

THE KING CRAB (*Limulus polyphemus*).

Four-fifths natural size.

19.—NOTES ON THE KING-CRAB FISHERY OF DELAWARE BAY.

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(With Plates CXXI-CXXIII.)

INTRODUCTORY.

The fishery for king-crabs, while not primarily intended to provide a food product, nevertheless indirectly contributes to that result by furnishing a simple yet efficient fertilizer for use on land the natural vitality of which is low or has been exhausted. The king-crab, therefore, notwithstanding it has no commercial value for edible purposes,* is an important economic factor both to fishermen and farmers, and its capture becomes an industry of no little consequence to the community, in addition to the inherent interest which it possesses for those whose attention is directed toward the commercial fisheries.

While farmers and others in many of the States on the Atlantic seaboard, from Massachusetts to Florida, utilize small numbers of the crabs for fertilizer, and occasionally as food for poultry and swine, it is only in Delaware Bay that the capture of the animal can be said to constitute a well-defined industry, and it is only there, so far as known, that special forms of apparatus have been devised and employed for taking the crabs.

OBSERVATIONS ON HABITS, REPRODUCTION, ETC.

The king-crabs are chiefly found on soft sandy or muddy bottoms, where, more or less imbedded, they spend the greater part of their existence. In the colder months they probably retire to the deeper portions of the bay, but what condition of life they then assume is not known. It is chiefly, and almost exclusively, during the breeding season that they approach the shore. The deposition and impregnation of the eggs being accomplished, they rapidly withdraw to deeper water and do not usually visit the beaches again in any numbers till the following year.

The breeding season may be said to cover two months, beginning about May 1 and extending to July 1. During this period the crabs seek the sandy shores in pairs, the male riding on the back of the female; sometimes, however, a female will

*Capt. Charles H. Townsend, of New Haven, states that he has found the king-crab very palatable when steamed, and thinks it equal or superior to any of the common edible crabs.

be attended by two or more males. Reaching the shore, the eggs are deposited above the water's edge in a slight depression in the sand made by the female, and the male extrudes the milt over them. The adults then withdraw to the water; the eggs receive no more attention, and are covered with sand and washed about by the waves. When hatching ensues, the young enter the water to return to the shore again upon reaching maturity.

The abundance of crabs on the shore during any special week or month appears to be largely dependent on the tides. Mr. Howell remarks that the farmers and fishermen take the greatest quantities when the moon is full or in perigee, and the influence of the tides on the movements of crabs has come to be fully realized. The wind is also held to increase or decrease the numbers of crabs, a westerly wind bringing them in abundantly on the New Jersey coast, while an easterly wind is most favorable on the opposite side of the bay, upon the shores of Delaware.

THE FISHING SEASON.

The season during which king-crabs are taken varies somewhat from year to year, owing to hydrothermal and other conditions, but ordinarily begins about May 1 and continues till June 15 or July 1, in New Jersey. In Delaware it is somewhat longer, and often extends to August 1. As already explained, the fishing season coincides very closely with the breeding season.

THE FISHING CENTERS IN NEW JERSEY.

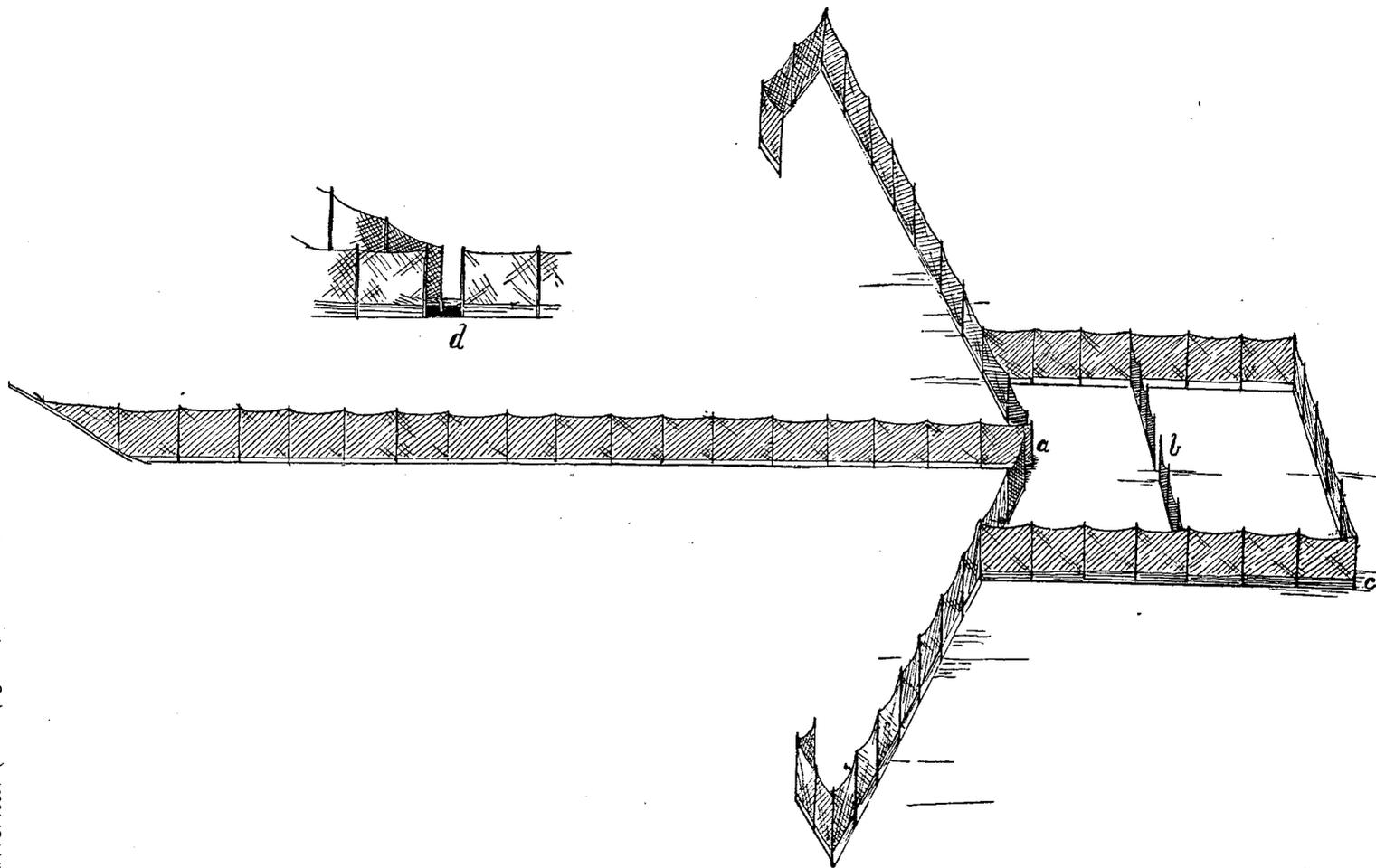
The most northern point on Delaware Bay at which crabs are taken is Heislerville, between which and Cape May Point, a distance of 20 miles, the crabs are sought at Ewing Neck, West Creek, East Creek, Dennisville, Goshen, Dias Creek, Green Creek, Fishing Creek, Town Bank, and one or two other minor settlements. About seven-eighths of the entire catch is made between Dennisville and Fishing Creek, inclusive, and about three-fourths of the yield is taken at Goshen, Dias Creek, and Green Creek, in which places the catch in 1890 was, in round numbers, 335,000, 410,000, and 411,000 crabs, respectively. At the extremities of the stretch of coast above defined the output was much smaller, varying from 10,000 to 30,000 at Town Bank, Heislerville, etc.

APPARATUS AND METHODS.

While considerable quantities of crabs are caught by hand on the shores of Delaware Bay, where they go to deposit their spawn, the growing scarcity of the species has more and more demanded the employment of apparatus of capture by means of which the individuals that are in the water adjacent to the shores may also be secured. As yet no traps have been employed on the shores of the State of Delaware, but such appliances have been set in New Jersey waters for a number of years, and their use is becoming more extensive each year.

Two forms of apparatus are in rather common use along the New Jersey shore between Cape May Point and Heislerville. One resembles some types of pound-nets, but the other is, so far as known, entirely unlike anything else used in the waters of the United States and is designed for and especially adapted to this fishery.

Regarding the pound-nets used in this fishery, Mr. Earll says:



POUND NET FOR CATCHING KING CRABS AND FISH.

a, entrance to outer crib ; *b*, entrance to inner crib or fish pound ; *c*, position of slats around bottom of pound net ; *d*, section at entrance to outer crib.

In 1880 there are nine of them on the flats along the shore, some having 2 or 3 feet of water at low tide, while others are entirely dry. They differ considerably from the pound-nets of other portions of the coast. The leader is about 50 fathoms long, and in the place of the fore-bay are two wings, each 25 fathoms in length. The pound proper or bowl is divided into two compartments, the first being intended for king-crabs (*Limulus polyphemus*) that are taken in enormous numbers during the early summer. The second compartment is connected with the first by means of a funnel-shaped opening large enough to allow the fish to enter, but too small to admit the crabs. The lower part of the pound is made of stakes imbedded in the mud and extending a foot or more above it. To these the netting is attached, the object being to keep it above the crabs that would otherwise destroy it.*

Mr. Howell states that most of the pound-nets now used have bowls or "pounds" only for crabs, and that but few fish have been taken in late years in the nets provided with two compartments, although formerly considerable quantities of squeteague and goody were secured.

The stakes which form the framework for these pounds are 8 to 10 feet long and 4 to 6 inches in diameter. They are located 4 to 6 feet apart. To the bottom of the stakes, constituting the "hedge," boards 1 inch thick are nailed to the height of a foot or more; the bottom of the bowl, and the sides to the height of 1 to 2½ feet, are formed in the same way, as mentioned by Mr. Earll. The door to the first bowl is from 18 to 24 inches wide on each side of the leader; the funnel-like entrance to the second bowl, when one exists, is much narrower, and only a few crabs pass through it. The netting consists of either wire or twine.

The cost of such an apparatus depends somewhat on the length of leader and size of bowls. The most expensive form operated in recent years was probably worth not more than \$75, from which amount to about \$25 every intermediate value is represented.

This form of net is employed where the tide leaves the "pound" dry or fully exposed at low water. Both boats and wagons are used in tending the nets; the wagons are considered more convenient and are more extensively employed. The crabs are taken from the nets with pitch-forks, or with a crab-spear consisting of a single piece of sharp-pointed metal mounted in a long handle.

The catch varies with the year, month, and tide. In 1888 the catch per tide was from 25 to 2,000 crabs to each net, or from 5,000 to 60,000 crabs per season. In 1890 the average catch was considerably smaller, taking the entire shore into consideration.

The weir, or "stake net" as it is here called, is very different from the pound-net just described, although both have some parts in common, as will be seen by consulting the accompanying plates. It consists essentially of poles or stakes driven into muddy or sandy bottoms, so as to form a leader or "hedge," wings, and a bowl or "pound." The poles constituting the bowl are 8 to 10 feet long and 2 to 4 inches in diameter at their larger ends and 1 to 1½ inches in diameter at their smaller extremities. For the wings and leader, poles from 3 to 6 feet long are employed. The poles are placed from 1½ to 3 inches apart to permit the sea to wash through.

The bowl is somewhat semicircular in shape, the extremities of the brush-work joining the wings about midway their length. Its capacity is encroached upon by the leader and the door or entrance to the pound, which is the most important feature of the apparatus. It consists of a wedge-shaped platform of boards fitting into the space between the wings as they approach the leader. The platform is inclined at a gentle

* The Fisheries and Fishery Industries of the United States, Section II, p. 397.

angle and is about 5 feet long, projecting about 1 foot over a support, as shown in the figure. It is important that the pitch of the platform shall not be too great and that the floor shall not be too smooth, otherwise the crabs can not or will not walk on it. The floor of the bowl is made of cheap boards to prevent the crabs scratching holes in the mud and loosening the poles.

The cost of such a weir is from \$12 to \$20. The catch is about the same as in the other form of apparatus.

Such traps are mostly made by farmers who have woodland near the shore on which to draw for poles, of which, as may be readily understood, a large number is required. They are usually set in a cove on muddy bottom. One person in a boat can fish from two to four such weirs on one tide. When they are set on a sandy beach, as is sometimes the case, they are fished with a horse and wagon, and one person can then tend more than the number stated. The crabs are removed to the boats or wagons in the manner already mentioned.

The resemblance of the shape of this weir to the general outline of a king-crab is worthy of mention.

DECREASE IN THE ABUNDANCE OF CRABS.

In 1880 Mr. Richard Rathbun wrote as follows concerning king-crabs in Delaware Bay:

They are very much less abundant now than formerly, on account of so many having been caught from year to year for use as a fertilizer. It would appear as though a few years more of indiscriminate capture would result in their being entirely exterminated from the region.*

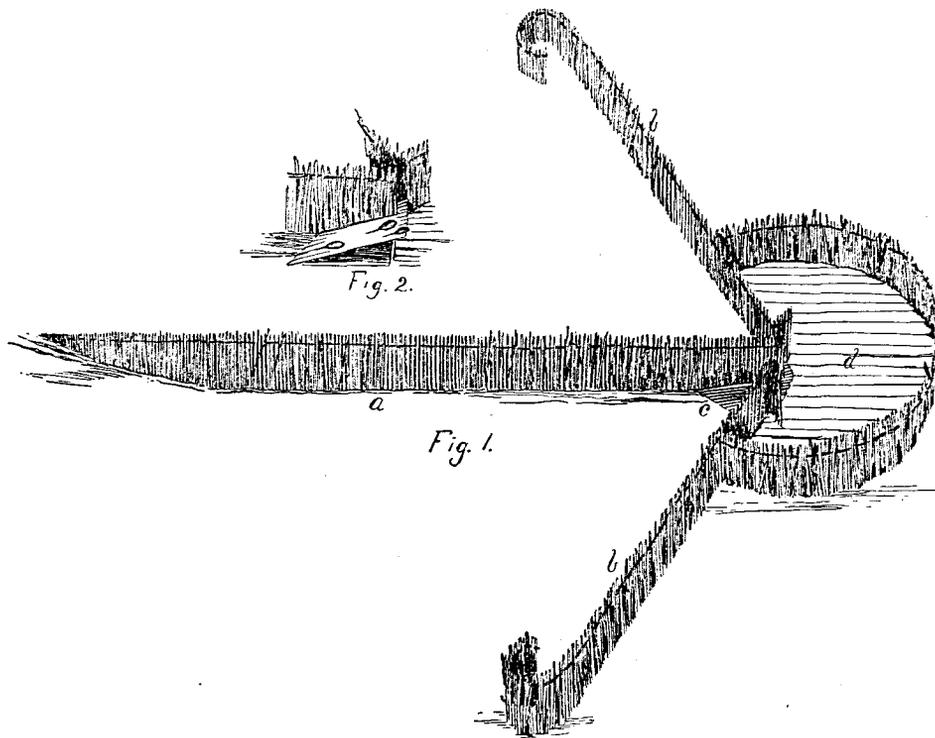
This note of warning was well-timed, as shown by the greatly reduced catch in recent years, although more persons and larger quantities of apparatus have been employed. The yield in 1880, 4,300,000 crabs, was more than double that of each of the years 1887, 1888, 1889, and 1890.

The diminution in the abundance of the crabs is no doubt chiefly due to the unfortunate practice of capturing them during the spawning season, usually before the eggs are deposited or impregnated.

It seems probable that before long the decimation will become so pronounced that the profitable prosecution of the fishery will be impossible; then it is hoped that the employment of the destructive forms of apparatus will be discontinued and the crabs given an opportunity to multiply unrestrictedly for a few years at least, although of course it is expected that the farmers will continue to utilize such individuals as are found on the beaches and can be taken by hand.

The actual extent of the diminution in numbers can perhaps be better appreciated by an appeal to figures. In 1887, in New Jersey, the total catch was 1,296,000 crabs; in 1888 the yield was 1,502,000 crabs, whereas, other things being equal, the increase in the apparatus should have resulted in a catch of about 2,275,000; in 1890 the number taken was 1,674,670, whereas, compared with 1888, it should have been about 3,415,000. Since much the larger part of the catch is made with the pound-nets and weirs, it seems legitimate to make these deductions.

* The Fisheries and Fishery Industries of the United States, section I, vol. 1, p. 830.



STAKE WEIR FOR KING CRABS.

FIG. 1. The weir. *a*, leader; *b b*, wings; *c*, entrance; *d*, flooring and crib.
FIG. 2. Sectional view of entrance to crib, showing inclined platform.

To show the case in a somewhat different aspect, the following comparative table is introduced, giving the percentage of increase in apparatus and the resulting increase in catch for the years 1887, 1888, and 1890:

Year.	Percentage of increase in apparatus.	Percentage of increase in catch.
1888 over 1887.....	75	16
1890 over 1887.....	183	28
1890 over 1888.....	30	11

Numerous instances of a more detailed character might be adduced to show the decrease in the numbers of crabs from year to year, but such cases are not so conclusive as are comparisons of the total yield of the State, owing to the conditions of temperature, etc., which might influence the advent of the crabs to particular sections of the coast, making them unusually abundant in one section and uncommonly scarce in another during one season, and completely reversing the conditions the following year. One noticeable instance, however, may with propriety be given: In 1887 two nets at West Creek, New Jersey, took crabs to the number of about 40,000; in 1890 the same apparatus at the same place yielded only 12,000 crabs.

It can not be denied, as shown by reliable returns, that in some localities there has not only been a maintenance of the supply but even an increase; but the general trend is and has been toward a decrease, and the catch has only been maintained by an increase in the amount of apparatus.

It is worthy of mention that, although no traps or other devices are employed in Delaware, the decline there has been quite as pronounced as on the opposite side of the bay, the catch being no doubt influenced by the great drain on the species in New Jersey. The yield in 1880 was 900,000 crabs, and in 1888 only 320,000.

THE OUTPUT IN NEW JERSEY.

The yield of this fishery during recent years is given in the following table, in which, for purposes of comparison, the catch in 1880 is also shown:

Years.	Number of crabs taken.	Value to fishermen.
1880.....	3,400,000	\$13,600
1887.....	1,296,000	6,480
1888.....	1,502,000	7,510
1890.....	1,664,670	8,030

Although there has been a small actual yearly increase since 1887, this, as stated elsewhere, is to be attributed to the employment of greater quantities of apparatus.

THE FISHERY IN DELAWARE.

The number of localities on the shores of Delaware at which king-crabs are taken is small, and the fishing centers are mostly adjacent to fertilizer factories. As stated elsewhere, there is no special fixed apparatus used in the king-crab fishery of Delaware. The fishery is confined to the shore and the shallow water adjacent thereto, and is prosecuted from boats and from wagons, according as the men are regular

fishermen or farmers. The fishing is chiefly carried on from Barker's Landing and Bower's Beach and in the vicinity of those places.

At Barker's Landing, where the fishing is mostly done for a factory, the business in 1888 was followed from six "lighters" or skiff-like boats, 12 to 16 feet long, and operated by eight men, all told. When the wind is "offshore," these boats go up and down the shore and secure crabs on the beaches. Two large scows, 42 and 30 feet long, respectively, are sent out to bring the crabs from the lighters to the factory, so that time may not be lost by the boats engaged in catching the crabs.

At Bower's Beach there were only four professional crab fishermen in 1888, but they were joined by thirty-five farmers, farm hands, and wood-choppers. The fishermen employed 25-foot scows; the farmers, farm hands, wood-choppers, and other semi-professional fishermen at the place made half of their catch in boats and half in wagons. In addition to the quantities sold to be made into fertilizer, about 25,000 crabs are annually utilized as food for hogs. A portion of the catch is also disposed of to vessels sent out by factory operators in New Jersey. At Banckenburg Creek, $1\frac{1}{2}$ miles below Bower's Beach, there is a small factory; eighteen men, using nine scows, were employed there as fishermen in 1888. In the same locality, about fifteen farmers regularly drive down to the beach in their wagons and get crabs for their own use or for sale to the factories.

The average annual catch to a scow in recent years has been about 7,000 crabs. The farmers and others do not usually take more than a few thousand each.

THE OUTPUT IN DELAWARE.

Accurate figures for this fishery in Delaware covering the year 1890 are not available, but the catch has been estimated at 275,000 crabs. The yearly decline since 1880 has been marked, and is no doubt suggestive of what would result in New Jersey were the annual increase in apparatus discontinued.

Years.	Number of crabs.	Value to fishermen.
1880.....	900,000	\$2,700
1887.....	341,000	682
1888.....	320,000	640
1890.....	275,000	550

THE FERTILIZER FACTORIES.

Three factories designed for preparing king-crabs for fertilizer were in operation on Delaware Bay in 1887 and 1888. Two of these were in Delaware and one in New Jersey. The buildings were comparatively inexpensive frame structures, with a combined value of \$4,100. The factory hands numbered eighteen.

The factories in Delaware were located at Banckenburg Creek and near Barker's Landing. The one at the former place was quite small, the building being only 16 feet square. Beneath was a furnace, by means of which the crabs were dried. About 200,000 crabs are the usual annual quota of this factory. The factory building near Barker's Landing was 24 by 60 feet in size. It was provided with a steam-mill in which the crabs were ground while green and then mixed with sodium sulphate

(Na_2SO_4). Some seasons as many as 100,000 crabs are utilized, but in 1887 and 1888 only 50,000 and 30,000, respectively, were used. The scrap is sold to farmers, and also to regular fertilizer dealers by whom it is further treated. Nearly the entire output is sold in Delaware and other States of the "Peninsula," at from \$25 to \$30 per ton.

The factory in New Jersey, situated at West Creek, was larger than either of those in Delaware, and was valued at \$2,000. The number of crabs handled is from 1,000,000 to 2,000,000 annually; and in 1887 and 1888 was about 1,300,000, representing almost the entire catch of the State, in addition to small quantities from Delaware. The sales of fertilizer prepared here are mostly local.

The approximate number of tons of crab fertilizer prepared in Delaware Bay was 740 in 1887 and 835 in 1888. These figures include the scrap manufactured at the factories ("cancerine") and also the crude product used by farmers and others on their land. At the ruling market prices, the fertilizer had a value of \$15,800 in 1887 and \$17,600 in 1888.

In 1890, 275,000 crabs were sent to Billingsport, New Jersey, and 225,000 to Baltimore, Maryland, from points on the New Jersey shore, to be used in the preparation of complex fertilizers. Almost the entire remaining portion of the catch was sold to the West Creek factory.

PRICES OF CRABS.

In 1880 the average value of crabs in New Jersey was given as \$4 per thousand and in Delaware as \$3 per thousand. In recent years the tendency has been toward an increase in price in New Jersey, owing to the growing scarcity of the crabs and the competition among the fishermen; while in Delaware, where the demand is less and the supply comparatively greater, the price has declined. Much the larger part of the catch in New Jersey during the past four years has been disposed of at \$5. In Delaware, on the other hand, about \$2 has been the ruling price.

STATISTICAL DATA.

Complete statistics of this industry in Delaware Bay are not available for a later year than 1888, when an investigation of this subject was made by the writer in connection with a general canvass of the fisheries. The figures obtained as a result of that inquiry are embodied in the following table, showing the extent of the industry in 1887 and 1888:

Year.	Regu- lar fish- ermen.	Factory hands.	Value of factories.	Boats.		Pound-nets and weirs.		Crabs taken.		Scrap produced.	
				No.	Value.	No.	Value.	No.	Value to fishermen.	Approx- imate number of tons.	Approx- imate value.
1887	96	18	\$4,100	42	\$1,210	41	\$561	1,637,000	\$7,162	750	\$15,800
1888	127	18	4,100	60	1,555	72	964	1,822,000	8,150	835	17,600

The following additional tabular statement has been prepared from information kindly furnished by Mr. E. S. Howell, of Dias Creek, New Jersey, upon whose fund of knowledge on fishery subjects the writer has had frequent occasion to draw:

Statement of the extent of the king-crab fishery in New Jersey in 1890.

Locality.	No. of fish-ermen.	No. of horses em-ployed.	No. of boats used.	Pound-nets and weirs.			The output.				
				No.	Value.	Character of shore on which located.	No. of crabs taken in nets.	No. of crabs taken by hand.	Total number of crabs taken.	Value.	Average value per thousand.
Heislerville	2	.....	.....	3	\$36.00	Sand	7,500	25,000	32,500	\$130.00	\$4.00
Ewing Neck	2	.....	.....	3	34.50	Sand and mud.	7,200	20,000	27,200	108.80	4.00
West Creek	3	.....	2	2	40.00	Sand	12,000	19,500	31,500	157.50	5.00
East Creek	3	.....	4	13	243.75	Mud	65,000	3,000	68,000	323.00	4.75
Dennisville	3	.....	5	20	380.00	do	120,000	5,000	125,000	625.00	5.00
Goshen	4	.....	4	6	82.50	Sand and mud.	27,450	306,600	334,050	1,568.74	4.75
Dias Creek	20	15	5	25	643.75	Sand	250,000	159,600	409,600	2,048.00	5.00
Green Creek	20	15	5	20	1,121.00	do	401,000	10,000	411,000	2,055.00	5.00
Fishing Creek	12	11	.....	12	420.00	do	180,000	3,000	183,000	824.50	4.50
Town Bank	2	2	.....	2	20.00	do	7,200	2,500	9,700	38.80	4.00
Elsewhere	2	.....	2	2	20.00	do	3,120	30,000	33,120	132.48	4.00
Total	73	43	27	108	3,041.50	.....	1,080,470	584,200	1,664,670	8,029.82	4.82

Mr. Howell says that, in addition to the regular fishermen mentioned in the table, about 150 men and boys along the coast take crabs when they are most plentiful. Their catch is included in the summary.