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PART IX.

THE MULLET FISHERY.

By R. EDWARD EARLL.

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1. DISTRIBUTION AND HABITS OF THE MULLET.

In Section I of this report may be found a discussion of the natural history of our east coast mullets, *Mugil albula* and *M. brasiliensis*. In the above-mentioned article much valuable information is given regarding the mullet fisheries from notes taken by Professor G. Brown Goode during a visit to Florida, and the statements of other observers from different portions of the coast are added, so that all localities where mullet occur are fairly represented. The main object of the article, however, is to put on record what is known of the distribution and habits of the species, and much material on the mullet fisheries was omitted as irrelevant. Having visited the various localities along the Atlantic coast where mullet are extensively taken, I have been requested to prepare an account of the mullet fisheries, and in doing so find it necessary to repeat much that has been already said in the article referred to in order that the account of the fisheries may be complete. I am under obligations to Professor Goode for many of his original notes on the fisheries and for placing in my hands the replies to the circular of inquiry regarding the habits of the mullet sent out by Professor Baird in 1875. I would also express my thanks to Mr. Silas Stearns, of Pensacola, Fla., to whom I am indebted for all facts of whatever kind bearing on the mullet fisheries of the Gulf of Mexico.

On the coast of the United States one or both species of mullet are found in all localities between Cape Cod and Texas, but in most places the fishermen fail to recognize the difference between them, calling them simply mullet, and supposing the two kinds to be identical. In describing the fishery, then, no attempt will be made to separate the species, for their habits are quite similar, and, where both occur, they are taken by the same apparatus and in a similar manner. The *Mugil albula* is much the larger and more important of the two, and the statements may be considered as referring chiefly to this species.

In the district north of Sandy Hook, N. J., large individuals are rare, but small ones are quite abundant at certain seasons. According to Professor Goode, great numbers of mullet about an inch in length have been observed along the Connecticut shores, where they are known to the fishermen as "bluefish mummichogs."

Along the New Jersey coast they are more plentiful and of larger size. The majority of them measure from 5 to 6 inches in length, but late in the fall larger individuals, weighing about a pound, make their appearance. These are called "bull-mullet," and are highly prized for food. Along the ocean shores of Delaware, Maryland, and Virginia, and in the lower waters of Chesapeake Bay, individuals of similar size are quite abundant.

At Oregon Inlet, in North Carolina, there is a perceptible increase both in the number and

size of the fish. In the waters of Core and Bogue Sounds, 50 to 75 miles farther south, they are more abundant than any other species.

The sounds and bays along the entire coast from Cape Hatteras (which seems to be the northern limit for the mature fish or roe-mullet, as they are called) to Texas have been visited annually by immense schools of mullet for many years. Early voyagers refer to them as occurring in almost inconceivable numbers, and the records from that time to the present warrant us in assigning to the species the first place on the list of edible fishes of the South.

A large majority of the fishermen consulted report that the species has not decreased in numbers during their recollection, though several think the reverse to be true for the localities in which they live, where they claim that the catch is much smaller than in former years. These assign various causes for the decrease, chief among which is the excessive use of seines or nets.

Mr. Moore, of Swansborough, N. C., thinks only one-third as many are taken now as ten years ago in that locality, owing to the small mesh of the nets used; while Mr. Masters, of Saint Augustine, attributes the decrease at his home to the use of gill-nets in the Saint John's River. There is no evidence, however, to show that a general decrease has occurred, though for various reasons the catch fluctuates within certain limits from year to year.

**MOVEMENTS OF THE MULLET.**—Probably no species is so little understood as the mullet, and the greatest confusion exists concerning almost every phase of its natural history. This is especially true of the migrations of the fish and the causes that govern their movements in different localities. Some of the most intelligent fishermen claim that they spend the summer months in the fresh and brackish waters of the bays and rivers along the coast, and go to the ocean in the fall for purposes of reproduction. Others insist that they sometimes spawn in fresh water, though as a rule they visit the large lagoons along the coast for this purpose, and that they seldom, if ever, deposit their eggs in the ocean. Again, it is asserted that they are present in any given locality during a portion of the year only, and that in the early winter they leave the northern waters, passing southward to their winter quarters, where they remain till the following spring. Others believe that their migrations are merely local, and that they stay in the same locality throughout a greater part of the year, accounting for their seeming absence by the supposition that they remain in the deeper holes of the creeks and marshes until the spawning time arrives.

From a careful study of the subject, we are led to believe that the young fish, at least, are present in all localities between Beaufort, N. C., and Texas throughout the entire year, though they are unquestionably more abundant from August to December. As a rule, the large fish are seen only at this time, and with the exception of the Saint John's River, Florida, we know of no place where large mullet are taken in any considerable numbers at other seasons.

During the spring and early summer the schools seem entirely broken up, but small-sized individuals are scattered about on the feeding grounds in the grassy bays and marshes bordering the coast. Here they remain till late in July, when they proceed to the deeper channels of the larger bays, where they gather in schools of small size. Little is known of the whereabouts of the large mullet at this season. Later the migrations begin, the fish of medium size moving southward. Their places are soon filled by large fish known to the fishermen as "fat mullet," the reproductive organs of these gradually developing until the fish come to be known as "roe mullet," when it is claimed that immense quantities are taken with the eggs and milt running freely from them. These remain until the first cold storm occurs, when they start for the south, moving rapidly along the outer shore, or through the inland passages, as is most agreeable. They probably spawn on the journey, and entirely disappear as soon as the eggs have been deposited. These fish are fol-

lowed by smaller individuals known as "frost mullet," which remain throughout the greater part of the winter. The movement seems to be general along the entire coast, all fish along the Atlantic seaboard being reported as traveling southward, while those rounding Florida Keys continue their coastwise migrations, gradually working northward and westward towards the Texas line. No return movement is reported at any season along the Atlantic, though in the Gulf, after the spawning season is over, the fish are said to return toward Key West.

The movements of the fish are thought to be considerably affected by tides, currents, and storms; and in many localities the fishermen assert that the schools often remain in considerable numbers about the inlets of the bays on the flood-tide and pass out on the ebb. This is doubtless true to a considerable extent before the migratory season begins, but when this occurs the mullet seldom remain long in one locality.

During stormy weather, when the sea is rough, the fish seek the inland channels for protection, but during pleasant weather they are equally or even more abundant along the outer beach. They are said to move most rapidly during the continuance of heavy northerly winds, the signal for a southerly movement being a cold storm from this quarter. When the weather moderates they slacken their speed and become more scattered, many of the fishermen contending that they are then swimming about in search of food. During pleasant weather they swim at or near the surface, when their presence can be readily detected by the ripple caused by their movement through the water, or by the constant splashing and jumping. Their approach is frequently heralded by the flocks of water-birds that hover over them, and by the sharks and porpoises that gather to feed upon and destroy them. Mr. Stearns, in referring to this subject, says: "During the fall they move in such immense schools that the noise of their splashing resembles distant thunder, and to persons living near the bay this noise, kept up day and night, becomes very annoying." "These schools," he continues, "are followed by large numbers of sharks, porpoises, and other destructive fishes, as well as pelicans and similar sea-birds, that eat mullet until they can eat no more and have to make way for fresh arrivals."

In New Jersey waters the mullet make their appearance in schools about the 1st of September, gradually working southward and entirely disappearing by the last of October. The same is true for the coast between Cape May and Cape Henry, including the waters of Chesapeake Bay.

The small fish are seen in June on the North Carolina coast, these gradually increasing in numbers until the first of August, when the schools have attained considerable size, but thus far no tendency to migrate is noticeable. A little later a southern movement begins, and school after school passes, the size of the individuals constantly increasing till the first of September, when the old or roe-mullet arrive. These often weigh from 3 to 4 pounds, and measure upwards of 20 inches. If the weather continues pleasant they remain about the shores until the eggs have become well developed before moving southward, but at the approach of the first cold storm they are off and other smaller individuals follow in their wake, so that by the first of January the greater part have disappeared. Comparatively few are seen from that date till the following June, though scattering ones may be taken at any time. They run best and most rapidly during stormy weather, but will not move much against a head wind or sea. The schools vary greatly in size, the average containing from 20 to 25 barrels of fish, though schools of 1,000 barrels are reported as not uncommon, and 600 barrels were landed at one haul of the seine, near Beaufort, in 1849.

At Wilmington small mullet are occasionally taken at any season, though they are abundant from June to September only, and large ones are seen only in the fall. As at Beaufort, the migrations begin about the middle of August. The first schools are composed of fish of medium size, known to the fishermen as "1½ inch mullet," from the size of the mesh in which they are taken.

By the first of September these have entirely disappeared, and their places have been taken by the "fat mullet," which are said to weigh about a pound and a half. These are very abundant for several weeks, the roe mullet arriving about the middle of October, before they have entirely disappeared. The last-named are by far the largest fish that visit the coast, many individuals, according to the statement of the fishermen, attaining a length of 28 to 30 inches, some of the largest weighing from 3 to 5 pounds. These schools are made up of mature fish of both sexes, with the roe-bags well advanced; and it is reported that many are taken with eggs and milt running freely. "Frost" or "inch" mullet, as they are sometimes called, follow in large, compact schools, the last disappearing about the middle of December. Smaller fish, called "winter mullet," are abundant till spring, and are taken by means of seines and gill-nets in the inner sounds.

At Charleston the run is somewhat similar to that at Wilmington, though, for various reasons, the fishermen engage exclusively in their capture for only a few weeks, beginning about the last of August; most of them stopping before the roe mullet put in an appearance. The Charleston seine-fishermen secure considerable quantities of small mullet while fishing for "trout" and other species in the tide-channels and creeks of the locality during the winter months. Fully one-third of the seine-catch between December and March is composed of this species.

In Eastern Florida, especially in the Saint John's River, fish of all sizes may be seen at any time. They ascend the Saint John's to Lake Monroe, a distance of 240 miles from the sea, and small specimens are taken even beyond this point. At Lake Monroe the fishing interests are limited, as the resident population is small and the demand for fish is proportionately light. This demand is supplied during the winter months by three or four Northern fishermen, who haul a seine for shad at one end of the lake, selling their catch to the hotels that are for several months filled with Northern visitors. Two gill-nets are owned by residents of Melouville for the capture of mullet, the catch in these being sufficient to meet the demand. Lake George, situated 150 miles above the sea, is the prettiest and clearest expansion of the Saint John's River. It is 12 miles wide by 16 to 20 long, and abounds in fish of various kinds, being seemingly the summer home of immense quantities of mullet. Several salt springs open into the lake, and the local fishermen think that many of the mullet enter them to deposit their eggs instead of taking the long trip to the sea. It is known, however, that many of the fish make yearly trips to the ocean, thus affording excellent mullet fishing along the entire course of the stream. The first fish arrive at Jacksonville from the upper waters early in June, the number gradually increasing till the middle of August, when the fishing becomes extensive, continuing till December, the size of the individuals increasing until the close of the season. The fishermen of Mayport, at the mouth of the river, claim that the spawning fish pass out into the ocean and proceed southward along the shore to Matanzas and Indian rivers and Mosquito Lagoon (which are said to be the spawning grounds for these fish), and there deposit their eggs. The same theory is held by the fishermen of Saint Augustine, one of whom assigns as the cause of a supposed decrease in the catch at Saint Augustine the extensive gill-net fishing of the Saint John's.

In the Gulf of Mexico it is claimed that the mullet are even more abundant than along our Atlantic coast, though the statistics of the catch for North Carolina would indicate that they are nearly as plentiful in that region. Mr. Stearns writes that these fish are more abundant in the shore waters of West Florida, Alabama, and Mississippi than any other species, and that they are about the only fish taken by the fishermen during several months of the year. They are never entirely absent; though, as on the Atlantic coast, they are much more abundant in the fall than at any other season. In referring to the Pensacola region, Mr. Stearns mentions a run of mullet in the spring, saying, "There is a spring run of mullet composed of various sizes of young, which are,

in part, no doubt of the previous year's hatching. The first school of this run appears on the coast in April or in the first part of May, and they continue to come for two or three weeks, when they are all inside and scattered about the bay shores. In September," he continues, "there is a run of large fish which come, as the young one does, from the eastward, swimming at the surface of the water and making considerable commotion. Some years there is but one large school in the run, and at others many small schools, and it is thought that the fish are more abundant when they come in the latter form. At Choctawhatchee Inlet, where the spawning grounds are near by, the fish come in with the flood tide and go out again with the ebb tide; and at Pensacola Inlet, where the spawning grounds are far away, they come into the bay and stay until the operation is over. \* \* \* The many lagoons of Choctawhatchee Bay are almost blocked up with spawning mullet in October, and they are very abundant at the head of Pensacola Bay, near the mouths of the fresh-water rivers, at that time."

In another place, Mr. Stearns, in referring to the run of mullet, says: "In the latter part of October and November the mullet are running, and the fishermen are then busy. Sometimes two or three weeks are passed in watching for the fish to come along, but if the station is a good one the fishermen do not go away or lose confidence in their arrival sooner or later. When they arrive they sometimes come in such numbers that one or two hauls constitute the catch for a season. From 20 to 150 barrels are caught at one haul of the seine, and with larger seines twice or three times that amount could be taken, for the fish often come in schools 1 to 3 miles long and 400 to 500 yards wide."

From the evidence at hand it is clear that the mullet fisheries for different parts of West Florida continue from the middle of August to the first of January, though the height of the season for most localities is in October and November. Farther west there seems to be less tendency to migrate, the fish remaining more constantly in any given locality, and on the Texas coast it is said that there is no special time of abundance, but that mullet are equally plenty at any season.

## 2. ORIGIN OF THE FISHERY.

The mullet fisheries of the United States began with the first settlement of the country, and the early colonists of Saint Augustine took sufficient quantities for their own tables by means of the primitive cast-nets which they brought from their foreign homes. Later the residents of the Carolinas took and salted small quantities each season for family use, and ere long some began putting up a few barrels to exchange with their neighbors for produce. Thus the fishery has gradually increased to the present time, though it is still far below its natural limit. In the Gulf of Mexico small vessels have frequently been employed in the mullet fisheries, the crews being provided with seines with which to secure the fish, while the vessels served as homes for the fishermen, and were also of service in marketing the catch. Several New England fishing vessels visited the west coast of Florida for the purpose of catching mullet, groupers, and red-snappers forty years ago, and the fishing for the last named species has been continued to the present time. Several Gulf smacks, in addition to the large fleet belonging at Key West and other Florida ports, engage regularly in the grouper and snapper fishery each season. Mr. A. Howard Clark informs us that in the fall of 1842 the schooner *Nautilus*, of Gloucester, Mass., was fitted out with a drag-seine, and after shipping a crew of eight men started for Florida to engage in catching and salting mullet to be sent to Savannah. Mr. Charles S. Stewart, of East Gloucester, one of the crew, told him that the *Nautilus*, and the *Yorktown*, another Gloucester schooner that went to Florida the same winter, were the first vessels to engage in the mullet fisheries of that region. Mr. Stewart says: "The *Nautilus* proceeded to Apalachicola, and from thence to Saint Ann's Bay, where 40

barrels of mullet were secured and shipped by vessel to New Orleans, no returns ever being received for them. At this time the customs officer of Pensacola took the vessel's papers—regular fishing papers issued at Gloucester—claiming that they did not grant the privilege of fishing for mullet. These papers were kept for about two months, and when returned the fishing season was over, so that the vessel was obliged to set sail for the North, with nothing to show for her voyage. The Yorktown had secured 16 barrels of fish, when her captain, hearing of the action of the customs officers in regard to the Nautilus, was afraid to continue the work." Mr. Stewart further adds that there were no commercial fisheries on the coast at that time, nor had there been much fishing for any purpose except by the Indians. He says: "The winter fishing fleet of Apalachicola consisted of two small boats, manned by four resident fishermen." There were certain places, however, in Eastern Florida where the mullet fisheries were of considerable importance, and parties at the mouth of the Saint John's River and elsewhere were engaged in drying and salting the species for shipment to the West Indies.

### 3. FISHING GROUNDS.

Owing to the peculiar habit of the mullet of following the shore in their migrations, it may be said that the fishing grounds extend without interruption throughout the entire range of the Atlantic species, with a limited fishery for the *M. americana* at San Diego, Cal. The fish are present in all bays and coves along the outer beach from Sandy Hook, N. J., to Mexico. From North Carolina to Mississippi they are peculiarly abundant, and within these limits they could undoubtedly be taken at almost any point, in case suitable apparatus was used, during the proper season. There are, however, certain regions or stretches of coast which, owing to their physical characteristics, are the natural feeding and spawning grounds of large schools of mullet, and when these chance to be near settled districts the fisheries are always developed to a greater or less extent. When in addition the region has rail or steamboat communications with the larger markets, or when it is tributary to a thickly settled agricultural region, the fishing becomes extensive, and many persons devote their entire attention to the fishing for several months.

In New Jersey there are no important mullet grounds, though about Sandy Hook limited quantities of small fish and "bull-mullet" are taken for home use and for shipment. A few are taken at various points between Long Island Sound and Pamlico Sound, North Carolina, the latter being the most northern fishing ground of importance on the coast.

The fish are found in the mouths of all the rivers of Pamlico Sound, and indeed they often ascend well up into fresh water. They are not uncommonly seen a few miles above New Berne, on the Neuse. They are often taken at Blount's Creek, 8 miles below Washington, in the Tar, and occasionally at Leedville, at the head of navigation on the Pungo River. They are also found in considerable numbers along "The Banks" as far north as Oregon Inlet. The waters above this point are usually quite fresh, and no large mullet enter them; but the young are seen in the lower portions of both Albemarle and Currituck Sounds, while specimens are occasionally taken at Edenton and Poplar Branch, near the head of these respective waters. The fishing for the species is wholly to the southward of Roanoke Island. Oregon Inlet is thus practically the northern limit of mullet fishing for profit in the United States. All portions of the coast between Ocracoke Inlet and Little River, the southern boundary of the State, are visited by numerous fishing crews, who spend several months each fall in catching mullet, which they salt for shipment to the interior. Some crews have no regular fishing station, but move about from day to day, hauling their seines at any point along the inner channels or on the outer beach, where the fish chance to be most abundant. Along certain portions of the coast, however, especially in the waters of Core and

Bogue Sounds, there are regular seining beaches that have been visited each season for many years. These are fished by the parties owning the land, or are rented out to fishermen, the price paid for the privilege depending largely upon the record of the shores in the past.

Charleston, S. C., is the next point where mullet are extensively taken. Here during the migrating season the fishing is chiefly along the southern shores of Sullivan and Long Islands, but when the weather is rough the fish seek the inside passages, and the seines are hauled at any point where the character of the bottom will admit. In winter smaller individuals are taken in the deep holes of the numerous creeks, some miles from the ocean.

Though the fish are taken in considerable numbers farther south, there are no important mullet stations until the Saint John's River is reached. Here, as already stated, the fish ascend to Lake Monroe, 240 miles from the sea, and their yearly migrations to and from the ocean give opportunities for extensive fisheries along the entire course of the stream, though, owing to the swampy character of the banks and to the limited population of the region, comparatively few are taken except at and near the mouth of the river, where the fishermen of Jacksonville, New Berlin, and Mayport secure large numbers. In the Matanzas, Halifax, and Indian Rivers, still farther south, the fish are abundant, and many are taken for local supply. In the Gulf of Mexico, according to Mr. Stearns, the fishing grounds are confined largely to the Florida coast, comparatively few mullet being taken elsewhere. Within the limits of this State the fisheries are widely distributed, though the bulk of the fish are taken by the fishermen of Apalachicola, Pensacola, Cedar Keys, and Saint Marks, in the larger bays of central Florida.

In California, according to Prof. D. S. Jordan, the only fishing grounds are at San Diego.

#### 4. THE FISHERMEN.

Along the New England coast we find a class of professional fishermen who follow fishing for a livelihood, deriving their entire support from this source. These parties, being wholly dependent upon the fisheries, which they follow during a greater portion of the year, naturally take a deep interest in their work, and give considerable thought to the apparatus and methods for catching the fish, as well as to curing and marketing the products. In order that a man may be successful in the fisheries of this region it is necessary that he be fully equipped with the apparatus best suited to that particular fishery in which he is engaged. New kinds of apparatus are frequently introduced, and if these are found to be more suitable than the old they are soon quite generally adopted. In this way the fisheries are being rapidly developed, and they become more profitable to all concerned. Many of the fishermen of the Middle States also may be regarded as professional fishermen, and, though they are decidedly below the New England fishermen in the amount of energy and skill displayed, many of them are provided with the most modern apparatus and manifest considerable energy in their work, and are rewarded by large profits. Along the southern coast for half a century prior to 1870 the fisheries remained almost stationary; but with the change wrought by the Rebellion they have more than doubled in importance. Even now, however, if we except the States of Maryland and Virginia and the shad and alewife fisheries of Albemarle Sound, the increase is due rather to the greater number of persons engaged than to any improvement in the apparatus employed in fishing or to improved methods for the preparation of fishery products. With a few notable exceptions, as at Beaufort, Charleston, Key West, and Cedar Keys, the coast fishermen of the South make fishing a secondary matter, some fishing merely a few months each season, and others only when necessity compels. At Saint Augustine, Fla., the primitive cast-net introduced by the early Spaniards is still used, to the exclusion of all other methods except the hook and line. Thus waters that, if properly fished, would



yield abundantly, furnish scarcely enough fish to supply the local demand. In most localities, owing to the peculiar abundance of the mullet at certain seasons, the farmers and laborers engage in their capture long enough to secure a supply of fresh and salt fish for their own tables. These usually have little idea of conducting the fishery on business principles, and take little pains in preparing the products. They are often provided with only the crudest apparatus for the capture of the species, and many fish are lost for lack of salt and packages for curing them, while a large percentage of those dressed are so poorly salted as to render them almost unfit for food.

The mullet fishermen, then, are, with few exceptions, farmers or laborers, who, after arranging with the owner of a seine and boat, go to the fishing grounds in the fall, assisting in the work of catching, dressing, and salting the fish, receiving in pay a certain percentage of the products. The owners of some of these seines are experienced fishermen, and, as such, are quite successful in directing the labors of the "green hands," so that the fishery is carried on quite systematically. In many cases, however, the men in charge are farmers, with no better knowledge of the methods of fishing than the *landsmen whom they employ*. Where the former condition exists the fisheries are often quite remunerative and are carried on with commendable energy; but where the latter occurs a shiftless set of men gather at the fishing stations, idling about the beach, living in the most uncleanly and disgusting manner, greatly preferring the idleness of camp life to the activity of the industrious fisherman.

Along the Atlantic coast a majority of those engaged in the mullet fisheries are resident whites, though a good many negroes are also employed. On the Gulf coast, according to Mr. Stearns, a majority of the fishermen are foreigners, the crews being made up of Cubans, Spaniards, Bahamans (called Conebas), and Creoles. Some of these visit the region for the express purpose of fishing, returning to their homes when the season is over, while others have settled in the locality and content themselves by eking out a miserable existence, working just enough to supply scanty food for themselves and their families. In speaking of the fisheries of La Fayette, Taylor, and Jefferson counties, Mr. Stearns says: "The men who carry on the fishery—owning the boats, nets, salt, and provisions—are the most thrifty class of planters living along the rivers. They fish throughout October, November, and part of December. Their object is mainly to get a good supply of fish for their own use and a few over for sale. The crews are of the poorer classes, generally white, these being quite ready to work a couple of months to secure a small supply of salt fish for their families."

In referring to the Ocklockonee Bay district, Mr. Stearns says that a number of sponge fishermen engage in the capture of mullet for a few weeks, and that many of the farmers of the region also give considerable attention to the fishery. "These farmers," he says, "are the genuine 'Florida Crackers,' and, with but few exceptions, are a wretched lot of men. They are lazy, ignorant, and unhealthy, not having proper food or taking proper care of their persons."

##### 5. APPARATUS AND METHODS OF THE FISHERY.

The mullet are taken in various ways along different portions of the coast. Large quantities are captured in haul-seines wherever the fishing is extensive. In many localities gill-nets, or "drift-nets," as they are sometimes called, are used to great advantage, while cast-nets, both of the Spanish and American patterns, are used for local supply from North Carolina to Texas, the fishermen of Florida employing them more extensively than those of any other region. These three kinds of apparatus are the principal ones employed in the fishery, and by means of them the great bulk of mullet are taken. Small quantities have been secured in a pound-net in the Gulf of Mexico, and we are informed by various parties that they are occasionally tempted to take a baited hook, though no one thinks of fishing for them regularly in this way.

**FISHING WITH SEINES.**—Seines are perhaps more generally used than any other apparatus. These vary endlessly in size and arrangement, and the fishermen of the different localities have peculiar methods of shooting and hauling them. Some are but a few yards in length, and are easily handled by two or three men, while the largest are 300 or 400 yards long, requiring a crew of twenty or thirty men to handle the net and care for the catch. Most of the fishermen purchase their twine from some local dealer, and tie their own nets during their leisure hours, which, by the way, are very numerous. Others send to Boston and New York for the prepared webbing, hanging the nets and supplying them with such floats and sinkers as they may think proper.

As has already been stated, the mullet fishermen are mostly farmers, who devote a greater portion of the year to agricultural pursuits, turning their attention to fishing for a short time only. Many of the farmers interested in the fall fishery live some miles from the salt water; but when the fishing season arrives they leave their homes and proceed in gangs of four to thirty men to the seashore under the leadership of a "captain," who controls their movements. A seine 75 to 100 fathoms long, two or three boats, material for splitting tables, barrels, salt, and a limited amount of provisions, with the necessary cooking utensils, constitute the outfit. On reaching the shore they at once build rude huts or cabins, in which they eat and sleep until the close of the season. The most rigid economy is practiced during their stay on the beach, and no outlay of money is made unless absolutely necessary. This economy is especially noticeable in the style of buildings which are erected for their own use as well as in those used for salting and storing the fish. It is again noticeable in the food with which the men are supplied, the average fisherman bringing simply a few pounds of meal, some salt pork, and a supply of sweet-potatoes, his chief food during his stay at the shore being composed of fish caught from day to day.

When a suitable location for the fishing station has been selected, which, as a rule, is on some sandy beach, or at some prominent point where the fish are known to pass in considerable numbers, all hands turn their attention to erecting the necessary shanties or huts. These differ considerably, according to the locality. In the vicinity of Beaufort, N. C., they are usually built of rushes and poles, and are, indeed, strange-looking pieces of architecture. When a building site has been selected, some of the men start for the woods in search of poles, which are to answer as a framework, while others go to the marsh to gather rushes, which are to serve as a covering. The ridge-pole is first placed in position, its front end resting in the crotch of a forked stick, while the other is supported by two poles that cross each other at the proper height, their bases being imbedded in the ground, to locate the corners of the building. Smaller poles are now placed in rows at an equal distance on either side of the ridge-pole. These answer the purpose of studding, each being notched at the point where the eaves should come, that they may be easily bent inward to the ridge-pole to support the roof. In some cases spikes are used to fasten the ends of the poles, but, owing to their cost or to the difficulty of obtaining, they are frequently dispensed with, strings of bear-grass being substituted in their stead. "Laths," consisting of small poles or sticks, are now tied to the studding in horizontal rows about 18 to 24 inches apart, and the framework is complete. A ditch is then dug along the outside of the frame, into which the base of a thick layer of rushes, is placed. Other long sticks, called "liggers," are now placed on the outside of the rushes, directly opposite the laths, the two being sewed or fastened together by means of threads of bear-grass, in order that the rushes may be held in position. When the bottom tier has been fastened another row of rushes is placed higher up, overlapping the first like shingles on a roof. These in turn are fastened to the laths in the same manner, care being taken that the line formed by their lower ends may be even. The same process is continued until the ridge-pole is reached and the entire structure has been inclosed. The layers of rushes are sufficiently thick to shed water and to break the force of

the wind, though for better protection against cold the fishermen frequently "bank" their houses with sand. The only openings in the house are a small hole at the rear gable, to allow the smoke from the camp-fire to escape, and a square aperture 2 or 3 feet in height at the front, which serves as a door. Two tiers of berths are now put up on either side of the shanty, and each fisherman gathers grass or leaves, out of which he makes his bed. During pleasant weather the cooking and eating is usually done outside, each man keeping his supply of food separate, though four or five usually mess together, taking turns in preparing the food, which consists largely of corn meal and fish.

About Wilmington the fishing districts are more thickly settled, and many of the mullet fishermen return to their homes every night; but those coming from a distance are obliged to build shanties of rough boards or rush houses similar to those already described.

According to Mr. Stearns, the buildings used by the mullet fishermen on the Gulf coast vary considerably. Some are well built and nicely arranged for the purposes for which they are intended, while others are of a low grade, being rude palmetto-thatched huts. In speaking of the fisheries of Sarasota Bay, he says: "The building in which the fish are cured and stored is about 30 feet long by 12 feet wide, and is built out from the shore on pilings. There are two other buildings; one, made of boards, is used as a kitchen and dining-room and dwelling for the captain's family, and the other, a palmetto-thatched shanty, is used by the men as a sleeping apartment. Amongst the apparatus owned here are seines, reels, frames on which to dry mullet roes, and machinery for hauling up the boats from the water." In speaking of the mullet fishermen of Ocklockonee Bay, Mr. Stearns remarks: "These fishermen live in small, roughly-made sheds, occasionally provided with a chimney and fire-place, with no other floor than the dirty sand on which it is built, no table on which to eat, no bunks or other arrangements for sleeping, no dishes or other conveniences which give the slightest suggestion of comfort. These dwellings are merely shells in which there is a confusion of barrels of salt, barrels of fish, fishing gear, and a lot of uninviting-looking men. The fleas can be both seen and felt. The food of the men is of the poorest quality, and not as abundant as they desire." He has seen them "take a few raw sweet potatoes out in the boat with them as a luncheon."

When the camp has been put in order, the seine is "stowed" in the boat, which is placed in position on the beach just out of the reach of the surf. In order that the fish may not pass unnoticed, and that sufficient time may be given before their arrival for setting the seine, it is necessary that a lookout station be established. This is usually located on the top of some sand-dune about a quarter of a mile above the camp. In case the shore is level, a frame-work is built to a height of 20 or 25 feet, on the top of which the fisherman on watch remains for the purpose of discovering and announcing the approach of the mullet. At Beaufort the frame is simply a tripod composed of two medium-sized and one large pole, the last-named having pegs inserted by means of which the man climbs to the crow's-nest in the crotch. On the Gulf-coast, a rectangular frame is built, the top being covered by a platform on which the lookout stands, while on one side is a ladder by means of which he ascends. The various members of the crew take their turns at the lookout station, though some are "ruled out," as they have "no eye for mullet" or, in other words, do not readily detect their presence, and thus often allow schools to approach unnoticed.

The presence of a school is usually detected by the ripple on the water or by the jumping and splashing of the fish, though they sometimes "swim deep," being detected only by their dark color contrasting with the lighter sand of the ocean. When a school is seen it is carefully watched by the lookout, who leaves his post, walking down the beach toward the camp, keeping directly opposite to the fish, and indicating their movements to the other members of the crew by a

peculiar motion of his arms. Many schools pass the camp at so great a distance from the shore as to be beyond the reach of the average net, and, for this reason, no attempt is made to catch them, but when running close to land the fishermen, at the proper signal from the lookout, proceed to launch the boat. This, along the outer beach, is not always an easy task, for, owing to the bar which skirts the shore in most localities, there is usually considerable surf. The fishermen, however, watch their chance and shoot out between the breakers, returning in the same way. The work is not only difficult but very dangerous, requiring the utmost dexterity and unity of action, and the men must spring into their places at once when the boat reaches the water and hold themselves in readiness to obey the captain's orders. Often several trials are made before the boat is gotten out through the surf and not unfrequently it is capsized or filled with water in the attempt. When the seine has been shot the same care is taken in landing, and as the boat grounds the crew jump into the water, and, seizing it by the gunnels, carry it beyond the reach of the waves. Five men constitute a crew, four manning the oars, while the other, usually the captain of the gang, does the steering. One end of the net is connected with the shore by means of a rope, and as the fish approach this end is drawn rapidly to land by men on shore to prevent them from passing. Even if not quite in, the fish are readily turned back by a rapid movement of the line. The boat at this time brings the other end of the net to the shore and the movement of the fish in this direction is thus shut off. When they find themselves surrounded, the mullet usually sink and make a circuit of the bottom for an opening through which to make their escape. When a large school is inclosed the pressure of the fish against the seine often lifts it from the bottom, and many pass under the lead-line; but failing to get out at the bottom, they rise to the surface and begin to jump over the cork-line with a rapidity that is truly surprising. Frequently a larger part of the fish escape in this way, the air being at times completely filled with mullet. When the water is calm, boats are placed behind the seine to catch the "jumpers," these often being completely filled in a few moments. As soon as shoal-water has been reached, some of the fishermen wade out to hold up the back of the seine and thus keep the fish from escaping. They are obliged to turn their backs to the fish that pelt against them in such numbers as to make their position anything but a pleasant one. In some instances a second seine is hauled behind the first to secure the runaways. The method of using a second seine, or of placing boats behind the first to intercept the escaping fish, is called "backing" the seine; and men frequently agree to assist in the regular work of cleaning and salting for the privilege of keeping such fish as they may take in this way while the water is still too deep to permit the men to wade out and hold up the cork lines.

At the permanent fishing stations along the gulf coast the method is somewhat different. Here, during pleasant weather, there is little surf to interfere with the shooting and hauling of the seine, and better arrangements can be made. In Ocklockonee Bay only one seine is used at a station, and that is so arranged as to be hauled directly in front of the fish-house. "This hauling place," writes Mr. Stearns, "is called a 'seine-yard,' and in fine weather, when the fish may be expected to move in the shoal water along the shore, the seine is kept half set in the water, the netting being shot straight out from the shore until the bag is reached and the boat containing the other half is fastened to the buoy which is moored there for the purpose. When a school of mullet approaches and comes within reach of the seine, the seine-boat is quickly unmoored and rowed around them to the shore. If the 'throw' is successful the next operation is that of hauling the net and fish upon the beach."

The seines used are somewhat similar to the large ones employed for shad and herring in the northern waters. They are, necessarily, made of heavy twine on account of the strain to which they are subjected when a large school of fish is being landed. Those employed along the outer

shore of the North Carolina coast range from 150 to 200 fathoms in length, and are from 12 to 18 feet deep. The mesh varies somewhat, the bar averaging about  $1\frac{1}{2}$  inches. Nets of this size cost from \$150 to \$200, from 15 to 20 men being required to handle them. Those used in the inner waters on the Carolina coast are a trifle smaller, averaging perhaps 100 fathoms in length, being manned by 8 to 12 men, according to circumstances.

Some of the nets used along the gulf coast, according to Mr. Stearns, are made in Boston and New York of strong cotton twine, and shipped by freight to merchants living in the vicinity of the fishing grounds. Each fisherman prefers to hang his own net, the manner of mounting and forms of floats and leads being similar to those in use along the Atlantic coast. These seines are from 100 to 120 fathoms long and 16 to 20 feet deep at the bunt, the wings at their extremities being, of course, much shoaler. One of these nets, when complete, costs about \$1.20 per fathom, and if properly cared for will last from three to four seasons.

Seine-boats are sometimes made expressly for the mullet fishery, though ordinarily any boat large enough to hold the seine answers the purpose well enough for fishing in sheltered bays. Along the outer coast, however, a strong and seaworthy boat is necessary. But even here the size and shape varies considerably. The style having the preference in the Carolinas is known as the "pilot skiff," which may have either a square or sharp stern. These skiffs are round bottomed, lap-streaked keeled boats, from 25 to 28 feet long, 4 to 6 feet beam, and 20 inches deep, costing from \$100 to \$150. They are steered by means of oars rather than rudders, as they can by this means be more readily handled in the surf. The men engaging regularly in the fishery become very expert in the use of these boats, and are among the best surf-men along the entire coast.

On the Gulf coast the boats differ greatly according to locality. In some places excellent boats made of light but very durable material are used. These are about 26 feet long and 7 or 8 feet wide, and though still retaining the form of round-bottomed boats, they are quite flat, in order that they may not ground in shoal water. The bow is, as a rule, very sharp, while the stern is wide and overhanging, the shape being calculated to give great carrying capacity, making them especially adapted for the work for which they are intended. In other localities the boats are of inferior quality, somewhat smaller, and so roughly built that they last but one or two seasons. These are usually made of pine or spruce boards and are neither calked nor painted, a coating of tar taking the place of both. They cost, when new, from \$10 to \$12.

Another class of boats is used by the Apalachicola fishermen for marketing the fish after they have been properly salted. These, according to Mr. Stearns, are similar to the dinghy boat used in the sponge fisheries, but are much larger, being often 20 to 22 feet long, with 6 or 7 feet beam. The forward part is decked over, and washboards are run aft to the stern on either side to keep out the water. These boats are propelled by oars or sails, as is most convenient. The sail used is a triangular one of the lateen pattern, arranged with a long yard and a very short, stubby mast. Riggered in this manner the boats are very fast sailers and are easily managed.

Small vessels also are employed, to a limited extent, in the Gulf fishery, these enabling the fishermen to visit the more distant grounds and affording shelter to the crews during the fishing season. They are, however, more frequently used as freighting vessels, to carry the salt fish to market. Quite a number of fair-sized vessels are employed in this way, some of them running to the larger markets of Florida, while others go directly to Havana and other points in the West Indies.

The catch for the season, which usually lasts during two or three months, ranges from a hundred to a thousand barrels. In some localities the fish usually move in small schools, and consequently only a few barrels are taken at a time. In others the schools are often of enormous size, and the

bulk of the catch for the season may be taken in a few days. Along certain portions of the Gulf coast there are weeks together when the mullet do not come into shoal water, and not unfrequently two weeks pass at the height of the season without any considerable number of fish being taken; again, with a change in the weather they come within reach of the seine in such numbers that, owing to the limited facilities for handling them, only a small percentage of the fish that could be taken are preserved. This large run usually lasts for a short time only, and when it is over the fishing season may be said to have closed.

At Beaufort, N. C., the catch varies according to the location of the fishery and the energy of the fishermen. Some crews stock large amounts, while others realize almost nothing for their season's work. A fair average catch to the seine between Beaufort and Wilmington would be from 300 to 350 barrels, containing 100 pounds each of salted fish.

At Charleston the seines are considerably smaller than those in use further north, and the fish, being sold fresh, are never reckoned in barrels. The catch for the average seine in this locality is about 2,500 strings, or 11,250 fish in number. In Sarasota Bay, Florida, 10,000 pounds were taken at one haul, and the catch is frequently so large that all of the fish cannot be saved. In one case so many were inclosed that the fish carried away the seine, the men being unable to hold them. At Robert's fishery, in the same locality, as Mr. Stearns informs us, "several hauls have proved larger than 22 men could split, in consequence of which large numbers were spoiled. One haul contained at least 20,000 fish in number." Mr. McIlvaine reports a single catch of 40,000 mullet in number at Cedar Keys, and 200 to 500 barrels are said to be an average catch for a seine manned by 8 to 10 Apalachicola fishermen, in a season which practically lasts from the middle of October to the last of November. These are, perhaps, exceptional instances, as they occurred upon the best fishing grounds. In other localities less frequented by the mullet the catch will average less than 50 barrels to the seine during the season. The average catch to the seine for the entire Gulf is placed by Mr. Stearns at about 250 barrels of 200 pounds each.

**FISHING WITH DRAG-NETS.**—A peculiar form of seine, extensively used in the capture of trout (*Cynoscion maculatum*) at Beaufort, N. C., is employed to a limited extent in the mullet fisheries also. This seine, locally known as the drag-net, is found only in North Carolina. It is 80 to 110 yards long, 3-inch mesh, and from 6 to 12 feet deep. It is used only along the inner sounds, where the water is shoal enough to allow the men to wade about. Two men are required for fishing the net. On leaving the landing they usually proceed to some shoal-water bank along the main channel of the sound, when one jumps into the water, holding a shore-line attached to one end, while the man in the boat "shoots" the seine in the form of a semicircle, so as to inclose as much of the channel as possible, bringing the other end to the shoal at a point some rods distant from the first. The fishermen gradually bring the ends together, thus completing the circle and cutting off all means of escape for the fish. The staff of the first end is now securely imbedded in the mud to hold it in position, while the men gradually draw in the netting, thus lessening the circle and bringing the fish within narrower limits. When the circle has been considerably reduced the hauling proceeds more slowly, one man handling the cork lines while the other pulls on the lead-line, passing it beneath his feet to keep it close to the bottom. The fish are thus forced into the "bunt" near the stationary end, when, by a quick movement on the part of the fishermen, the staff is pulled up, and the net, with its contents, is quickly transferred to the boat.

The channel fishing is carried on only when the mullet are more or less scattered. When they begin schooling the fishermen move about from place to place until a school of fish is seen, when they proceed to surround and secure them. In this case the fishing is necessarily confined to the flats, where the water is shoal enough to allow the fishermen to wade about.

**FISHING WITH GILL-NETS.**—Owing to the jumping propensities of the mullet, the drag-seines are little used after the fishing becomes extensive, and are gradually replaced by gill nets, which are much more successfully employed. Gill-nets are extensively used in all localities where the mullet are taken. The local name of the net for the different regions depends largely upon the form and methods of use. In many places ordinary floating gill-nets, or "drift-nets," are used. These are allowed to drift with the current, the fish entering them only when they happen to come in their path. In other regions "stake-nets" are employed, these being set across the principal channels and held in position by means of poles.

"Sweep-nets" have been quite generally introduced among the fishermen of the different States. They are in common use among the fishermen of North Carolina, and are found in considerable number along the Gulf coast. Those used in Carolina waters are 75 to 100 yards long and 4 to 6 feet deep, with a mesh varying from  $2\frac{1}{2}$  to 4 inches. The twine of which they are made is purchased in Norfolk, at \$1.20 per pound. The nets, which are tied by the fishermen and their families during their leisure hours, usually cost, when complete, from \$12 to \$30 apiece. Two men usually own a net in common, going out together in a small boat on their fishing trips. As soon as a school has been surrounded by the net, the fishermen proceed to the inside of the circle and, by pounding on the gunwale, splashing the water with oars, or, when shoal enough, jumping overboard and running about within the circle, drive the mullet into the meshes. If left to themselves, many of the fish would see the net and avoid it, but in their effort to escape from the noise and splashing they soon become entangled in the twine. When all have been gilled, the net is hauled into the boat and the fish are secured.

A common method is for three to six crews to join forces, setting their nets together in such a way as to include the largest possible area. This method is found much more profitable for all concerned than setting separately, as, owing to the increased number of nets and the greater dispatch in setting them, only a small percentage of the fish escape while they are being inclosed, and much larger schools can easily be surrounded. When a school of mullet is seen, two of the boats are brought together a short distance in front of them, and the others take their position a net's length apart. At the proper signal a man from each boat jumps into the water, holding the staff of one end, while the net is being shot toward the man who is holding the staff of the adjoining net. They are shot simultaneously, and when all are out they form a large circle, which completely incloses the mullet. The remaining men now get overboard, and after the ends of the adjoining nets have been properly secured the fishermen proceed to the inclosed area to frighten the fish and drive them into the meshes. Frequently the space inclosed is so large that it becomes necessary to lessen it, and the men take the ends of their respective nets and draw them toward the center of the circle, care being taken that no opening shall occur through which the fish may escape. In this way loops or pockets are formed, into which the fish are obliged to enter. When thus inclosed, if any are seen swimming about, the area is still further reduced by drawing in the nets until every mullet has been gilled. The nets are then taken into the boats, and after the fish have been removed are at once put in order, and the fishermen start in search of another school, which is surrounded and captured in the same way. At the close of the day they gather and divide equally the catch. The average yield to the net in this locality for the season, which lasts from June to November, is about 20 barrels of salted mullet, though the quantity could be greatly increased by diligence on the part of the fishermen.

The methods employed in the Gulf of Mexico differ only slightly from those already described. The gill-nets used in this region are said to have been introduced by Northern men about six or eight years ago. They are of Boston or New York manufacture, and are made of hand-laid, six-

thread cotton twine. They are from 50 to 100 fathoms long, 6 to 12 feet deep, and have a mesh varying from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches. When properly hung they are worth about 50 cents per fathom. The fishing with gill-nets at Cedar Keys lasts about six months, beginning with September. The nets are usually set at high water, the night tide being frequently utilized. Two nets are usually fished in common. When a school of mullet is seen the boats take such a position as to bring the fish directly between them. The nets are then shot in opposite directions, the ends of one meeting or overlapping those of the other. The catch is equally divided.

A method known as "stop-fishing" is frequently employed in the small creeks tributary to the sounds and bays. The mullet frequently enter the creeks in considerable numbers on the flood-tide, and at high water the nets are stretched across the mouths to prevent their escape. As the tide ebbs, many, attempting to get out, are gilled in the meshes, while the others remain in the deeper holes and channels, where, at low water, they are easily secured by means of a small haul-seine. By this method all of the fish that chance to be in the creek when the net is set are easily secured.

The average catch to a gill-net at Saint Mark's, according to Mr. Stearns, is 100 pounds daily or 15,000 pounds per annum. At Ocklokony Bay he estimates the catch to be 100 to 300 fish at a tide, or 15,000 to 20,000 for the season.

**FISHING WITH CAST-NETS.**—Another kind of apparatus extensively used in the mullet fisheries of both Eastern and Western Florida, and to a limited extent by the fishermen of other States, is the cast-net. This is, perhaps, next to the hook and line, the apparatus earliest used in the fisheries of the United States. It is said to have originated in Spain, and was doubtless introduced into this country by the Spauiards who came to Saint Augustine in 1565, since which time it has been in constant use in that locality. A superficial examination of the cast-net by one who had never seen it in actual use would lead to the belief that it was a very crude affair, and could hardly be successful in the fisheries; but a more careful examination shows that it is fairly adapted to the fisheries in which it is employed, and that by long use the fishermen come to be very expert in handling it. The cast-net, briefly described, is a circular piece of netting, 8 to 16 feet in diameter, with a stretch-mesh varying from 1 to 2 inches. It has a hole at the center, through which pass 20 to 30 brails or cords, which are attached to the circumference at points equally distant from each other. The inner ends of these are secured to a long line, by means of which the fisherman handles the net. On every second or third mesh of the circumference is a sinker, usually of lead. The number of sinkers varies, according to the diameter of the net, from 100 to 200, each weighing about an ounce. During the fishing season the fisherman takes the net in his boat and starts for the shoal-water fishing grounds of the inner coves, bays, or lagoons, where the net is most successfully used. When a school of mullet is seen he at once rows or paddles up to it, and, after fastening the line to his arm, seizes in his left hand the ring which lines the aperture at the center, and with the other proceeds to throw the net over the fish. In throwing, one of the leads at the circumference is held between the teeth and a number of others are gathered in the right hand; then, by a swinging motion of the arms and body, the net is thrown to a distance of 8 to 10 feet from the boat, in such a way that it spreads out and falls flat upon the surface of the water. The leads at the circumference at once carry this to the bottom, the central portion of the netting forming a bag, into which the fish rise as they find themselves surrounded. The sinkers keep the rim of the net well down, and, by a slight jerking motion of the line which connects with the brails, the circumference is gradually drawn inward till the leads are together in one bunch at the center; and as they are raised from the bottom the netting drops over them, the fish being retained in the folds until they can be lifted into the boat.

Two styles of cast-nets are in common use, the Spanish, or "bag-net," as it is sometimes



called, differing from the English, or "brail-net," in that 8 inches of the outer part of the netting is doubled inward and upward, being attached to the body of the net at every eighth mesh, thus forming loops or pockets into which the fish drop when the net is being lifted. In these nets the sinkers are placed at the bottom of the fold, which thus really marks the circumference. Nets of this form cost about \$7.50. They are preferred to the "brail-net" by the fishermen of Saint Augustine, Clearwater Harbor, Cedar Keys, and Saint Mark's, as well as by those of the entire coast between Apalachicola and the Mississippi River. In other localities the English net, which costs about \$6.50, is more generally used.

Fifteen to twenty-five large mullet are often taken at a single throw of the cast-net, while twice that number of small ones are frequently secured. In 1876 Mr. H. S. Williams, a fisherman of Indian River, Fla., secured about 400 pounds from a single school in less than an hour.

**POUND-NET FISHING.**—The pound-net has not yet been fairly tested in the mullet fisheries. It is a form of apparatus used principally by the Northern fishermen, being almost unknown to those fishing south of Albemarle Sound, North Carolina. Two or three were set in the waters of Core Sound, near Beaufort, N. C., but not being properly arranged they took but few fish, and were soon taken up and transferred to the Neuse River. One can reach no definite conclusion as to their value for the mullet fisheries from these experiments, and must wait until they have been more thoroughly tested. Many of the Beaufort fishermen, however, state with a good deal of positiveness that the mullet will not enter them, assigning as a reason that on striking the leader they will turn directly back rather than attempt to get around it by following it into deeper water. This impression arises from the fact that the mullet are so readily turned from their course by the seine-rope, even before the netting has been drawn to the shore. Mr. Stearns, in his examination of the Gulf fisheries, found a crude trap somewhat resembling the pound-net in the waters of Tampa Bay, Florida. This was made of piles, small poles, and boards, the leader being 100 yards long, with a V-shaped bowl or heart 20 yards across and 30 yards long, having a small pocket at the outer corner. On consulting with the owner he learned that "when the pound was first set fish would not approach it, but after the stakes had become covered with barnacles and oysters the fish collected about it in considerable numbers." The owner assured him that "all the common fish in the bay now enter his pound." The largest catch made by him consisted of 300 mullet in one night, all of them being found in the pocket. An average night's catch brings him a dozen or two fish of various kinds. Sheephead, redfish, and salt-water trout seem to be taken in greater numbers than any other species.

**FISHING WITH HOOK AND LINE.**—As already stated, mullet are occasionally tempted to take a baited hook, though no one fishes regularly for them in this way, the few secured being taken while fishing for other species. They are sometimes caught by parties fishing with hook and line in the deeper holes of the tide-creeks about Charleston, and we learn of other localities where they are occasionally secured. Professor Goode, in his article on the natural history of the mullet, says: "It does not readily take the hook, but is sometimes caught with a bait of banana, or one manufactured of cotton and flour."

**LAY OF THE FISHERMAN.**—The financial arrangement or lay of the men engaged in the mullet fisheries varies greatly. It depends somewhat on the locality, but more particularly upon the kind of apparatus used. The simplest arrangements are found among the gill-net fishermen who work together for the more successful prosecution of the fisheries. In such cases the men usually own their own boats and nets, and the fish are either divided equally among the different crews or each fisherman keeps the mullet taken in his net, be the quantity large or small. Exceptional cases occur where capitalists furnish the boat and net and take one-third of the catch. In the seine fisheries,

where the apparatus is expensive and the number of men interested is much larger, the lay system becomes much more complicated. It depends somewhat upon the financial condition of the fishermen, as affecting their relations with fishing capitalists; though in many localities the arrangements framed in early times have been handed down to the present generation with scarcely a change, for there is certainly no class of people that cling so tenaciously to the methods of their fathers as the fishermen.

We will consider the principal lays only, for these, though differing somewhat with the locality, vary only within narrow limits.

At Wilmington the average catch is about 350 barrels to the seine. Of this quantity the owner of the seine and boat draws one-third, the remainder being divided equally among the members of the crew, with the exception of the captain, who receives twice as much as any of the others. At Beaufort, where larger seines are employed, and the shores are owned by farmers, who exact a large price from the fishermen for the privilege of using them, the financial arrangement is as follows: The seine receives from six to ten shares; the boat takes one; the beach three to ten, according to its relative importance as compared to other shores in the vicinity; one share is given to the man who supplies the camp with wood; and the remainder is divided equally among the members of the crew, including the captain. We thus find the season's catch divided into twenty-two to forty shares, the average being about thirty. During the season of 1879, which lasted from the middle of August to the 1st of November, the catch for the different seines averaged about 300 barrels each, a share thus consisting of 10 barrels.

In certain parts of Western Florida the men, as a rule, own their own nets, but as the fishing stations are some distance from their homes, they usually provide themselves with salt and the necessary outfit and remain at the fishing shores during a greater portion of the season. Owing to a scarcity of money they are frequently obliged to obtain their outfits on credit, and the man who furnishes them agrees to take the fish at a stipulated price in payment for the goods. This arrangement usually works to the disadvantage of the fishermen, as they are thus largely under the control of the merchant, who often charges exorbitant rates for the outfits, while he pays a comparatively small price for the fish. In speaking of the fisheries of Hunter's Point, Fla., Mr. Stearns says: "At this fishery, as at all others engaged in supplying the Cuban markets, the lay arrangement, with slight variations, is as follows: After all bills have been paid, such as duties, tonnage fees, provision bills, salt bills, &c., the owner of the fishery apparatus receives 15 per cent. of the gross stock, the owners of the vessels employed in taking the fish to Cuba 20 per cent., and of what is left each fisherman receives one share, the boys, if any, being allowed only half a share, while the captain receives a share and a half. The general complaint is that there is no money to be made in the business and that the fishermen always come out in debt. The vessel's expenses are quite heavy and are paid out of the common stock, but unquestionably more profit is made by the vessel than by the men engaged in the fishery or by the owner or owners of the apparatus. The continued political troubles in Cuba have injured these fisheries, for the Cubans have no money, and so to save themselves from being worsted impose heavy duties upon all imports." Occasionally all of the gear and outfit and the vessels engaged in marketing the fish are owned by the same parties. Under such circumstances a slightly different lay is generally adopted. At Gasparilla all of the gear and the carrying vessels belong to one company, who, having provided the outfit, receive 35 per cent. of the catch and pay 35 per cent. of all the bills. The other 65 per cent. is divided equally among the two captains and the crew, who pay the remaining 65 per cent. of the bills.

Prior to the rebellion, farmers living along the Alabama coast frequently owned seines and hired

fishermen to handle them. Usually regular wages were paid, and the fishermen always succeeded in making more money than could have been made in the ordinary way. This system is now practically abandoned, as the division of the catch into shares is found to work more satisfactorily.

#### 7. DISPOSITION OF THE CATCH.

**METHODS OF PRESERVING THE FISH.**—If we except Beaufort and vicinity, few mullet are salted along the Atlantic coast, as there is in the markets of the larger towns a fair demand for the fish in a fresh state, and the fishermen usually prefer to dispose of them in this way. In former years nearly all of the fish taken to Beaufort were salted and packed in barrels for home supply or for shipment to the interior. Within the past few years, however, the trade in fresh fish has opened a market for a small percentage of this catch, though the majority, especially of the large fish, are now salted as formerly. The same is true, to a certain extent, for the Wilmington district. Here the entire catch was formerly salted, but of late the fishermen prefer to sell their fish fresh when they can get 7 or 8 cents a bunch for them. Each member of the crew receives his share of a haul as soon as the seine is landed, and is, of course, at liberty to dispose of it as he may think proper. If in poor circumstances, he is usually anxious to turn his mullet into money at once, and he thus sells the bulk of his fish at Wilmington, regardless of the price paid by the dealers.

South of Little River, which marks the boundary between North and South Carolina, almost no mullet are salted for market, although each fisherman puts up a limited supply for his own use. The remainder taken by those fishing for the larger markets are at once sent to the principal fish-dealers. In the thinly populated regions any surplus is sold to farmers, who salt the fish for family use. Many of the fishermen of this region, especially those of Georgia and Eastern Florida, are wholly unacquainted with the methods of salting as employed in other localities, and owing to their ignorance of the proper methods of curing their fish they often lose most of those put up by them. This has led many of them to entirely discontinue the salting of mullet, and during our visit to the region we met quite a number who insisted that no mullet taken during the warmer weather could be salted so as to keep sweet for any length of time. About Charleston, S. C., and at Jacksonville, New Berlin, and Mayport, on the lower Saint John's, though considerable quantities of mullet are taken, the entire catch is sold fresh.

On the Gulf coast, where the fisheries are extensive, most of the mullet are salted. The methods vary considerably with the locality, some of the fishermen "kenching" or dry-salting their fish, while others salt in brine in the ordinary way. Kench-curing is, perhaps, more generally practiced in Southern and Southwestern Florida than elsewhere, and three-fourths of all the mullet prepared on the Gulf coast of that State are treated in this way, although in Apalachicola and vicinity salting in brine is the favorite method.

The method of dressing is similar to that employed for other species in the same localities. As soon as the boat containing the mullet arrives at the station the fish are carried to the salting-sheds, where suitable arrangements have been made for preserving them. The men are arranged in gangs, each having his particular work to perform. Several persons, known as splitters, take their positions on one side of the table, while the others, known as gillers, scrapers, and spawners, stand on the opposite side. The splitter takes the fish in his left hand, while in his right he holds a knife, with which he cuts it open from nose to tail along the back. It is then thrown to the giller, who removes the gills and entrails and cuts a gash along the side containing the backbone, in order that the salt may the more readily penetrate the flesh. This done, he tosses it to the scraper, who removes the blood and the black membrane that adheres to the nape. When roe-mullet are taken,

the giller, after performing his work, passes the fish to the spawner, that the roe-bags may be removed before it goes to the scraper. When the dressing process is complete the fish are thrown into a trough of clean salt water, in which they are allowed to remain and soak until all are split, after which they are thoroughly washed before salting. Much of the blood is taken out in this way, and the fish thus become lighter and of a more desirable color. Usually all the fish are dressed before the salting begins, but when the catch is large the dressing and salting are carried on at the same time, several additional men being employed for the work. As the salting requires care, the captain usually superintends the work in person, seeing that all are properly treated. After they have been washed they are rubbed in salt, and if they are to be pickle-cured they are at once placed in pork-barrels or other tight packages, with the fleshy side up, an additional quantity of salt being sprinkled between the alternate layers, the fish in each layer being placed at right angles to those in the layer next above and below. They are allowed to remain in this condition for several days, until they have been thoroughly struck and the moisture which they contain has passed out of the flesh to form a pickle, which nearly or quite covers them. They are then taken out, and the pickle, which contains considerable blood and dirt, is placed in large kettles and boiled, after which it is allowed to cool and carefully strained. The fish are then again placed in barrels with additional salt, and the clarified brine is poured over them. After a barrel has been headed an additional amount of brine is added through the bung-hole, so that the barrel may be entirely filled. In many localities the heads of the mullet are removed before the fish are split, but in a majority of cases they are left on. This latter method is commonly employed in preparing fish for the Cuban market, as the people of that island prefer mullet dressed in this way. Some of the fishermen have the habit of scaling their mullet and removing both head and backbone before salting them. Fish prepared in this way bring a little higher price than the others.

The kenching process, as already stated, is more extensively employed in Southwestern Florida than elsewhere. The fish are dry-salted and packed in boxes or tied up in bundles for shipment. They are dressed and salted in the ordinary manner, after which they are corded up in piles, an additional quantity of salt being introduced between each layer. The scaly surface of the fish is placed downward, to retain the salt that is dissolved by the moisture of the body. In some cases, after the fish have been split, they are covered with salt and the sides are again brought together, so that the body cavity is entirely filled. Mr. Stearns, in describing the kench-curing at the Hunter's Point fishery, says that the fish, after being cleaned, pass to "the salting-tables, where they are rubbed with Liverpool salt, after which the insides are filled with it and closed up, leaving the natural shape of the fish. Men or boys are employed in packing the fish away as soon as they have been salted. They are packed in rows or tiers, heads out, in one corner of the house, and when the pile becomes large they present a most peculiar appearance, resembling a work of masonry more than anything else. \* \* \* The first fish thus carefully put up," he continues, "are in a first-class condition for any market; it is only in the warmest weather of August or September that the mullet are known to rust or turn red."

No uniform size or style of package has been generally adopted by the mullet fishermen, and considerable annoyance is experienced by the dealers from this source. In many places ordinary pork-barrels are used, while in others barrels, or in fact any water-tight packages, regardless of size, are utilized for packing and marketing the pickled fish. In North Carolina all kinds and sizes of barrels were formerly used indiscriminately, but the quantity of fish contained in them varied so much that no uniform standard of price could be adopted, and much hard feeling arose between the fishermen and the merchants. This led to the passage by the legislature of that State in 1879 of a law requiring that mullet should be put up in barrels having a stave 25 inches

in length and a head 13 inches in diameter. The capacity of this barrel is about half as great as that of the common fish-barrel, holding, when properly packed, about 100 pounds of mullet;\* but, as the law does not specify the exact weight of fish, some of the fishermen who are inclined to dishonesty pack their mullet in such a way that the side of the fish containing the backbone shall come in the center. By packing in this way, 90 pounds of fish will fill a barrel. Mr. Stearns says that the packages now used for putting up pickled mullet at Apalachicola "are of white pine, either barrels, half barrels, quarter barrels, or kits. These come by freight from Boston. Formerly cypress packages were used, but they were discarded because they were not so neat or cheap as the ones just mentioned. With the freight included, those white pine barrels, half-barrels, quarter-barrels, and kits cost, respectively, \$1, 65 cents, 45 cents, and 30 cents." In other portions of the Gulf home-made barrels are in general use, though a portion of the supply is usually obtained from the North.

In the shipping of keneled or dry-salted mullet ordinary wooden boxes are frequently employed. In many localities the fish are simply bundled up in such a way that the fleshy side of the mullet may be turned inward and kept clean while in transit, or, again, the outside of the bundle is covered by a single layer of matting or palmetto leaves.

As already stated, only young mullet are found in New Jersey; these being too small to sell when salted in the ordinary way, most of them are used fresh, though a few of the larger ones are sometimes salted for family use. We learn indirectly that a few of the small mullet are put up in vinegar and spices, though we have never seen any fish of this kind in the market.

At New Smyrna, Fla., and in a few other localities, according to Mr. J. F. McCarthy, mullet are smoked to a limited extent for family use, though none are prepared for market in this way.

**METHODS OF PREPARING MULLET ROES.**—The roe of the mullet, which consists of two cylindrical masses of eggs an inch or more in diameter and 4 to 8 inches long, is considered a great delicacy, and many are saved by the fishermen, who find a ready sale for them. They are obtained from the schools of roe or spawning mullet that are so abundant in all of the bays and coves along many portions of the coast between the middle of September and the 1st of December. The marketable ones are taken from gravid females which, though full-roed, have not yet begun spawning. At this time the ovaries, though large, are still compact, and the eggs are hard and firmly held together by means of a membrane that surrounds them. As the spawning season approaches, the eggs gradually soften and expand until they burst the membrane and fall into the ovarian duct, slowly passing toward the opening, through which they are excluded. When in this condition the roes are too soft to be of value, and are hence usually thrown away. At most of the larger fisheries one man usually gives his entire attention to gathering and preparing the roe.

Fresh roes are in good demand in the larger fishing towns, and they are highly prized by the fishermen, who consume quite a quantity of them during the season. A large percentage of those saved, however, are cured for shipment to the commercial centers. In some localities they are salted

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\* We publish the following letter received from Messrs. Hall & Pearsall, of Wilmington, N. C., in reply to our inquiry as to the quantity of mullet contained in a barrel of regulation size:

JULY 16, 1881.

R. E. EARLL, Esq., *Asst. U. S. Fish Com., Washington, D. C. :*

DEAR SIR: Yours of the 14th to hand. Having no good fish in stock, we took to-day a barrel of the regulation dimensions named and filled it with pickled fish which had partially dried. We then covered it with the usual quantity of salt pickle, and subsequently reweighed it, with the following result: Barrel, fish, and pickle (gross), 166 pounds; fish, 95 pounds; pickle, 41 pounds; barrel, 30 pounds. As these had lost some weight in partially drying, we estimate that a barrel of this size should contain 100 pounds net of pickled fish.

Yours, respectfully,

HALL & PEARSALL.

in kegs and kits in the ordinary way; in others they are slightly salted, after which they are thoroughly dried and packed in boxes for shipment. Along certain portions of the coast the practice of smoking them prevails to a limited extent.

If the roes are to be dried they are immediately on removal from the fish placed in brine, where they are allowed to remain for several hours, after which they are spread upon boards and placed in the warm sunlight until all or a greater part of the moisture has been evaporated. In some localities the roes are pressed, in which case the partially dried ones are placed between boards, where they remain, subjected to a slight pressure, until thoroughly dried. In pleasant weather the time required in drying and pressing is about a week; if cloudy or rainy, a proportionately longer time is needed. When properly dried and pressed these roes are from 2 to 4 inches wide and half to two-thirds of an inch thick. They vary greatly in color from yellowish brown to dark red, the shade depending largely upon the method of curing.

Some of the fishermen give special attention to the preparation of roes, and produce those that, in addition to being very palatable, are of excellent appearance. Others, on the contrary, bestow little care upon them, and as a result they produce an article which is always inferior and in many cases nearly worthless.

Mr. Stearns, after mentioning the excellent appearance of the roes seen by him at the Sarasota fishery, says that those noticed at a Spanish fishery near by "were maggoty, but the fishermen seemed to think they were all right, remarking that that condition was nothing unusual."

For many years the North Carolina fishermen have been accustomed to preserve the roes, either dry or in pickle, and ship them to Charleston, from which place they have been largely exported to the West Indies. At Saint Augustine, Fla., considerable numbers are dried for local consumption, though few, if any, are shipped from the region. Along the Gulf coast the fishermen make a regular business of saving and curing them. The majority are sun-dried for the Cuban trade, while a large percentage of those put up in kegs are shipped to the interior towns of Georgia and Alabama.

Both the dried and salted roes are sold by count, the price varying somewhat in the different markets, usually ranging from 60 cents to \$1 per dozen. The price paid to the fishermen averages about 50 cents. When dried the roes are often sliced up and eaten raw, though they are occasionally cooked in different ways. The salt roes are usually fried, and when well cooked are exceedingly palatable.

#### 8. EXTENT OF THE FISHERY.

Comparatively few mullet are taken north of Cape Henry, as they are not sufficiently abundant to warrant any one in making a business of catching them. The first important fishery as we proceed southward, is in the North Carolina waters between Roanoke Island and New Berne, where all of the local fishermen engage in their capture to a limited extent in the fall. The majority fish only for home supply, but several parties fish more extensively, selling their surplus catch to the farmers of the locality. The quantity taken in this region, if we exclude the 1,500 barrels taken by the "bank" fishermen south of Cape Hatteras, is 700 barrels of salt fish, valued at \$2,500, and 20,000 bunches of fresh fish, having an equal value.

In the waters of Core and Bogue Sounds the largest fisheries on the Atlantic coast are found. The number of seines between Ocracoke Inlet and New River in 1880 was 37; 20 were fished in the sounds and 17 along the outer beach. In addition to these, a large number of drag-nets and upwards of 200 gill-nets were used; nearly all of the fishermen being extensively engaged in the capture of the species for two or three months, some of them continuing for a much longer period.

The catch for 1880 in this region amounted to 13,000 barrels of salt mullet and 40,000 bunches of fresh ones, having a value to the fishermen of about \$45,000. In the Wilmington district, including the coast between New and Little Rivers, 48 seines, with 100 additional gill-nets, were employed, the catch amounting to 2,800 barrels of salt mullet, in addition to the large quantity sold fresh in the Wilmington market. The statistics for the whole of North Carolina show 1,500 men, with 450 seines and 700 gill-nets, employed in the fisheries; the total catch being 3,368,000 pounds of mullet and 2,000 dozen mullet roes, having a total value of \$80,500.

At Charleston 12 mullet seines, manned by 72 men, are fished regularly for a couple of months in the fall, these landing during the season an average of 2,500 bunches each, or a total of 30,000 strings, equal to 135,000 mullet. In addition, the seiners that fish along the numerous tide-creeks during the winter months catch about 4,000 bunches, or 35,000 mullet in number, in addition to their other fish, making the total mullet yield for Charleston 34,000 bunches, or 170,000 fish, which, at an average value of 12 cents a bunch, would pay the fishermen nearly \$4,000, while the retail value is nearly double that amount. In addition, not less than 5,000 bunches were secured by the fishermen of Winyah Bay, a large percentage of them being sent to Charleston. The statistics for the South Carolina waters show 80 men, with 15 seines and 10 gill-nets, regularly employed during the height of the season, marketing 232,000 pounds of mullet and 20 dozen roes, with a total value of \$7,210.

The mullet fisheries of Georgia are quite unimportant, only 30 men, with 5 seines and 20 gill-nets, fishing extensively. The value of the catch was about \$4,500.

At the mouth of the Saint John's River, and in the sounds further south, quite a quantity of mullet are taken, 181 men being engaged to a greater or less extent in this fishery. The total yield for Eastern Florida is 663,000 pounds, valued at, including the 500 dozen roes, \$20,787. At Saint Mark's a large number of men are engaged in the capture of mullet for shipment to Savannah. Fully 90,000 pounds are sent fresh each season, and a quarter as many more are salted for local use and shipment. The fisheries of Cedar Keys and Apalachicola are perhaps more extensive than those of any other towns on the Gulf of Mexico, while those of Sarasota and Tampa Bays are also important. Mr. Stearns, who has collected the statistics for the Gulf coast, says that seven hundred and thirty-six men, with 85 seines and 125 gill-nets, are employed in the fishery for a number of months. The total catch for Western Florida he places at 2,831,333 pounds of mullet, with 13,325 dozen mullet roes, the total value to the fishermen being \$102,721.

In Alabama, Mississippi, and Louisiana the catch is quite small, the men devoting only a few weeks to the capture of this particular species, though the mullet are present during the entire year, and are taken in greater or less numbers by the fishermen while seining for other species. The values of the products for these States, as given by Mr. Stearns, are \$3,750, \$60, and \$1,650, respectively.

In Texas there are no regular mullet fisheries. The fish are present in small numbers, and, though not regarded with much favor for food, a few are taken by parties fishing for other species.

Professor Jordan, in his account of the California fisheries, says that 600 pounds of mullet (*M. mexicana*) are taken by the fishermen of San Diego during the average season.

The following table gives a condensed summary of the mullet fisheries of the United States, showing the number of persons and amount of apparatus employed, and the quantity and value of the products:

THE MULLET FISHERY.

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Table showing the extent and value of the mullet fisheries of the United States for the year 1879.

	Number of fishermen.	Fishing apparatus.						
		Number of seines.	Number of gill-nets.	Number of cast-nets.	Value of netting.	Number of boats.	Value of boats.	Total value of apparatus.
Total.....	3,101	658	966	285	\$52,656	539	\$57,198	\$109,764
Long Island Sound to North Carolina.....	*120	50			900	45	1,450	2,350
North Carolina.....	1,500	450	706	20	31,000	775	36,500	67,500
South Carolina.....	80	15	10	10	1,200	20	1,060	2,200
Georgia.....	86	5	20	85	900	25	750	1,650
Eastern Florida.....	181	18	57	226	4,125	273	4,780	8,905
Western Florida.....	736	85	125		9,351	311	9,078	18,429
Alabama.....	106	15	20		1,620	85	1,000	3,620
Mississippi.....	22	4	7		610	10	750	1,360
Louisiana.....	832	18	27		3,150	45	1,800	4,950
Texas.....								
California.....								

	Products of the fisheries.								
	Pounds of mullet sold fresh.	Value of fish sold fresh.	Pounds of fresh mullet used for salting.	Pounds of salt mullet produced.	Value of salted mullet.	Total number of pounds of mullet taken from the water.	Number of dozen roes saved.	Value of roes.	Total value of the products.
Total.....	2,966,863	\$87,168	6,270,422	3,572,250	\$134,833	8,237,305	15,845	\$7,127	\$224,292
Long Island Sound to North Carolina.....	82,700	2,480	33,000	22,000	770	115,700			3,250
North Carolina.....	683,000	19,500	2,685,000	1,790,000	60,000	3,368,000	2,000	1,000	80,500
South Carolina.....	220,000	7,000	12,000	8,000	200	232,000	20	10	7,210
Georgia.....	100,000	4,000	4,000	4,000	100	106,000			4,100
Eastern Florida.....	633,000	19,337	30,000	20,000	700	663,000	500	250	20,787
Western Florida.....	1,058,083	28,881	2,504,422	2,028,250	73,603	3,562,505	13,325	5,867	102,721
Alabama.....	125,000	3,750	(?)	(?)		125,000			3,750
Mississippi.....	1,500	60	(?)	(?)		1,500			60
Louisiana.....	55,000	1,650	(?)	(?)		55,000			1,650
Texas.....	8,000					18,000			240
California.....	600					600			24

\* These fish only occasionally for mullet, and hence cannot be regarded as professional mullet fishermen.

† Estimated.

9. MARKETS.

A good deal has been said from time to time about the food qualities of the mullet. In all of the principal seaport towns between North Carolina and Louisiana it is an important article of food, and in many places a third, or even a larger percentage, of all the fresh fish consumed are of this species. When perfectly fresh, mullet are considered of excellent flavor and find a ready sale, but owing to their fatness they soon deteriorate in warm weather, and when stale have a rank flavor which is not at all pleasant. In cool weather, however, or in seasons when they are not particularly oily, they keep equally well with the other grades of fish. Many contend that salt mullet are of an inferior quality, and will never come into general favor. These insist that the fish are soft and of a rank and muddy flavor. Others, on the contrary, hold that they compare very favorably with the mackerel and with other pickled fish so frequently met with in the principal markets. Professor Goode, in referring to the subject, says: "I had an opportunity of tasting some salted by a negro at Mill Cove, and can bear testimony to their excellence. Their flavor is more like that of a salted salmon than of a mackerel, and they are hard, toothsome, and not at all muddy in taste." An examination of the evidence on both sides leads to the belief that where inferior grades of mullet are found the difficulty is to be attributed to the defective methods of



curing rather than to any inherent qualities of the fish. In many localities little care is bestowed upon them, and the fish are often allowed to become stale before they are salted. Again, they are frequently put upon the market in a half-cured and dirty state, so that their appearance will prejudice one against them, even though their flavor may not have been seriously impaired. When properly cured they are undoubtedly of excellent flavor, and we see no reason why they will not compare favorably with the Northern mackerel, of which several hundred thousand barrels are consumed annually.

Up to 1870 no fresh mullet were shipped from Beaufort, N. C., all of those taken, with the exception of the quantity used in the locality, being salted for sale among the farmers in the northeastern portion of the State. It seems that for many years the mullet fishermen of this region, after catching and salting their fish, have been in the habit of hiring vessel-owners to market them. As soon as the fishing season was over, the mullet were loaded upon these vessels, in charge of the captain, who was to exchange them for corn with the farmers living along the banks of the navigable streams tributary to the Carolina sounds. The captain was at liberty to make the exchange upon any basis that he might think proper, but as he was given a percentage—usually one-fifth of the corn received—for his services, he was apt to drive the best possible bargain. Five bushels of shelled corn for one barrel of mullet was considered a fair exchange, though the price varied somewhat from year to year. Having secured his cargo of fish, he usually set sail for some small town on one of the larger rivers, where he remained until all of the mullet were sold. The arrival of a "mullet-trader" soon becomes known among the residents of any locality, and the farmers of the region at once load their wagons with corn and start for the landing to secure their fish. This practice has continued to the present time, and even now a large percentage of the mullet salted by the fishermen of Core and Bogue Sounds are marketed in this way, only a small part of the catch being sold for cash at Beaufort and Morehead City, though the merchants and others are anxious to purchase at fair prices. Those marketed in Beaufort are usually shipped by rail to the larger cities of Eastern North Carolina or to Norfolk, from which points they are redistributed to the farming districts. Probably nine-tenths of the mullet taken in North Carolina waters are consumed in the eastern half of that State. When money is received, the price paid to the fisherman is \$2.75 to \$3.50 per barrel of regulation size, which is supposed to contain 100 pounds of fish.

In the spring of 1870 a small trade in fresh fish began. This business increased slowly at first, but of late it has grown with remarkable rapidity, and during the year ending with June, 1880, fully 40,000 bunches, equal to about 150,000 pounds, of mullet, in addition to large quantities of other fish, were shipped fresh to the larger cities of the Carolinas and Georgia. The price paid to the fishermen at Beaufort ranges from 2 to 4 cents per pound.

At Wilmington, as at Beaufort, nearly all of the mullet taken in former years were salted. The farmers of this region made a practice of driving down to the fishing shores each season to obtain their supply for family use. Many of them came a distance of 30 to 40 miles. Some brought corn and other produce to exchange for the fish, while others brought the money with which to purchase them. The price paid averaged about \$3 per barrel, less the value of the package, which the farmer usually did not care to purchase. Of late years, owing to the large demand for fresh fish, few mullet are salted in this locality, and it is stated on good authority that during 1879 not over 50 barrels were put up for shipment within a radius of 15 miles of Wilmington, though at distances more remote, owing to a difficulty of marketing the fish fresh, many were salted. The "roe mullet" usually find ready sale at an average of 12½ cents each. The "fat mullet" are strung in bunches of from 2 to 4 each, according to size, and sold at from 15 to 20 cents. A bunch

of "finger-mullet," containing 5 to 10 fish, brings 7 or 8 cents, though at times of over-supply the dealers can often purchase them for half that amount.

Though so few mullet are now salted in the immediate vicinity of Wilmington, the city has long been, and still is, an important market for salt fish, the supply coming from various portions of the coast between Bear Inlet and Little River, the majority being received from the fishermen at New River, who divide their catch about equally between Wilmington and Beaufort. According to Messrs. Hall & Pearsall, the largest salt-fish dealers in Wilmington, the height of the business was in 1871, when about 6,000 barrels were handled. Since that time the trade has fallen off greatly, until in 1879, according to the same authority, only about 2,800 barrels were sent to the city. The average annual quantity handled during the last ten years is about 4,000 barrels. Two-thirds of those received are sold in the eastern half of North Carolina, the remainder being divided between the western portion of the State and South Carolina, where they are consumed largely by the farmers and laboring classes. The price paid to the fishermen at Wilmington has varied from \$1.50 to \$4.50 per barrel, the average being from \$2.50 to \$3.25; 50 to 75 cents more being paid for roe mullet, on account of their size, than for the other grades.

At Charleston the entire catch of mullet is sold fresh, at 6 to 15 cents per bunch. Owing to this demand for fresh fish the city dealers are obliged to send to North Carolina for their supply of salt mullet.

A large majority of the fish taken in the Saint John's river are sent fresh by rail or steamer to Savannah, from which point they are distributed to the larger cities of Georgia and the Carolinas. Almost no mullet are salted in this region.

On the Gulf coast, owing to a lack of shipping facilities, a majority of the mullet are salted; but where opportunities for shipment are found, as at Cedar Keys and Saint Mark's, nearly all of the fish are sold fresh. In some cases they are kept alive in smacks until the shipping time arrives, that they may reach the market in better condition. At Cedar Keys the demand for fresh fish is good, and the price is usually such that the fishermen are not warranted in salting them, though they frequently resort to this practice to keep their catch from spoiling when for any reason they cannot be shipped. Those sent fresh are first washed in ice-water, after which they are packed with ice in hogsheads, tierces, or barrels. After they have been thoroughly iced they are shipped by express to Savannah or to some of the larger towns of Florida and Georgia. The price at Cedar Keys has increased about 25 per cent within the last four or five years. At present the fisherman receives 2 cents apiece for fresh roe mullet and 2 to 2½ cents for salted fish of equal size. The prices charged by the dealers are 4 cents for fresh mullet and 3 to 3½ cents for those salted. All other kinds of fish are sold by the pound. In some localities where the fish are salted, as at Ocklokony Bay, they are bought by the farmers, who drive down to the shore to secure them. In other localities they are often peddled through the country by the fishermen after the fishing season is over. Mr. Stearns, in speaking of the Ocklokony region, says: "When the gill-netters begin fishing none of the planters have arrived, and all fish caught in October are dry-salted and carelessly packed dry in boxes for home consumption, or to be held until the customers arrive. The roe in these fish is undeveloped, and is therefore not often saved. A little later the farmers begin to arrive at the fishing station with their teams, and sometimes their families. Some of them bring 25 or 50 sacks of salt, to exchange for the fish or to use in preparing any fresh fish which they may purchase. Others bring country produce, and a few bring money. All have their favorite trading stations, at the most popular of which, it is said, 100 to 150 are often seen waiting their turn. When a seine is landed or when a gill-net crew comes in, all of these people flock down to the shore and buy the fish at so much apiece fresh, or make some arrangement for a certain number salted."

In referring to a locality where some of the fish are peddled, Mr. Stearns says that some of the fishermen prefer to carry their catch to market, though a majority sell at their own doors. Those who adopt the former plan load up their ox-carts and start for the interior, stopping at every small town and plantation along the road until all of their mullet have been sold. In case they have been preceded by other carts, they find it necessary to travel a good many miles, some of them going as far as Columbus before they have disposed of their entire load. This practice was more prevalent in *ante bellum* days than at present, and at that time the planters, who fed their slaves largely on fish and bacon, were the principal buyers.

For many years Cuba has been an important market for salted mullet. Thirty years ago the fishermen at the mouth of the Saint John's were extensively engaged in salting fish for shipment to Havana, and though the business has been discontinued in that locality, it is still kept up by the fishermen of the Gulf coast. A large percentage of the mullet taken in Southern Florida are dry-salted and sent to Cuba, many of the fisheries being provided with vessels that devote their entire attention to marketing the catch. These vessels make regular trips during the fishing season between Havana, Matanzas, Cardenas, and other ports, selling the salted mullet at 3½ to 4 cents per pound and the dried roes at 50 to 75 cents per dozen. The duty on fish imported into the West Indies amounts to \$1.40 per quintal. Probably a majority of all the mullet-roes put up along the Gulf coast, as well as many of those prepared on the Atlantic seaboard, find their way to the Cuban markets.

**POSSIBILITIES FOR THE FUTURE DEVELOPMENT OF THE MULLET FISHERIES.**—Questions are often asked by fishermen and capitalists in different parts of the country concerning the abundance of the mullet along the Southern coast and the possibilities of a further development of the mullet fisheries. There seems to have been a wide difference of opinion on the subject, and the answers to the questions have been very conflicting. Some maintain that the species is now taken in as large numbers as practicable, and that as many fish are now placed upon the market as can be sold to advantage. Parties holding these views think the mullet not sufficiently abundant to warrant any extended commercial fisheries, and they further claim that the fish, owing to their inferior flavor, are not destined to be generally introduced. Others, on the contrary, insist that the prospects for an extended development of the fishery are very encouraging. They state that the fish occur in such numbers as to practically do away with the question of extermination from overfishing, and that the mullet when properly prepared compare favorably with any other species, and further that by a little effort they can be readily introduced into almost any portion of the country.

During our visit to the South we were unfortunate in that we did not see the fishery at its height, though in many localities considerable quantities were taken daily, thus enabling us to get a pretty definite idea of their relative importance as compared with other species. In addition to our own observations, we improved every opportunity for gathering, from the most reliable sources, such information on all points connected with the abundance of the species and the prosecution of the fishery as would lead to a better understanding of the subject.

After comparing these notes with our own observations, we are led to believe that the prospects for an extended development of the mullet fisheries are very favorable. The reasons for this view may be briefly stated as follows:

(1) *Abundance and extended distribution of the mullet.*—One or more species of mullet may be found in the waters of seventeen of our twenty-one sea-bordering States and Territories. In thirteen of these it is taken in greater or less quantities for food, and in seven States, covering a coast line of hundreds of miles, it is more abundant than any other species during six months of the year, while in some localities it is never entirely absent.

(2) *Peculiar abundance in the in-shore waters.*—The peculiar instincts of the mullet which draw them toward the shore are greatly in the fisherman's favor, for while the cod, mackerel, red-snapper, grouper, and many other important food-fishes remain in the deep water at a considerable distance from the shore, the mullet enter the shoal water in enormous quantities, and continue their migrations along the outer beach within a few rods of the land; and, indeed, they as frequently enter the inner bays and sounds, where they are readily taken by the fishermen, who are not obliged to endure the hardships and perils of the open ocean in the prosecution of the fishery.

(3) *Readiness with which the mullet can be secured.*—The gregarious instincts of the mullet bring them together in schools, which are often of large size and great density. Instances are on record where 600 barrels have been taken at a single haul of the drag-seine, and schools containing 200 to 300 barrels are not uncommonly seen. Again, in their migrations the mullet swim near the surface, where their presence is easily recognized by their continual jumping and splashing, and the fisherman is thus directed as to when and where to set and haul his nets. With bottom-swimming fish the conditions are much less favorable, for he is obliged to make "blind sets," trusting to chance to surround a school, much time and labor being lost in making "water hauls."

(4) *Its merits as a fresh fish.*—The fresh mullet is rapidly growing in favor among the fresh-fish dealers in the districts where it is known, and though somewhat inferior to several of the more highly prized species, such as the Spanish mackerel and the whiting, it is of firm flesh and excellent flavor. Formerly it was sold only in the markets of the seaboard towns, but of late it has been introduced into many of the interior cities, where it has met with a ready sale and is regarded with considerable favor. Its distribution, however, is still confined to a comparatively small area, though there seems little doubt that it will soon be much more widely known. The improved shipping facilities along the southern coast will aid greatly in the distribution of the fresh fish, and the demand, as well as the price, will undoubtedly be increased in proportion, and the time seems not far distant when the market will take much greater quantities than at present.

(5) *Its value for salting.*—The fishermen of many localities have little idea of the value of the mullet, and in many counties almost none are salted, as the residents do not know that they could find a market for them even though they might be able to catch and cure them. The business is thus confined within narrow limits, and there are stretches of coast 50 to 75 miles in extent where not a single barrel of mullet is put up for shipment, though the fish are present in immense numbers and would yield remunerative employment to the fishermen of the locality. Even in places not now accessible by rail or steamer the fisheries could be carried on with profit, as the products could be carted overland or boated through the inner tide-channels and lagoons to the nearest shipping point. In fact, we see no reason why the entire coast from Carolina to Texas should not be one continuous mullet fishing ground.

At present a large percentage of the Southern fishermen, even where salting is practiced, are unacquainted with the best methods of curing, and many of them are putting up mullet in so crude a manner as to greatly impair their flavor and to render them of little value. Such fish greatly injure the reputation of the species and do much to destroy the demand, for when a person in testing the mullet gets fish of an inferior quality he at once infers that all mullet have a similar flavor, and seldom cares to give them another trial. Some, however, are giving careful attention to the preparation of these fish, and are putting them up in a neat and attractive manner. When thus cured the mullet are held in much favor even by the epicures. It only remains for the fishermen to become familiar with the proper methods of curing, and to give more attention to cleanliness in the preparation of their fish, to have them meet with a ready sale.

(6) *The growing demand for fishing products.*—For many years prior to the rebellion the fishery

remained almost stationary, it being carried on largely by the planters for the purpose of supplying food for their slaves. During the war, and, indeed, for six or eight years thereafter, the fishery was greatly reduced, many stations being entirely abandoned. Of late, however, owing perhaps to the changed social condition of the people, there has been a growing demand for both fresh and salt fish in all portions of the South. In the Northern States, also, the demand for fishery products has greatly increased, and to day larger quantities of fish are consumed than ever before, while twice as many could be readily disposed of in case they could be obtained at reasonable rates. This growing demand is chiefly supplied in the spring and early summer by the large catch of shad and alewives in the larger rivers, and by the mackerel vessels fishing off the New England coast. In the winter the cod and haddock are peculiarly abundant off the northern coast, and many persons are engaged in catching them to supply this trade. During the fall, however, when the great run of mullet occurs, comparatively few other species are taken in any considerable numbers, and the market is quite bare of fresh fish. This gives an excellent opportunity for the development of the mullet fisheries, for it provides a sufficient outfit for almost unlimited quantities of mullet at a handsome figure. The salt-fish trade is also greatly increasing, and the supply of mackerel, though larger than for many years, does not equal the demand, and the prices are rapidly advancing, the figures in 1882 being several dollars more per barrel than for the same quality of fish in 1881, while those of the last-named season were considerably in advance of those of the year previous.

No systematic effort has yet been made to introduce salt mullet into the markets of the North or West, and they are little eaten outside of Florida, Georgia, and the Carolinas. Even in this region, owing to the poor quality of the fish, the demand is often limited. With well-cured fish it seems that little trouble would be experienced in extending indefinitely the territory over which they are eaten, and the better grades of mullet might be brought into competition with the mackerel and lake whitefish, when their relative merits would at once be recognized.

(7) *The profits to be derived by the residents from the mullet fisheries.*—Many of the residents of the sea-bordering counties of the Southern States own small tracts of land, on which they raise limited quantities of the various products commonly cultivated in those regions. From these they derive a moderate revenue, which is often quite insufficient to supply the wants of their families, and they are obliged to devote a portion of their time to other work. In the fall and early winter, when the mullet are most abundant, these men have little to occupy their attention, and they could, therefore, engage in the prosecution of the fishery with great profit to themselves and at the same time be increasing the food supply of the country, thus greatly benefiting the manufacturing classes. The present methods are fairly adapted to the capture of the species, though they could, perhaps, be somewhat improved upon by the exercise of a little thought and ingenuity. The purse-seine, now so commonly employed by the Northern fishermen in the capture of mackerel, might be introduced with advantage for use along the outer shore, where the fish are running too far from the beach to come within reach of the drag-seines. Other Northern apparatus might, perhaps, be introduced with advantage. Even with the apparatus now in use, however, we see nothing that offers greater inducements to active and energetic men during the months of September, October, and November than the mullet fisheries.