

NOTES ON THE MOVEMENTS, HABITS, AND CAPTURES OF MACKEREL FOR THE SEASON OF 1882.

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The mackerel fishery ranks among the most important of our great food-fisheries, and in some respects—especially that of international consequence—it takes precedence of all others. Nearly all of the claim made by the Canadian Government against the United States at Halifax, in 1877, was based upon the supposed advantage derived by American fishermen from having the privilege of catching mackerel in British waters. And for this concession our government paid \$5,500,000. In view of this fact, therefore, it seems desirable that some record should be kept of the most interesting and strongly-marked features of the mackerel fishery, especially of the movements and habits of the fish, so far as these can be ascertained. If this is done from year to year, we shall soon be in possession of much information on a subject concerning which somewhat indefinite ideas have prevailed in the past. With this object in view these notes are presented. They have been gathered from various sources, but chiefly from some of the most reliable and intelligent men engaged in the mackerel fishery, with whom I had an opportunity of conversing during my stay at Gloucester the past summer and autumn (1882).

The mackerel appeared at the usual time off the coast of the Middle States, and in about the same locality in which they have generally been found in early spring. The first fare of fresh mackerel for this season was brought to New York on April 1, by the schooner *Nellie N. Rowe*, which, according to Mr. W. A. Wilcox, secretary of the Boston Fish Bureau, had taken 50 barrels of large-sized fish, averaging 11 to 15 inches each in length. The first catches were made between the parallels of 36° and 39° north latitude, and the meridians of 72° and 75° west longitude.*

* The following list of the early catches of mackerel on the southern coast from 1878 to 1881, inclusive, taken from the History of the Mackerel Fishery, will show with much exactitude and clearness when and where these fish are first met with as they approach the coast in the spring:

EARLY CATCHES OF MACKEREL, 1878 TO 1881.

The earliest catches of the past three years are shown in the following notes:

EARLY CATCHES OF MACKEREL IN 1878.

March 30.—Schooner *Lillian*, of Noank, Conn., Captain Latham, off Chincoteague.

April 16.—Schooner *Sarah M. Jacobs*, of Gloucester, Capt. Solomon Jacobs, caught her first mackerel in latitude 36° 10' N., longitude 74° 45' W.

April 18.—Schooner *Alice*, of Swan's Island, Me., Capt. Hanson B. Joyce, master, caught her first mackerel 25 miles southeast from Cape May.

In connection with first catches of mackerel by the schooners off our southern coast, it may not be out of place to allude to the fact that many individuals of this species were found in the stomachs of cod taken off the New Jersey coast several weeks before the commencement of the mackerel seining season. Capt. F. M. Redmond, master of smack Josie Reeves, of New York, who for many years has been engaged in the winter cod fishery, says that nearly every spring, for the past six or seven years, he has found mackerel, both large and small, in the stomachs of cod two or three weeks before the capture of any mackerel by seiners. He states further that in the latter part of February, 1882, he found a great many mackerel inside the cod which he took 10 or 12 miles off Egg Harbor, N. J., in 12 to 15 fathoms of water. Nor, according to the same authority, was it an uncommon occurrence to find from 15 to 25 mackerel in the bottom of each dory, these fish having been thrown out by the cod with which the boats had been loaded. Captain Redmond also says that frequently menhaden are found in the stomachs of cod-fish several weeks before the former are seen in schools off the coast. In nearly every instance these expectorated fish, menhaden or mackerel, were in a perfectly fresh condition, which would indicate that they had been swallowed but a short time. Whether these mackerel had been eaten by the cod at some distance from the coast or on their regular feeding grounds, where the cod are caught, is a question which must be settled by future investigations. It seems only reasonable, however, to suppose, as above stated, that the mackerel had been swallowed but a short time, as otherwise they would, when thrown up, have been in a very decomposed state. We are, from these facts, led

April 25.—Schooner John Somes, of Swan's Island, Me., Capt. J. S. Staples, master, caught her first mackerel 50 miles southeast from Cape May.

EARLY CATCHES OF MACKEREL IN 1879.

April 12.—Schooner Sarah M. Jacobs, of Gloucester, caught first mackerel in latitude $36^{\circ} 35' N.$, longitude $74^{\circ} 50' W.$

April 13.—Schooner Augusta E. Herrick, of Swan's Island, Me., Capt. William Herrick, caught first mackerel (130 barrels) in latitude $37^{\circ} 37' N.$, longitude $74^{\circ} 23' W.$

April 13.—A few fish taken by schooner S. G. Wonsou, of Gloucester, 75 miles southeast from Cape Henlopen.

April 14.—Schooner Charles Haskell, of Gloucester, caught first mackerel in latitude $38^{\circ} 8' N.$, longitude $73^{\circ} 57' W.$

April 19.—Schooner Alice, of Swan's Island, Me., caught first mackerel (140 barrels) in latitude $37^{\circ} 50' N.$, longitude $74^{\circ} 3' W.$

EARLY CATCHES OF MACKEREL IN 1880.

April 1.—Schooner Edward E. Webster, of Gloucester, Capt. Solomon Jacobs, caught the first mackerel of the season in latitude $35^{\circ} 30' N.$, longitude $74^{\circ} 15' W.$

EARLY CATCHES OF MACKEREL IN 1881.

March 20.—Schooner Edward E. Webster, of Gloucester, caught the first fish of the season, and the earliest on record, in latitude $37^{\circ} 10' N.$, longitude $74^{\circ} 5' W.$ A second fare was caught by the same vessel on April 18, in latitude $38^{\circ} 38' N.$, longitude $74^{\circ} W.$

to infer that stragglers from the main body reach the coast several weeks in advance of the main schools, which are sought and captured by the seiners.

For a few days after the first appearance of the mackerel this season, there was nothing remarkable in their movements; but, as they passed towards the north, the principal body of the fish, according to Capt. Henry B. Thomas, of Gloucester, came much closer to the shore than usual, moving along the New Jersey coast in water averaging 15 to 25 fathoms deep, while good catches were also made inside of the light-ship on Five Fathom Bank, off the mouth of the Delaware, as well as between the shore and the light-ship lying off Sandy Hook, at the entrance to New York Harbor. It is a somewhat rare occurrence for mackerel to be taken so near the shore in spring. At the same time, however, according to Captain Thomas, some of the fishing schooners met with large schools of small-sized mackerel some 70 miles off-shore, in a direction about south-southeast from Sandy Hook. Several large fares of these were obtained.

The main body of the mackerel, composed of the largest fish, exhibited such a decided tendency to keep close to the shore during the spring, that it was predicted by the fishermen that the schools would "play in" near the coast when north of Cape Cod. This, however, proved to be a mistaken opinion, for, as a rule, the chief part of the mackerel after entering the Gulf of Maine, kept far off-shore, while only scattering schools were met with on the shoal grounds near the land, which are generally the favorite haunts of the species in summer.

During the last few days of May and the early portion of June, the movements of these fish presented some peculiar phases which have been rarely noticed in former years. A large body of mackerel, passing through the South Channel, moved on between Cape Cod and George's Bank in a northeasterly direction. From its left wing scattering schools reached in near the land, extending, in some cases, as far as Massachusetts Bay and the shores of Cape Cod; while from the right flank other schools passed across George's Bank and gathered in great masses about the western part of Nova Scotia, in which locality the fish appear to have remained for a much longer period than usual. This detention in the waters of Nova Scotia may probably be accounted for by the fact that, for many weeks previously and at that time, great quantities of ice had been collected about the eastern coast of that peninsula, off Newfoundland, and on the Grand Bank, from March until well into June. Frequent mention of this fact was made by the press.* This

* As an instance, the two following paragraphs appeared in the Boston Herald of June 10:

"SAINT JOHN'S, NEWFOUNDLAND, *June 10, 1882.*—It is reported that the schooner Ripple is imbedded in an ice-pack 20 miles off Fogo Island, and her crew of twenty-two men are starving. The steamers Vola and Benacre are also in the ice. The steamer Hercules has been sent to their assistance. Bark Petunia, from Cadix, re-

great accumulation of ice would naturally lower the temperature of the ocean so much along the eastern coast of Nova Scotia as to deter the mackerel from making their spring migrations in that direction at the usual time.

The numerous pounds and fish-traps about the western part of Nova Scotia, especially from Yarmouth to Barrington, profited by this halt of the fish, and caught larger quantities of mackerel, in some instances, than the weirmen could properly care for. These fish were said to be, for the most part, remarkable for their large size, being, according to several statements, much larger than any mackerel caught elsewhere during the season. I cannot, however, vouch for the verity of this statement, as from my examination of several barrels which were brought thence by a Gloucester schooner, I failed to note anything remarkable regarding their size, though it is true a majority were above 13 inches long. While these schools were filling the waters between Cape Cod and Cape Sable, there was yet another body of mackerel bringing up the rear in the waters off Noman's Land. These, however, were smaller fish than those which first went north.

The following mention of arrival of vessels at Gloucester, with mackerel caught between June 9 and June 20, in different localities, may give some idea of the area covered by these fish. Capt. S. J. Martin, in his *Journal of Gloucester Fisheries*, records that some mackerel were caught off Cape Cod on June 9, and that about that time good hauls were made by the seiners 10 miles southeast from Noman's Land. It appears that mackerel continued to be abundant at the latter place for several days after the 10th of June. The *Cape Ann Advertiser* of June 16 contained the following mention of a good fare from that point:

"The schooner *Madawaska Maid*, of this port, took a large haul of mackerel off Noman's Land last week, and arrived at New York Thursday with 300 barrels."

The captain of the schooner *Martha A. Bradley*, which arrived in Gloucester on June 23 with a fare of 303 barrels, told me that he caught them from June 15 to June 18, inclusive. The fish were small, ranging from 9 to 11 inches in length. The first day's catch was obtained 20 miles southeast from Block Island, and the fish moved so rapidly to the eastward that those which were taken four days later were caught 20 miles to the southwest of the light-ship on the South Shoal of Nantucket.

On June 11 some fish were taken by seiners 40 miles east-southeast from the high land of Cape Cod; and five vessels, with fares ranging from 300 to 350 barrels, arrived in Gloucester on June 14, having caught the greater portion of these fish eastward of the Cape. On

ports seeing eight ocean steamers working their way through the ice-fields between latitude 44° and Cape Race."

"*SAINT JOHN'S, NEWFOUNDLAND, June 10, 1882.*—Fishing schooner *P. L. Whitton* arrived last evening. She reports stormy weather, and that it is impossible to fish on the Grand Banks, owing to numerous icebergs. Advices just received from the northward say that the bays are again packed with ice. Six sailing vessels are jammed some distance northeast of Cape John."

June 13 one schooner took 140 barrels 30 miles southeast of Cape Ann. On June 15 the schooner Joseph Story arrived at Gloucester with 290 barrels of mackerel from the pounds near Pubnico, N. S.,* while on the same day the schooner Charles Tappan came in with a fare of 300 barrels, reported to have been taken on George's Bank.

The Port Mulgrave correspondent of the Cape Ann Advertiser, writing under date of June 9, states that mackerel had made their appearance on the eastern coast of Nova Scotia, "Captain Rood, of the steamer M. A. Starr, reporting that he passed through large schools between Halifax and Canso. Captain Harding, of schooner Keetsca, of Lockeport [N. S.], made the same report. What had been caught in nets were of large size."

From the foregoing it may be seen that early in June mackerel in greater or less abundance were met with all along the coast, from Block Island on the south to Cape Canso on the north, a distance, in a straight line, of about 500 miles. Their abundance off the New England coast is apparent from the unusually large captures made at this period, to which reference has already been made, and when we consider the enormous area which they covered it is difficult to form any accurate estimate of the quantity of these fish which swarmed in our waters, and from which our fishermen were gathering a bountiful harvest.

Before proceeding further in the discussion of the movements of the mackerel, I shall pause to consider some facts in connection with their spawning habits. It has generally been supposed by close observers that mackerel spawn on the New England coast soon after the 1st of June; in the summer of 1882, however, this operation took place later than had ever before been recorded. On June 23 I opened thirteen mackerel, caught the preceding evening at Rockport, Mass. Their average length was 12 inches. In nine of them (males) the milt was nearly ripe. One was a spent male, and the remaining three had been eviscerated, so that no determination as to sex or condition was possible. According to some of the most experienced Gloucester fishermen, the mackerel on the off-shore grounds had not finished spawning until a month or more later than the above date. Captain Thomas says that the height of the spawning season this year (1882) occurred from about the middle of July to August 1. The majority of the fish taken during that interval appeared to be partially spent, the ovaries and spermaries being somewhat shrunken. They contained, however, more or less eggs and milt in a ripe condition, which ran from the fish when they were handled. A portion of the mackerel had finished spawning and were fatter than the half-spent fish taken from the same school. As a rule, in previous years, it had been noticed that the mackerel sank during the season of reproduction, rarely appearing in schools at the surface, and for a space

* On the following day the schooner J. J. Clark arrived with a full fare from the same locality, and other vessels came in later which had obtained loads of mackerel from the Nova Scotia pounds.

of two or three weeks comparatively few fish could be taken. According to Captain Thomas, the mackerel "showed up" during the spawning season of 1882 better than the records indicate for any previous year, and great numbers were caught in the deep water about 15 to 40 miles to the east of Cashe's Ledge. The late occurrence of the spawning season this year was perhaps due to a probable lower temperature of the water than is common, caused by the masses of ice to the eastward, reference to which has already been made. My brother, Capt. D. E. Collins, says that as late as May 15 the ice on the southern coast of Nova Scotia extended as far west as Whitehead, and even at a later date vessels were blockaded in the harbor of Cape Canso, nor was passage through the straits of Canso possible. Very few scientific observations, so far as I know, have as yet been made concerning the degree of water temperature at which mackerel prefer to spawn, and for this reason any intelligent theoretical discussion of the subject is impossible.

Returning, then, from this digression to a further consideration of the movements of the mackerel, we find that about the middle of June, as has already been stated, they were massed in four large divisions, with here and there additional straggling schools. The two largest and most important bodies were those of which the first was found between Cashe's and George's Banks, and the other off the coast of Maine and about the mouth of the Bay of Fundy. A third body of mackerel which, pursuing its way along the southern coast of Nova Scotia, subsequently entered the Gulf of Saint Lawrence was of much less importance than the two last mentioned. The fourth division, the capture of which was comparatively unremunerative by reason of the small size of the fish, was found off Noman's Land and near the South Shoal off Nantucket.*

One of the most important features to be noted in connection with the mackerel that swarmed in such abundance in the Gulf of Maine, during the summer, is that they remained in unusually deep water and much farther from the coast than these fish generally occur.

From early in June until the last of July, mackerel were very abundant between Cashe's and George's, playing in the deep water immediately east of the former bank. According to Captain Martin, a large portion of the mackerel which were brought into Gloucester between the above dates was taken in that locality. On July 13 he records the arrival of the schooner Reporter (a haddock-catcher), whose captain testified to having sailed through schooling-mackerel for a distance of 50 miles

* From the fact that the schools of mackerel found off Noman's Land and Nantucket Shoals, in June, were composed of such small individuals, none of the vessels sought them after about the 20th of June. For this reason no reliable data can be obtained concerning the movements of these fish, though there is every reason to suppose that they entered the Gulf of Maine—between Cape Cod and the Bay of Fundy—in July, since schools of small mackerel were occasionally captured in those waters during the latter part of the summer and throughout the fall. For the above reasons, no further allusion to the movements of this body of fish will be made.

between Brown's and Cashe's Banks. The western edge of this body of fish extended to within 10 miles of the latter bank. Captain Thomas says: "Nearly all mackerel fishermen know that in June and July the chief part of the fish was caught in the deep water between Cashe's and George's Banks in depths ranging from about 100 to 200 fathoms." Captain John W. McFarlane, of the schooner William F. Gaffney, which arrived in Gloucester on June 23, with a full fare, told me that he caught the larger portion of his fish in the deep water 40 miles southeast from Cashe's and that when the fish failed to "show" at the surface there, he "stood in" toward Cape Ann. When about 30 or 40 miles distant from the land, in the deep water lying in an east-southeast direction from the Cape, he fell in with numerous schools, capturing enough in one day to complete his load. Mr. Silas Calder, one of the crew of the schooner W. H. Wellington, of Gloucester, states that from July 1 to July 20 there was a large fleet of mackerel schooners fishing from 90 to 100 miles southeast by south from Monhegan Island. He thinks that a very large percentage of the mackerel caught by the New England fleet, during the period above mentioned, was taken in that locality, namely, the deep water between Cashe's and George's Banks, where also the Wellington, which left Gloucester on her first trip June 23, returning in twelve days, caught her fare of 400 barrels. The whole fleet did well, many vessels securing large fares in a few days.*

Captain Hurlburt, formerly of the United States Fish Commission, and others who have been engaged during this season in the mackerel fishery, concur in this statement. Captain Hurlburt is one of the crew of the schooner Wildfire, which arrived from a mackerel trip on August 7, after an absence of twelve days, with 535 barrels of fish. He says that 400 of the above were taken in the deep water 35 miles east-southeast from the shoal water of Cashe's. These were all fine fish.

*The following chronological record of arrivals of mackerel schooners with full fares caught, for the most part, between Cashe's and George's, from July 20 to July 29, inclusive, is obtained from Captain Martin's journal:

July 20.—Seven schooners arrived, two of which averaged 360 barrels each, after an absence of only six days, while the total aggregate brought in by the whole was 2,390 barrels.

July 21.—Two schooners, with an aggregate catch of 370 barrels.

July 22.—Two schooners, with an aggregate catch of 490 barrels.

July 24.—Nine schooners, with an aggregate catch of 2,404 barrels

July 25.—Seven schooners, with an aggregate catch of 2,225 barrels.

July 26.—Eleven schooners, with an aggregate catch of 3,150 barrels.

July 27.—Eight schooners, with an aggregate catch of 2,835 barrels.

July 28.—Fifteen schooners, with an aggregate catch of 5,398 barrels.

July 29.—Fifteen schooners, with an aggregate catch of 4,965 barrels.

This gives a grand total of 24,227 barrels of mackerel taken by seventy-six schooners.

In corroboration of the above, the Cape Ann Bulletin of August 2, 1882, contained the following:

"Last Thursday there was an immense arrival of mackerel, one vessel bringing 500 barrels, another 400 barrels, another 375, and another 350. The best mackerel are of extra good quality, most of them being taken between George's and Cashe's."

As soon as the schools disappeared and could no longer be found in this region, most of the fleet, numbering about eighty sail, went to other grounds. The Wildfire ran to the eastward, and the remainder of her fare, 135 barrels, was taken 25 miles west by south from Bryer Island, N. S. Capt. George M. McClain, master of this schooner, says that before the middle of August he caught no fish in shoal water. It is not possible to say with any degree of certainty why the mackerel, as a rule, exhibited such a disposition to remain off-shore and in deep water. Their presence and long continuance to the eastward of Cashe's may, however, be due to the abundance of food which could be obtained there, though the same reason cannot so positively be assigned for their presence elsewhere. The fishermen during the month of July reported that the mackerel caught in the vicinity of Cashe's were "full of feed," while those taken along the Maine coast and in the Bay of Fundy had little or no food in their stomachs. It is very probable that the unusual disinclination of the main body of the mackerel to approach close to the coast may be attributed to a remarkable scarcity, along the shore, of the forms of life upon which they feed. The fact that the fish which were caught nearest the coast were rarely found gorged with "seed"—indeed, the opposite being generally the case—would indicate that there was little to attract them in-shore, and consequently they remained a long distance from the land, where the chances for obtaining food were better. But even on the off-shore grounds a decrease in the abundance of mackerel "feed" was noticeable about the 1st of August, and this may have influenced the subsequent movements of the fish found thereabout.

At any rate the mackerel, which were so abundant to the eastward of Cashe's during June and July, apparently left that locality early in August, since by that time they were no longer accessible in large numbers to the fishermen, and during the remainder of the season only a few scattering schools were found in those waters. It is possible that during the period of abundance on Cashe's the schools were in reality on their way to the east coast of Maine, the mouth of the Bay of Fundy, or to Seal Island Ground, passing along slowly in an eastward or north-easterly course. That the fish did move in one of these directions, about the last of July or the 1st of August, there can be but little doubt. Further reference will be made to this matter in a subsequent paragraph.

Passing, now, to the consideration of the schools of mackerel which were found near the coast of Maine, I will say that with rare exceptions they kept off in deep water at distances from the land varying from 15 to 40 or 50 miles; and, according to the statements of the fishermen, their method of schooling differed in some respects from that followed by the mackerel on Cashe's. Captain Martin also records, under date of July 24, the following facts relative to this matter:

"The mackerel, which are in large bodies, when they go across Cashe's

appear to be more scattered, and break up into small *pods* when they reach the Bay of Fundy."* Perhaps the greatest quantities of mackerel taken on the coast of Maine during June and July were caught in the vicinity of Mount Desert Rock, at distances therefrom of 15 to 30 miles, and usually in a southeast direction. Mr. Calder told me that the Wellington, while on her second trip, took the greater portion of her fare in the deep water 45 miles south from Mount Desert. He also states that at the end of July and the beginning of August, a fleet of 50 to 85 sail was fishing in those waters. At the same time, good catches were made from 15 to 25 miles from Matinicus and Monhegan Islands.†‡

Indeed, mackerel had never been more plentiful on the American coast from the commencement of the spring fishing to the middle of August, nor had vessels ever made larger captures, than during this period.§ In August, however, a decided change took place in this fishery, the receipts of mackerel at the principal fishing ports falling off considerably.

* By the Bay of Fundy, Captain Martin may be understood to mean the waters extending from Monhegan Island to Grand Manan.

† The term *deep water*, as used here, may be taken to mean a depth varying from 60 to 200 fathoms, but generally more than 80 fathoms.

‡ The following record of arrivals with full fares taken in this region is gathered from the journal of Captain Martin:

June 22.—Arrival of four mackerel schooners, one of which fished off Mount Desert.

June 26.—Arrival of ten mackerel schooners. Most vessels report catching their fish off the coast of Maine.

June 27.—Arrival of four mackerel schooners from 20 miles southeast of Matinicus.

June 29.—Arrival of four mackerel schooners, one of which caught its fish 30 miles east of Mount Desert Rock.

July 16.—Schooner S. A. Campbell arrived with 360 barrels, reported to have been caught 10 miles from Grand Manan Island.

August 2.—Five fares of mackerel arrived on previous day, one of which was caught 40 miles southeast from Mount Desert Rock, one 35 miles southeast from Matinicus, and a third 35 miles to the southward of Monhegan Island. The other two fares were caught on Cashe's.

August 8.—Six arrivals of mackerel fares, some of which were caught 30 miles northwest from Yarmouth, N. S., and the others 25 miles southeast from Mount Desert Rock.

It is worthy of notice that quite all of the localities mentioned here by Captain Martin are those where there is deep water, or at least where the depth is more than 50 fathoms. Indeed, the area is very small off the coast of Maine where a depth of less than 50 fathoms can be obtained outside of 15 miles from the land.

§ The following extracts from the Cape Ann Advertiser of July 7, 1882, bear testimony to this statement:

"Schooner Carl Schurz, belonging to Messrs. Rowe & Jordan of this city, landed 850 barrels of mackerel in two trips between 6th and 30th ultimo, June."

"Schooner Augusta E. Herrick, of Swan's Island, has landed 850 barrels in fourteen days."

"Schooner Henry N. Woods, Captain McEachran, seined 500 barrels of mackerel off Seal Island inside of two weeks."

"Schooner Edward E. Webster, Captain Solomon Jacobs, sailed from Boston on Monday and was back there Thursday with 250 barrels of mackerel, seined off Mount Desert Rock, stocking \$1,300."

This decrease was due in a great measure to the prevalence of dense fogs which hung over the waters frequented by the mackerel fishermen, and often rendered fishing impracticable. It is also possible that the comparative scarcity of the fish which occurred at this time may have been caused by a remarkable discoloration of the sea-water, which appeared about the 1st of August along the coast of Maine and in the Bay of Fundy. Mackerel fishermen, returning from the Bay of Fundy and the coast of Maine, August 10, reported that for ten or twelve days previous the water off Monhegan and Mount Desert had presented a most singular appearance, its color resembling that of diluted milk. This whitish streak was 30 or 40 miles wide, and extended some 65 or 70 miles in a northeasterly direction from Monhegan Island, its inner edge varying from 5 to 25 miles distant from the land. The line of demarcation between this colored water and the blue sea was very conspicuous and as regular as a wall. During this period the white water was semi-transparent, so that the fish, to which was imparted a reddish tinge, could be seen beneath the surface at a great distance. Some men stated that mackerel passing from blue to white water appeared to be peculiarly affected by the change, apparently becoming wild and rushing madly to and fro. Others, however, did not notice any of these peculiarities in the movements of the fish, merely stating that the mackerel rarely schooled at the surface. The semi-transparency of the water, however, enabled the fishermen to see the schools so far beneath the surface that, in consequence, they could be inclosed in the purse-seines as well as if they were inclined to swim closer to the top of the water. For a couple of weeks after the appearance of this phenomenon many schools of mackerel were captured in the "white water," though the best fishing was beyond its limits about the western part of the Nova Scotia coast, off Yarmouth, and on the Seal Island Ground. At the same time, however, the market boats, and occasionally the salt fishermen, made some large hauls in the waters around and inside of Monhegan, which were, at the time of the phenomenon, within the area of discoloration. It is difficult to define precisely the influences which this "white water" may have exerted on the movements of the mackerel, but it certainly is the general opinion of the fishermen that one effect produced was a sudden and almost total disappearance of the main body of the fish from the coast. Though it is probable that the discoloration was due to an unusual accumulation of some form of animalcula or crustacea in the water, it is nevertheless true that little or no food suitable for the mackerel occurred within its limits. All of the mackerel fishermen with whom I have conversed on this subject agree in saying that without exception the fish taken in the "white water" had little or no food in their stomachs. It is not probable that there was any chemical change in the sea, yet many of the most intelligent and observing fishermen are of the opinion that the schools of mackerel were peculiarly affected by the "white water," or at least acted queerly within its limits. Capt. George H. Martin, of Gloucester, assured me that the

fish appeared less shy and could be captured far easier than when in blue water, not attempting to escape from the seine by "diving," as is so frequently the case under ordinary circumstances. This is all the more remarkable since the wonderful clearness of the water, previously alluded to, made it possible even for the fishermen to see the bottom of their seine which was sunk a depth of from 18 to 25 fathoms.

The occurrence of heavy fogs, as has already been stated, during the month of August and the beginning of September, and the fact that the main body of mackerel was at that time found on the Seal Island Ground* and Brown's Bank, where strong currents and heavy tide-rips occur, rendered it extremely difficult for the fishermen to capture the fish which were found in that region. The result, therefore, of these combined adverse influences was a great decrease in the catch of fish by the mackerel fleet. It seems altogether probable that the mackerel caught on the Seal Island Ground and about Brown's Bank were the same fish which occurred earlier in the season in such abundance between Cash's and George's Banks, and which, as has previously been stated, probably moved to the eastward from the above-mentioned locality. What direction this body of mackerel took after leaving Brown's Bank cannot be absolutely determined, but it is the opinion of most of the experienced fishermen that the fish, continuing their outward course from the shore, swept off by the southern edge of George's instead of passing inside, as is their usual habit when making their regular fall migration. This irregular movement was anticipated as early as July, for on the 8th of that month Captain Martin wrote: "If no other school of mackerel comes along the catch will be light during the latter part of the season. I do not think the mackerel on the Seal Island Ground will go into the Bay of Fundy." The fishermen at that date, too, reported an abundance of mackerel on George's, and Captain Martin, on June 28, 1882, noted the arrival, in Gloucester, of two fares of mackerel from that bank. Although a few fares may have then been taken on George's, it seems probable that in most cases, there was a slight error in the reports of the skippers; for, to my knowledge, several of the Gloucester vessels which visited George's on the strength of these statements failed to find any mackerel in that locality. These failures may have been due to some extent to the prevalence of dense fogs which covered the bank much of the summer, and rendered it next to impossible for the skippers to keep their position on this ground, where the tides sweep with great velocity. Therefore it seems probable that most of the fares which were reported on several occasions to have been caught on George's Bank were in reality taken in the near vicinity, north of the bank, or farther east, on Brown's Bank.

Little more can be said relative to the movements of the mackerel on the New England coast during the season of 1882, except to speak of the scarcity of fish throughout the remainder of the season, which was

* Catches of mackerel were also made on this ground as early in the season as the latter part of June.

in remarkable contrast to their abundance in the early part of the year. It is true that a few of the vessels—the “lucky ones”—succeeded in making many good catches during the late summer and fall, but the majority of the fleet averaged small fares. I am, indeed, assured that some vessels took less than 100 barrels each from the first of August until November. The mackerel which still remained near the coast, appearing in somewhat scattered schools—and for the most part of small size—began their fall migration at about the usual time, that is, late in September or early in October. About this date the vessels, many of which had been fishing on the off-shore grounds, having lost trace of the fish there, collected near the coast and pursued the mackerel as they moved in a westerly course from the shores of Maine towards Massachusetts Bay and contiguous waters. The fall catch of mackerel, which, even with favorable weather, would probably not have been very large, was seriously affected by the prevalence of strong easterly winds, and no doubt the departure of the fish from the coast was somewhat hastened by the same cause.

An interesting and somewhat remarkable feature of the mackerel fishery during the fall should be mentioned. When the mackerel reached the waters about Cape Ann and Massachusetts Bay, comparatively few catches were made in the daytime; the phosphorescence exhibited at night, however, aided the work of the seiners. The fish rarely schooled by daylight, and even when they did they were, according to the statements of several parties, so shy as to render their capture very difficult and often impossible. Most of the fish taken were caught at night, and, as I was assured by some of the fishermen, so small was the probability of seining mackerel in the daytime that on many of the vessels no one was kept on the lookout for schools. Dark, moonless nights are, under such circumstances, best for the capture of mackerel, since at such times the movements of the fish may be known and traced by the phosphorescence thrown out from the schools. Notwithstanding, however, that every effort was made both night and day, the vessels, as a rule, did so poorly that the majority of the mackerel fleet had “hauled up” before the 1st day of November. A few very fair catches were, however, made in Barnstable Bay and about Cape Cod on subsequent dates.

Before closing these remarks it may be well to refer again to the schools of mackerel which, detained beyond their usual period of migration along the Nova Scotia shore, eventually found their way into the Gulf of Saint Lawrence. Whether any of the fish, which under other conditions might have gone to the Gulf of Saint Lawrence, were hindered from doing so by the accumulation of ice about the eastern part of Nova Scotia, can only be conjectured. According to the reports of the Boston Fish Bureau, mackerel have never within the memory of man been so scarce in the Gulf of Saint Lawrence as during this season. The catch of the boat-fishermen at Prince Edward Island has been unusually small, while not a single fare, so far as can be learned, was taken by either American or Canadian vessels, if we except a small trip

caught in gill-nets by an American schooner on the Labrador coast. Indeed, it is a fact that one Provincial vessel, at least, the *Festina Lente*, Capt. Andrew Hammond, of Lockport, Nova Scotia, was engaged during the past season in mackerel seining on the New England coast. It seems only proper to allude to this fact in this connection because it goes to prove that the claims made by the Canadians concerning the superiority of the mackerel fisheries in their waters is wholly without foundation. There is every prospect that in future years a fleet of Canadian vessels will be engaged in mackerel seining on our coast, instead of our fishermen being compelled to resort to Provincial waters, as was the case when hand-lining was the principal means of capture. In this connection, and as a fair demonstration of the importance and prosperity which the mackerel fishery has reached at the present day on our coast, should be mentioned the remarkable and unparalleled stocks which have been realized by some of the vessels from the sale of their fish. The following extracts from the Cape Ann Advertiser give a statement of the most important stocks made by the vessels engaged in the mackerel fishery during the season when this species can be taken, namely, from April 1 to about the middle of November:

"Two of the largest mackerel stocks ever landed at this port or in New England have been made by the schooners *Nellie N. Rowe*, Capt. Eben Lewis, and the *Edward E. Webster*, Capt. Solomon Jacobs, the past season, comprising eight months of time actually employed. The net stock of the *Rowe* was \$35,537, and of the *Webster* \$34,229. The average share of the *Webster's* crew was \$959.75, and the steward, Mr. Warren Fowles, with his extra pay of \$160, made for his season's work, \$1,129.75."—(Cape Ann Advertiser, November 17, 1882.)

"The following good stocks are reported in the mackerel fishery by vessels hailing from this port: Schooner *J. H. French*, Capt. John Chisholm, net stock about \$20,000, crew shared \$615; schooner *Leona*, Capt. Willard Pool, net stock \$19,715.72, crew shared \$582; schooner *Carl Schurz*, Capt. Jed. Warren, net stock since June 6, \$15,608, crew shared \$468—stock for the year, \$23,222, crew sharing \$733.86; schooner *John D. Long*, Capt. Charles Hardy, net stock \$18,500, crew shared \$571; schooner *Helen M. Crosby*, Capt. Joseph Swim, net stock \$18,020, crew shared \$596; schooner *Ivanhoe*, Capt. James Crowley, net stock \$16,945, crew shared \$525; schooner *Golden Hind*, Capt. Solomon Reed, net stock \$16,323, crew shared \$594; schooner *John S. McQuin*, Capt. Henry G. Coas, net stock \$16,035.57, crew shared \$517."—(Cape Ann Advertiser, November 24, 1882.)

It should be borne in mind that the above figures, large as they may appear, represent only the *net* stock made by the several vessels, and that to get a more correct idea of the value of the fish taken we must add to the stock of each schooner from two to three thousand dollars. This will give us, approximately, the amount for which the fish were sold.