters part voluntarily with one or more claws when too tightly held or crushed; thus they escape many accidents and enemies. The lost claw grows again. The young in stage I. to III. seek the light, swimming at the surface by day, going below at night. Stage IV. shuns the light and seeks the bottom. The adults are night rovers, remaining concealed by day.

Artificial propagation has been most highly developed by Dr. A. D. Mead, his assistants and successors, through the support of the United States Bureau of Fisheries, the Rhode Island commission of Inland Fisheries, along lines suggested by earlier investigators, F. H. Herrick, H. C. Bumpus and others.

Relative to hatching and rearing, as developed by the Rhode Island Commission, we quote from their thirty-sixth annual report, 1906, page 136: —

In view of the decided disadvantage with which the recently hatched larvæ commence life, and the very slight advantage, if any, which hatching them artificially has over the natural methods, it has been clearly recognized for a dozen years or more that some further protection must be given the young lobster, if artificial methods are to make any appreciable difference in the lobster supply. Herrick, in whose charge the United States Bureau of Fisheries has placed the investigation of the entire lobster problem, said, in 1895: "The problem of artificial propagation of the lobster will be solved when means are devised by which larvæ, after hatching, can be reared in enclosures until the fifth or sixth stage, when they are able to take care of themselves."

This idea of rearing the larvæ until they are able to care for themselves has been before the Rhode Island Commission since 1898; but, instead of rearing them to the fifth and sixth stages, it has been the policy to rear them only to the fourth stage, when, as has been seen, the lobsters assume the general form of the adult and to some extent its habits. It is true that the lobster does not entirely give up its swimming habits till it reaches the fifth stage, and occasionally not until the sixth stage is reached; but since, as will be shown later, the

fourth-stage lobsters do burrow, and, if liberated with care, at favorable localities, will hide among the stones and eel grass, it has been thought impractical to retain them until a later stage.

The successful method of rearing the lobsters through the free-swimming stage was the result of many painstaking experiments. Since the idea was hit upon, in 1900, it has taken five years of continued experiments in order to bring the work up to its present condition. It can now be truly said that the scheme, as now operated, is entirely practical and successful. The chief obstacles which had to be overcome in reaching success were the serious cannibalism of the larvæ, the necessity of crowding them together in order to rear large numbers, the difficulty of supplying them with sufficient food, and the parasitic growths of diatoms and protozoa which infest the early stages.

The main features of the scheme used in rearing consists in keeping the fry in constant circulation. This is accomplished by confining the fry in canvas bags, which are suspended in the water and provided with windows of fine-mesh copper-wire netting. Two bladed paddles, not unlike restaurant fans, are kept revolving slowly in the bags at a rate of 10 revolutions per minute. Through their motion the water is kept fresh, and the fry are prevented from settling to the bottom. The current of water is made just strong enough to keep them separated, thus preventing them from feeding upon one another, and yet of sufficient strength to keep their food in circulation near them.

A 2½-horse-power gasoline engine supplies the power for operating the paddles. This power is transmitted from the house boat in which the engine is located, to the floats attached to the side of the house boat, by means of shafting and mitered gears. A specially constructed device is used for transmitting the power to the constantly moving floats, and consists in a pair of toggle-joints, connected by a sleeve in which two pieces of square shafting slide. The two floats are fastened to the house boat, one on each side, and are composed of a framework of 6 by 6 inch spruce, floated by barrels. Each one is capable of containing five rearing bags. These bags are made of canvas, 11 feet square and 4 feet deep, with three windows of copper netting, one in the bottom and one on each of two sides of the bags.

A more detailed account is given by Mead, "A Method of Lobster Culture," in Bulletin of the Bureau of Fisheries, Washington, D. C., Vol. XXVIII., 1908, Part 1, pp. 29–240. while the history of the development of the method and the progress of the work is found in the annual reports of the Rhode Island Commission of Inland Fisheries, from 1900 on.

The following report deals with the facts of —

I. The general decline of the lobster fisheries, from Newfoundland to New Jersey.

II. The causes of this decline.

III. Remedial measures.

IV. A draft for uniform laws, based upon scientific facts, — not mere opinions of parties seeking personal or selfish advantage.

I. — The Decline.

The facts of a decline are too obvious to require extended proof. It is evidenced, first, in the disappearance of lobsters from definite areas from which formerly large quantities of lobsters could be taken. Nevertheless, at every session of the Legislature numerous fishermen obstinately claim that they are catching as many lobsters as ever, and that there are as many lobsters in the sea as formerly. Nearly every one who is at all familiar with the seashore can testify from his own knowledge to the practically complete disappearance of lobsters from many sections of the shore where they were reasonably abundant but a few years ago. In Massachusetts, Buzzards Bay, Provincetown and Wellfleet waters show depletion over wide areas; while particular ledges and definite localities where the decrease is certain are almost too numerous to be readily catalogued here. Although the writer was in early life familiar with the lobster fisheries of Massachusetts Bay, and of Plymouth, Barnstable, Dukes and Nantucket counties, and since 1885 at frequent intervals has inspected these fisheries in Rhode Island, Maine, New Brunswick, Nova Scotia, the Province of Quebec and Newfoundland, his observations but confirm the opinions of our late honored chairman, Captain Collins, who said: —

> I can scarcely claim to be inexpert regarding the lobster, for I have been familiar with it and have had it under observation for more than fifty years. It has been my privilege to make careful inquiries concerning it throughout its range of distribution in America — from the Delaware Capes to the Strait of Belle Isle — and also in northern Europe, where the lobster is a different species from ours, but differs chiefly in size.
>
> As a child, with bared feet and legs, I often waded into the sea on the coast of Maine to a depth of a foot or so, and pulled big

lobsters from beneath seaweed-covered boulders, where they generally were found at low tide. When only ten to fifteen years of age I caught lobsters in the waters of Nova Scotia, Prince Edward Island, the Magdalen Islands and Lower Canada; later I was a lobster fisherman on the coast of Maine; in 1879 and 1880 I collected information regarding the lobster and the lobster industry from Eastport, Me., to Delaware; and subsequently assisted in the preparation of an illustrated history of the lobster fishery of the United States. Since then my interest in the lobster has never ceased, and every opportunity has been utilized to gain additional information concerning it on my trips to Newfoundland, Labrador and others of the maritime provinces, as well as to Maine and Europe. (Statement by Capt. J. W. Collins, report upon a convention held at Boston, 1903, to secure better protection of the lobster, page 34.)

And again he says: —

In 1887, when I was at Seldom-come-by harbor, at Fogo Island, off the coast of Newfoundland, an old fisherman came alongside of the "Grampus" with a lot of large lobsters that he had gaffed from beneath the boulders along the shore just outside of the seawash. Mr. Fred. A. Lucas of Washington, who was with me at the time, as a scientist from the United States National Museum, was in the same region last year on official business, and he informs me that where the incident I have related occurred the lobster is now very scarce. Who will doubt the agency of the cannery and the multitudinous lobster pot in causing this change? On the same cruise we touched at Magdalen Islands, where we learned that there was a general complaint of the scarcity of lobsters, as a result of only a few years' fishery. But Professor Prince, the eminent Canadian writer on these subjects, has discussed this matter ably and thoroughly, as you have heard, so that we are not left in doubt as to the result of man's operations on the lobster in the waters of the Dominion. (*Ibid.*, page 42.)

Down in the Buzzards Bay region, more particularly about Cuttyhunk, where the fishermen have the reputation of utilizing everything in the shape of a lobster that comes from the sea, the decadence has been something startling; and conditions have reached a point on that part of the coast line of this State where the reproductive possibilities of the animal have been reduced to such a degree that it seems as if the lobsters are soon to be exterminated, or nearly so. (*Ibid.*, page 44.)

The Canadian Lobster Commission, in their report, 1898, page 7, says: —

Not many years ago it was no uncommon spectacle to see, after a storm, miles of the shore strewn between tide-marks with lobsters. In some localities in New Brunswick and Quebec lobsters in windrows four or five feet high were cast up by the waves and left stranded and dead along considerable lengths of the coast. As many as one thousand lobsters have been counted along two rods of shore, and in some years, as in 1873, the destruction of lobsters in this way, especially along the Shippegan shore, Gloucester County, N. B., was memorable.

Similar conditions formerly obtained on certain exposed points on the Massachusetts coast, *e.g.,* Nantasket beach. Slight traces may even be seen now after severe storms on this Nantasket shore, where many small lobsters are occasionally gathered.

The late Ex-Representative R. E. Conwell, at the convention held at Boston, 1903, to secure better protection of the lobster, said: —

Of course you know that the Provincetown lobster fishery is a little different from the fishery of other places. At Provincetown we catch all large sea lobsters. Our people put their slats 2 inches to 2¼ inches apart. During the months of June and July there is a school of lobsters which comes along there which are all males, and in the latter part of June we get a mixture of female lobsters. A year ago this month, in September, I drew in seven pots. There were 15 lobsters, and 11 of them were egg bearing. Our lobster fishermen claim they catch no short lobsters, on account of the size of the traps. [Large rings and wide distance between the slats. — Ed.] Last year the lobster fishery on Cape Cod never was better. This has been an off year, owing to the abundance of crabs, which came in and covered up the bait in the pots.

The lobster fishing is nothing to what it used to be. We, as trap fishermen, catch some small lobsters about 5 or 6 inches long in the pound nets. We fish in water from 3 to 7 fathoms deep, and even 15 to 16 fathoms deep, sometimes.

I think all good, honest lobster fishermen would not object to a license law, and I believe the fishermen as a whole are as honest as we are.

Within three years after the above statement was made, the important lobster fishery, which had meant so much to Provincetown, became commercially extinct.

With regard to the size of lobsters, the commissioners were unanimous in their view that it had diminished, as compared with former years, but in some localities this decline is less marked than in others; for example, around the southeast coast of Cape Breton and along the shores of Gaspe County and Bonaventure in the Province of Quebec the average size, it is claimed, still continues fairly large. (Report of Canadian Lobster Commission, 1898, page 26.)

In 1906, 1,000 lobsters taken in Boston on their arrival from Nova Scotia, and regarded as a fair sample, comprised 563 which were 11 inches or less, or 56.3 per cent.; and 437 over 11 inches, or 43.7 per cent. Of these latter, 262 were between 11 and 12 inches long; 151 were between 12 and 13 inches long; 25 were between 13 and 14 inches long; 9 were 14 inches long. The largest was 14¾ inches; the smallest was 10 inches. Of the 1,000, 35 were below the then legal limit of 10½ inches.

In 1911, of 1,005 lobsters, taken under similar conditions, 759 were 11 inches or less, or 75.8 per cent., and 246 over 11 inches, or 24.2 per cent. Of the 1,005, 408 were below 10½ inches.

In almost every lobster-producing country this favorite crustacean is threatened with extermination. The quantity secured each year is lessening and the price advancing, notwithstanding the efforts made to arrest the decline. Many high authorities hold that the lobster is destined to extinction, like the great awk, the dodo and the buffalo. Newfoundland, unfortunately, is no exception to the decline in the lobster fishery, and the utmost care and vigilance are called for to prevent its destruction. The export each year is lessening, and the size of lobsters taken is diminishing in most districts. Great stringency in enforcing the rules which regulate this fishery is called for, and, above all, a continuation and extension of artificial propagation are needed. In fact, it is desirable, wherever there is a lobster factory of any considerable extent, that incubators should be at work, and none of the ova should be destroyed. There is no surer sign of a declining fishery than the diminution in the size of the lobsters taken; and this is the result of their capture before they have reached the spawning age. Very large numbers of our people are now dependent, to a certain extent, on this fishery for their subsistence. There is, in consequence, a more urgent call for our best efforts to arrest its decline. (Report of Newfoundland Department of Fisheries, 1898–99, page 24.)

In certain other localities, however, the figures show an apparent increase. This increase, however, is only apparent, for the reason that it is a result of more men, using a larger number of traps over a wider area, with more effective methods of fishing, under the stimulus of increased prices.

There has been also a noticeable decrease in size.

The St. John's (N. F.) "Trade Review" says: "There is no use mincing matters. The present deplorable conditions of our lobster fishery is due entirely to the cowardice of the government, who are afraid to carry out the letter. They have a regulation calling for a defined length of lobster for packing, but they know that this law is broken every day in the year; but, fearing to lose the fisherman's vote, they will not prosecute. *Thus it goes on year after year, but available lobsters becoming smaller and smaller, until at present it sometimes takes the meat of 30 or 40 fish to fill a 1-pound can.* ("Fishing Gazette." January, 1909, page 103.)

Careful measurements of 17,365 egg lobsters purchased by this department in 1905–08 show that, while in the years 1905–06 there were 159 lobsters 12 inches and over to every 100 under 12 inches, in 1907–08 there were but 75 which measured 12 inches and over to every 100 below 12 inches.

In spite of a larger number of men, using a larger number of traps and fishing over a vastly increased area, there has certainly been a well-marked decrease in the number caught when a sufficiently wide range of facts are considered.

In the following table, compare the annual catch of lobsters in Massachusetts waters, based upon the law which calls for sworn statements from the fishermen, from 1888 to 1910: —

Date.	Fishermen.	Traps.	Number of Lobsters Above 10½ Inches.	Egg-bearing Lobsters.	Average Catch per Pot.
1888,	367	21,418	1,740,850	–	81
1889,	344	20,016	1,359,645	61,832	68
1890,	379	19,554	1,612,129	70,909	82
1891,	327	15,448	1,292,791	49,973	84
1892,	312	14,064	1,107,764	37,230	79
1893,	371	17,012	1,149,732	32,741	62
1894,	425	20,303	1,096,834	34,897	54
1895,	377	17,205	956,365	34,343	56
1896,	453	22,041	995,396	30,470	45
1897,	388	18,829	896,273	23,719	48
1898,	340	16,195	720,413	19,931	44
1899,	327	15,350	644,633	16,470	42
1900,	309	14,086	646,499	15,638	46
1901,	331	16,286	578,383	16,353	35
1902,	410	20,058	670,245	–	34
1903,	309	20,121	665,466	–	33
1904,	326	19,539	552,290	13,950	28
1905,	287	13,829	426,471	9,865	31
1907,	379	21,342	1,039,886[1]	10,348	49
1908,	349	19,294	1,035,123[1]	9,081	54
1909,	522	29,996	1,326,219[1]	11,656	45
1910,	390	26,760	935,356[1]	7,857	35

[1] Number of lobsters above 9 inches.

We are informed that less than 5 per cent. of the Massachusetts supply now comes from Massachusetts waters.

Similar conditions obtain in Canadian waters: —

Many considerations might be adduced to show that, unless overfishing and illegal capture be prevented, the lobster must inevitably become extinct in Canada, as it has practically become in many other countries. Lobsters are admittedly becoming more and more scarce, while the demand and the market price continue to increase. A live lobster of 11 inches in length, which ten years ago could not be sold for more than 1 or 2 cents, will bring to the fishermen, especially early in the year, 10 to 20 cents. A case of canned lobsters, which sold in 1897 for $4 or $5, can now readily be sold for $8 or $9, or even more. (Report of Canadian Lobster Commission, 1898, page 7.)

Of most serious import, however, is the fact that there has been a distinct and alarming diminution in the number of egg lobsters caught in proportion to the total number of lobsters taken.[1] For the entire coast of Massachusetts, in 1889, 1 lobster in every 22 was carrying eggs; in 1905, 1 lobster in every 43 was carrying eggs; in 1906, one lobster in every 48 was carrying eggs; in 1907, 1 lobster in every 100 was carrying eggs; but in 1909 only 1 in every 114.

Another most significant fact, still further elucidating the alarming situation, is indicated in the report of the United States Bureau of Fisheries, relative to the total number of eggs secured annually from a stated number of lobsters. Comparison of these returns, in the two years the figures of which are readily available and therefore taken really at random, seem to show that while, in 1903, 1,323 lobsters yielded 22,983,000 eggs, or an average of 17,300 per lobster, in 1908, 2,792 lobsters yielded 23,337,000 eggs, or an average of only 8,300 eggs.

The following table shows how small a percentage of egg lobsters are protected by the present law (9 inches), or even by the former law (10½ inches): —

[1] The lobster fishery at Monomoy still comes nearly to the original conditions, (viz., 1 lobster carrying to every two females without eggs). It is reported by one of our observers that in August and September, 1906, there was 1 "egger" to 5 in the total catch.

EGG LOBSTER MEASUREMENTS, 1906–10 INCLUSIVE.

Total Number of Lobsters measured in Each District.

A.	Salem to Newburyport,	1,773
B.	Boston harbor fishermen,	1,068
C.	Boston dealers,	8,157
D.	Cohasset to Sandwich,	3,306
E.	Monomoy,	5,228

Percentage of Each Size in Total Catch in Each Locality.

SIZE (INCHES).	A.	B.	C.	D.	E.
7 to 7¾,	–	–	–	.03	–
8 to 8¾,	.17	–	.01	.15	–
9 to 9¾,	1.64	.75	.53	2.87	.10
10 to 10¾,	17.20	7.02	9.08	21.55	1.93
11 to 11¾,	28.09	15.08	23.95	29.07	5.15
12 to 12¾,	31.30	42.79	32.75	24.50	15.09
13 to 13¾,	14.78	26.31	23.02	14.73	30.71
14 to 14¾,	5.02	7.02	8.35	4.54	27.31
15 to 15¾,	1.35	.84	1.71	1.54	12.86
16 to 16¾,	.45	.19	.53	.66	5.09
17 to 17¾,	–	–	.06	.18	1.51
18 to 18¾,	–	–	–	.15	.25
19 to 19¾,	–	–	.01	–	–
20 to 20¾,	–	–	–	.03	–
Total,	100.00	100.00	100.00	100.00	100.00

The average size of egg lobsters in the various localities is indicated by the following table, based upon our actual measurements of 19,532 lobsters: —

Year.	Gloucester.		Boston Fisheries.		Plymouth.		Boston Dealers.		Monomoy.	
	Number.	Size (Inches).	Number.	Size (Inches).	Number.	Size (Inches).	Number.	Size (Inches).	Number.	Size (Inches).
1906,	719	11.720	495	12.409	1,442	11.570	726	12.234	–	–
1907,	269	11.818	213	12.321	988	11.458	1,307	12.306	711	13.726
1908,	367	12.203	193	12.596	148	12.289	2,204	12.456	1,254	13.576
1909,	279	12.131	167	12.638	225	12.894	2,054	12.425	1,732	13.815
1910,	139	12.507	–	–	503	12.791	1,866	12.221	1,529	13.758
Totals and averages,	1,773	11.962	1,068	12.463	3,306	11.845	8,157	12.350	5,226	13.724

All these facts can mean nothing less than that the reproductive capacity of the race is already seriously impaired.

The chief arguments upon which contrary opinions are based are due to the generalizations of incompetent observers, who have wrongly supposed that the countless numbers of certain crustacea — for example, *Gebia,* burrowing in the sand, hermit crabs inhabiting snail shells along the shores, arthropods swimming at the surface of the water — were small lobsters. As a matter of fact, the swimming or larval stages of the lobster are only rarely seen, even by skilled observers. Fishermen in general are loath to acknowledge existing conditions, almost invariably claiming that there are as many lobsters caught as formerly, and that there are just as many lobsters available for the market. In periods of special scarcity they are wont to content themselves with the statement that the lobsters have gone elsewhere, or falsely attribute the absence of the lobsters to various coincidences, such as, for example, " sand fleas have eaten the lobster bait; therefore, the lobsters are obliged to migrate for food."

II. — Causes of the Decline.

The causes of the decline may be divided into two groups, (1) those resulting from natural environment, such as enemies and severe storms, and (2) those resulting from the conditions introduced by man. These latter are by far the more important, for the reason that before the lobster became fashionable as a food this crustacean was certainly a dominant species.

Before man became its greatest enemy, there is abundant evidence that the lobster was a favored race, but with the coming of the white man the balance of nature was upset. The sole reason for the decrease of the lobster is to be found in the conditions introduced by civilized man. These conditions again in turn fall naturally under two heads: (1) the increased market demand, arising from increased population and accumulated wealth, — the demand for toothsome dainties, entirely apart from their value as food; (2) ineffective laws, difficult of enforcement; and based upon misconceptions.

The market has not been met by a correspondingly augmented source of supply other than the uneconomic exploitation of wider fishing grounds. Unlike the free-swimming migratory species of fishes, the lobster is peculiarly subject to these influences. Again quoting Captain Collins's statement at the conference held in 1903 in Boston (page 12): —

Attention was invited to the fact that any attempt to compare the lobster with free-swimming migratory species of fishes was not based on sound principles of reasoning, and therefore was misleading; for, in the first place, there could be no comparison in the fecundity of free-swimming fishes, which might yield tens or hundreds of thousands of eggs annually, and the lobster, whose power of procreation has been so very much reduced in recent years by over-fishing that it now usually has only about ten or fifteen thousand eggs at a time, and, as is well known, it generally breeds only once in two years. The disparity, therefore, between the undersized lobster of to-day — often too small to breed at all — and the mature fish of the sea, in the matter of reproduction, is such that no instructive comparison could be made.

It was also pointed out that the lobster is non-migratory; that it occupies only a narrow belt along the coast, which seldom extends more than fifteen miles from the outer headlands and islands; that, for this reason, it is subject to the operations of man (as in Maine) throughout the year, and is not exempt from being hunted five or six months of the year, as are many species of migratory fishes.

The effect of man's operations upon the lobster was cited as an evidence of the fact that he has ever been the cause that has led to a decimation of the species and a marked diminution in the size of individuals. These conditions did not exist before fishing began, but they are universal where it has been carried on. There is no exception in the world. From Norway to Newfoundland, and from the latter island to New Jersey, the story has been the same. Everywhere where a lobster fishery has been established there has been a marked diminution of the species, — in cases reaching almost to extermination, — until it has always become necessary for governments to step in, and to so regulate and control the fishery as to delay final exhaustion of the supply of lobsters, or perhaps to apparently stay the ruinous decimation.

In view of these well established facts, — facts which are patent to every one who cares to inform himself on this subject, — the question was very properly asked. "If all this does not prove man's agency and influence in the decadence of the lobster, where shall we look for proof of the cause of that decadence?"

The increased demand has led to the catching of both the large and small lobsters. One of the managers of a lobster cannery on Prince Edward Island assured the writer in conversation that a lobster "as large as a grasshopper" was not too small to be included in the canning operations.

These small lobsters, too, are used for bait in large quantities, as well as for local consumption by the fishermen.

Warden N. J. Hanna of Maine, who has been a warden for more than twelve years, and who previously has been a practical fisherman, says: "I will now offer three causes for the present scarcity of lobsters, and three causes they are that no fisherman can deny. First, each lobster fisherman on the coast of Maine now engaged in the lobster business is using on an average 12 little lobsters per day for the purpose of catching cunners for his traps, and, as there are at present 2,700 men employed in the business, it takes 32,400 little lobsters per day for cunner traps alone, or 226,800 per week, or 907,200 per month, or 19,886,400 per year; no fisherman will dare to dispute these figures. My second reason is this: that for two months out of the year we have on the coast of Maine about 100,000 summer tourists, and, with all the vigilance of twenty-four wardens, these people will average at least 1 small lobster to each person per day. This would take 100,000 per day, or 700,000 per week, or 2,800,000 per month, or 5,600,000 for the two months that our summer visitors are with us. Add to this what the fishermen consume in their families and what is smuggled out of the State each year, you will then come pretty near knowing what has depleted our lobsters on the Maine coast. And I now ask the captain whom he holds responsible for this wholesale extinction? Has the lobster hatchery had anything to do with the several ways I have enumerated, which you know to be facts? The whole fault lies with the 2,700 lobster fishermen. If they don't haul short lobsters, no person can buy them, the summer tourist cannot get them, the hotels cannot get them." (Maine report, Sea and Shore Fisheries, 1905–06, page 29.)

Enormous quantities of eggs have been destroyed, some being cooked and eaten, but more brushed off for the purpose of evading the law. This practice still obtains, though to a greatly diminished extent.

Political considerations have very often entered into the question of preventing effective legislation for the preservation of the lobster supply, the chief argument being that fishing was

free for the benefit of any person who chose to enter upon it; that any restriction upon the taking would work a hardship upon worthy people who were dependent upon the daily catch of fish for their daily bread. Public sentiment has not yet crystallized relative to the necessity of the introduction of improved methods to meet the increased demand.

III. — Remedial Measures.

Certain methods have been applied or suggested for checking this decline.

Sweden, in 1686, was the first nation to enact restrictive legislation relative to the lobster fishing.

In this country Provincetown, in 1812, fearing the extermination of the lobster, induced the Legislature to enact a law imposing a fine if lobsters were taken from the waters and shores of the town without permit from the selectmen, and providing for the appointment of several wardens, etc. This was followed by chapter 110, Acts of 1874, forbidding the sale of lobsters less than 10½ inches long: —

Section 1. Whoever sells, or offers for sale, or has in his possession with intent to sell, either directly or indirectly, any lobster less than ten and one-half inches in length, measuring from one extreme of the body to the other, exclusive of claws or feelers, shall forfeit for every such lobster, five dollars.

Section 2. All forfeitures accruing under this act shall be paid, one-half to the person making the complaint, and one-half to the city or town where the offence is committed.

Section 3. This act shall take effect on the first day of May, eighteen hundred and seventy-four.

The first restrictive law as to lobsters in Maine was passed in 1879, restricting the canning to the months of April, May, June and July in each year, and during the other months forbidding capture of lobsters measuring less than 10½ inches in length. In 1883 the foregoing law was supplemented by a close time, extending from August 15 to November 15, and allowing no lobster less than 9 inches to be canned, and no

lobsters with eggs attached to be taken. In 1885 this was changed by making a close time extending from August 15 to October 1, and allowing canning from April 1 to July 15, providing also that no lobster with eggs attached should be destroyed, or that any measuring less than 9 inches should be canned. In 1891 another change was made, shortening the time in which lobsters might be canned, this time allowing it to be done only from April 20 to July 1 in each year; and in 1895 the Legislature passed a law that allowed no lobster less than 10½ inches to be handled for any purpose, thus terminating the business of canning lobsters in Maine.

Almost invariably the first tendency of so-called protective legislation is towards restriction. Practically all restrictive legislation is defective, for the reason that attention is directed towards checking the demand, rather than increasing the supply. Among such types of restrictive legislation may be mentioned that relative to the distance apart at which traps must be placed. This was soon found to be impracticable, since it led to interminable controversy. Similar statements are true relative to laws limiting the amount of gear to be used by each person, or restricting the areas to be fished.

Combinations of fishermen ostensibly for the purpose of compelling respect for the law, but which incidentally shut out transients and summer residents from fishing in the public waters, have been advocated, and have secured some standing and results in certain sections.

The close season, similarly, is essentially restrictive in its nature, in that it limits consumption to a shorter season. While a close season may furnish satisfactory results in the case of an animal which breeds rapidly, it can be but slightly effective in such a case as the lobster, where the eggs are ordinarily produced but once in two years, and where the eggs are carried for from ten to eleven months. More than that, winter is a natural close season, in which the lobsters retire to a considerable extent to deeper water, and are therefore more difficult to catch. There is also a perceptible check in the demand during that season; while, on the other hand, the time of the greatest economic

necessity and advantage for such food is during the summer, when a larger proportion of the population is at the seashore. Unfortunately, this period coincides with the time of hatching in June and the laying of the eggs in September, together with the period of shedding in July.

While the close season has the advantage of being more readily enforced than any other type of law, it is, as a matter of fact, of relatively little economic value in proportion to its cost to the market.

Close seasons fall into two classes: —

(*a*) *For a Portion of the Year.* — A close season may bring manifest and satisfactory results in cases where the animal is a rapid breeder, or where the young reach maturity in a short time. But a close season is not equally applicable for checking the numerical decline of every, or any particular, animal. This is notably true of the lobster. A close season must fail to bring the expected results, for the reason that the lobster is a slow breeder, laying eggs but once in two years, and carrying these eggs, attached to the modified legs under the abdomen, for ten or eleven months after laying; while the young require probably from four to seven years to reach maturity, and attain a length of 7 to 10 inches. Finally, the fundamental defect of a close-season law is that it restricts the demand, but does not adequately and economically increase the supply. Aside from the practical difficulties of securing a uniform close season throughout the lobster range, and enforcing the laws, the value of the close season to the lobster as a race is commensurate with the duration of this close season. The longer it extends, the better for the lobster but the worse for man. The burden upon investments in the lobster fisheries is increased. The absence of the lobster from the human food supply is felt by the public. Yet all this is of little avail, for the effects of the close season are not permanent, — the causes of the decline have not been removed. The lobsters, through a close season, either from one to six months each year, may have a chance to "catch up," only to be themselves "caught up" with redoubled energy, resulting in a glutted market and consequent economic waste for a time,

with the certainty of a rapid return to the former conditions which made a close season necessary.

(*b*) *Close Season for a Term of Years.* — Most of the foregoing statements apply also to a close season for a term of years. The primary inherent defects in the close season are that it does not reach the cause of the decline, and it fails to recognize the fact that the lobster can and should be reckoned as a perennial and perpetual food for man. Human effort can so control conditions that the supply may be large or small. By taking proper measures, the lobster supply can be made abundant and continuous, instead of intermittent.

The most conspicuous example of the application of the close-season principle is that in force in the Maritime Provinces, where, by an order in council on the thirtieth day of September, the following laws relative to close seasons were put into effect in the respective districts: —

Geographical District.	Close Season.
Province of New Brunswick, embraced and included within the counties of Charlotte and St. John.	June 30 to January 5, both days inclusive.
On and along that portion of the coast or the waters thereof of the provinces of New Brunswick and Nova Scotia, embraced and included within the county of Albert, New Brunswick, and the counties of Kings and Annapolis, Nova Scotia.	June 30 to January 14, both dates inclusive.
On and along that portion of the coast or the waters thereof of the Province of Nova Scotia, embraced and included within the county of Digby.	June 16 to January 5, at 9 o'clock A.M., both days inclusive.
On and along that portion of the coast or the waters thereof of the Province of Nova Scotia, embraced and included within the counties of Yarmouth, Shelburne, Queens, Lunenburg, and that portion of the county of Halifax west of a line running S.S.E. from St. George's Island, Halifax harbor, and coinciding with the fair-way buoys in the entrance of the said harbor.	May 31 to December 14, both days inclusive.

Geographical District.	Close Season.
On and along that portion of the coast of the Province of Nova Scotia or the waters thereof, from the aforesaid line, running S.S.E. from St. George's Island, Halifax harbor, and coinciding with the fair-way buoys in the entrance of the said harbor, extending eastwardly and following the coast line, as far as Red Point, between Martin Point and Point Michaux in the Island of Cape Breton, and including Chedabucto Bay and St. Peter's Bay and the coasts and waters of all the islands lying in and adjacent to these bays, and including the coasts and waters of the Gut of Canso, as far as a line passing from Flat Point, in Inverness County, to the lighthouse in Antigonish County opposite.	July 1 to March 31, both days inclusive.
On and along that portion of the coast of Cape Breton Island, in the Province of Nova Scotia, or the waters thereof, from Red Point, between Martin Point and Point Michaux in the Island of Cape Breton, and extending to and around Cape North as far as and including Cape St. Lawrence; also, on the north shore of the Gulf St. Lawrence, from and including the Bay of Blanc Sablon in the Province of Quebec, westward to the head of tide, embracing the coasts and waters of all the islands adjacent to the said shore, and including the Island of Anticosti.	August 1 to April 30, both days inclusive.
On and along the coast or the waters thereof of the Magdalen Islands, including Bird Rocks and Byron Island; but no one shall at any time fish for lobsters in the lagoons of these islands.	July 11 to August 31, both days inclusive; and October 1 to April 19, both days inclusive.
Along the coasts and in the waters of that portion of Northumberland Strait, between a line, on the northwest, drawn from Chockfish River in New Brunswick to West Point in Prince Edward Island, and a line on the south-east, drawn from Indian Point, near Cape Tormentine in New Brunswick, to Cape Traverse in Prince Edward Island.	August 11 to May 24, both days inclusive.
On and along that portion of the coast of the Province of Prince Edward Island or the waters thereof not embraced in the immediately foregoing subsection, viz.: from West Point, around the west, north, east and that portion of the south coast of the Province to Cape Traverse.	July 11 to April 25, both days inclusive.

Geographical District.	Close Season.
On and along any portion of the coasts of Canada or the waters thereof, where lobsters are caught, not embraced in the limits described in the foregoing subsections, viz.: from, but not including, Cape St. Lawrence in the Island of Cape Breton, southwestwardly to Flat Point, Inverness County, in the Island of Cape Breton, and from the lighthouse in Antigonish County, Nova Scotia, opposite Flat Point, Inverness County, westwardly, embracing the coast and waters thereof of the portion of the county of Antigonish west of the lighthouse specified, and of the counties of Pictou, Colchester and Cumberland, Nova Scotia, and that portion of the coast and waters thereof of Westmoreland County to Indian Point, near Cape Tormentine; then northwardly from Chockfish River, Kent County, New Brunswick, embracing the coast and waters thereof of the county of Kent, from the river specified, and of the counties of Northumberland, Gloucester and Restigouche, New Brunswick, as well as the coast and waters thereof of the counties in Quebec south of the River St. Lawrence, to the head of tide.	July 11 to April 19, both days inclusive.

In substance, the chief result of the close season is to close the market at a time when, and at places where, healthful fish food is most in demand, most accessible and most needed; to put the fishermen out of business, whereby opportunity is given for lobsters to migrate and repopulate the areas which are obviously overfished during the feverish activity of the open season. The relatively few egg-bearing females which escape the perils of the open season are, it is true, permitted to hatch their eggs; but this number is almost inconsequential when compared with the large numbers of breeders which are destroyed in the open season. The incidence of the close season should fall upon the breeding lobsters themselves, rather than upon a portion of the time in which they are carrying the eggs. In other words, to paraphrase a famous aphorism, apply the close season to *some* of the lobsters (viz., the breeders) *all* of the time, rather than to *all* the lobsters for *some* of the time. This idea is elaborated later.

Another important phase of the lobster question which obtains especially in Massachusetts is the sale of lobster meat. Section 18 was therefore inserted by your commissioners, in the draft of uniform laws adopted by the conference of commissioners at Newport, R. I. The conditions which make such a law advisable were described in our earlier report (Public Document, No. 25, 1905).

The schemes for outwitting the deputies and of evading the short-lobster law far excel the peculiar ways of Bret Harte's "Heathen Chinee." In general, since to secure conviction it is necessary to seize the short lobsters while in possession of the offender, the illegal lobsters are kept where they can readily be thrown overboard in case a deputy appears. Our deputies have compelled the fishermen thus to throw overboard at least 1,000,000 "shorts" this year. In case a deputy does not appear, the "shorts" are placed in a sunken bag or car, the location of which is marked by a buoy kept just under water; or by an inconspicuous floating object, which would attract no special attention, such as a bit of wood, kelp, etc.; or the bag or car may be hung by a small line over the stern of a boat, or to a boat-mooring, or a pile under a wharf. When 50 to 500 "shorts" have been accumulated, these are taken in the night by regular collectors, who ply along the shore from Rockport to Plymouth. Some such have been driven so hard by our deputies as to go out of the business, but "there are others." They have a well-organized system of sentinels and spies, who keep track of and report the movements of the deputies. The fines imposed by the judges, even at the maximum, are small when compared with the profits; and usually this amount is reckoned as a contingent expense of the business, and is divided among those participating in the profits. Most of these lobsters are marketed as "lobster meat." The following report, from Deputy Burney, indicates how the law is evaded during the summer at many places along the shores between Boston and Gloucester: —

LYNN, MASS., Aug. 1. 1905.

Commissioners on Fisheries and Game.

GENTLEMEN: — Complying with your request, I make this report of my observations upon the short-lobster traffic on the shores of Massachusetts. The enforcement of the lobster law is becoming more diffi-

cult each year, on account of the methods adopted to evade it by the lobster fishermen on the north shore.

In the past it was the custom of the fishermen to land their catch; then it was a comparatively easy matter to catch the violators. At present, landing the catch is dangerous, and in some cases a very costly way to dispose of their lobsters. The fishermen have adopted ways of avoiding that. It was soon found that there was a growing demand from the beach houses and hotels along the shore for lobster meat out of the shell. Raw meat soon became too dangerous to handle, and other means had to be found. The new way is an evasion of the law, and it is relatively safe. There are two ways to work it: one is to cut up the raw meat into small cubes, when it is impossible to show to the courts that it is lobster tails; the other is to scald the lobsters on board the boats, cut the meat up and land it in pails and firkins. There has been but one conviction (in my recollection) on scalded meat, and that was on meat *not* cut up.

One or two instances are sufficient for examples of what happens nearly every day during the summer season. On Wednesday, July 19, I was at Salem Willows. Two boats ran in on the Beverly side and anchored a short distance off shore. I could see very plainly with my glass every move of the men. They were busy for more than half an hour, shocking out and cutting up lobster meat and putting it into firkins. When they had finished, the meat was taken by one of them to the restaurants at the Willows. They were not gone over ten minutes when another boat came from Beverly shore and did the same thing.

Tuesday, the 25th of July, off the Magnolia shore I saw two sloops at anchor, their crews busy "shocking" and cutting up meat. This is something that can be seen almost if not every day. In past seasons it was common talk that a man could run down to the nearest beach any morning early and get a mess of shorts. I am asked quite often, "Where are all the shorts? I used to get a mess once in a while, but I can't get them now." I venture to say that where there were hundreds of short lobsters landed every day five years ago, there is not one dozen landed today. Of course there are some men who *will* take chances, but they are few. Where a man can sell his shorts off shore to the boats engaged in buying shorts, he will not bring them ashore and take chances. A number of lobster fishermen with whom I have talked say that this is the poorest season they have ever had.

Yours respectfully, THOMAS L. BURNEY.

On the south shore of Massachusetts some "shorts" are handled locally, but the greater number are shipped to Rhode Island and New York, being landed at Newport. Every boat and every stranger is carefully scrutinized, to learn if he is "all

right;" and at the slightest suspicion the signal is passed to "stand by to heave the 'shorts' overboard."

The public is largely to be blamed for this condition of affairs. The seashore public creates the demand. It is a common practice to leave baskets outside the doors, where in the early morning short lobsters "descend like manna from heaven," at the rate of 50 cents to $1 per dozen, according to risk of detection. People who carry on such practices might not steal private property, but they thus steal public property. A finer public sentiment should develop. To the unthinking, the attitude of the State appears to be directed solely against the poor fisherman, in a rather petty way. On the contrary, the State is doing its duty in protecting public property and the interests of the fisherman. Too often the fisherman discounts the future by excessive greed in destroying fish, for fish means money.

The public, however, should be particularly warned, and in no uncertain terms, against the use of lobster meat taken from the shell at a distance from the place where it is consumed. The State Board of Health and the local health boards in every town and city are distinctly and earnestly urged to deal with this lobster meat problem. The facts are as follows: —

Ever since the law prohibiting the killing and possession of short lobsters has been in effect, the fishermen and consumers of lobsters have devised all sorts of expedients to use short lobsters in violation of the law, and to escape detection by the officers. A common scheme is to boil the lobsters on board the boat, remove the meat from the shell, cut up the meat in such a way as to destroy all evidence possible as to the size of the lobster, and bring the meat ashore. This meat is then sold by the pound to private customers, to hotel and to restaurant keepers, and to near-by city, town and shore resorts. This practice is not alone a screen for the "short-lobster trade," but it is a positive and serious menace to the public health. Numerous severe and even fatal cases of ptomaine poisoning can be traced directly to the use of the lobster meat prepared in this manner. One day's record is given below: —

Hull, Sept. 1, 1905. — Francis H. Cleverly of the Hull board of health went over to Fort Andrews at Peddocks Island this morning,

and obtained for the first time from Dr. Luke B. Peck, the post surgeon who attended Antonio Gomes, Joseph Oliver and Joseph Oliver, Jr., who died on the island Sunday morning, a doctor's certificate. In the doctor's certificate Dr. Peck states that to his best knowledge and belief the cause of the death of all three was ptomaine poisoning, from eating lobster that was supposed to have been decomposed. The board of health will accept the cause of the death of all three as attributed by Dr. Peck as final, there having been no autopsy. (Boston "Globe," September 2.)

Lynn, Sept. 1, 1905. — After attending a banquet at which lobster salad was served, several of the great chiefs of the Improved Order of Red Men, who were guests of Winnipurkitt tribe in this city last night and to-day, were taken ill, and in many cases had to call in physicians.

The one who suffered the most from what the physicians call lobster poisoning is Frederick Williams, 84 Tracy Avenue; the others who were compelled to call in physicians are William Embree, George Eastman, Roscoe Patton, Jacob Steadman, E. L. Hiller and W. J. Spoonley. These are all members of the Lynn tribe, and it is not known how many of the visiting great sachems have been affected.

Williams and Spoonley were taken ill while attending the outing tendered to the visitors to-day at Nahant, and forced to leave for home long before the rest of the party. On arriving home they went immediately to bed and called in their physicians. The others who did not attend the outing were taken ill about the same time. Others of the party were affected, but in a less degree.

It is said by the caterers that none but the best lobsters were used in the salad, and that they cannot imagine why any serious effects should be felt. The lobster was bought for fresh, and it was not canned, as was alleged by many of the members of the party; in fact, much of it was bought at the fish market of one of the members of the committee. The other edibles were also fresh, nothing being used that had ever been canned. (Boston "Globe," Sept. 2, 1905.)

These facts should be known to the public, and specific warning given as to the danger to health and even to life of such methods of placing lobsters on the market. Every responsible hotel or restaurant manager should refuse to buy lobsters unless either in the shell or canned; and customers should object to being served with lobsters at such hotels or restaurants as do not conform to practices which safeguard the life or health of patrons. It is a well-known fact that crab and lobster meat spoils very quickly after exposure to the air. The reason is

that the texture of the meat is very loose and spongy, with many spaces through which the air penetrates. This air carries the bacteria which cause putrefaction and the rapid development of certain ptomaines which are virulent poisons even in very small quantities. The bacterial changes which give rise to ptomaines progress most rapidly at about the temperature of ordinary ice chests, — at about 50° F. Ptomaines may develop without the presence of an offensive odor. In the case of the properly boiled lobster, kept in the shell until ready to serve, these changes do not begin so quickly or progress so rapidly, for the reason that adequate boiling sterilizes the shell and the meat, and the sterilized shell protects to a considerable measure the meat enclosed within it, so long as the shell is unbroken. Upon removal of the shell the air has readier access to the meat, and ptomaine formation or putrefaction soon ensues; therefore, the shell should not be removed until close to the time for serving the meat. In the case of lobster meat removed from the shell at some distance from the point of consumption, the length of time between the removal from the shell and the appearance of the meat upon the table is in many instances too long for safety. Further, lobsters boiled and prepared under such unfavorable, not to say unclean, conditions are not only often imperfectly sterilized, but also liable to infection from unsanitary surroundings and careless handling, and therefore much more liable to rapidly develop ptomaines. Unclean handling, filthy receptacles, etc., may also introduce the germs of typhoid and other serious infectious diseases. Our deputies are using every effort to make this practice of using illegal lobsters unprofitable, and special attention will be directed to cases where lobsters are sold as meat. But the most effective remedy is a public knowledge of the dangers of ptomaine poisoning from the use of "lobster meat" or "picked meat," taken from the shell in places unknown, and at any considerable period of time before being prepared for the table. Purchasers should therefore be warned against buying lobster meat unless it is in the shell or canned; and, in buying lobster, never buy one which was boiled after death.

Many of the lobsters which die in transit, together with the

"sleepy" (moribund) and the "Joe" (crushed or otherwise mutilated) lobsters, reach the consumer as "picked meat." Such should be bought very cautiously, for the reason that the history of the preparation of it is unknown. "Hash" is said to be above suspicion only "when you know the lady as made it;" but in the case of "picked meat" and "lobster meat" you should in addition know the condition of the lobster and the sanitary conditions under which the meat was prepared, together with the length of time since this preparation.

The sale of lobster meat, therefore, is a serious menace to the lobster supply; it is a burden upon the law-abiding lobstermen and lobster dealers; and, above all, it is a positive menace to public health. The public should demand that lobsters be sold only in the shell or canned.

One of the most unwise types of legislation is that involved in the so-called size limit law, which was first enacted by Massachusetts in 1874, and later adopted by all the American States and provinces where lobster fisheries exist. The argument used in favor of the passage of this law, the so-called 10½-inch law, was that the lobsters were so abundant in the sea, the area inhabited by them was so vast, that if the lobster was granted but an opportunity to lay one or possibly two litters of eggs, the race would then be able to maintain itself. Those who advocated this law were utterly unable to predict the enormously increased demand, and the biological effect of the destruction of so many of the best breeders as must occur when a law is passed which permits the taking of lobsters only at the best breeding age. The 10½-inch limit — the one fixed upon — did actually permit the lobster to lay at least one, and frequently two, litters of eggs; but the subsequent modification to the 9-inch law (1907) practically prevented the laying of any eggs at all, for the reason that egg-laying begins between the periods of 9 and 11 inches.[1] Therefore, under the present laws the only source of natural increase remaining to the lobster rests in those individuals above 9 inches which escape capture. It follows that every year this number must be actually reduced in numbers to the extent of the numbers caught, and their ranks

[1] O the 9,530 egg lobsters measured and tabulated, only 10 were less than 9 inches long

can be refilled only by the lobsters which result from a diminished number of eggs laid by the survivors.

The following statement, as given in the Newfoundland Fisheries Commission report, 1890, page 36, reflects the conditions which obtain from the Straits of Belle Isle to New Jersey: —

> The fixing by law of a size below which no lobsters shall be taken, if it is to be of any benefit or protection to the fishery, will always give rise to dissatisfaction among those engaged in this industry. It may be regarded as an impossibility to fix a size which will satisfy even a majority of the people, and at the same time have the desired effect in regard to the preservation of the fishery. If the standard is placed high, so as to protect all immature lobsters, the greatest benefit to the fishery will follow; but the great majority of packers and fishermen will be dissatisfied, and the law will be evaded. On the other hand, if we permit a small size to be taken, we satisfy those engaged in the fishery, but we fail to protect the immature lobster or secure the future of the fishery. *The very fact that we attempt to protect any fishery implies that abuses have taken place, and that more fish have been taken than the natural production can withstand; and we own that, should this continue, the fishery will come to ruin.*

Neither the 9-inch law in New York, the 9-inch and "female lobster with spawn attached" in Connecticut, 9-inch and a close season in Rhode Island, 10½-inch in Massachusetts, 10½-inch and "female lobsters while carrying their spawn or hatching their young" in New Hampshire, 10½-inch since 1897 in Maine, nor the 10½-inch and a closed season from June 30 to January 14 in the Maritime Provinces, has prevented the continued rapid decline in (1) the number of lobsters caught, (2) the average size of the lobsters caught, (3) the average number of egg-bearing females reported, (4) the number of persons who can depend upon the fisheries for support, or (5) has checked the rapid rise in the price of lobster meat.

Further, these laws have been found by experience to be difficult of application and expensive in enforcement, and alike disagreeable to officer and offender.

The sole apparent merit of this law seems to be that it does prevent the catching of some lobsters; just how many is dependent upon the honor of the fishermen and the means of enforcing the law. Its greatest defect, and from a scientific point of view an irreparable one, consists in the fact that it affords no protection to those lobsters which most need protection, — the mature breeding individuals, — but puts a premium on their capture through tacitly specifying that only

adults above the breeding age shall be killed. What would be the effect upon our supply of poultry and eggs if a law should be made "protecting" poultry under one year, or under a certain size or weight? It absolutely ignores the biological laws which man has found by experience to be of the utmost importance wherever it has become necessary to increase the natural food supply to meet the increasing population, — the protection of the adult animal, in order to secure a supply of young of that species. ("Science," N. S., Vol. XV., No. 381, Page 612–616, 1902.)

If, however, the law requiring a measurement of length is a necessary evil, the possibilities of injustice can be much reduced by adopting the procedure first advocated by the State of Maine officials, which provides for measurement of the carapace ("from the tip of the bone of the nose to the end of the body shell," exclusive of the tail). This measurement is 4¾ inches for an average 10¼-inch lobster, and 4⅛ inches for the average 9-inch lobster. While not absolutely accurate, for the reason that lobsters break off or abrade their "nose" (rostrum), for which allowance must be sometimes made, this method of measurement reduces the frequent errors arising from the alterations in a lobster's length due to changes of temperature, to stretching, etc., and is therefore in every way far preferable to the present antiquated Massachusetts method of measurement. This method of measurement has now become law in Maine, and all the Maritime Provinces, where the measure is 4¾ inches; and in Rhode Island, where it is 4⅛ inches.

The first practical assistance given to the lobster fisheries was that early carried on in Newfoundland, by the confinement of the egg-bearing lobsters in floating boxes, where the eggs were allowed to hatch. This method, later carried on on a larger scale in Maine and Nova Scotia, by confining the egg-bearing lobsters in large pounds, sometimes covering several acres of area (see illustration), are all open to the objection that the young upon hatching are peculiarly liable to be eaten by predacious fish which congregate around the pounds, together with the very considerable losses, frequently amounting to 30 per cent., in the adults thus confined. There are numerous such pounds on the coasts of Maine and Nova Scotia, whence the winter market supply is in considerable measure taken.

These pounds are the source of many millions of eggs which are sold to the United States Bureau of Fisheries for artificial propagation. The pounds have thus contributed to maintaining the lobster fisheries of this State as well as of Maine.

The first distinct advance was made by the United States Bureau of Fisheries, when it inaugurated the method of purchasing directly from the fishermen the egg lobsters captured. This method has gradually been extended from Massachusetts to the States of Maine, Connecticut, Rhode Island, and to the Canadian Provinces. The chief advantage is found in the fact that millions of eggs are thus saved which otherwise would have been brushed off by the fishermen. It is open to the objection that a considerable portion of the adult lobsters with eggs are lost when kept over winter, and to the even graver objection that the newly hatched fry are liberated in unfavorable locations, and in such quantities that the major portion of them are unavoidably destroyed by their enemies.

The most important advance was made by the investigators of the United States Bureau of Fisheries, acting in conjunction with the Rhode Island Commission on Inland Fisheries, whereby experiments were carried on systematically over a period of years for the purpose of devising methods by which the lobsters could be reared to such a point that they would on liberation seek shelter on the bottom, where they are relatively safe from enemies.

The result of this work, as elaborated by Dr. A. D. Mead and his assistants, by the Rhode Island Commission of Inland Fisheries at Wickford has been the most noteworthy contribution to solving the lobster problem. Such an important contribution can receive full justice only by consulting the original publications and inspecting the existing plant in operation at Wickford, R. I. We need only say that a successful method has been evolved whereby the newly hatched lobsters ("lobsterlings") may be reared upon artificial food in large scrim bags suspended from rafts. The water in the bags is agitated gently by large fan-like blades, slowly revolved by gearing driven by a low-power gasoline engine. Full details are to be

had in the annual reports of the Commissioners of Inland Fisheries of Rhode Island for 1906–09, and in the proceedings of the Fourth International Fishery Congress, held at Washington, D. C., in 1908.

The importance of rearing and protecting the young lobster through the dangers incidental to its free-swimming infancy was early understood. The results in Rhode Island were preceded by those of Gullion and Coste at Concarneau, France, in 1865; later by experiments at Stavanger, Norway, in 1873–75, described by Rasch and G. C. Sars; by W. Saville Kent, in England, in 1883; by Dannevig, at Flodevig, Norway, in 1885; and also in the United States, when the Fish Commission commenced, in 1885, at Woods Hole, Mass., the scientific investigations by Professors Herrick and Bumpus, and the practical application of the results to rearing the young lobster. These methods have been extended to Gloucester, Mass., and to Boothbay, Me., and have been developed to eminent success by Professors Bumpus, Mead and their assistants and successors at Wickford, R. I.

The practice of purchasing the egg lobsters may be criticized on the following grounds: —

(1) That the fishermen are paid at the expense of the public for doing what is obviously for the fishermen's own interest.

(2) Extending protection to the adults solely through purchase of "egg lobsters," however, is open to the still graver objection that there is an undue destruction of the male lobsters, which will ultimately result in unbalancing the approximately equal ratio of the sexes which nature has determined to be necessary for securing adequate fertilization of the eggs.

The plan does not extend far enough. Not a sufficient number of individuals are protected, and these only of one sex. It is of equal importance to preserve the males which are of breeding age, for nature has established the proportion of male to female lobsters, necessary to insure fertilization of the eggs, at approximately equal numbers. Herrick puts it at 100 males to every 106 females, and the observations of the writer confirm this. Not *all* the females of breeding age are included. Our observations indicate that not over 20 per cent of the mature females are thereby protected. *If it is*

an advantage to protect some of the female lobsters, it must be of greater advantage to protect all of them. The method pursued by the Bureau of Fisheries for many years, and two years ago adopted in Massachusetts, of buying the egg-bearing lobsters and hatching the eggs artificially, is open to all of the above objections, and to the more serious one that artificial hatching, if followed by the liberation of the just-hatched fry, appears to the writer to be far inferior to the natural methods. The chief value which can be claimed for this method is that many lobsters are carried off shore and liberated, where the eggs hatch under natural conditions. ("The Lobster Fisheries and the Causes of their Decline," in Massachusetts Public Document No. 25, 1906, page 28.)

(3) There is a question, too, whether in the near future the inevitable decrease, under the present laws, of the large lobsters, as a result of using the best breeders for food, may not lead to a scarcity of eggs for artificial propagation. Though artificial propagation in the case of the lobster must proceed on an enormous scale with the maximum of efficiency and at a very great cost, if we are to secure therefrom a sufficient market supply, it appears destined to be of increasing importance in maintaining the present supply. It is, however, completely dependent upon a sufficient number of breeding adults to furnish the eggs, which are the *sine qua non.*

It is far more important to consider the natural laws underlying the maintenance of the supply, and to act in conformity with these laws. Of these, "*omne vivum ex ovo,*" "every life comes from an egg," is fundamentally true of the case in point.

If, then, we maintain unimpaired the number of fertilized eggs produced, and limit the destruction of these eggs, we are doing the utmost possible for securing a permanent market supply of lobsters. But fertilized lobster eggs can be produced by no other agency than by lobsters which have reached the breeding age (four to seven years old, and on the average 9 to 11 inches long). Is it, then, a common-sense practice to destroy every lobster possible as soon as it attains the breeding age, thus destroying the only possible source of fertilized eggs? This is precisely what the present laws of all the New England States, of New York, of the Maritime Provinces and of New-

foundland — practically the entire range of the American lobster — are doing.[1]

Scientists and intelligent fishermen, who have "a long look ahead," and are in a position to be untrammelled by the temptations incidental to the daily possession of large lobsters, which promise a "long price," should see the importance of protecting the large lobsters, and of deriving our market supply from the intermediate lengths. The following are extracts from some of the letters which have been received from fishermen: —

Commissioners on Fisheries and Game, Boston, Mass.

GENTLEMEN: — As I am engaged in the lobster business, like all others of the same calling, I want the best legislation we can get under the circumstances. As I wrote you in my report last fall, I think we are going at it wrong in selling the mature lobsters, as I believe most of the egg-bearing lobsters fail to reach the water after once being caught. The smaller egg-bearing ones are usually returned to the water. This practice, if long continued, must result in producing an inferior race of lobsters.

To remedy this by the suggested small funnel in the traps, if enforced this year, must work a great hardship to the fishermen, as they have now in most cases completed their traps for next season. The idea of having traps inspected may be all right; but in order to have it effective, I would suggest that every man in the business take out a license, and have the number marked on his boat and on his buoys in figures large enough to be read when sailing by, any boat hauling a pot not so marked to be dealt with as if hauling some one's else pot. In this way it would be easier to detect the owner of pots with illegal funnels than if every man used buoys with no distinguishing mark on them. While I fully realize that something ought to be done to better protect the lobsters, yet I earnestly hope no law will be passed, to take effect this year, requiring us to change the size of the funnel of our lobster traps.

Another writes as follows: —

My observation is that some change in the existing laws would be beneficial to both the lobsters and consumers, leaving the fishermen out of the account. The law as it now stands is decidedly unpopular with

[1] In his preliminary "Report on the Life History and Habits of the Lake Shrimp" (*Penaeus setiferus*), published by the Gulf Biological Station of the State of Louisiana, H. M. Spaulding says: "By the constant inroads upon the natural supply the number of breeding individuals is gradually lowered, until there comes a time when the supply begins to decrease."

the fishermen. The 10½-inch lobsters being so small a percentage of the whole catch, and the egg-bearing lobsters mostly large lobsters, that is, 10½ inches and upwards, I believe the temptation to retain them is so great that in many boats but few are ever returned to the water. Fishermen generally have a pretty correct idea of how the unlawful lobsters are treated by the other boats. Now, if the small lobsters could be taken and the large ones returned to the water, the men who kept an egg-bearing lobster would be unpopular with lobstermen, as the present law now appears to be.

Another states: —

As the chairman well knows, I was the author of the bill this year that met with the approbation of the fishermen of the north shore, and that was a change of the law so that all lobsters taken under 10½ inches in length would be legal. I have gone through the question so far as I was able, and for years we have fought the lobster question relative to legal length. I came to the conclusion, in studying the question, that by preserving the propagating lobster the result would be that there would be no diminution of the lobster whatsoever. I think that lobsters below 7 inches might not be desirable to catch. I say to you that the fishermen of my district are largely in favor of the proposition that I offered this year.

Another fisherman writes: —

There is only one way, I believe, that the supply can be maintained without serious inconvenience or hardship to fishermen, dealers and consumers. The large lobsters are the greatest egg producers, and therefore most valuable in keeping up the supply. The small lobsters are the best for food, and are in the greatest demand. Accordingly, we should protect the large lobsters, and the only way that can be done is by using pots which large lobsters cannot get into.

A law, such as has been proposed, protecting large lobsters, can be of no more use than the one has been protecting small ones, for as I have previously said, all lobsters that are caught will be used, in spite of the law; therefore, I say *make all lobsters legal,* but restrict the entrance to the pots to 3¼ inches, and the big lobsters will go free to raise the eggs which maintain the supply. A law of this kind I believe can be easily enforced where all pots must bear the owner's name or number. A pot found with an entrance exceeding the limit could be used as evidence against the owner, or those found without an owner could be destroyed. A man might set a few illegal pots, but there would not be the chance for such an extensive illegal business as is carried on at the present time.

A law of this kind would of course necessitate the changing all existing gear, which would seriously handicap the fishermen for the coming season; but I believe plans for this change could be carried out so that every fisherman could be prepared to abide by such a law.

The Maine "Sea and Shore Fisheries" report, 1902, page 33, quoting a fisherman, says: —

As a change in the lobster law, either have a close time for a number of years, or protect the large lobsters; that is, make a diameter of the ring so small that a large lobster cannot enter the pot. Change law so that the large lobster will be protected. Let the small ones be taken. As it is now, the small and large are taken despite the law, and the lobsters are fast disappearing. Large lobsters can be readily detected. The law should not allow any broken or mangled lobsters of any size to be sold, or allow any female lobster to be taken in any way for a period of years. Give the large lobster a chance. Diameter of ring is the important factor. As it is, the large females are taken and their eggs scraped off and thousands of lobsters destroyed. I would advise heavier penalities by fine and imprisonment.

Again quoting from the Maine "Sea and Shore Fisheries" report, 1902, page 27: —

The business has increased since 1895. The number of men has increased four-fold; the traps and gear have increased; the prices received have increased; pounds from 4 in 1895 to 23 in 1902. Steam smacks have taken the place of sailing smacks; rapid-transit and refrigerator cars are carrying our lobsters all over our country. Each year the demand is greater, and the question is, — Can we ever supply the demand?

Warden W. W. Blood states his position upon the present lobster law in the following language: —

"I have never been in favor of the present lobster law as it now stands. It is my opinion that it would be far better to catch the medium lobster, between 9 and 12 inches, or what length could be decided on. I do not think the law obtains the results for which it was intended, — to protect and increase the lobster.

"To free all lobsters above 12 and below 9 inches would, in my opinion, tend to protect and increase them. Above 12 inches would save so many spawn fish for breeders; those below 9 inches are rather small to catch and make use of. There is no question but that many fishermen destroy the spawn and save the lobster, which, if the fish above 12 inches were illegal, they can have no object to do.

"I do not think it would decrease, — it would rather increase their catch. In my opinion, something of this kind will be done sooner or

later. Local close time will not do it; perhaps general close time may help some."

Prof. E. E. Prince, F.R.S., Commissioner of Fisheries of the Dominion of Canada, calls attention to the value of the practice of killing the adults when it is desirable to use the most effective method to diminish the number of fish of little value, *e.g.*, suckers, perch, pike, etc: —

> The killing of the breeding animals is the most rapid and certain method of reducing the numbers of undesirable animals. This has long been known in the case of land animals. (Methods of Coarse Fish Extermination, Sessional Paper No. 22, 1904, page lxxiv.)

If it were actually desired to exterminate the lobster, what more effective method could be used than the present practice of catching the adults?

To secure the necessary immunity for the adults and the young or "too small" lobsters, the plan of specifying a regulation trap having the slats such a distance apart as to permit the escape of lobsters below marketable size, and with an entrance ring of such a size as to prevent the entrance of those which are most valuable as breeders, has been devised. By such a procedure we would approximate most closely to the conditions which have been found necessary in the maintenance and development of the best type of domesticated animals, which biological principle of action has been applied with success to whatever animals and plants man has found necessary or possible to domesticate, and has indeed proved to be an absolutely essential procedure, if we would maintain and increase the supply of such domesticated animals and plants. It cannot, therefore, be called a new theory, but merely the application of an old theory to a new case. By such an act we would automatically regulate the capture of lobsters and practically do away with all measurements. The inspection of the trap would be far easier than the inspection of the lobsters, with less inconvenience to the fishermen and less damage to the market qualities of the lobsters, as well as diminishing the extensive loss of eggs through handling the egg-bearing lobsters.

As the following table shows, such a ring would prevent the capture of a substantial majority of the egg lobsters, thus permitting them to breed under natural conditions; while, on the

other hand, a very considerable number would still be available for use in artificial propagation.

These careful caliper measurements, showing the relative diameter of body shell (carapace) in lobsters of various lengths, indicate that a 3½-inch ring would permit the capture of practically all lobsters less than 13 inches in length, and would prevent the catching of those above 13 inches. Such measurements of over a thousand lobsters show that usually the largest diameter is on the carapace, less frequently on the abdomen, and very rarely on the large claw. At Monomoy the average of 596 lobsters, taken at random as caught, was: diameter of body shell (carapace), 2.465 inches; diameter of large claw (chela), 2.18 inches.

Size (Inches).	Total Number examined.	Diameter.
5½,	1	1 had diameter of 1⅝ inches.
6,	1	1 had diameter of 1⅝ inches.
8,	10	2 had diameter of 1½ inches. 1 had diameter of 1⅝ inches. 7 had diameter of 1¾ inches.
8½,	7	1 had diameter of 1⅝ inches. 3 had diameter of 1¾ inches. 3 had diameter of 2 inches.
8¾,	5	3 had diameter of 1¾ inches. 1 had diameter of 1⅞ inches. 1 had diameter of 1⅞ inches.
8⅞,	1	1 had diameter of 1⅞ inches.
9,	41	2 had diameter of 1½ inches. 8 had diameter of 1⅞ inches. 19 had diameter of 2 inches. 9 had diameter of 2⅛ inches. 3 had diameter of 2⅜ inches.
9¼,	12	10 had diameter of 2 inches. 2 had diameter of 2⅜ inches.
9½,	23	13 had diameter of 2 inches. 10 had diameter of 2⅛ inches.
9¾,	43	1 had diameter of 1⅞ inches. 17 had diameter of 2 inches. 13 had diameter of 2⅛ inches. 12 had diameter of 2¼ inches.

Size (Inches).	Total Number examined.	Diameter.
10,	88	3 had diameter of 1⅞ inches. 24 had diameter of 2 inches. 24 had diameter of 2⅛ inches. 25 had diameter of 2¼ inches. 4 had diameter of 2⅜ inches. 6 had diameter of 2½ inches. 2 had diameter of 2⅝ inches.
10¼,	61	8 had diameter of 2 inches. 20 had diameter of 2⅛ inches. 21 had diameter of 2¼ inches. 10 had diameter of 2½ inches. 2 had diameter of 2¾ inches.
10½,	42	5 had diameter of 1⅞ inches. 8 had diameter of 2⅛ inches. 10 had diameter of 2¼ inches. 6 had diameter of 2⅜ inches. 11 had diameter of 2½ inches. 2 had diameter of 2⅝ inches.
10¾,	32	1 had diameter of 2 inches. 9 had diameter of 2¼ inches. 4 had diameter of 2⅜ inches. 10 had diameter of 2½ inches. 8 had diameter of 2¾ inches.
11,	38	4 had diameter of 2¼ inches. 5 had diameter of 2⅜ inches. 8 had diameter of 2½ inches. 5 had diameter of 2⅝ inches. 12 had diameter of 2¾ inches. 4 had diameter of 2⅞ inches.
11¼,	19	5 had diameter of 2¼ inches. 12 had diameter of 2¾ inches. 2 had diameter of 3 inches.
11½,	40	3 had diameter of 2¼ inches. 8 had diameter of 2⅜ inches. 21 had diameter of 2¾ inches. 6 had diameter of 2⅞ inches. 2 had diameter of 3 inches.
11¾,	13	2 had diameter of 2½ inches. 7 had diameter of 2¾ inches. 4 had diameter of 3 inches.

Size (Inches).	Total Number examined.	Diameter.
12,	18	5 had diameter of 2⅞ inches. 8 had diameter of 3 inches. 2 had diameter of 3⅛ inches. 2 had diameter of 3¼ inches. 1 had diameter of 3⅜ inches.
12⅛,	5	1 had diameter of 2⅛ inches. 4 had diameter of 2¾ inches.
12½,	10	2 had diameter of 2⅛ inches. 2 had diameter of 2½ inches. 2 had diameter of 3 inches. 3 had diameter of 3⅛ inches. 1 had diameter of 3 1/16 inches.
12¾,	4	2 had diameter of 3 inches. 2 had diameter of 3¼ inches.
13,	1	1 had diameter of 3⅛ inches.
13¼,	3	3 had diameter of 3 inches.
13½,	1	1 had diameter of 3 inches.
13¾,	5	2 had diameter of 3⅛ inches. 2 had diameter of 3⅜ inches. 1 had diameter of 3½ inches.
15,	1	1 had diameter of 3¾ inches.

In considering such a proposition it is important to note carefully the objections, the most prominent of which are the following: —

The possibility of injury to vested interests, — to capital invested in the lobster business, particularly by the individual fishermen. If the ring is placed at 3½ inches, there will be a slight diminution in the average size of the lobsters on the market. In the case of lobsters caught in Massachusetts, this will be considerably less than half a pound each. This prohibition of the taking of large lobsters would fall heaviest at present upon the lobster fishermen of Monomoy, where are caught a larger proportion of large lobsters than any point south of Maine, where 205 out of 738 were above 12 inches, as determined by actual counts of the daily catch from Aug. 16 to Sept. 15, 1906, as compared with fisheries in other places, the proportions being shown in the diagrams.

The reduction in the number of lobsters caught in such regulation traps would undoubtedly be less than the present catch; and, inasmuch as in certain localities it is absolutely essential for the fishermen to use both large and small lobsters, if they are to secure a profitable season's work, great hardship might be brought upon worthy people. It should be borne in mind, however, that similar hardship, by necessarily restrictive laws, has been brought upon lumbermen, who have been put out of business by such legislation as forbidding the cutting of timber on public lands; upon market hunters, who have been forced out of business by laws preventing the sale of partridge, woodcock and other birds. Further, some economic loss would doubtless arise from the fact that no provision is made for bringing on the market large lobsters 18 inches and upwards in length, which doubtless in time become worthless as breeders, through senescence. To this objection it may be said that the present methods of capturing lobsters by rings which average 5 or 6 inches in the inside diameter sometimes do not permit the capture of these veterans, and it is only rarely, and when taken on trawls, that they come upon the market. A most important query is, whether enough lobsters will pass the critical period up to 12 inches or thereabouts, when they are exposed to capture, to pass into the exempt class, where they can be certain of an extended period of egg-producing usefulness. To the unthinking, the argument "If you catch all the small lobsters, how can there be any large ones?" appears at first sight conclusive. Letters written by fishermen indicate the general point of view.

A Maine captain says: —

Catch up the little ones and throw over the large ones; or, in other words, let us kill all the boys, — the old men will die themselves, — for this is about what that kind of legislation amounts to.

A Truro fisherman writes: —

The lobstermen are opposed to any change in the present law, because: —

1. Many lobstermen depend wholly upon the catching of lobsters for a living, and the changing of that law, as contemplated, would deprive them of a living.

2. Further, we are fully conviced that, if the law is reversed, so that the mature instead of the short lobsters are protected, the present evil will not be abated, but aggravated. If the mature only be protected, the result would be in a short time no lobsters. It stands to reason that there can be no mature lobsters without the short.

Much more important, however, is the question, "If, as at present, you destroy all the breeding lobsters possible, how can eggs be produced from which the young may come?" It is, of course, an obvious fallacy to say that the supply of marketable lobsters is solely derived from small lobsters, which by natural growth are constantly entering the marketable class; and that a lobster which at 8 inches long is worth 5 cents, may a month later become so much larger as to be worth three or four times that amount on the market; thereby losing sight of the fact that, to secure a satisfactory number of young, sufficient numbers of parents must be maintained for producing the requisite supply of eggs. It is quite as logical to say that the supply of poultry comes exclusively from chickens, and not from eggs; or to advise killing the best-breeding hen or cow, because such is worth more money than one which is about to attain the breeding age.

The writer has said that one 11-inch lobster is worth for the maintenance of the fishery at least five 9-inch lobsters; but Dr. Herrick states the biological value of the adult in much stronger terms, by saying that "in the twelve years following the beginning of the reproductive age, when the lobster grows from a 9-inch lobster to a 15 or 16 inch animal, the value of one lobster to the fishery has been increased 800 per cent." There is abundant evidence that there would be a very considerable and probably sufficient number of smaller lobsters which would at one moult pass into the exempt class, and thus become increasingly efficient breeders for the succeeding fifteen to thirty years. The all-important biological fact is that, whereas under the present law every lobster above 9 inches is exposed to capture throughout its life (possibly thirty to forty years), under the suggested law a lobster would be thus exposed during only a relatively brief space (not exceeding two years). There is no question that such efficient protection to the source of the lobster supply and adequate regulation of the fisheries would work hardship to many worthy fishermen, even to driving many out of business. Yet many worthy persons who formerly shot game and song birds or caught trout for market purposes have, as a result of wise and necessary restrictive laws, experienced a somewhat similar depriva-

tion, for the immediate benefit of the public and the ultimate advantage of every individual. (Annual report of the Massachusetts Fish and Game Commission, Public Document No. 25, 1908, page 28.)

Of very practical interest to the consumer is the fact that, figured on a basis of 20 cents per pound, boiled, a pound of lobster meat from lobsters less than 12 inches costs the consumer less than 70 cents per pound, whereas from larger lobsters the cost may exceed 90 cents per pound.

We cannot emphasize too strongly the fact that under a law which protects the adults any particular lobster would be in danger of capture only during two or possibly three years, instead of during the whole period of its reproductive age, — probably not less than ten or more than thirty years.

IV. — Uniform Laws.

It has long been justly held that uniform laws are exceedingly important, in questions relating to protecting and securing a permanent source of supply of fish and game.

Several conferences have been held, under various auspices, for the purpose of securing uniform legislation relative to the lobster. One which has resulted most satisfactorily was held in Boston, Sept. 23 and 24, 1903, which included representatives from the Maritime Provinces, all the New England States, and New York, fishermen, business men, legislators and scientists.

Around the laws relative to the lobster industry have been waged many famous battles of debate, the most recent being those in 1907 and 1908. The following correspondence relating thereto is here submitted, for the reason that the position taken at that time by the Governor and by the chairman of the commission has been generally misunderstood: —

Boston, Mass., Feb. 17, 1908.

His Excellency Curtis Guild, Jr., *Governor of the Commonwealth, State House, Boston, Mass.*

Sir: — On February 11 I attended the hearing upon the recommendation of Your Excellency concerning the lobster industry in Massachusetts. I presented the arguments and submitted statements of the

opinion that the lobster is rapidly decreasing in Massachusetts, for the reason that the method of fishing is wasteful and destructive, through the killing of the breeding animals. I urged that a close season for at least five years be established, in which the taking of all lobsters be prohibited. In case, however, it may not appear expedient to establish a close season for five years, I submitted the draft of a bill which restricted the taking of lobsters by any other means than a regulation trap, having a funnel ring not exceeding 3¼ inches in diameter. This would greatly diminish the destructive catching, by preventing the entrance of lobsters above 11 inches.

The opposition was represented by several lawyers and between fifty and one hundred lobster fishermen and dealers, all of whom testified that such a law would be a great hardship to them personally and to vested interests; that in their opinion the lobster was not decreasing. They cited the good results of the present law, and urged that the same be continued.

With the committee I left the following statement, taken from the last annual report (1905) of the United States Bureau of Fisheries, together with letters, copies of which I am sending you herewith: —

"*Lobsters.* — The catch of lobsters in Massachusetts shows a constant decrease from year to year; in 1905 it was 1,238,071 pounds, valued at $176,234, — a decrease of 412,617 pounds since 1902. The value, however, was $1,139 more than in 1902, and this increase is constant as the supply diminishes."

I am also sending herewith copy of the bill which seeks to slightly relieve the situation by permitting the capture of lobsters during a brief period of their life, thus in a measure mitigating the hardship to fishermen and seashore residents which would undoubtedly follow a completely closed season. A close season of less than five years would be of no value, on account of the slowness with which the lobsters breed.

Ex-Senator ——, representing the Monomoy fishermen, strongly opposed the measure, and in addition claimed that this method of protection was a personal matter to me. May I not take this opportunity to repeat that such is not a fact, but that it is my duty to furnish a reliable basis of facts upon which proper legislation may rest. Five years ago the Provincetown fishermen were getting a goodly number of large lobsters, as is now the case at Monomoy Point. To-day the lobster is commercially extinct at Provincetown, and at Monomoy alone exists the last instance of original abundance in Massachusetts waters.

Respectfully yours, (Signed) G. W. Field,
Chairman.

COMMONWEALTH OF MASSACHUSETTS,
EXECUTIVE CHAMBER, STATE HOUSE,
BOSTON, Feb. 26, 1908.

Dr. GEORGE W. FIELD, *Chairman, Fish and Game Commission, State House, Boston.*

DEAR SIR: — I beg to acknowledge receipt of your argument. I am very much surprised to find that you did not bring to the attention of the committee the solemn pledge and covenant entered into by the lobster fishermen, that if I would sign last year's bill[1] they would support your bill this year for the 3¼-inch ring. I have furnished the committee written proof that that pledge was made, and that I only signed last year's bill on account of the pledge of the lobster fishermen, together with the Senator from New Bedford and the Representative of Marblehead, that they would stand by you this year.

Faithfully yours, (Signed) CURTIS GUILD, JR.

On account of the diverse conditions, opposing views and opinions, little practical results followed, other than a threshing out and crystallization of some of the important problems involved. The same might be said of the special conference of the fish and game commissioners of New England, which resulted from the first conference of the Governors of the New England States, held in Boston, Nov. 23 and 24, in 1908. The commissioners returned to their respective tasks, and much attention was given to these problems, with the result that the heads of the commissions in Connecticut, Massachusetts and Rhode Island met in Newport on Dec. 15 and 16, 1910, where, in a conference which included fishermen, legislators and scientists, the following resolutions were adopted and the draft for a uniform code of lobster laws was drawn up. This draft is herewith submitted as the conclusion of this report. In making this code of laws, the vested rights of the fishermen as a class and the importance of maintaining the fisheries unimpaired was carefully considered. The question of facilitating the business of the dealers and distributors was duly considered, and the demand of the public for the best size of lobsters for food was given special attention. It was determined that arti-

[1] The so-called "straight 9-inch bill" (section 88, as amended by Acts of 1907, chapter 303).

ficial propagation must be supplemented in such a manner as to secure an absolute certainty of a sufficient number of eggs. The important principle of a close season, too, came in for consideration, — a principle of close season which promises to work a minimum injury through restricting the demand, and also promises an ultimate increase in the supply. These principles have all been incorporated in the code of uniform laws herewith submitted. Experience has shown that it is impossible to meet completely the diverse views of the lobster fishermen and dealers, and at the same time assure the permanency of the supply and the maintenance of the fishery as an asset of the whole people. On account of the long-continued abuse of nature's bounty, what now appear to be drastic measures must be applied. Your commissioners believe that the measures embodied in these following sections are necessary and adequate to meet the condition, and respectfully urge the acceptance of all the principles involved therein.

At this convention the following resolutions were adopted: —

Whereas, certain conditions which have seriously reduced the lobster fisheries of New York, Connecticut, Rhode Island and Massachusetts are still operative; and

Whereas, the continued decline of these fisheries is a serious economic loss to the people of these States, be it

Resolved, That these conditions can be best mitigated by a code of uniform laws in force in all these States. Further, the fundamental economic and biological facts have been thoroughly studied by the investigators of the National Bureau of Fisheries and by the commissioners of Rhode Island, Connecticut and Massachusetts. Acting upon a thorough knowledge of the essential basis of facts, looked at from the points of view of the fishermen, the public and the scientist, the accredited representatives of the States of Connecticut, Rhode Island and Massachusetts, meeting at Newport, R. I., Dec. 16, 1910, are of the unanimous opinion that the fundamental and essential points to be incorporated into an effective law must be: —

1. Uniformity in general provisions.

2. Adaptation to effective, rapid, definite and economical enforcement.

3. Protection both of the lobsters of breeding age and of those below a suitable market size.

4. Purchase of egg-bearing lobsters by the State for propagating purposes, and prohibition of possession for any other purpose.

5. Encouragement of intelligent efforts to propagate and rear lobsters artifically.

6. Licensing all lobster fishermen, with provision for recalling license in case of infraction of law.

7. Forbidding the use of young lobsters for bait.

Resolved, That a copy of these resolutions be respectfully transmitted to the governors of the States of New York, Connecticut, Rhode Island and Massachusetts.

Committee on resolutions

E. HART GEER, Chairman, of Connecticut.
D. B. FEARING, Commissioner, of Rhode Island.
G. W. FIELD, Commissioner, of Massachusetts,
Secretary.

The above resolutions were unaimously adopted.

CHARLES W. WILLARD,
WILLIAM H. BOARDMAN,
ADELBERT D. ROBERTS,
ISAAC H. CLARKE,
DANIEL B. FEARING,
WILLIAM P. MORTON,
Rhode Island Commission of Inland Fisheries.

GEO. T. MATHEWSON,
E. HART GEER,
E. HART FENN,
Connecticut Commission of Fisheries and Game.

G. W. FIELD,
J. W. DELANO,
G. H. GARFIELD,
Massachusetts Commission on Fisheries and Game.

The following draft of uniform laws was adopted: —

SECTION 1. No person, either as principal, agent, or servant, shall, at any time, catch or take any lobster from any of the waters in the jurisdiction of this state, or place, set, keep, maintain, supervise, lift, raise, or draw in or from any of said waters, or cause to be placed, set, kept, maintained, supervised, lifted, raised, or drawn in or from any of said waters, any pot or other contrivance designed or adapted for the catching or taking of lobsters, unless licensed so to do as hereinafter provided. Every person who shall violate any of the provisions

of this section shall be fined twenty dollars or be imprisoned not more than thirty days, or both, for each such offence.

SECTION 2. The commissioners on fisheries and game may grant or refuse to grant licenses to catch and take lobsters from the waters within the jurisdiction of this state (in the manner, at the times, and subject to the regulations provided in this act), to such citizens of this state as have resided in this state for at least one year next preceding the granting of such license, as they may think proper. Whenever any such license shall be granted, the same shall be granted to expire on the fifteenth day of November next succeeding the granting of the same, unless sooner revoked as hereinafter provided; and each person to whom such license shall be granted shall, for each license, pay to said commissioners the sum of five dollars for the use of the state. Said commissioners, in their annual report, shall state the number of licenses granted, with the names of the persons licensed and the amount of money received therefor. Said commissioners shall issue to each person licensed as aforesaid a certificate stating the name of the person to whom such license has been granted and the date of expiration of such license, and shall also issue to each person so licensed a metal badge, in such form and bearing such inscription as said commissioners shall determine. If any person licensed as aforesaid shall, at any time, be adjudged guilty of any violation of any of the provisions of this act, after full hearing by said commissioners or a majority of them, the said commissioners or a majority of them shall revoke the license issued to such person, and such person shall thereupon cease to have any authority thereunder.

SECTION 3. Each person, licensed under the provisions of this act, shall, at all times, while engaged in the pursuit so licensed, wear upon his person the badge issued to him as provided in the preceding section; and shall, upon demand of any of said commissioners or any of their deputies, exhibit said badge and the certificate issued to him as provided in the preceding section. Every person violating any of the provisions of this section shall, for each offence, be fined five dollars.

SECTION 4. No negative allegations of any kind need be averred or proved in any prosecution brought under this act, but the respondent in any such action may show his license by way of defence.

SECTION 5. No person shall catch or take from any of the waters within the jurisdiction of this state, or have in his possession within this state, any lobster, cooked or uncooked, so taken, which is less than three and five-eighths inches or more than five and seven-eighths inches, measured from the forward end of the bone projecting from the head to the rear end of the body shell. Every person violating any of the provisions of this section shall be fined five dollars for each such lobster; except that any person licensed under this act catching and taking any such lobster and immediately returning the same alive

to the water from which it was taken shall not be subject to such fine. The possession of any such lobster, cooked or uncooked, shall be *prima facie* evidence that the same was caught and taken in violation of this section.

SECTION 6. Each and every "lobster pot", so called, set, kept, or maintained, or caused to be set, kept, or maintained, in any of the waters in the jurisdiction of this state, by any person licensed under this act, shall be separately and plainly buoyed. Every person violating any of the provisions of this section shall be fined twenty dollars or be imprisoned not more than thirty days for each offence, or both; except that any person licensed under this act, setting pots where natural conditions make it impractical to separately buoy each pot, may, upon applying to the commissioners on fisheries and game, stating the location and proposed manner of buoying said pots, receive a permit from said commissioners or a majority of them, and such person shall not be subject to the penalties provided in this section for the locality and the number of pots set in accordance with this permit. Whenever any such permit shall be granted, the same shall be granted to expire on the thirtieth day of October next succeeding the granting of the same.

SECTION 7. No person licensed under this act shall use any pots for catching, or cars or other contrivance for keeping, lobsters unless the same and the buoys attached thereto are plainly marked with the name or names of the owners thereof, or the person or persons using the same, and the license number or numbers of such person or persons. Every person violating the provisions of this section shall be fined twenty dollars or be imprisoned not more than thirty days, or both, for each such offence; and all pots, cars, and other contrivance used contrary to the provisions of this and other sections of this act shall be seized by any officer engaged in the enforcement of this act, and said property shall be forfeited.

SECTION 8. Between twelve o'clock midnight on the thirtieth day of October in each year and the thirty-first day of March next succeeding, no person shall catch or take any lobster from any of the waters in the jurisdiction of this state, or place, set, keep, maintain, supervise, lift, raise, or draw, or cause to be placed, set, kept, maintained, supervised, lifted, raised, or drawn, in or from any of said waters, any pots or other contrivances designed or adapted for the catching or taking of lobsters. Every person violating any of the provisions of this section shall be fined twenty dollars or be imprisoned not more than thirty days for each such offence, or both.

SECTION 9. No person except the commissioners on fisheries and game and their deputies shall lift or raise any pot belonging to any person licensed under this act, set for the catching or taking of lobsters, except with the permission of the owner or owners thereof and license

so to do under this act. Every person violating any of the provisions of this section shall be fined ten dollars for each such offence.

SECTION 10. No person shall mutilate any uncooked lobster by severing its tail from its body, or have in his possession any part or parts of any uncooked lobster so mutilated. Every person violating any of the provisions of this section shall be fined five dollars for each such offence; and in any and all prosecutions under this section the possession of any part or parts of any uncooked lobster, so mutilated, shall be prime facie evidence sufficient to convict.

SECTION 11. The commissioners on fisheries and game shall appoint at least two deputies, whose duties shall be the enforcing of the provisions of this act. Each of said deputies appointed as aforesaid shall be, by virtue of his office, a special constable, and as such deputy may, without warrant, arrest any person found violating any of the provisions of this act, and detain such person for prosecution not exceeding twenty-four hours. Said deputies shall not be required to enter into recognizance or become liable for costs.

SECTION 12. For the purpose of enforcing the provisions relative to the protection of lobsters, the commissioners on fisheries and game and their appointed deputies may search in suspected places, or upon any boat or vessel that they may believe is used in the catching or transporting of lobsters, and may seize and remove lobsters taken, held, or offered for sale in violation of the provisions of this act.

SECTION 13. No person or persons shall, after the commissioners on fisheries and game or their deputies have announced their intention of searching in any suspected place or upon any boat or vessel by hailing the person or persons in charge and showing their badges, interfere with the search by destroying, removing or otherwise disposing of any article for which it may be desired to search. If any person or persons shall be adjudged guilty of violating the provisions of this section, after a full hearing by said commissioners or a majority of them, the said commissioners or a majority of them may either revoke the license of such person or persons or may cause their arrest, or both. Every person found guilty of violating the provisions of this section shall be fined ten dollars for each offence.

SECTION 14. Fines incurred under any of the provisions of this act shall inure one-half thereof to the use of the county and one-half thereof to the use of the state.

SECTION 15. The several district courts shall have concurrent jurisdiction with the superior court over all offences under this act, and to the full extent of the penalties therein specified; parties defendant, however, having the same right to appeal from the sentences of said district courts as is now provided by law in other criminal cases.

SECTION 16. No person shall have in his possession within this state any female lobster bearing eggs, or from which the eggs have

been brushed or removed, unless he shall have a permit from the commissioners on fisheries and game, as hereinafter provided. Every person violating this provision shall be fined twenty dollars for each lobsters; except that any person licensed under this act catching and taking any such lobster and immediately returning the same alive to the water from which it was taken shall not be subject to such fine.

The commissioners on fisheries and game are directed and empowered to purchase, at a rate not exceeding twenty-five per cent above the market price, any female lobster bearing eggs caught or taken from the waters of this state. Any person licensed under this act may, after receiving a permit from said commissioners, safely retain said female lobsters in lobster cars or sections of cars used for that purpose only, as shall be designated in the permit, and shall keep the same separate from other lobsters until such time as said commissioners or some person or persons authorized by them can gather and pay for them.

The egg lobsters so taken may be disposed of by said commissioners as they may deem for the best interests of the lobster industry of the state.

SECTION 17. Each and every "lobster pot", so called, or other contrivance, set, kept, or maintained, or caused to be set, kept, or maintained in any of the waters in the jurisdiction of this state, shall be provided with a circular entrance ring or rings, the greatest inside diameter of which shall not be greater than three an done-half inches. Every person violating the provisions of this section shall be fined ten dollars for each offence.

The commissioners are hereby authorized and empowered to make the necessary regulations attendant upon the enforcement of this section.

SECTION 18. All lobsters or parts of lobsters sold for use in this state or for export therefrom must be sold and delivered in the shell. Whoever ships, buys, gives away, or sells lobster meat after the same shall have been taken from the shell shall be liable to a penalty of not more than twenty-five dollars upon each conviction thereof. Any person or corporation in the business of a common carrier of merchandise who shall knowingly carry, or transport from place to place, lobster meat after the same shall have been taken from the shell, shall be liable to a penalty of not more than fifty dollars upon each conviction thereof. All lobster meat so illegally bought, shipped, sold, given away, or transported, shall be liable to seizure, and may be confiscated. Nothing contained herein shall be held to prohibit the sale of lobsters that have been legally canned, or when sold for food by licensed victuallers, or when removed from the shell on the premises where eaten.

SECTION 19. All barrels, boxes, or other packages in transit containing lobsters shall be marked with the word "lobsters", together

with the full name of the shipper and consignee. Said marking shall be placed in a plain and legible manner on the outside of such boxes or other packages. In case of seizure by any duly authorized officer of any barrel, box, or other package in transit containing lobsters which is not so marked, or in case of seizure by such officer of any barrel, box, or other package in transit containing lobsters less than the legal length, such lobsters as are alive and less than the legal length shall be liberated, and all such lobsters as are of the legal length found in such barrels, boxes, or packages shall be forfeited and liberated or sold by the commissioners as hereinafter provided.

Every person, firm, association, or corporation that shall ship lobsters without having the barrels, boxes, or other packages in which the same are contained marked as prescribed in section eighteen shall upon conviction be punished by a fine not exceeding twenty-five dollars, and upon subsequent conviction thereof by a fine not exceeding fifty dollars; and any person or corporation in the business of a common carrier of merchandise who shall knowingly carry or transport from place to place lobsters in barrels, boxes, or other packages not so marked shall be liable to a penalty not exceeding fifty dollars for each conviction thereof. Any sheriff, deputy sheriff, constable, the commissioners on fisheries and game and their deputies, or other officers qualified to serve criminal process, are hereby authorized to search for, to seize and to confiscate without a warrant lobsters held or transported in violation of this act; and they shall report such seizure to said commissioners, who shall authorize the sale of such lobsters as are of a legal length. The proceeds of such sale shall be paid into the treasury of the commonwealth.

Respectfully submitted,

G. W. FIELD,
J. W. DELANO,
G. H. GARFIELD,
Commissioners.

APPENDIX.

The following paper, presented by Prof. F. H. Herrick and read at the recent meeting of the American Fisheries Society at New York is so closely pertinent to the problems before us that we are by permission reprinting it in this report: —

Protecting the Lobster.

The true condition of the lobster fishery cannot be determined from reports upon single regions or for single years. When long periods are considered, the statistics as a whole present the clearest evidence of decline. In deciding the question of actual increase or decrease in the lobster, certain variables must be duly considered; yet it is these highly important variable factors which are apt to be neglected. To state that more lobsters were captured one season than another, without a knowledge of the conditions under which these catches were made, affords no reliable basis for determining the true state of the fishery. We need to know also the numbers of men engaged and of traps used, as well as the character of the areas fished and the size of the animals caught.

The lobster fisheries of Canada, next to those of the codfish and salmon, are most valuable to the Dominion, and from 1869 to 1906 inclusive yielded a grand total of $83,291,553. In 1897 the product of this industry was estimated at 23,721,554 pounds, with a value of $3,485,265. In 1906, ten years later, in spite of rising prices, the yield had dropped to 20,241,764 pounds; but, though less than at the earlier time by nearly 3,500,000 pounds, this quantity had nearly the same value, namely, $3,422,927. The greatest yield of this fishery is recorded for the years 1885 to 1887, in 1886 reaching approximately 34,000,000 pounds, these quantities in all cases representing the meat preserved in cans and the animals shipped alive.

This great fishery has much to hope for in propagative measures of the right sort, and all persons the world over who like lobsters should welcome every sign of its actual increase. At the same time we should wish to know the truth of the matter, and a long memory is necessary.

The produce of the Maine lobster fishery for 1907 is stated to have been between 8,000,000 and 9,000,000 pounds of lobsters 10½ inches and over in length. This seems a large quantity, but if we go back fifteen years, to 1892, we find that it is only about one-half the

amount recorded for that year, namely, 17,642,677 pounds. But is it not rather significant that the smaller quantity was worth in market nearly three times as much as the larger, or $2,000,000, as compared with $663,043? To catch the smaller number, moreover, required some 400 more men, using I do not know how many more traps, and working I cannot say how much wider or more diverse a field.

Now, it is such facts as these which lead us to pause when we hear of increased yields to this industry, and inquire if our friend has duly considered the variables in his problem; for until he has done this, his assertions have no value, and may be grossly misleading both to himself and to others. So far as I have been able to analyze statistics at present available, the conclusion seems inevitable that the lobster fisheries in both America and Europe have steadily declined from the time when they began to be pursued with the means and energy characteristic of modern conditions, beginning in Canada nearly a quarter of a century ago. The cause of this decline is evident: more lobsters have been destroyed than nature has been allowed to replace by her slow processes of reproduction and growth.

How have we tried to check this declining tendency by legislative and other means? Various curative measures have been adopted, which will be discussed more fully in another place; but for the present we can dwell upon the two most important only, — the gauge laws, and the practice of artificially hatching the eggs and immediately liberating the young in the sea. The first is prohibitory, penalizing the destruction and sale of lobsters of either sex under 9 or 10½ inches in length; while the second is a constructive measure, by means of which it is hoped to increase the species.

I do not pretend to be able to award a just proportion of praise or blame for any measure or practice in such a matter, for I recognize that there are many doubtful factors in every biological problem; but I am forced to believe that both measures have been injurious to the interests of the entire fishery, — the first by sanctioning the destruction of the best breeding stock, and the second by diverting large amounts of money and energy in an unproductive channel. The present gauge laws are a survival from a time when the biology of the lobster was not even approximately understood, and both measures seem to ignore or to neglect the law of survival, the importance of which can hardly be exaggerated. By the law of survival we mean the proportion of eggs or young which must surive and produce sexually mature animals, in order to maintain the species at an equilibrium. It should be noted that while fishing has disturbed the equilibrium by reducing the number of adults, it has in no way affected the law of survival, which was presumably established at an earlier age, and which, for all we now know, may persist until the race is extinct.

What is the rate of survival in the lobster? Since the sexes in this

animal are approximately equal, and since to maintain the species it is necessary for each pair or for each mature female to produce only 2 adult individuals in the course of life, this rate would be expressed by the proportion 2 : x, in which x represents the average number of eggs laid by a mature female during the whole of her life. While this average number cannot be determined directly, inasmuch as female lobsters are destroyed at all ages, an indication of it should be given by determining the average number of eggs carried by lobsters of every age or size. By an examination of 96,098 egg-bearing lobsters from Newfoundland, Allen found the average number to be 23,000, which would correspond to a lobster 12 or 12½ inches long which had carried at least two broods, or 36,000 eggs in all. This would place the rate of survival at not less than 2 in 30,000, or 1 in 15,000. A much higher rate was indicated for the Woods Hole region, although my examination covered only 4,645 individuals. Now, when we consider that 8-inch lobsters when at breeding age produce on the average 5,000 eggs, and that a 17-inch lobster, which must be at least twenty years old, has probably laid on an average 9 batches of eggs, to the number of 300,000, the average number sought is bound to be high. We may consider 20,000 or even 30,000 as a modest estimate, and well within the truth.

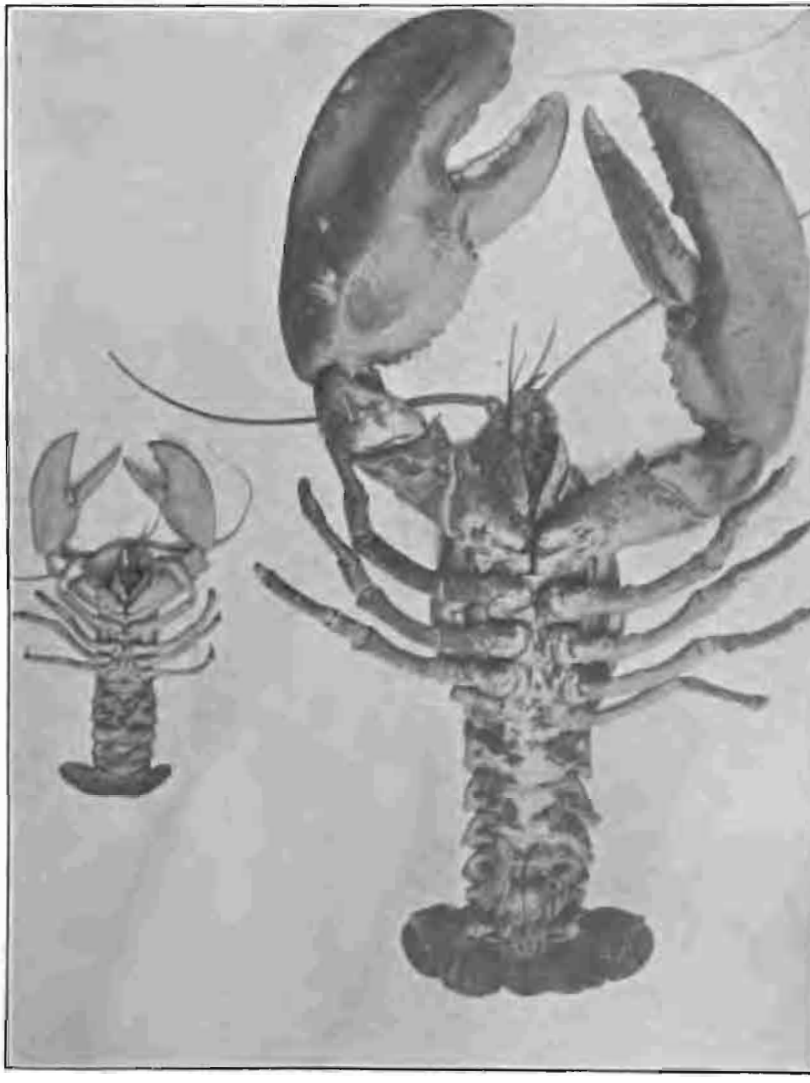
If the law of survival is a hard and stubborn fact, and if the average number of eggs approximates that given above, — and I cannot see how such a condition can be avoided, upon scientific grounds, — the bearing upon the methods in question is evident. It means that this race of animals is maintained, not by paltry thousands, but by billions and hundreds of billions of eggs. It means that the present and past gauge laws have been robbing this fishery of its best breeding stock; first, because the breeding age is variable; and second, because the number of eggs borne is proportional to the cube of the length of the mature animal. If the lobsters matured at a uniform age and size, and reached full breeding capacity at once, the question would be simplified; but neither of these conditions is fulfilled. The age of becoming mature covers a period corresponding to a length of a little over 7 inches to a length of a little over 12 inches; and probably not over 3 per cent. of the 9-inch size, the legal gauge in certain States, have ever laid a single egg. Again, owing to the rapid geometric increase in the product of eggs in relation to volume or size of the animal, the value of a 15-inch lobster to the fishery is vastly greater than that of the 9 or 10 inch size. Under the present gauge laws the fishery is being steadily depleted of the eggs which it sorely needs, which it must have if it is ever to be rejuvenated, and which it can get only through its larger and best breeding animals. Protection of the female lobsters with eggs already attached to the body is only a palliative, since one-half of all mature females are without eggs at

all times of the year, and since there is an overlap of a few weeks in summer when practically no females carry eggs attached. These conditions are brought about by the fact that the breeding periods are, as a rule, two years apart, and by the further fact that the bulk of the old eggs hatch before the bulk of the new ones are laid.

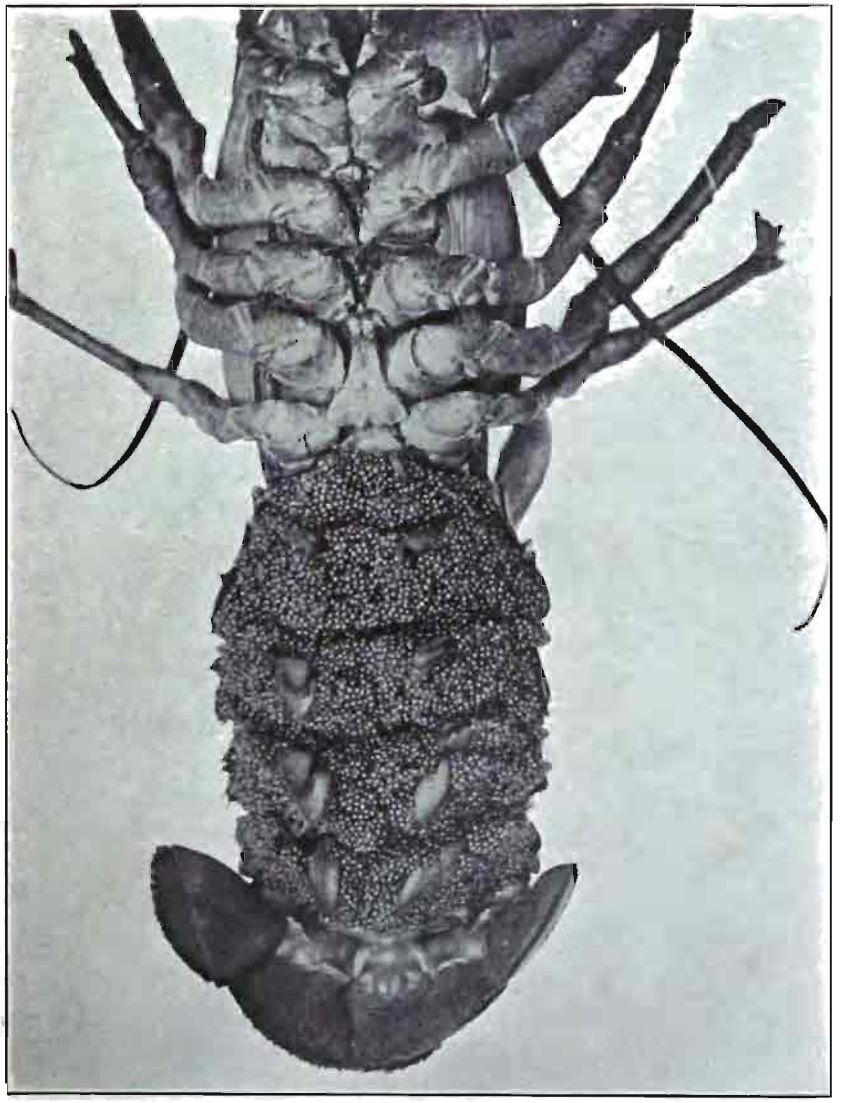
. The hatching of the eggs, followed by the immediate liberation of the fry, is ineffective, because it cannot be done on a scale commensurate with the requirements of nature, or upon any scale which can be deemed profitable. This is seen to be the case by applying the law of survival to the records of the hatcheries during the period of their greatest activities. Thus, for the decennium 1893 to 1902 the combined hatcheries of Newfoundland, Canada and the United States turned out, according to the records, 4,214,000,000 young lobsters. At a rate of survival of 1 in 15,000, this would yield 280,933 adults, many of which would certainly never enter a trap. At the lower rate of 1 in 10,000, the number of survivors would be less than half a million. In other words, during the ten years in question there were added to the ocean by this means some half million lobsters, while at the same time its waters were depleted of from half a billion to a billion adults. This suggests drawing from the spigot while our barrel leaks from the bung.

Where, then, is it best to make the sacrifice, — for some sacrifice must be made. Plainly, it would seem, among the younger breeding adults. Eat the young and better lobsters in the culinary sense, and save the older and better in a biological sense for breeding purposes, as has been urged by Dr. Field of the Massachusetts Fish and Game Commission. We do not say destroy all the young, for that would be quickly fatal, but fortunately all the lobsters of any given size do not enter the traps; but protect the young and adolescents at the one end, say up to the 9-inch length, and the older lobsters at the other end, say after the 12 or the 13 inch length has been reached. In a word, put the better breeders in a growing and protected class, — the animals which produce eggs by the twenty, forty and eighty thousands at a time. Stop the wasteful process of hatching the eggs and turning the helpless larvæ into the sea, but rear them if possible to the bottom-seeking stage, and then distribute them with the greatest care, as the Commission for Inland Fisheries of Rhode Island has wisely done, through the efforts of Dr. Mead and his associates. What the rate of survival may be in the lobster at the fourth or fifth stage, when it seeks the bottom of its own accord, with brand-new powers and instincts fitted to cope successfully with its environment, is not known; but it is safe to assume that it is a hundred fold, perhaps a thousand fold, greater than in the helpless state in which it leaves its mother and seeks the dangerous surface of the open sea.

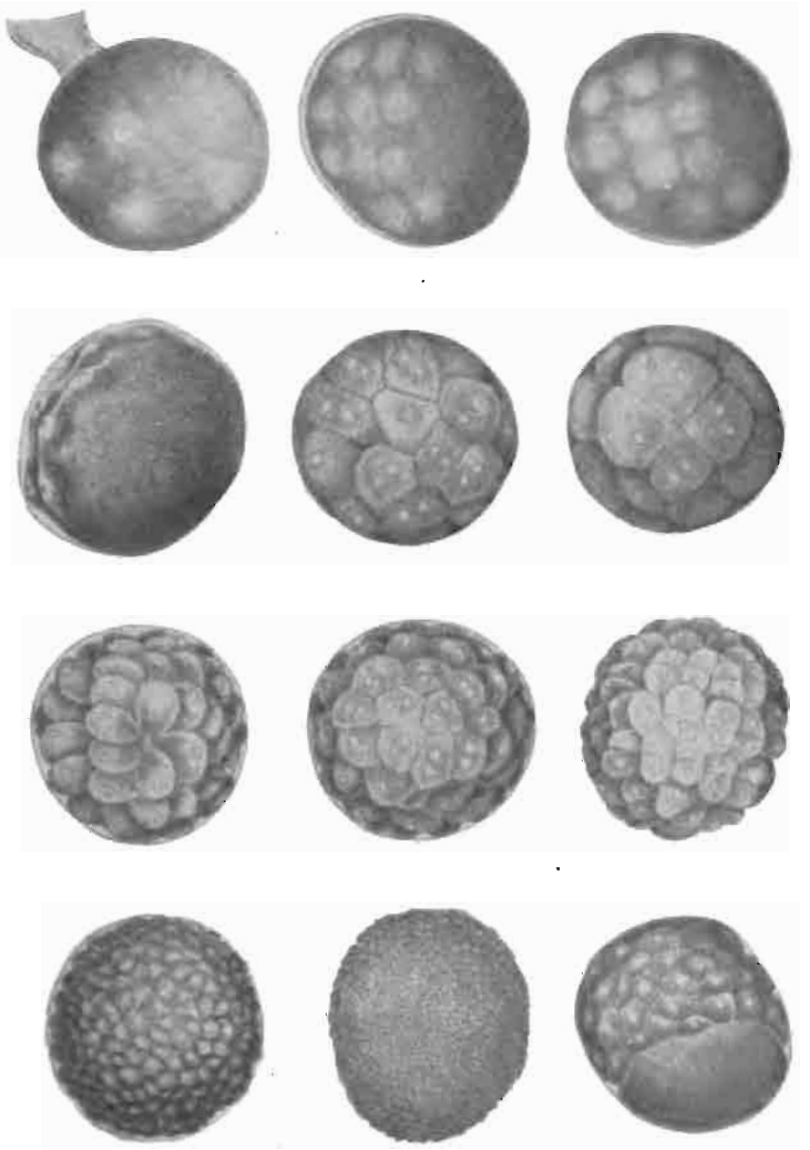
FRANCIS H. HERRICK.



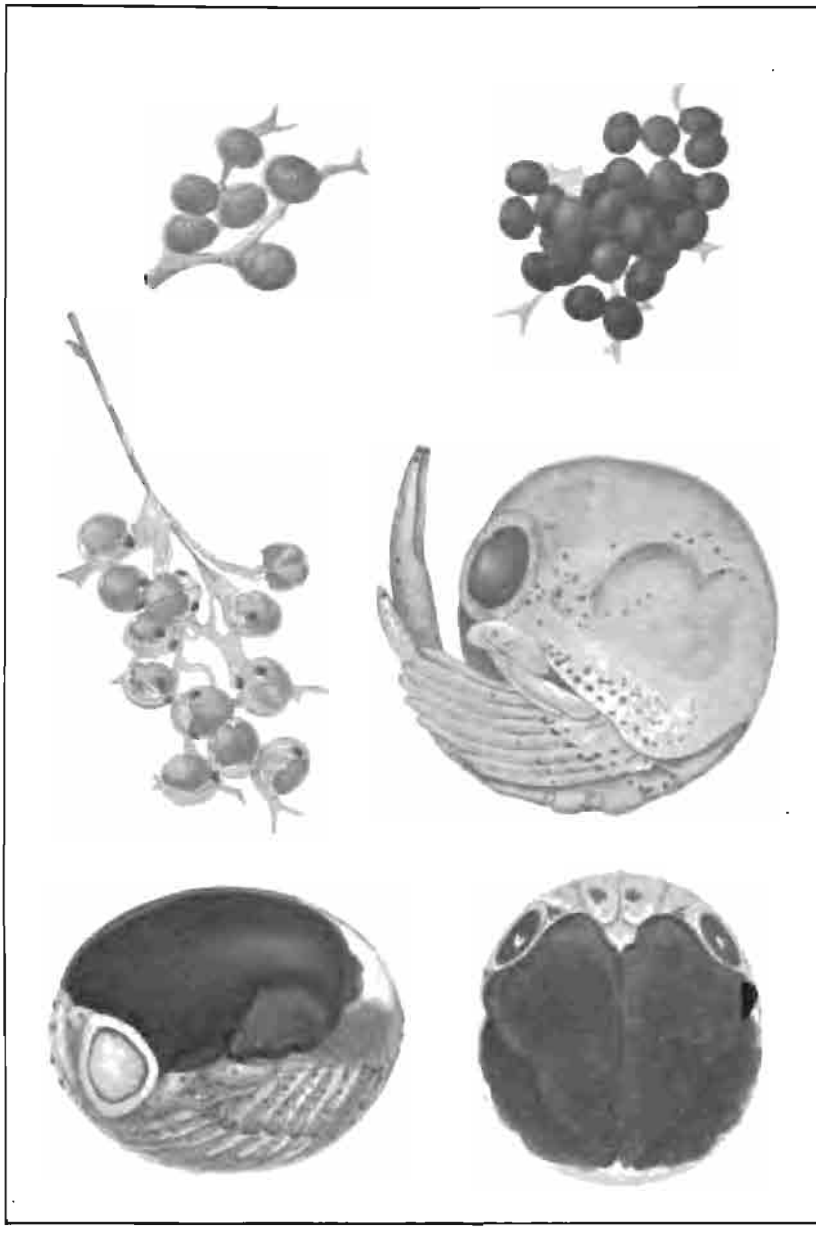
The smaller specimen weighed 1½ pounds; the larger, 23 pounds; showing relative sizes. (After Herrick.)



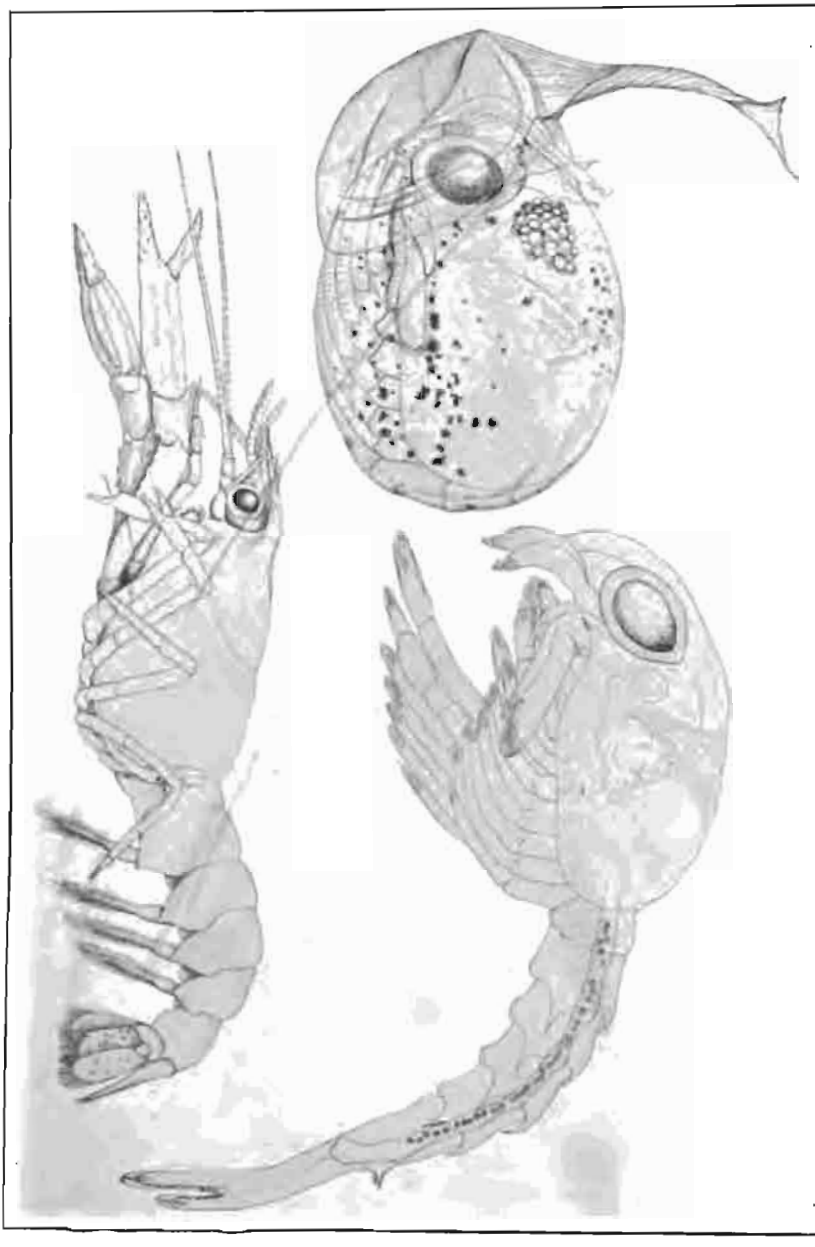
Female lobster, showing method of carrying eggs externally, for ten or eleven months, until hatched. (Reproduced by courtesy of Rhode Island Commission on Inland Fisheries.)



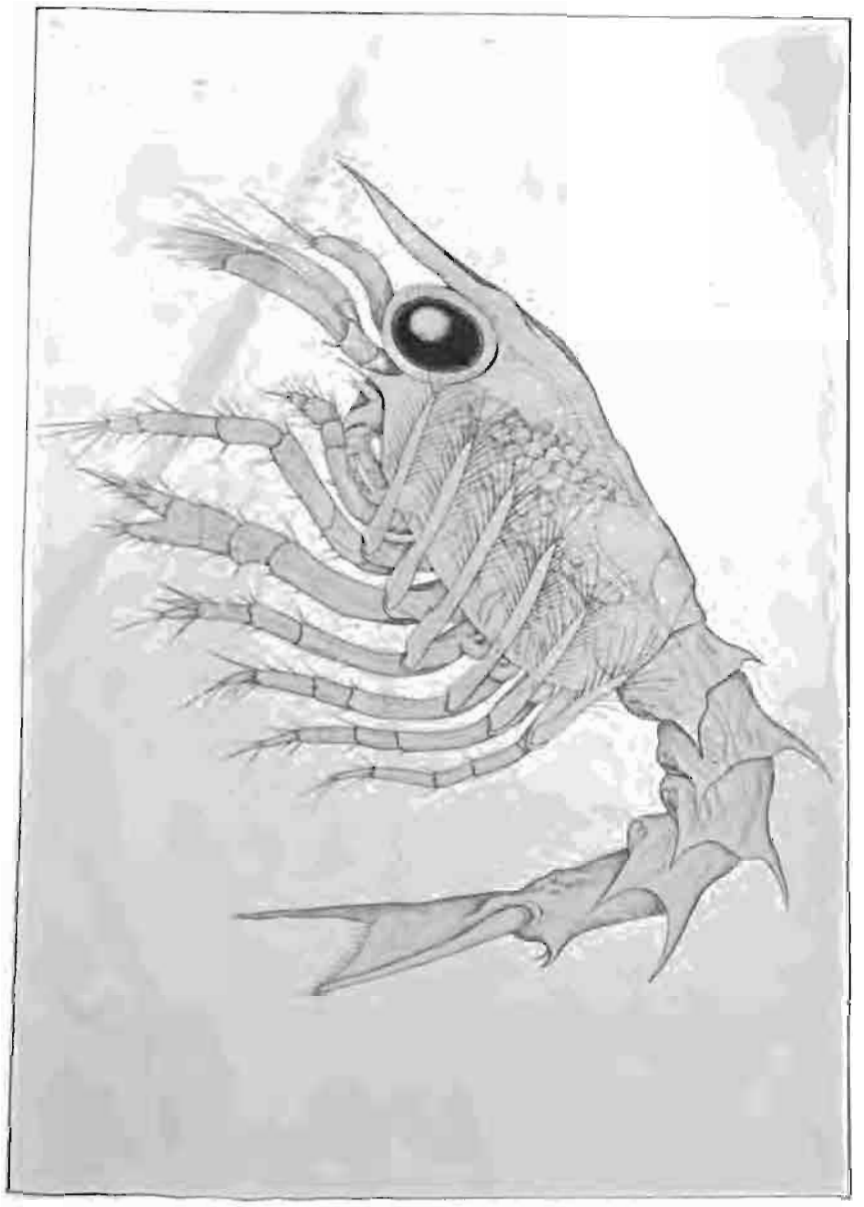
Segmentation of egg, *i.e.*, early stages in development of embryo, previous to "eyed" stage. During this process the "green" egg changes gradually to the "brown" egg. (After Herrick.)



Upper figures, newly laid eggs; middle figure, left, "eyed" eggs; middle figure, right, embryo ready to hatch; lower figures, advanced embryos.

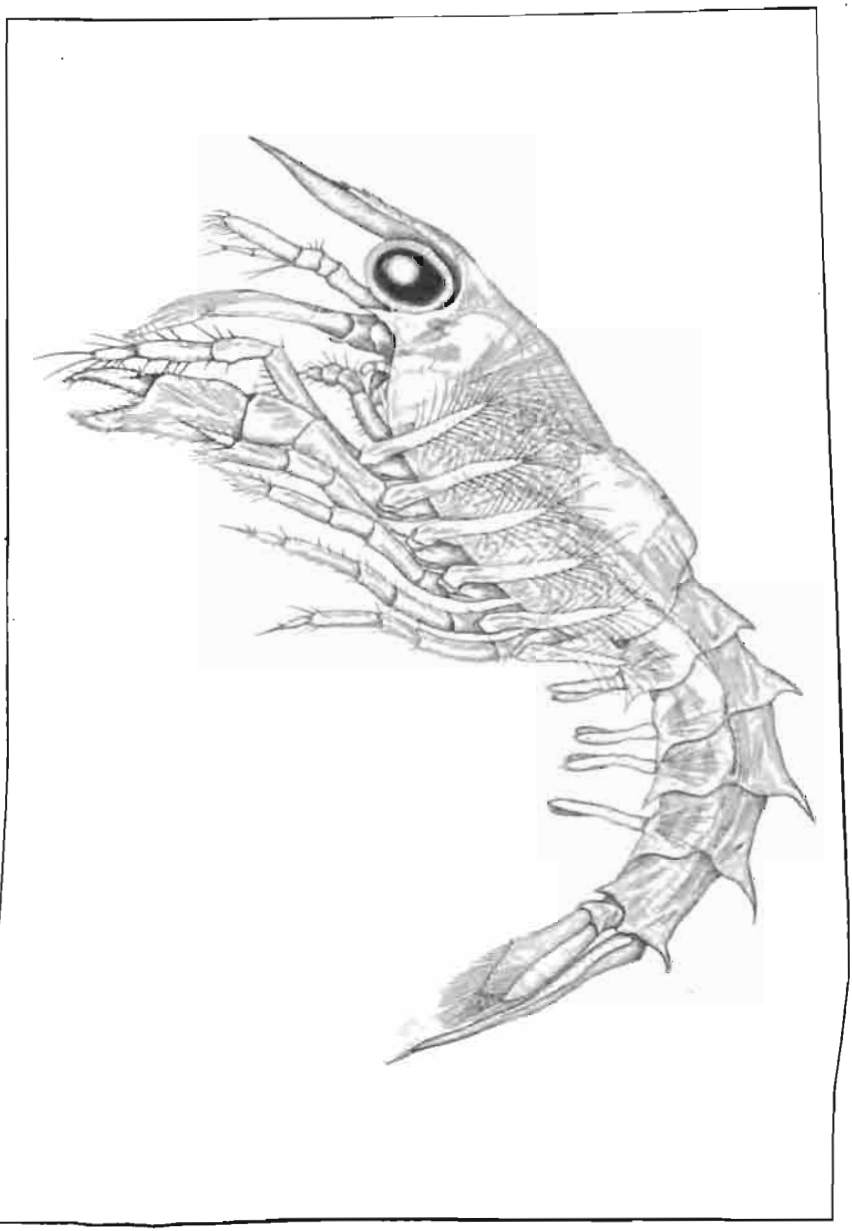


Upper figure, embryo escaping from egg membrane; lower right figure, immediately after leaving the egg; lower left figure, young lobster. (After Herrick.)

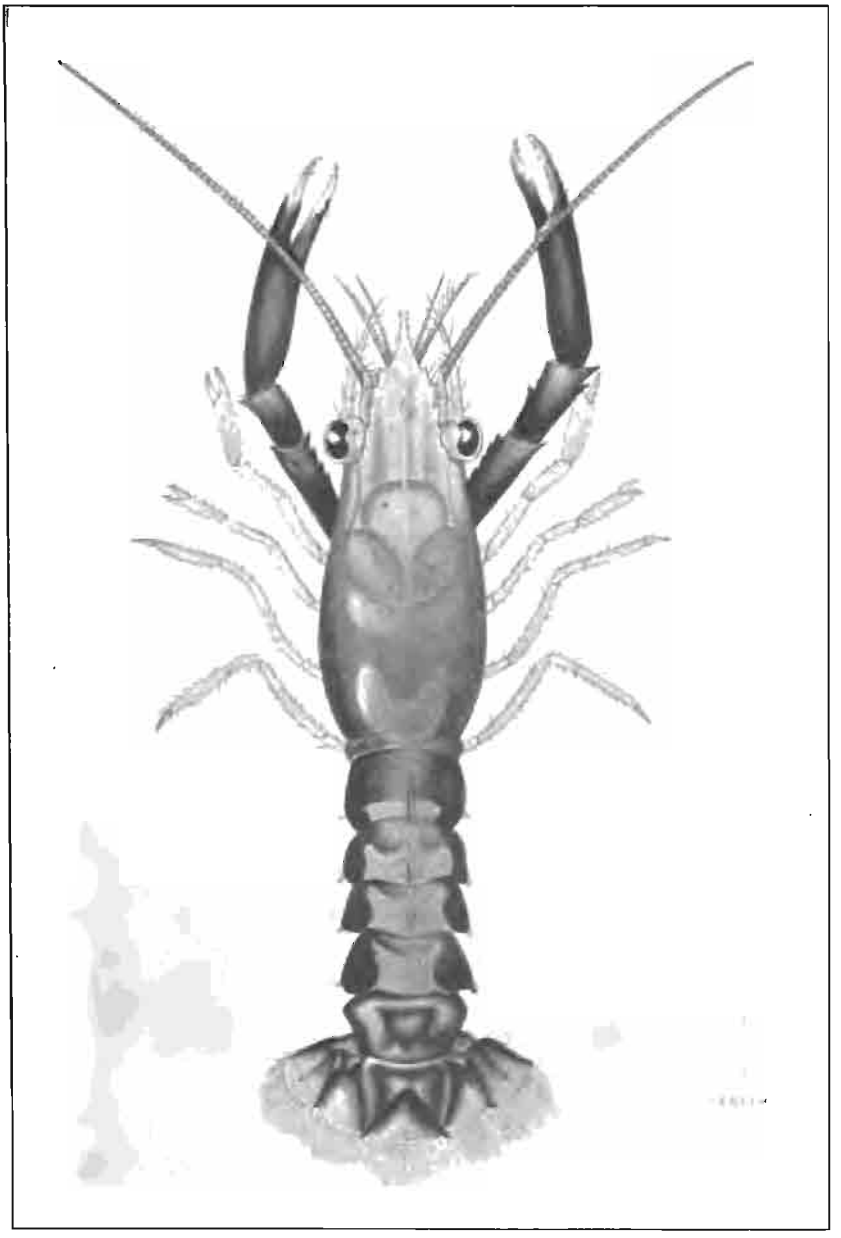


Stage I. First larval stage. (After Herrick.)

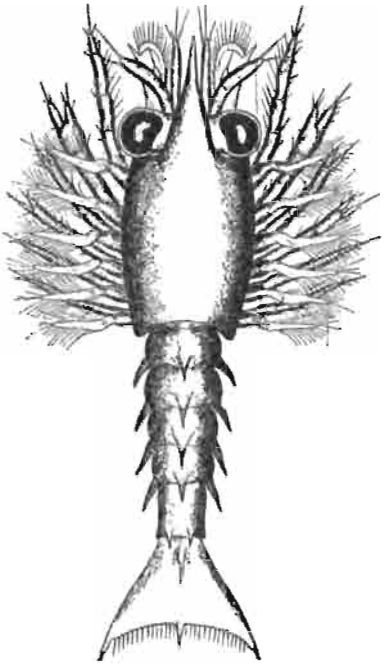
Stage II. Second larval stage. (After Herrick.)



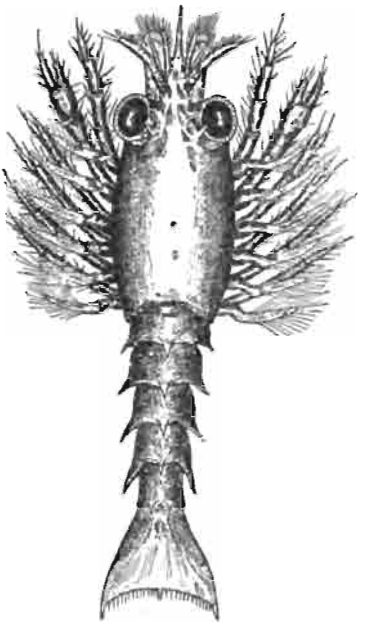
Stage III. Third larval stage, end of transparent helpless existence, floating near the surface of the sea. (After Herrick.)



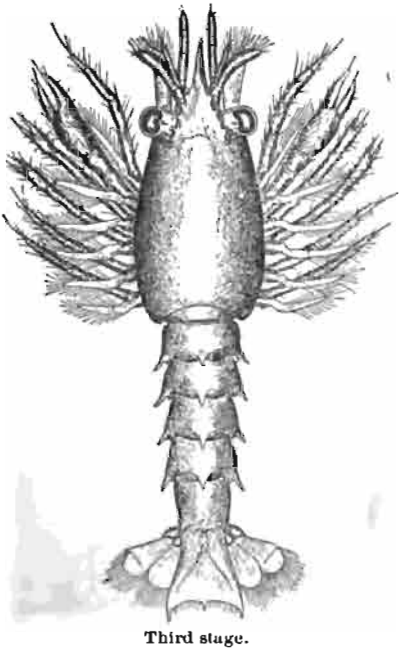
Stage IV. After floating at the surface for ten to fourteen days after hatching, the larval characteristics disappear, and the young lobster goes to the bottom, concealing itself in holes, at night crawling over the surface. (After Herrick.)



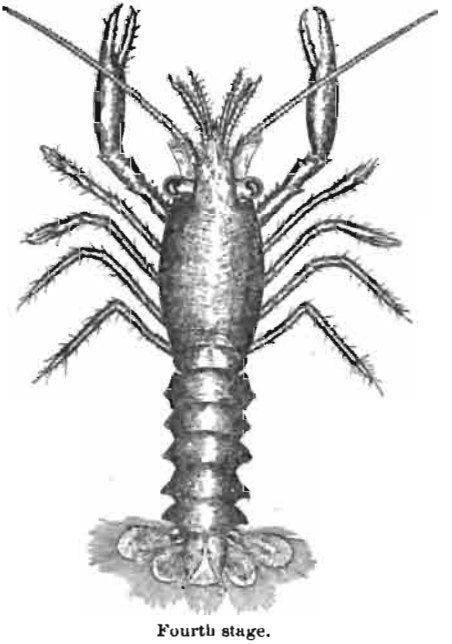
First stage.



Second stage.



Third stage.

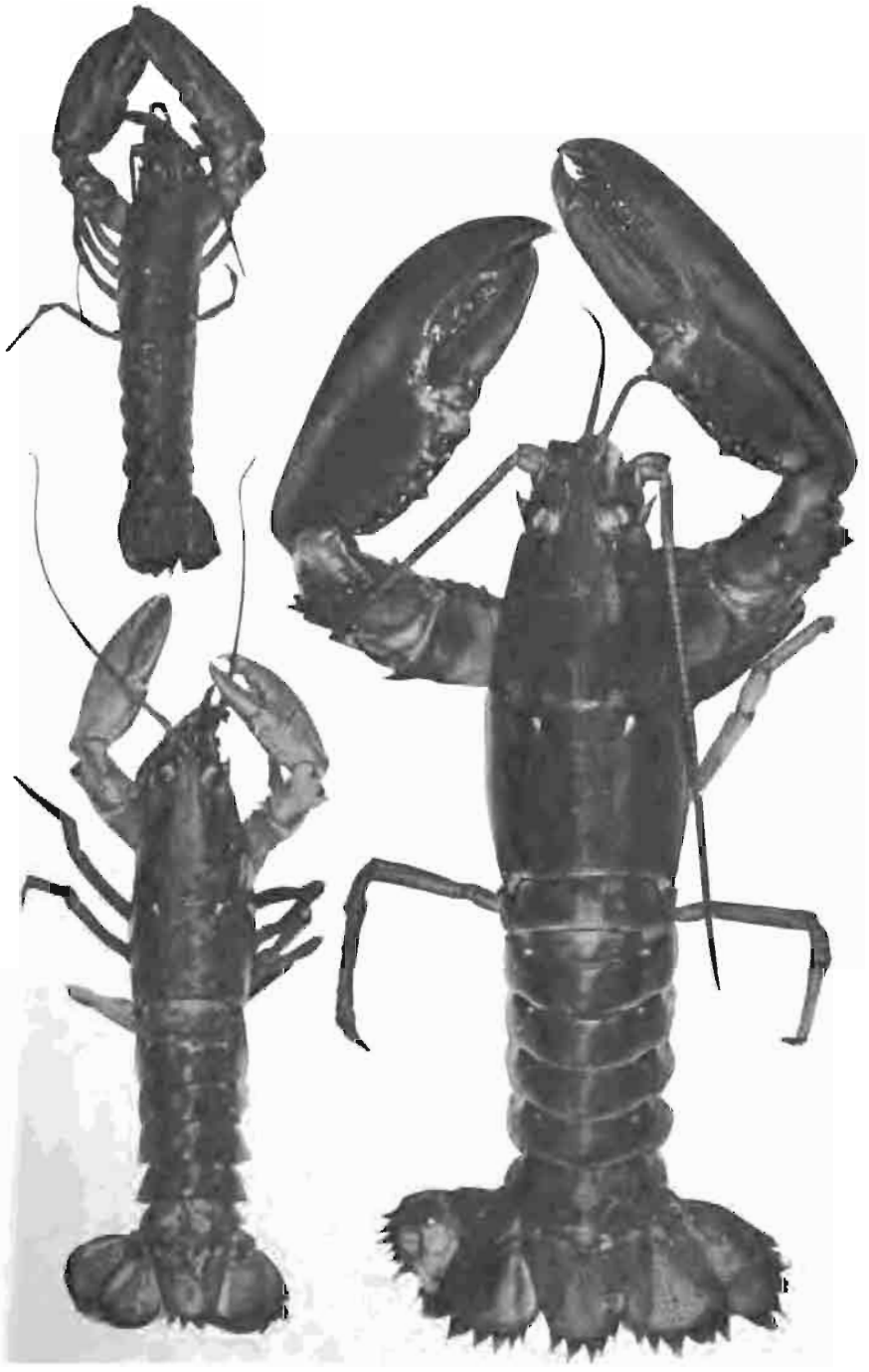


Fourth stage.

Larval lobsters, dorsal view. Condition for first two to three weeks after hatching. (After Hadley.)

Lobsters, first stage, just hatched, natural size. (Reproduced from photograph, by courtesy of Dr. A. D. Mead.)

Lobsters, third stage, natural size. (Reproduced from photograph, by courtesy of Dr. A. D. Mead.)

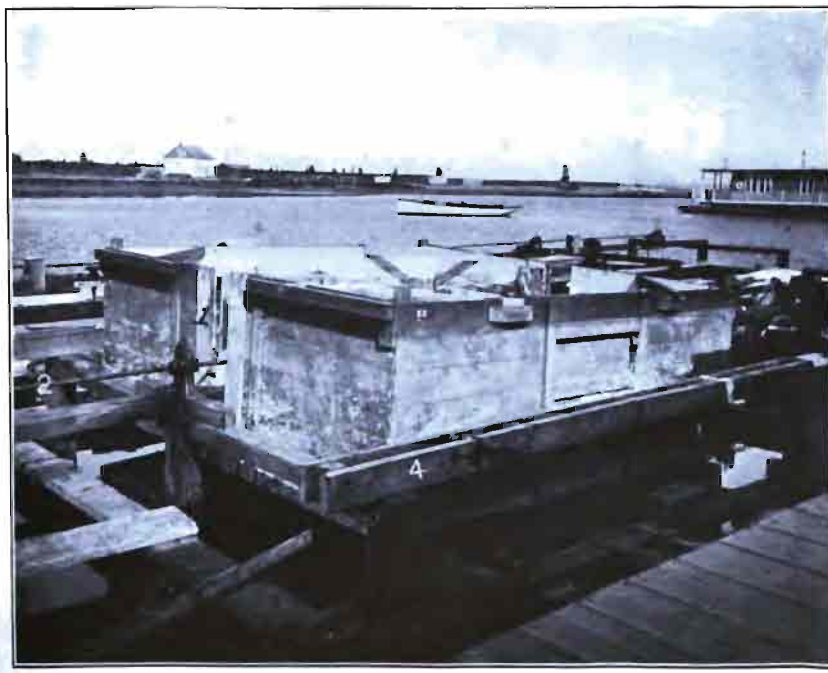


Three lobsters of the same age, illustrating the difference in the rate of growth. They were hatched in the summer of 1901, and photographed alive Oct. 23, 1902. Age, about 1 year and 4 months. Life size. (Reproduced by courtesy of Rhode Island Commission on Inland Fisheries.)

General view of house boat, with floats attached. Hatching boxes sunk in place covered with white shades. (Reproduced by courtesy of Dr. A. D. Mead.)

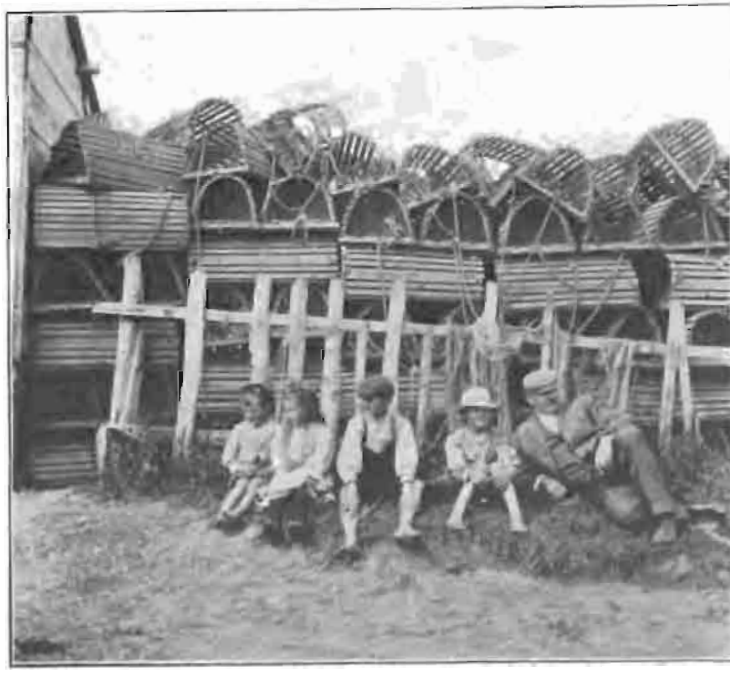
General view of plant from outer rear corner, starboard side. In foreground one car shows propeller shaft, and faint indication of propeller blades in water. The shaft coming through side of engine house passes into extension device seen just outside first shaft-hanger, then connects with longitudinal shafts. Location of rearing cars and alleys with barrels. (Reproduced by courtesy of Dr. A. D. Mead.)

Floats from outer corner, looking forward and toward house boat. The appearance of car in water and gearing of propeller shafts are shown in nearest car. (Reproduced by courtesy of Dr. A. D. Mead.)

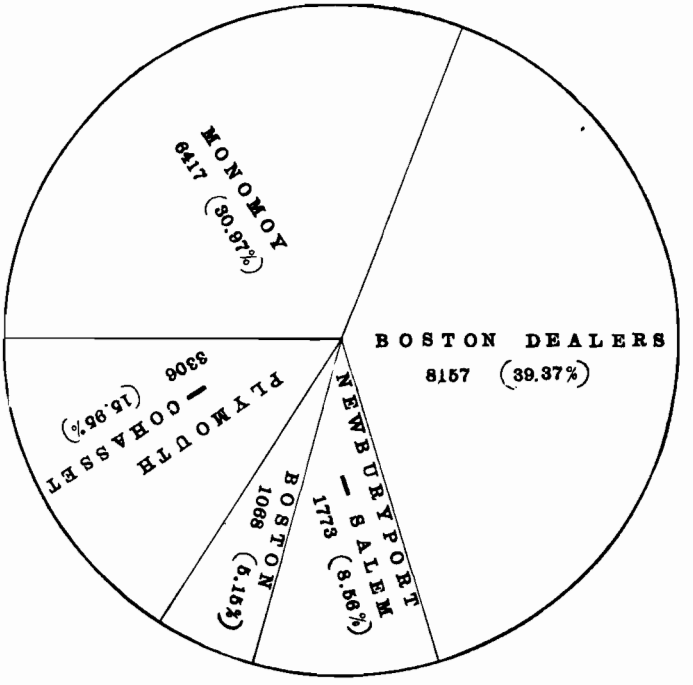


Rearing car raised and held up by portable windlass, showing slot in end of car, through which, when car is raised, longitudinal shaft runs (1); longitudinal shaft (2); side window of car (3); portable "horse" and windlass (4). (Reproduced by courtesy of Dr. A. D. Mead.)

"Laboratory," Powder Hole, Monomoy Point.

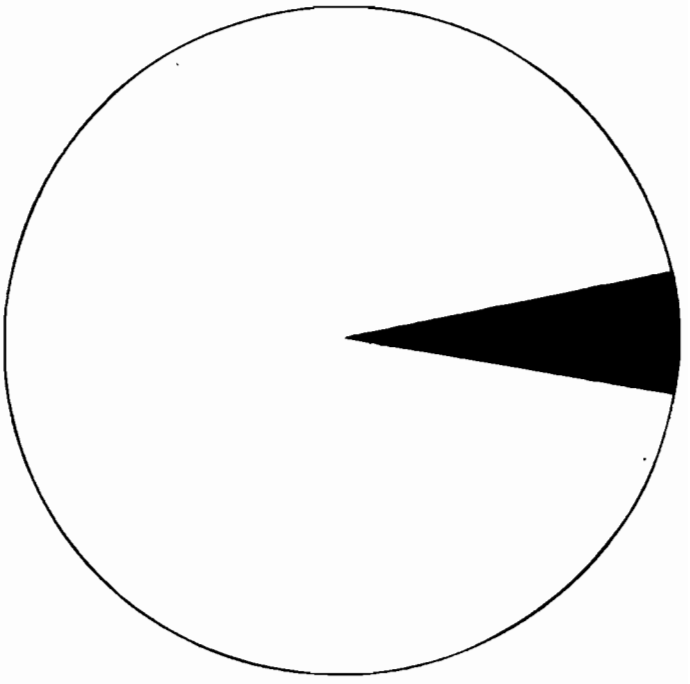


Lobster pots, Richmond Bay, Prince Edward Island. The entrance to these traps measured from 3 to 3¼ inches, inside diameter.

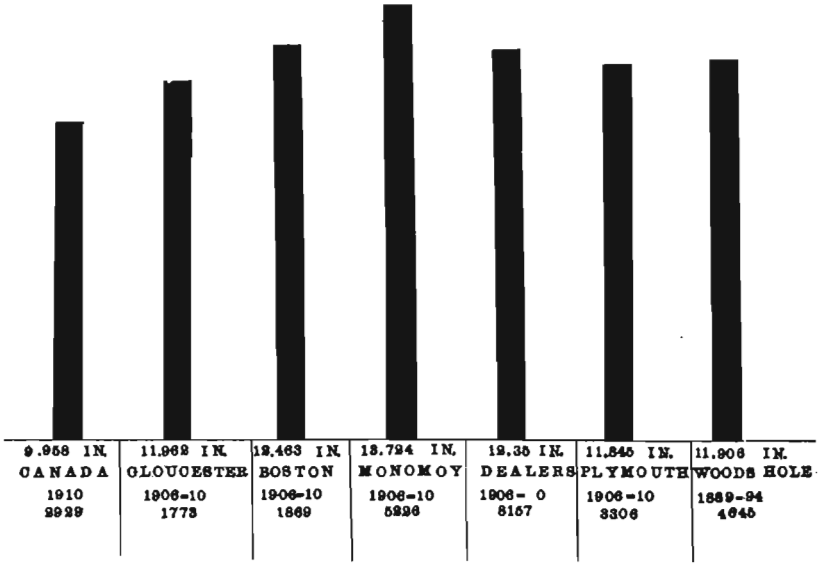


Graphic representation of the catch of egg lobsters in Massachusetts, as purchased by the department of fisheries and game during a period of five years (1906–1910). The egg lobsters taken in Vineyard Sound, as collected by the United States Fish Commission, are not included. It is interesting to note that the greatest per cent., as represented by the largest segment of the circle, came from the Boston dealers. It is estimated that 4,649 out of the 8,157 lobsters taken from the Boston dealers, or 22.44 per cent. of the total, came from Maine and Nova Scotia.

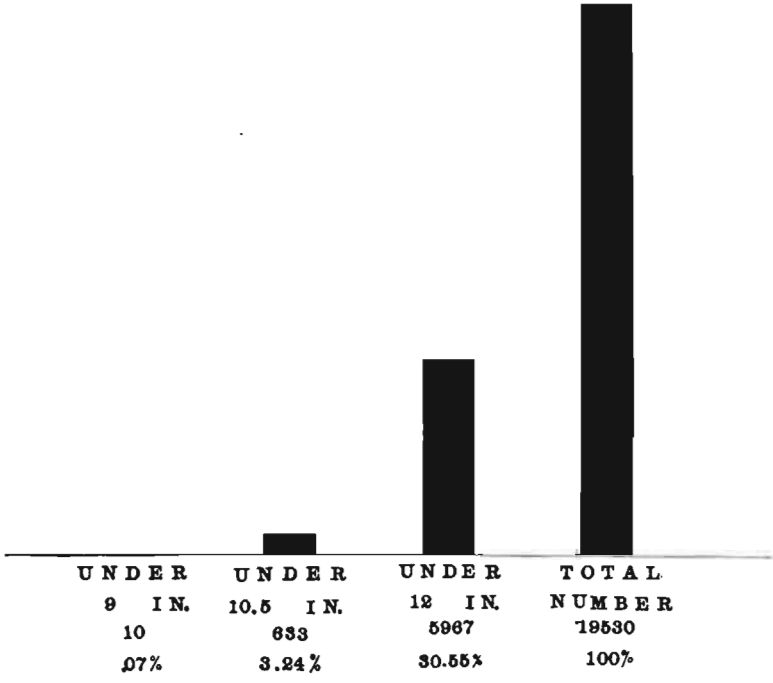
	Number.	Per Cent.
Boston dealers,	8,157	39.37
Monomoy (south side Cape Cod),	6,417	30.97
Newburyport–Salem,	1,773	8.56
Plymouth–Cohasset,	3,306	15.95
Boston fishermen,	1,068	5.15
Total,	20,721	100.00



The entire circle represents the total number of lobsters sold annually in Massachusetts. The black segment roughly shows what proportion of these are caught in Massachusetts waters. It is estimated by the dealers that the lobsters caught in Massachusetts only furnish about 5 per cent. of the product, the remaining 95 per cent. coming from outside the State.



Showing the average size of egg lobsters taken in the localities indicated, the years covered by the observations, and the number of lobsters measured.



The four columns, reading from right to left, represent: (1) the total number of measured egg lobsters taken from 1906 to 1910, inclusive, in Massachusetts waters, 19,530 in all; (2) the number, 5,967, under 12 inches, 30.55 per cent.; (3) the number, 633, under 10½ inches, 3.24 per cent.; and (4) the number, 10, under 9 inches, .07 per cent.