

can apply to him, as I have supplied him with all that he has got from that river. He took some spawn from them this season.

I omitted to state that the "dolly vardens" are very destructive to other trout, or any kind of fish. They spawn in September and November. Their eggs are about one-half the size of those of the common trout. The fish are very difficult to obtain. They will live in a small place where the common trout would not. I have kept them in a pond, about 6 feet square, for a month, where the common trout would kill themselves in a short time. They appear to be more hardy. I have watched the salmon and the trout during their spawning more than any other man in this part of the country, as I have fished a great deal, and have been fishing longer than any one who takes any interest in the matter. I came here in 1855; I have caught hundreds and probably thousands.

J. B. CAMPBELL.

[NOTE.—The species referred to in Mr. Campbell's descriptions are the following: "Rifle Pike," *Gila* sp.; "Whitefish," *Ptychochilus oregonensis* (Rich.) Ag.; "Dolly Varden," *Salvelinus malma* (Walb.) Jor. & Gilb.; "Sucker," *Catostomus occidentalis* Ayres; "Red-sided Trout," *Salmo irideus* Gibbons; "Bull Head," *Uranidea* sp.—EDITOR.]

#### THE ORIGIN OF THE MENHADEN INDUSTRY.

By CAPT. E. T. DEBLOIS.

[NOTE.—In the following article, Captain DeBlois has thrown new light upon several long mooted questions, especially the date of the discovery of the value of menhaden oil, the origin of menhaden oil manufacture; the application of pressure in the manufacture of fish oil, and the invention of the purse seine, besides placing upon record an important series of observations upon the growth of the menhaden fishery within the past half century.—G. BROWN GOODE.]

In 1811 two men, one by the name of Christopher Barker, and the other John Tallman, commenced the business of making oil out of menhaden fish, with the use of two iron pots, upon the shore, a few rods south of what was then called the Black Point wharf, near Portsmouth, R. I. They boiled the fish in the pots or kettles, and bailed the fish and contents into hogsheads, putting on top the fish in the hogsheads pieces of board with stones on top, to press the fish down so that the oil would come on top, and also in order that the oil could be skimmed off. A man by the name of John Hunt was the oil man who skimmed off the oil, and put it up in barrels for market. It was sent to New York to market by a house or people that were doing business in Newport, R. I., by the name of Munroe, who were in the West India trade.

Barker & Tallman, it seems, found the oil business to be profitable, for in 1814 they added two more pots to their business, and the same fall two other men commenced the same business, by the name of Munroe, very near Barker & Tallman's works. The business was carried on

only in the fall, as the fish were too poor in the summer. The notable September gales of 1815, which were so very destructive on the New England coast, destroyed the above works, and washed them some 60 feet up on the land, from where they were located.

It is thought that the business did not get started again until 1818. It seems that in 1824 Mr. Barker conceived a new idea of cooking fish, and put his ideas into practice, by building a box 5½ feet high and 6 feet wide, and 8 feet long, with a fire-place or furnace in or on one end, and a copper pipe running from the fire furnace through the middle of the box, by which all the smoke and fire had to pass through the box. He usually put 60 pounds of fish in the box at a time, covering the same with water; this was called the "Bit Barker Fish Oil Factory." It was built on skids, and was conveyed from place to place by his oxen, using it most of the time on his farm, which was a mile from the shore, drawing the fish from the shore with his oxen. By this method he saved the water, and put it on his land as well as the scrap, which made his farm produce very large crops.

The first factory that was built to cook fish by steam in wooden tanks, as far as I know, was built by John Tallman; the second in the year 1841 on M'Gay's Point, Portsmouth, R. I. It had eight wooden tanks, holding 60 barrels of fish, and a flue boiler. The boiler was fed by a force-pump worked by hand. The next year Mr. Tallman joined Mr. George Lambert, of East Cambridge, Mass., and built a factory at the mouth of Merrimac River, Mass., and soon after Mr. Daniel Wells got Mr. Tallman's plan of factory and built one on Shelter Island, near Greenport, N. Y.

Mr. Charles Tuthill, of Greenport, was the first to express fish, for which we are very much indebted to him, as well as many other improvements that have been used by him in the business. The first purse-seine that was made, so far as I know, was made by John Tallman the first, and Jonathan Brownell and Christopher Barker, in the year 1826. It was 284 meshes deep and 65 fathoms long. The purse weight was a 56-pound weight, and the blocks were the common single blocks, and they had to reeve the end of the purse-line through the blocks, before they put the purse-weight overboard. The first time the seine was set, there were fourteen men to help; they set around what they called a 500-barrel school of menhaden, and, while they were pursuing, the fish rushed against the twine so hard, that they twisted and snarled the twine around the purse line and weight to that extent, that the men could not gather the seine up, or get her into the boat again as they were, and, after they had worked six hours, and quarreled over the matter, they decided to tow or warp the seine ashore at high water, and, when the tide left the seine, they would be able to *unsnarl* it, which they did the next day. It was a number of days before they could muster courage to set her again, and, when they did, they set around a small school with better success.

The menhaden fisheries have been carried on here very extensively, catching them, before the oil factories were using many, expressly for bait and for the farmers, the farmers using them very freely, Mr. Abner Chase using, to my knowledge, 3,000 barrels a year some years (and his son has told me that his father used one year upwards of 4,000 barrels of menhaden fish) from 1849 to 1857. There were from 300 to 500 vessels a year after bait in Narragansett Bay, bank fishermen from New London, Conn., and mackerel and cod fishermen from Massachusetts and Maine, taking from 25 barrels to 150 barrels, some of them taking bait two or three times in a season, paying from 25 to 50 cents a barrel for them. There are not nearly as many vessels coming here now after bait, because they can get the bait at their own homes. Capt. Benjamin Tallman, of this place, formerly took the lead in the fishing business, at one time running four gangs, but, at present, the business is carried on more extensively in Tiverton, R. I., Joseph Church & Co. taking the lead. I commenced fishing in the year 1847 and fished with Capt. Nicholas Tallman, the most successful fisherman of his day. We fished twelve springs at Seaconnet Point, with traps and purse-seins, for every kind of fish that came along. It was my duty to be off on the water with a small boat with another man, and look down in the water around the trap, and to see if there were any fish that were likely to go in the trap. I observed that everything and all that came along in the spring always came from the southwest and went northeast invariably. The first fish that usually came along would be herring and shad, next tautog and flounders, and, in a few days, striped bass and sea-robins or wing-fish. About the same time scup and sea bass, squid, menhaden, and mackerel came, and every kind of fish full of spawn except menhaden. I have taken a fish out of the trap many a time and put it in the water, and headed it up the river, and, as quick as I let go of it, it would turn at once and go down the river northeast, satisfying me that the first run of fish, of every kind, belongs east of Rhode Island. I never knew of a round mackerel to be caught three days after horse mackerel made its first appearance. I have seen a great many horse mackerel and have caught a great many, but never saw any signs of any spawn in them. When menhaden fish first come, they seem to be about 6 inches to 12 inches or more apart, very thin, not in schools, always going east, and in about a week after their first appearance they come along in large schools. That body of fish would be four weeks or more going by Rhode Island. The next body of menhaden that came along were smaller fish and came very slow and worked in the rivers. Horse mackerel and sharks were with them. We usually left the Seaconnet Point about the 10th of June and went pursuing menhaden, and could always catch more than we could sell. In 1858 we had good fishing in the spring, but no menhaden in the summer, and, as there were a number of fishing vessels here waiting for bait, we persuaded them to go to New London, Conn. with us, which they did, and we found three schools

of menhaden off New London light, caught them, and baited the vessels, and that was all that we could find. From there we went to Greenport, L. I., and did not find any there, although we heard of the fishermen hauling some ashore up at Jamesport and River Head. That I think was the dryest season for my business that I ever saw. Since then, most of the time, there has been plenty of menhaden; although I think it will average about one year in five, since I commenced, that fish are very scarce. In talking with some of the old fishermen, they say by what they hear the menhaden are as plenty now as they were when they first went fishing. They say that they then had seasons when they were very scarce, and also when they were very plenty. The fishermen here are all satisfied that the menhaden spawn in Rhode Island waters, and the little menhaden that we see here are hatched in Narragansett Bay. I went to Maine to build a pogie factory, the first one that was ever built in Maine, in November, 1863, and had it in running order June 10, 1864. The people of South Bristol, Me. told me that I would not have any trouble catching all the pogies that I should want in John's Bay, that the shores and bays were full of them, and that they plagued and bothered them, while they were fishing for mackerel, so much that they carried stones in their boats to stone or drive them away, but I did not find them so. The fish were very scarce in 1864. I got only 4,000 barrels. I cruised off-shore 20 miles and hailed vessels. They reported that they had not seen any fish. The same year Capt. Albert Grey, of Tiverton, started with four boats and a full gang to fish in Maine. He sailed from Rhode Island to Mount Desert, Me., but did not see a school of menhaden to set at, and returned without wetting his seine. Up to that time there had not been a purse-seine set in the waters of Maine.\* Therefore, it is very evident that it was not the purse-seine that drove the pogies off the coast of Maine at that time. The first part of the fishing season of 1865 was not much better until the 4th of August. At that time a large body of very large and fat pogies came in from off-shore from the southeast. They were not in schools, but in one body. I fished between the islands of Damiscove and Monhegan. I, as well as my fishermen, thought that body of fish was eight miles wide, and it seemed to completely fill the space between those two islands, which is about ten miles. Capt. Washborn Clifford, of South Bristol, was freighting canned lobsters from the factory at Isle au Haut to Boston that season. He told me that the pogies seemed to be the whole length of the coast, and he did not run out of them until he got to Wood Island, a distance of one hundred miles. He said they made him think of a heavy shower of rain falling on the ocean; the ocean appeared to be alive with them. It may seem like a large story to tell,

\* This statement needs some slight modification. Though menhaden were scarce in Maine in 1864, many thousands of barrels were caught. Purse-seines were used in these waters by Gloucester fishermen in search of menhaden and mackerel as early as 1857.

but, knowing the captain and knowing that, where I was fishing, the fish were in one body of about ten miles square, I have every reason to believe *Captain Clifford's statement*.

I honestly believe if the fishermen of Maine had had the experience in using the purse-seine in 1865 they have now, they would have taken out of the ocean between one and two millions of dollars' worth of wealth in pogies that season. I caught that summer upwards of forty thousand dollars' worth with one purse-seine. That body of pogies left the 1st of October, and worked gradually to the southeast. Everybody must admit that that large body of fish have lived and passed away long before this, as far as we know, without the least benefit to mankind, and I also believe that while the present fishing law is in force it will be the means of depriving the fishermen of Maine from taking hundreds of thousands of dollars' worth of fish from the ocean, that are about to pass away without being brought into use. There are two schools or families of pogies that usually come on the coast of Maine. The first follows the coast of Virginia along the shores to Maine, generally going into the rivers and bays. They usually get there about the 1st of June. They are the same kind of menhaden that we catch in the waters west of Cape Cod. They resemble Figure 1 in the Report of 1876-'77. About the middle of July to the 1st of August (and sometimes later) we have a school of pogies come inshore from the ocean, from a southeast direction, and make their first appearance to the east of Monhegan Island. These fish are very large and fat; resemble Fig. 3 in the Report of 1876-'77. They work gradually to the west, sometimes as far as Wood Island. These fish are never found to have any spawn in them. They generally leave the coast of Maine about the 20th of September. After cruising about some two or three days after they leave, and finding no fish, we start at once for Provincetown, Mass., expecting to fall in with them there; but we always find the pogies, that we get there, with spawn in them about 3 inches long. It seems that they cannot be the pogies that left the coast of Maine, as we never find the large fat fish in Maine with any sign of spawn, and all the pogies we catch at Provincetown in the fall have spawn in them. My idea is that the large fat pogies strike off the coast of Maine in the fall and do not make the shore again, unless they make the Carolina shore (if they make any shore), and the menhaden that we have passing along the New England coast in the fall are the same ones that went east in the spring. They always have spawn in them when they return in the fall, and it is not an uncommon thing to find spawn in them in Maine.

There is one more subject to which attention should be directed: I fished in Gardner's Bay, New York, five years or seasons from the spring of 1859 to the fall of 1864. On August 17, 1862, a school of very large fat menhaden came into Gardner's Bay, which made 14 gallons of oil to the thousand of fish without expressing. The next season, the 18th of August, the same kind of fish came again, and since that Mr. G. W.

Miles and Mr. Henry E. Wells have told me, that the same kind of fish have made their appearance in Long Island Sound, making 18 gallons of oil to the thousand fish. This is much fatter than any that I ever knew in Maine.

PORTSMOUTH, R. I., *January 24, 1880.*

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**FISH CULTURE IN NEW ZEALAND.**

**By R. J. CREIGHTON.**

SAN FRANCISCO, CAL., *May 13, 1881.*

HON. PROFESSOR BAIRD, *Washington, D. C.:*

DEAR SIR: I have to apologize for not returning your circular inquiries relative to fish-culture sooner; but, as I was only personally interested in the colonial work of fish-culture, I was unable to do so satisfactorily.

I have, however, received some information from New Zealand by the last mail which may prove interesting to you.

Mr. J. C. Firth, of Auckland, president of the Acclimatization Society there, writes to me to state that "Salmon have been caught in Wairoa River, about ten miles south of Auckland City. They have also appeared in other rivers, notably the Thames, in isolated cases. [The Thames is a large navigable river about fifty miles south of Auckland.] I must confess to some disappointment," he adds, "in not seeing more salmon, and I can only account for the circumstance by supposing that one of our native fish, a most voracious fellow, the 'kawai,' has devoured the young fish on the banks. I am glad to be able to report that the 'whitefish' from Lake Michigan have been seen in considerable numbers in Rotorua, Tarawera, and Taupo Lakes."

In explanation I may say that the first salmon ova (about 30,000) reached Auckland in 1874 or 1875, I am not sure which. Of these a few were hatched out and placed in the Wairoa. At the close of 1876, I had the honor to open a correspondence with you on the subject of a further shipment of salmon ova through Cross & Co., San Francisco, and this and a third shipment were made, the ova being pretty widely distributed north and south. I have had a note from Mr. Farr, secretary of the Acclimatization Society, Christ Church, New Zealand, in which he states that a salmon had been caught in one of the Canterbury rivers, and similar reports have come from more southerly districts. Mr. Farr also reports that 30,000 young whitefish had been hatched out in the society's hatching-house, and placed in a mountain lake, and were doing well.

The whitefish deposited in the large lakes of Otago, in the south of New Zealand, have not showed themselves, but, as the conditions are favorable, I have no doubt they are doing well.