
PART XIV.

THE FISHERIES OF THE GREAT LAKES.

BY LUDWIG KUMLIEN.

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I.—THE POUND-NET FISHERY.

I. FISHING-GROUNDS.

The pound-net fishery is the most important carried on in the Great Lakes. It absorbs a greater amount of capital, employs more men, and yields larger returns than any other fishery, and its importance is annually increasing.

The position of the pounds is constantly being changed, some grounds which a few years ago were very productive being now almost abandoned, and others just coming into prominence, so that we can hardly do more than to point out the location of the more important grounds as they existed in 1879.

The most important stations in Lake Superior are located among the Apostle Islands. The majority of the nets are set from the shores of the islands nearest land. To the westward the stations occupied in 1879 were at the entrance to Superior City, Wis., at Bark Bay, and Siscowet Bay; eastward, in Chagnamegon and Bete Grise Bays, at Portage Entry, in Keweenaw, Huron, and Marquette Bays, the channel between Grand Island and the mainland, at Whitefish Point, and in Whitefish Bay.

In Lake Michigan, the most productive grounds are about the Beaver Islands and on the north shore east of Scott Point, on the west shore of Green Bay, and among the islands at its entrance. On the west shore of the lake there are numerous stations, the most important being near Jacksonport; at Whitefish Bay, between Two Creeks and Manitowoc; at Amsterdam, Port Washington, and Waukegan. At the head of the lake the principal stations are located between Michigan City, Ind., and New Buffalo. On the east shore pound-net fishing is not prosecuted to any considerable extent except in Little and Grand Traverse Bays. The only stations southward are at Good Harbor Bay, Big Point Sable, and near Ludington. The principal fisheries in Grand Traverse Bay are near Hog Island and in Northport Bay. There are others also on the north shore of Little Traverse Bay and near its entrance. Several nets are usually set at Point Wangoschance.

The Lake Huron pound fisheries are comparatively not of great moment. The principal grounds are located on the north and south shores of Thunder Bay and at the head of Saginaw Bay.

Among the most remarkable grounds in the lakes are those situated at the west end of Lake Erie. The whole shore from the mouth of the Detroit River to Lorain, several miles east of Vermillion, is occupied at short intervals by pounds. Kelley's Island and the Bass Islands are also favorite localities. There are other important stations at Dover Bay and between Willoughby and Painesville.

The pound-net fisheries of Lake Ontario are of minor importance. The few stations occupied are situated at the east end of the lake, near Sackett's Harbor and Cape Vincent.

The nets, with few exceptions, are set comparatively near shore. When a very large number are set in a line, however, as is the practice at the west end of Lake Erie and some other localities, the outer net, of course, is situated in quite deep water. The station for single nets most distant from land is probably that situated at the north end of Green Bay, midway between Point Peninsula and Summer Island. The nets set here are about $7\frac{1}{2}$ miles from the nearest shore.

The kind of bottom most sought for is fairly hard clay covered with sand. If the bottom is too hard the great labor involved in driving stakes becomes a serious obstacle, while if too soft the stakes will not bear the weight of the net without becoming loose and unstable.

Pounds are seldom set in more than 75 feet of water, the average depth being about 35 feet. The deepest net in the lakes is situated off the north shore of Saint Martin's Island, at the entrance of Green Bay. The bowl stands in 97 feet of water. The stakes, which are three times spliced, are 125 feet in length.

2. FISHERMEN.

There is nothing peculiar characterizing the pound-net fishermen not shared by others. The owners are generally men having considerable capital and possessed of the ability to carry on a large business.

3. APPARATUS AND METHODS OF THE FISHERY.

NETS.—The pound-nets of the Great Lakes are of simple construction. Each consists of a leader, a heart-shaped pound, and a square bowl or pot. The length of the leader varies according to the situation of the net, from 30 to 85 rods, or from 500 to 1,400 feet, the average being about 50 rods. The size of the mesh is usually 6 inches, but in some localities is reduced to $4\frac{1}{2}$ inches, and in others increased to 8 inches. At the east end of Lake Ontario, the size of mesh in leader, heart, and bowl is uniformly only 2 inches. The mesh of the heart is usually 5 inches, but varies from 3 to 7 inches in a few instances. The bowl or pot is generally about 30 feet square. In the largest nets, however, it is occasionally 40 feet square, while in the smaller ones 28 feet is a very common size. In Lake Ontario the pounds are smaller and the bowl is only 20 feet square. The mesh varies in size from 2 to 4 inches, the average being about 3 inches. In depth the nets vary very greatly, making it difficult to form an average. The widest differences are found among the nets in Green Bay. Some are set in a single fathom of water, while others are from 40 to 65 feet deep. The great Saint Martin's Island pound, already noted, which is 97 feet deep, may also be mentioned in this connection. The average value of the nets is about \$350.

Besides the ordinary pound-nets there are others, known as "baby" pounds, employed in some localities.

BOATS.—Many different shapes and sizes of boats, from small skiffs to steam-tugs, are employed in the pound fishery. There is one, however, universally known as the "pound-net" boat, which is in use in greater numbers than any other. Those employed on the west shore of Green Bay may be regarded as typical, and we will therefore describe one of them.

The Green Bay "pound-net" boats are large, flat-bottomed, and broad of beam. Their average length is about 28 feet, their breadth of beam 9 feet, and their depth about 42 inches. They will carry from 60 to 80 half-barrels of fish, a safe load being 70 half-barrels, or about 10,500 pounds. They are usually sloop-rigged and carry long, heavy masts. They are constructed of rough boards, and commonly built by the fishermen. On each side of the center-board there is usually a covered bin.

These boats are moderately fast sailers, are very safe, and can run in 6 inches of water. When the nets are to be lifted they are taken into the bowl.

Various modifications are made in the shape and rigging of the pound-net boats in other localities. On the east shore of Green Bay they have no masts, being propelled entirely by oars. On the west shore of Lake Michigan, in the vicinity of Two Rivers, some have but one mast and a gaff-sail, while others have two masts. They are also somewhat better built than those in use in Green Bay, and are employed only in lifting the nets or when driving the stakes. Between Two Rivers and Port Washington again the boats are without masts. In the vicinity of Grand and Little Traverse Bays, on the east shore of Lake Michigan, some have masts and are rigged like Mackinaw boats, while others, particularly in Grand Traverse Bay, are without masts. The same obtains in the Straits of Mackinaw. In Lake Huron most of the boats are schooner rigged. At the west end of Lake Erie they are commonly used in transporting the fish. At Port Clinton, Sandusky, and Huron the boats are of fine model and large, and generally carry two masts. Many of them are 30 feet long and have a breadth of 10 feet, and will carry from 7 to 10 tons. The masts are from 35 to 40 feet high. At Rondeau Bay the boats have two masts and are furnished with a gaff-topsail, but in the same sheet as the main sails. No jibs are employed. The Painesville and Willoughby boats are among the best on the lakes. They vary in length from 28 to 34 feet, and are 4 feet deep. They carry two masts.

The average value of the "pound-net" boats, at least those having masts and sails, is about \$200.

Many Mackinaw boats are also employed in the pound-net fishery, particularly at Marquette, Lake Superior, and at Two Rivers, on the west shore of Lake Michigan. They are better adapted for cruising than the "pound-net" boats. Regarding the model and peculiarities of this boat, Milner says: * "The famous 'Mackinaw' of the lakes has bow and stern sharp, a great deal of sheer, the greatest beam forward of amidships, and tapers with little curve to the stern. She is either schooner rig, or with a lug-sail forward, is fairly fast, the greatest surf-boat known, and with an experienced boatman will ride out any storm, or, if necessary, beach with greater safety than any other boat. She is comparatively dry, and her sharp stern prevents the shipment of water aft when running with the sea. They have been longer and more extensively used on the upper lakes than any other boats, and with less loss of life or accident. The objection to the more general use of the Mackinaw is that her narrowness aft affords too little room for storage."

At Waukegan scows about 22 feet in length and 8 feet in breadth are employed. They carry 6 tons and are worth only about \$60. A small boat, known as the "anchor" boat, is also used here in drawing the stakes and removing the fish.

Steam tugs are employed in the vicinity of the Straits of Mackinaw, at Escanaba, Green Bay, and in several fisheries on the west shore of Lake Michigan and the Beaver Islands, in connection with the off-shore nets.

* MILNER: *The Fisheries of the Great Lakes*. Report U. S. Commissioner Fish and Fisheries, Part II, 1874; Appendix A, pp. 13-14.

The firm of Grosse Brothers, of Little Suanico, Green Bay, employ two steam yachts late in the season in connection with their off-shore fisheries.

In the Lake Erie fisheries row-boats are employed in calm weather in place of the larger "pound-net" boats.

"Hayward" and "Huron" boats are also used in the pound-net fishery in some localities.

PILE-DRIVERS AND STAKE-LIFTERS.—In setting the pound-net stakes, pile-drivers, worked by steam or by hand, are employed in all the larger fisheries. The driver commonly used consists of a strongly-built raft carrying two uprights, from 10 to 25 feet in height, at one end, between which a block of wood, faced with iron and weighing about 150 pounds, works upward and downward. This weight or hammer is attached to a rope and suspended by means of a patent double block. When in operation the pile-driver is anchored at the four corners.

Driving stakes is considered the hardest work connected with the pound fishery. Under the most favorable circumstances, the weather being calm and the bottom clayey, four men can drive about twenty stakes in a single day. The stakes are driven into the bottom from 3 to 10 feet, according to their length and the character of the bottom.

On the west shore of Lake Michigan, in the vicinity of Two Rivers, the pile-drivers are built more substantially than in some other localities. On account of the frequent storms and heavy seas, they are not mounted on rafts, but on two pound-boats lashed together.

In removing the nets a sort of scow, about 30 feet long and 12 feet wide, is sometimes employed. It has a slit, about 2 feet wide and from 4 to 6 feet long, cut in the bow. When in operation the scow is run on to the stake, the latter passing to the end of the slit, where, by means of a low, stationary windlass, it is easily removed. Such scows are owned only by the wealthier firms, and are borrowed or hired by their neighbors.

METHOD OF FISHING.—The length of the fishing season varies largely in different parts of the lakes. In the upper lakes the season opens about the middle of May or the first of June, and closes ordinarily about the middle of September. At the west end of Lake Superior, however, some nets are removed in August, from the more exposed points, while at the Magdalen Islands they are allowed to remain until ice forms. In Green Bay some nets are removed in July and reset in October.

In Saginaw Bay, Lake Huron, and also to a greater extent in the river, pounds are allowed to freeze into the ice in fall, and are not removed until it breaks up in spring. A channel 2 feet wide is cut over the sides of the bowl, and the large cake of ice loosened is moved to one side when the fish are to be removed.

The season in Lake Erie opens about the middle of March or the first of April and closes in June. The nets are reset in fall for about two or three weeks during the latter part of September and the first of October, or until the weather becomes too stormy for fishing. In Lake Ontario the ordinary season is from June to October.

At the Green Bay fisheries, and indeed in nearly all localities, the nets are visited daily during the height of the season, if the weather permits. During summer, however, the fish are removed only once in three days. The fishermen go out early in the morning as soon as it is light. In the vicinity of Bronhelm Bay, Lake Erie, the nets are usually visited in the afternoon.

Three men are generally employed to work the nets, except in very heavy weather or when fish become unusually abundant, when the number is increased to four or five or even to seven.

In transporting the catch to market from the more remote fisheries, schooners are commonly employed. The boats of the dealers at Green Bay City and other towns on the bay cruise along the north shore and among the islands, and collect whatever supplies of fish the pound fishermen

may have for sale, and in return furnish them with the supplies of which they stand in need. Near the larger towns, both in Green Bay and elsewhere, the fish are brought in directly from the pounds in the pound-boats, and are generally shipped inland or to other distributing points by rail. At one fishery at Lake Erie, however, a steam tug is employed to tow the pound boats to and from the nets; this, however, is unusual.

FINANCIAL ARRANGEMENTS.—The nature of the apparatus used in pound-fishing and the outlay which it involves make it impossible for men of limited means to engage in it. The industry is therefore largely carried on by men who possess considerable capital and capacity for prosecuting a business of some magnitude. Fishermen are ordinarily hired, and the owners, especially of the larger fisheries, such as those on Lake Erie, although they may have a complete knowledge of the methods employed, rarely engage personally in fishing.

2.—THE GILL-NET FISHERY.

I. FISHING-GROUNDS.

The gill-net fishery is second only to the pound fishery in importance. It is carried on extensively, moreover, in some localities where pound-fishing is impossible on account of the nature of the coast, and during the winter season, when the pounds are not in operation, and becomes, therefore, in these places and at this time, of paramount concern.

The gill net grounds have already been described at length in the chapter devoted to fishing-grounds in general, and only their location will be given here.

The principal gill-net grounds of Lake Superior extend from the national boundary on the northwest shore to Grand Island, Michigan, on the south shore. East of Grand Island the only important grounds are located at Whitefish Point, and these are but a few miles in extent.

In the vicinity of the Straits of Mackinaw we find many grounds of greater or less extent and productiveness. The most easterly extends 16 or 17 miles southeast of Strong Island to Spectacle Reef. Stations of minor importance are located between Mackinac and Round Islands, west of Round Island, and north of Point Saint Ignace. Extensive grounds occupy the shore west of the Straits as far as Seul Choix Point.

Gull Island is surrounded by gill-net grounds, but it is owned by private parties and the fisheries are prosecuted only by them.

The only additional fishery on the north shore of Lake Michigan is at Point aux Basques.

The entire entrance of Green Bay, north of Washington Island, is occupied by gill net grounds. There are four principal ones, known as the "Sag Bay," "Saint Martin's Island," "Summer Island," and "Washington Island" grounds. The two former extend into Lake Michigan, the last two westward into Green Bay. The "Washington Island" ground far exceeds the others in size, but all are important and productive.

On the west shore of Green Bay we find but two localities where summer gill-netting is carried on. These are beyond the pound stations opposite Indian Village and Bark River. In winter, however, fishing is prosecuted all along the shore, but not extensively north of Menominee.

Limited grounds are situated in the vicinity of Green Bay City.

On the east shore of the bay a small amount of fishing is done in the vicinity of Chambers Island and at Sturgeon Bay.

On the west shore of Lake Michigan there are numerous grounds of varying importance. The most northerly is at the Cana Islands, a little to the north of Jacksonport. The next lies off Clay Banks, and a small one 4 miles farther south. None of these grounds are of great extent. Southward, however, stretching from Two Creeks to Manitowoc, is a large and much-frequented ground, and one of the most important on the west side of the lake. Other grounds occur farther south, beginning at Sheboygan and extending with occasional interruptions to within a few miles of the boundary line between Wisconsin and Illinois. The principal fishing is in the vicinity of Sheboygan, Milwaukee, Racine, and Kenosha.

Gill-nets are employed along almost the entire eastern shore of Lake Michigan, north of Michigan City, as far as Manistee, in Grand Traverse Bay, and from its entrance northward to the Straits of Mackinaw.

In Lake Huron the most noteworthy grounds extend northward from the entrance of Thunder Bay, and southward from the entrance of Saginaw Bay.

At the west end of Lake Erie there are two grounds of considerable importance, one opposite the village of Toussaint, and the other around Gull Island Shoal, east of the Bass Islands.

Eastward we find grounds of very great size, extending several miles in either direction from Erie, and far out into the lake. Others of nearly as great proportions lie off Ashtabula and Conneaut.

The gill-net fishery in Lake Ontario is of less importance than that carried on in the other lakes. Grounds of limited extent exist in the vicinity of Poultneyville, Fair Haven, Oak Orchard, Wilson, Braddock's Bay, Charlotte, and Colise Landing, at the east end of the lake.

2. FISHERMEN.

On account of the number of steam-tugs employed in the gill-net fishery, many men, such as engineers, pilots, and firemen, who are not strictly fishermen, are connected with it. Furthermore, participation in the gill-net fishery does not imply the possession of any considerable amount of capital, as in the pound fishery, and hence we find all classes of fishermen employed. Some own hundreds of nets and employ steam-tugs and other large craft; others possess only a small boat or two, and fish with scarcely more than a score of nets. As a class, the gill-net fishermen are, perhaps, the most venturesome men, and at the same time the most skillful seamen, of the lakes. In certain regions they set their nets near the shore, but in other localities they invariably fish at a distance of 20 or 30 miles from land, and frequently encounter storms, which, were it not for their skill in managing their boats, would inevitably overwhelm them. As we have already stated, however, disasters are comparatively rare.

3. APPARATUS AND METHODS OF THE FISHERY.

BOATS.—A great variety of boats are employed by gill-net fishermen, most important among which are the steam-tugs, and the boats known as the Mackinaw, the Huron or "square stern," the Hayward, the Carver, the Wheeler, and one called the Clinker, the name being descriptive of the manner in which it is built. Norwegian sloops are also used in some localities.

The Mackinaw boat has already been described in the chapter on the pound-net fishery.

The steam-tugs used in the fisheries are from 5 to 30 tons burden, modeled after the ordinary towing tug. They cost from \$2,000 to \$10,000 each. In the forward hold bins for storing fish and ice-boxes are built. The after third of the boat is housed over and used as a place of storage for the net-boxes. Rollers are arranged at the bow, over which the nets are hauled in. Tugs are used only with "heavy rigs," that is, with a large number of nets, and principally in off-shore fisheries.

The Huron or "square-stern" boat is employed principally in Lake Michigan. A few are also to be found at the east end of Lake Ontario. "It is the ordinary model of a schooner-rigged sail-boat, with less sheer than the Mackinaw, but with plenty of room for net, fish, or half-barrels. The better models are faster than than the Mackinaws. They are generally from 30 to 40 feet in length. In most of the regions where they are employed the fishing is done much farther from shore than in the 'light-rig' localities. An inquiry into the history of the loss of life and accidents among the fishermen of Lake Michigan indicates that these boats had suffered the most, partly, no doubt, because of their longer runs out from shore."*

The Huron is used in preference to the Mackinaw when it is desirable to carry a heavy load, the sharp stern of the latter not affording sufficient space for storage.

The Hayward boat, named after the maker, is a schooner-rigged craft, usually capable of carrying a five-ton load. Its average length is 32 feet, and its breadth of beam 8 or 9 feet. They are used principally on the east shore of Lake Michigan. A number were formerly owned at Thunder Bay, Lake Huron, but they have been superseded, with one exception, by Mackinaw boats.

The Carver boat, used exclusively at the east end of Lake Erie, is similar to the last described in shape and rig. They are from 24 to 30 feet in length, with from 6 to 9 feet breadth of beam. They carry two masts, and are schooner-rigged, generally with gaff top-sail, and some with jibs. The latter, however, are going out of use. The boats are worth from \$200 to \$225.

The Wheeler boat, used only in the vicinity of the head of Lake Huron, does not differ materially from the last two, except that it is clinker-built. It is usually larger and more valuable than the Carver, being generally 32 feet in length and costing \$375.

"The Norwegian is a huge unwieldy thing, with flaring bows, great sheer, high sides, and is sloop-rigged. She is absolutely dry in all weathers, and though perfectly safe, and with ample room, is only used by the Scandinavian fishermen, most other fishermen objecting to her slowness and the great labor of rowing in time of a calm. These boats are in use in but very few localities. They are from 35 to 40 feet in length."* They carry about 200 yards of canvas. Some owners, perhaps rather rashly, claim that they are the fastest as well as the driest boats. They assert that they can easily pass the lake schooners. They are worth about \$300. Grand Haven is the principal place where they are employed. One was used at Racine, Lake Michigan, in 1878, but none in 1879.

NETS.—The gill-net of the lakes is usually about 40 to 45 fathoms in length, and from 13 to 18 meshes deep, the size of the mesh being from 4½ to 5½ inches, stretch measurement. The average length is exceeded in some localities, however, being 65 fathoms at Bayfield, Lake Superior; about 75 fathoms in certain stations at the east end of Lake Erie; 90 fathoms at Two Rivers, Lake Michigan, and 100 fathoms in the Beaver Island region. At Saint Joseph and South Haven, the length is usually but 30 fathoms. Nets carried by the tugs are generally longer than those set from boats.

At many of the Lake Superior fisheries the nets are counted by the "box," each box containing from 450 to 500 yards in one piece. At certain fishing stations on Lake Michigan also the box is taken as the unit of measure, but the number of nets in a box varies somewhat with the locality.

The size of the mesh does not vary very much in the upper lakes, where the catch consists almost entirely of whitefish and trout, and the extremes of size employed there are about 3½ and 6 inches. In most localities different sizes are employed at different seasons—the smaller in the spring and summer, the larger in fall. In Lake Erie the mesh of the whitefish nets varies from

* MILNER: Report U. S. Commissioner of Fish and Fisheries, Pt. II, 1874; Appendix A, p. 14.

4½ to 4¾ inches, while in the pike-nets it is smaller, varying from ¾ to 3¾. At Sackett's Harbor, Lake Ontario, the size of mesh employed for different species is as follows: For ciscoes, 2 inches; pike and bass, 3 to 4 inches; whitefish, 4½ to 5 inches; trout, 6 inches; sturgeon, 8 to 10 inches.

Some nets employed in Green Bay are only 4½ feet deep, and some in Thunder Bay, Lake Huron, 5 feet.

In certain localities the nets are buoyed by wooden floats and weighted with stones, while in other cork floats and lead weights are used.

Many nets were formerly knit by the fishermen's wives and daughters, but now they are usually made by machinery and purchased from dealers in the larger cities. At Two Rivers, Wis., however, a majority of the women and children spend most of the winter in making nets for local supply and for shipment to other fishing towns on Lake Michigan. Nets made of cotton twine are worth about \$5.50, but linen nets are valued at \$2 more apiece. Cotton nets are generally employed.

METHODS OF THE FISHERY.—There is no season of the year in which gill-nets are not in use in some part of the lakes. Summer is the least profitable season, and in some localities fishing is suspended altogether during the warmest weather, which occurs usually in July. With this exception the regular season lasts during "open-water" time, that is, while there is no ice in the lakes. Of course, the length of this season varies very considerably in different years and in different parts of the lakes in the same year. In the upper lakes it opens usually in April and closes in November, while in the lower lakes fishing begins in March and ends in December. Winter fishing lasts while the ice is firm.

"Open-water" fishing is prosecuted on all the grounds mentioned in the early part of this chapter, while winter fishing is confined principally to Lake Michigan, and is usually carried on at the outer limit of the warm-weather grounds, or even farther from shore.

Gill-net fishing with steam-tugs is essentially different from boat fishing. The tugs, like the large sail boats, carry "heavy rigs" or many nets in contradistinction to the "light rigs" or smaller number of nets carried by small boats. Tugs usually carry from two hundred and fifty to four hundred nets, disposed in gangs of about forty nets each. They are set from the stern of the boat while it steams slowly along, and are taken in over the bows, where rollers are arranged to lessen the hardship. Nets are invariably anchored, but are frequently moved about considerably by the currents.

Some of the larger boats, as already stated, carry "heavy rigs," or from seventy-five to one hundred and eighty nets, but some of the smaller ones use but a score or two. The latter carry two or three men. The Lake Erie tugs carry about one hundred and twenty-five nets and keep three gangs of twenty-five nets each in the water at one time. The fishermen of Grand Haven always own four gangs of nets. When they go out to remove the fish, they carry a dry gang with them, which they set in place of the one "lifted;" another is left to dry in the fish-house, and the fourth does service when it is impossible to dry that recently "lifted."

The methods of the winter fishery are quite different. In Green Bay each fisherman owns from twenty-five to one hundred nets, which are set in gangs usually across the bay, and in deep water, 60 fathoms being a favorite depth. The men have little shanties with about 7 by 12 feet floor-space and 6 feet high, built light and covered with canvas and mounted on iron-shod raners.

In working the nets holes are cut in the ice at intervals of 100 feet. A pole, with a line attached and long enough to reach from one aperture to the next, is thrust under the ice. A net is fastened to the line and the latter is then hauled in at the second hole until all the net has passed under water at the first hole. This manœuvre is repeated until all the nets are set. In "lifting" the

nets the shanty is drawn over a hole and the fish removed from the nets on either side. Two men can manage about thirty nets. Similar methods are employed at the Saginaw Bay fisheries in Lake Huron, which are, perhaps, the most extensive winter gill-net fisheries on the lakes.

While the water is cold fish are removed from the nets about once in three days, but in warmer weather, when there is danger of their spoiling, they are removed every other day, or even daily. Fish caught in gill-nets do not ordinarily bring as high a price as those which are taken in pounds, for the reason that the former, if allowed to remain in the gill-nets for any considerable length of time, die, and are liable to decay, while the latter are sure to reach market in better condition.

4. PREPARATION OF THE FISH.

There are no peculiarities in the methods of preparing gill-net fish for market. A large proportion, however, are sold fresh, because in the more important gill-net fisheries, especially those carried on in the vicinity of, or in close communication with, the markets, only large fish are taken, which are too valuable to salt. Schooners are employed to a considerable extent by dealers to cruise among the Beaver Islands and along isolated portions of the shore to collect the products of the fisheries.

5. FINANCIAL ARRANGEMENTS.

In Section IV, devoted to fishermen, we have already alluded to the arrangements which hitherto existed extensively everywhere on the lakes, but which brought disaster to so many fishermen. It was usual for dealers to advance full outfits, including provisions, to the fishermen, and to look for pay in the fish which were to be caught. Although this system proved fairly successful in years of abundance of fish, it proved utterly ruinous to both fishermen and outfitters in years of scarcity. It found its most complete development in Green Bay, where the financial condition became at length critical. In 1876 one dealer alone at Green Bay supplied the fishermen, many of whom came from a long distance, with provisions to the amount of \$25,000, the greater part of which amount remains still unpaid. At present, however, only a few reliable and well-known men are allowed credit, and others are obliged to pay at once for the nets and other necessaries which they receive.

In the large fisheries, in which steam-tugs are employed, the capitalists keep the apparatus under their own control and hire a sufficient number of fishermen to carry on the industry.

3.—THE SEINE FISHERY; MINOR FISHERIES.

1. THE METHODS AND EXTENT OF THE SEINE FISHERY.

The seine fishery of the Great Lakes has probably altered more in its general character than any other branch prosecuted. In the early days, when the fisheries were carried on in this region to but a limited extent, seine fishing was of the highest importance, but with the introduction of gill-nets and pounds, which enabled the fishermen to take much larger quantities of fish than it was possible to do by means of seines, the latter gradually disappeared; in fact, in a number of localities the seines were cut to pieces and used in the manufacture of pound-nets. At the present time the principal seine fishery of the lakes is that carried on in the Detroit River. This is very

extensive and important. The seines used here are large and are hauled ashore by means of horse-power, so that a large amount of capital is necessary to carry on the fishery. Seining, however, is also prosecuted to a greater or less extent at Marquette, Mich.; Whitefish Point, Lake Superior; Escanaba and Oconto, Green Bay; Milwaukee, Racine, and at several points at the east end of Lake Ontario.

As has been intimated, the seines used in the Detroit River are large, averaging not less than 60 fathoms in length and 30 feet in depth, with a mesh varying from $1\frac{1}{2}$ to 2 inches. In most of the other localities mentioned the seines are small affairs, worth usually not more than \$20, and but few fish are taken in them. The ones in use at Escanaba, however, are about 70 rods in length, and are valued at \$200 each. At Racine the seines are 100 fathoms long, the mesh being about 3 inches. About Port Ontario, at the east end of Lake Ontario, there are several seines in use, which are 200 rods long, and from 5 to 7 feet deep, the mesh varying from 3 to $3\frac{1}{2}$ inches in different parts of the same net. All the seines are set from land, and, so far as could be ascertained, except at Detroit River, are drawn in by hand. The larger ones which are managed in this manner require at least eight men.

The principal season in which seine-fishing is carried on is the early summer, usually from June to the middle of July. In some localities, however, the seines are used both at this time and also in the fall.

As might be expected, a great variety of fish is taken in these seines, different fish being more or less abundant in different localities. The principal marketable species which are taken at Escanaba are pike, sturgeon, herring, and bass. In the Detroit River the catch consists mainly of whitefish and pike, known in this locality as "yellow pickerel." Large runs of herring appear frequently in the spring before the arrival of the whitefish, and some of the managers use seines with small meshes for taking quantities of this fish. At Port Ontario the catch is almost entirely of whitefish; a few sturgeon, suckers, and mullet, together with other varieties of minor value, are also taken.

There are no peculiarities in the manner of working the seines which it is necessary to mention, except, perhaps, some which obtain in the Detroit River. The seine-fishery is by far the most important branch prosecuted in the river, and the seines, with the exception of a few fykes and "baby-pounds," are the only form of apparatus employed. At each of the fishing stations is established a building for the accommodation of the men engaged in fishing and also for the storage of the fish, and near-by is a pen in which the fish may be kept until such time as they may be sent to market. These pens are constructed of planks and vary in size from a few feet to several acres. The boats employed in connection with this fishery are simple row-boats, 25 or 30 feet long, carrying eight men. In hauling in the seine two windlasses, moved by horses, are employed, to each of which is attached one end of the leading-line of the seine. The net and the windlass are so disposed that when the former is hauled in it reaches a spot near the opening of the pen, and the fish are very-easily transferred from it to the pound in which they are to be kept. Usually about sixteen hauls are made in each twenty-four hours, two gangs of men being employed.

No peculiarities exist in the method of preparing seine-fish for market, except, perhaps, that a large proportion of them are sold fresh. They do not, as a rule, bring a higher price than fish taken by other means.

2. SPEARING AND HOOK-AND-LINE FISHING.

Besides the three principal modes of fishing—pound-netting, gill-netting, and seining—which have been treated of somewhat at length in the previous parts of this chapter, there are several other methods, which, although not of great importance, are prosecuted to a considerable extent in certain localities. Among them we may mention spearing, hook-and-line fishing, grappling, fyke-net fishing, and dip-net or "scap"-net fishing.

SPEARING.—The principal locality at which spear-fishing is carried on is Saginaw Bay, where it is prosecuted by the ordinary fishermen.

In Saginaw Bay spearing is carried on only in winter. The grounds vary in proportion with the advance of the season and the thickness of the ice. Usually, however, few fishermen fish outside an imaginary line drawn from Shebawaing, on the east shore of the bay, to Point Aux Gres, on the west shore.

During a favorable winter a village of considerable size springs up on the ice, and all manner of supplies are brought out to the fishermen by the traders from the neighboring shore. So many fishermen congregate in the course of the season that it has been found profitable to carry out billiard tables for their amusement during the long winter evenings.

A writer in the *Provincetown Advocate* of February 28, 1877, gives the following account of the appearance of this singular village at that date:

"The fishermen on Saginaw Bay, Lake Huron, have erected a good sized town of shanties far out on the ice. The dwellings are of thin wood, lined with thick building paper, and are placed on runners so as to be moved from place to place. The slab city also boasts a hotel. The shanties dot the surface of the bay in all directions. The number is now over 300 and about 30 are being put up daily. The average number of occupants in each shanty is three men or boys, making not less than 1,000 persons already living on the ice. There probably will be twice that number during February, and they can remain there in safety until the middle of March."

The number of men engaged during the season of 1879 was about 400, a much smaller number than formerly.

The apparatus employed, in addition to the shanties already described, which stand in the same relation to the fisheries as the boats used in summer, consists of spears and lure-fishes. The spears are of the ordinary pattern, size, and weight. The lure-fishes are small blocks of wood, shaped like a fish, weighted on the under side by a small piece of metal, and furnished with metal fins and eyes. A cord is fastened to them and they are let down into the water, but not to a great depth, so that they may be watched readily by the fisherman. The fish mistake the decoy for their natural prey and attempt to seize it, bringing themselves within range of the fatal spear of the fisherman. The value of all the apparatus employed in 1879, including shanties, spears, lure-fishes, &c., was estimated at \$4,500.

The daily catch of each fisherman is not less than 25 pounds. This amount, however, is small, compared with the yield of other years. Instances were given by the fishermen of the capture of from 400 to 600 pounds of fish by one man in a day. The fishery has declined very much within the last half-decade.

HAND-LINE AND TRAWL FISHING.—Angling for pleasure is carried on to a large extent with hand-lines in all the lakes during summer, but as the supply of fish obtained in this way varies extremely in amount and rarely enters into commerce, no account of it can be taken in the statistical tables. The trawl, however, is employed in many localities as a means of capture, for purely commercial ends. It is so employed to a greater or less extent at Racine, Chicago, Michigan City, Saugatuck, Toledo, Port Clinton, Toussaint, Sandusky, Vermillion, and a few smaller places.

The trawl, ordinarily called a "trot-line," "ground-line," "long-line," or "hook-rig," is very similar to the trawl-line used on the Atlantic coast. The form employed at Vermillion consists of a ninety-thread line, about 3 miles long, to which hooks attached to gangings 2 feet long are fastened at intervals of 16 or 18 feet. About 20 pounds of line are required for each mile. The line is anchored to the bottom, and has its position marked by a buoy at each end. Each trot-line is worth from \$20 to \$35.

At Sandusky and Vermillion the product of the trawl-fishery consists of catfish exclusively, but at most of the other places mentioned a variety of kinds are taken, among which trout and sturgeon are the most important. For the capture of catfish a variety of baits are used. At Sandusky all kinds of offal are employed, but at Vermillion herring is the principal bait, although large quantities of grasshoppers are used in summer, and oftentimes blackbirds. At Racine and at Chicago, however, where several species of fish are taken, minnows and "shiners" furnish the principal bait.

The depth at which the fishery is carried on varies very considerably. The cat-fishermen usually fish in shallow water from 35 to 50 feet deep, although in many cases at a considerable distance from shore. At Chicago, where a number of species are taken, the boats "run out 15 or 20 miles and sometimes farther. Setting their lines, which contain from five hundred to a thousand hooks each, baited with minnows before leaving shore, they continue on and run into Michigan City, and remain overnight. Starting early the next morning they take up their lines and arrive in Chicago during the day."*

The season for trawl-fishing usually lasts from March to October, but at Racine and one or two other localities fishing is prosecuted during the winter. The cat-fishermen expect to take about \$3 worth of that fish in a day. The season of 1879 was an unusually profitable one for them in many localities, and the business is rapidly increasing in importance.

At Toledo, and probably at some other points, when quantities of catfish are taken too great to be disposed of profitably at once, they are kept in live-boxes until the demand increases. Of late years the fishermen have salted a large part of their catch and have disposed of it in the city to wholesale dealers and grocers, or have shipped them to various neighboring inland towns. This custom prevails also in other localities. The majority of the fish taken at Saugatuck by hook-fishermen are consumed in the immediate vicinity.

Ordinary hooks and lines are used at Buffalo in winter for the capture of pike and sturgeon. The fishermen are mainly sailors. In some winters as many as three hundred and fifty people are engaged in this fishery, but no ice formed in 1879, and consequently it proved a failure.

3. FISHING WITH GRAPPLINGS, FYKE-NETS, AND DIP-NETS.

GRAPPLING.—At Buffalo and in one or two other localities considerable quantities of sturgeon are taken by means of a three-pronged grappling-hook. The hook is dragged over the bottom by fishermen in boats, and the fish are impaled on its sharp prongs. All nets are prohibited at Buffalo, and consequently a large proportion of the sturgeon captured here are taken with these hooks.

FYKE-NET FISHING.—Fykes are used in many localities. Many of them are of small size and are not worth more than from \$1.50 to \$5.

At Green Bay City more fykes are used than elsewhere on Lake Michigan, at least one hundred and fifty of them being employed. At Huron the fykes in use are about 4 feet in diameter, with wings 6 rods in length. The catch here consists of bull-heads, perch, grass-pike, and black bass.

* MILNER: Rept. U. S. Fish Commission, Pt. 2, pp. 785, 796.

The most valuable fykes, however, are those used in Saginaw Bay. About one hundred are employed here, worth \$10 each.

A considerable number of these nets are employed at the east end of Lake Ontario, but no particulars regarding them were obtained.

DIP-NET FISHING.—Besides the dip-nets used in taking fish out of pounds and for other similar purposes, there are some which are used as means of capture. At De Pere, near Green Bay City, about one hundred large dip-nets, from 5 to 7 feet square, and having a mesh of 3 inches, are employed. They are used by the farmers and others who live along the river for catching suckers, moon-eyes, and other non-commercial species, which they use as manure and as bait for catfish.

At Sault de Ste. Marie dip-nets are employed by the Indians in catching fish in the rapids. One Indian sits at the stern of the canoe to steer while another stands on the alert at the bow, dip-net in hand, and scoops in any fish which may be seen in the vicinity of the boat. Frequently several hundred pounds are taken in this way by one canoe in a day.

4. STATISTICS OF FISHERIES OF GREAT LAKES.

The fisheries of the Great Lakes in 1880 employed 5,050 fishermen and an invested capital amounting to \$1,345,975. Included in the apparatus were 1,500 pound-nets, 44,544 gill-nets, 148 seines, and 1,656 vessels and boats. The fishery product was valued at \$1,784,050, and aggregated 68,742,000 pounds of whitefish, trout, herring, sturgeon, and other species.

The full details of the extent of these fisheries in the several lakes will be found in another section of this report, and also in the Census volume on the Fisheries of the United States.