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STATE OF NORTH CAROLINA
DEPARTMENT OF
CONSERVATION AND DEVELOPMENT
WADE H. PHILLIPS, Director

BULLETIN No. 35

FISHING IN NORTH CAROLINA



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FOREWORD

Without attempting to treat the subject in a strictly scientific manner, this bulletin is issued for the purpose of disseminating information regarding the fish life of North Carolina.

By means of statistics showing the extent of the industry in the State and pointing out the need of conservation and development of the natural supply, it is hoped that the bulletin will be instrumental in creating a deeper impression of the importance of this natural resource.

The Department hopes that the bulletin will be a step toward bringing about a more thorough appreciation on the part of the general public of all natural resources, thus impressing upon each individual the real responsibility which he owes toward contributing his part to the prosperity and pleasure of the future.

The subject is considered here in two divisions: first, that part dealing with the commercial fishing industry, which ranks as one of the most important in the State from the standpoint of total returns and of the population dependent for a livelihood; and game fishing, a sport participated in by thousands of enthusiasts.

Before beginning consideration of the subject, a brief review of the status of the Department's work may be helpful in showing of what its program consists. The real start of a definite State-wide program of conservation and development of fishing resources may be said to have originated with the creation of the Fisheries Commission Board by the 1915 General Assembly.

By consolidating the Fisheries Commission Board with that of the Department of Conservation and Development, the General Assembly of 1927 brought together the State's program of activities which deal with natural resources.

North Carolina's first State-wide angler's license law was also enacted by the 1927 General Assembly, and, as a result, it is expected that the game fish supply will be better protected and that artificial propagation will be increased steadily by means of funds supplied by the sale of fishing licenses until the waters of the State are stocked sufficiently to meet the growing popularity of the sport.

Materials incorporated in the bulletin were gathered from a number of sources, the publication, "Fishes of North Carolina," compiled by Hugh M. Smith in 1907 and issued by the former North Carolina Economic and Geological Survey, proving especially helpful. Among other contributors were: H. H. Brimley, W. A. Queen, Capt. J. A. Nelson, J. K. Dixon, Frank J. Rieger, Harry T. Davis, W. E. Baker and the U. S. Bureau of Fisheries.

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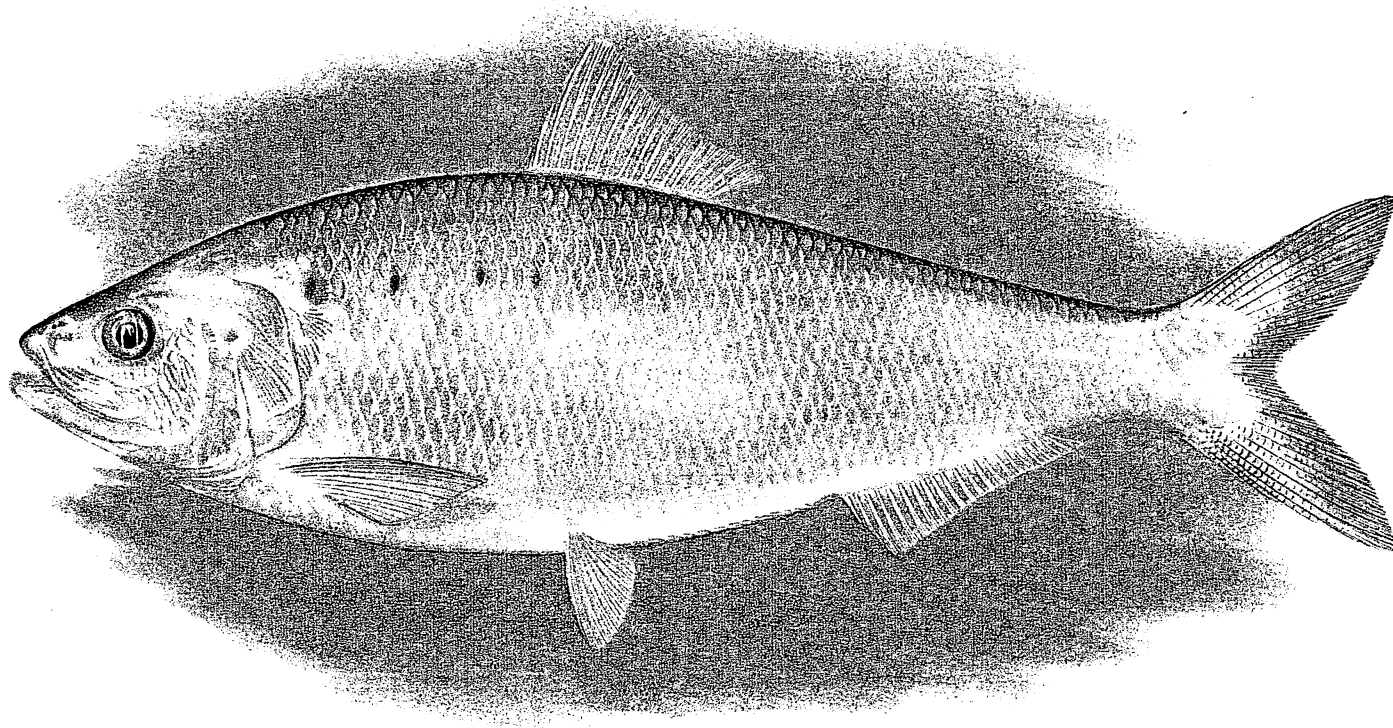
VALUE OF FISH AS FOOD

A majority of the people of North Carolina do not consume more than a small per cent of the quantity of fresh fish and oysters that they should. How to bring about an increase in this kind of food for the average family is an important problem. In these times when every family, both in town and country, is a large consumer of canned goods, it is more important than ever before that there should be an increase in the quantity of oysters, in season, and fresh fish on every table. This is necessary in order to maintain a proper balance in the kind and quality of food best for good health. From pre-historic times to the present moment seafood and the products of the inland rivers and streams have been regarded as an important source of food necessary in the life of human beings.

Oysters and fish, especially the salt water fish, contain large amounts of mineral matter, especially iodine, a certain amount of which is necessary for every person in order to maintain good health. These foods are all, when properly prepared, easily digestible. Ordinarily they are not expensive, and the average householder should find it an easy matter to increase the present ratio of consumption of these foods.

In this connection one of the most important items to consider is the fact that there are no finer fish or other seafood, including oysters in season, than the product obtained in the coastal waters of Eastern North Carolina. These areas are free from sewage disposal from large cities, and from a health standpoint, are probably as safe and desirable as any such products produced anywhere in the world. The people of North Carolina should insist on obtaining a North Carolina product primarily because these products are safe from sanitary standpoint, and also because the food value of these products is equal to any anywhere.

The State Board of Health would like to urge upon the people of this State a study of the foregoing facts in order to realize the importance of these foods in maintaining the health standards of the people of the State.—DR. CHAS. O'H. LAUGHINGHOUSE, *State Health Officer*.



SHAD (*ALOSA SAPIDISSIMA*)

A. HOEN & CO.

PLATE 5

COMMERCIAL FISHING

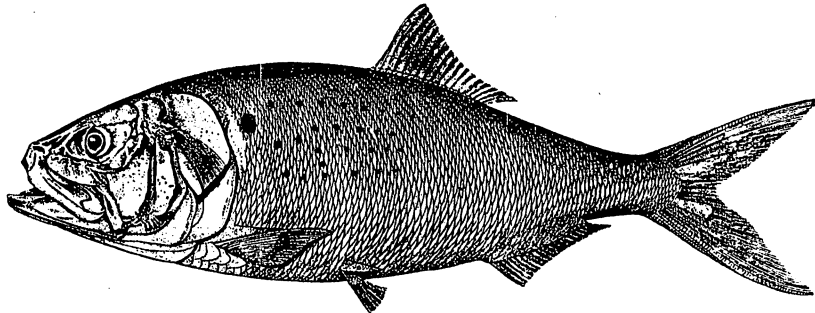
IMPORTANCE OF COMMERCIAL FISHING

Fishing is one of the two oldest pursuits known to man, and with hunting, records of this enterprise have come down through the most obscure pages of history.

Before the mind of man had devised implements with which to establish even the crudest of trades and when the sustenance of human life depended upon the fruits which could be plucked with small effort from overhanging branches and the game and fish man could take with the crudest of devices, fishing has been an important provider for man.

Virtually every coastline in the world has been skirted by fishing vessels since the time when advancing civilization made necessary diversification in vocations and established markets for sea products.

North Carolina has been smiled upon by a beneficent Providence and endowed with a great variety and abundance of sea life, and the fisherman's



The menhaden (fatback), which is the foundation of an industry of large proportions along the coast of North Carolina. More than three millions of dollars are invested in menhaden factories, boats, and other equipment. Around 1,500 men are employed in the menhaden industry.

(Courtesy U. S. Bureau of Fisheries)

net has grown into an important provider of food for the State and Nation. In importance commercial fishing today ranks third in value of output from natural resources of the State. This rank refers to the simple operations of gathering and turning the products into trade channels, exclusive of any preparations for market or, in other words, the raw product of the fishing grounds. The two natural products which surpass fishing in value of the raw article are timber and minerals.

Fishing probably has engaged in its actual operations a dependent population larger than is engaged in the original production from either the mines or forests in North Carolina. Latest available figures (1925) show that approximately 15,000 persons are engaged in fishing activities incident to the production and marketing of the seafoods in North Carolina; and a population of around 50,000 is estimated to be dependent upon the industry for a livelihood. The last figure includes those engaged in canning, by-products factories, and associated operations.

The total annual value of fish taken from North Carolina waters is estimated to be around three and a half million dollars, of which food fish (fin and shell) amounts to around two and a half million dollars.

Captain J. A. Nelson, Fisheries Commissioner, estimates that investments in plants, boats, nets and other equipment used in production, manufacturing, and marketing of fish and fish products amounts to around \$3,756,468.00, ranking the industry as one of the most important in the State.

COMMERCIAL FISHING GROUNDS

Because of its physical characteristics, the coast of North Carolina furnishes practically a double line of fishing grounds, extending for a distance of three hundred miles from the Virginia line to South Carolina.

The fishing grounds are classed as "inside," and "outside." Those of the numerous sounds and mouths of large rivers are the "inside" grounds, roughly consisting of approximately three thousand square miles, and the "outer" are ocean water grounds. These physical peculiarities have had an important influence on the abundance and variety of the commercial fisheries.

North Carolina's sounds are situated between the narrow strip of land, known as "the Banks" and the mainland, communicating with the ocean through narrow inlets or through other sounds, some of which are salt and others fresh water.

The largest of these sounds are Currituck, Albemarle, Roanoke, Croatan, Pamlico, Core, Bogue, and a number of smaller ones. Large rivers such as Chowan, Roanoke, Pamlico, Alligator, Neuse, and Cape Fear are well known as spawning grounds for white shad. The Chowan is said to be the greatest spawning ground for shad in this country.

Currituck, the most northern of the North Carolina sounds, is a fresh-water body; is forty miles in length; averages in width three or four miles; and has an area of approximately one hundred and thirty square miles. The sound has no direct outlet to the sea, its only communication directly to the Atlantic having been closed by natural forces since early last century. Black bass, perch, and striped bass are found in abundance in the sound.

Immediately south of Currituck Sound is Albemarle, credited with being the largest coastal body of fresh water in the world, extending from east to west a distance of sixty miles with an average width of six to seven miles, widening at some points to fifteen and covering an area of approximately four hundred and fifty square miles. Eight rivers, among which are the Roanoke and Chowan, emptying into the sound, provide favorable spawning grounds for white shad and striped (rock) bass, probably the best along the Atlantic coast.

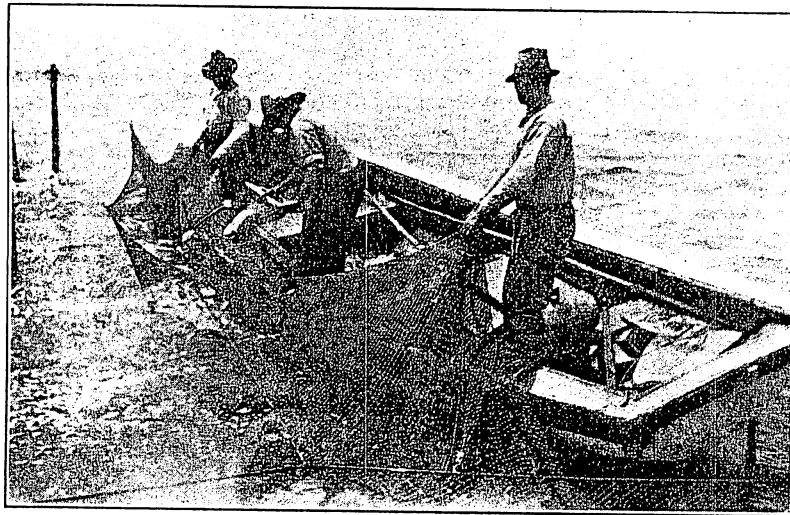
Roanoke and Croatan sounds, parallel to the coast and separated by historic Roanoke Island, form a natural passage between the larger Albemarle and Pamlico Sounds. Both of the smaller sounds are about eight miles in length, Roanoke being between one and two miles in width and Croatan, two to four miles.

Croatan, being the natural passage between Pamlico and Albemarle, is considered one of the best fishing grounds in the State. It is said that its bottom is more valuable than the same area of some of the best farming

lands. State regulations require that at least one-third of the area of this sound must be kept open to allow the passage of fish.

Largest of the sounds along the North Carolina coast is Pamlico, seventy-five miles long, and ten to thirty miles wide. It has an area of 1,860 square miles, and ranges in depth up to twenty feet. This is the largest sound on the Atlantic coast except Long Island sound. Migratory fish use the sound as a passage to their spawning grounds, especially the white shad and striped bass.

The sound also affords large quantities of salt water species such as mullet, spot, croaker, drum, bluefish, sheephead, and hog fish. Much of the bottoms of this sound are covered with the finest quality of oysters.



Pound-net fishermen making a haul. This form of fishing derives its name from the use of a center pound into which the fish are guided by means of leads, usually extending out for a distance of 30 yards on each side. The illustration shows the fishermen gathering their catch into one corner of the net from where they are dipped out.

(Courtesy U. S. Bureau of Fisheries)

Tests of the waters of the sound and of the oysters show that they are free of pollution, both the State and Federal Health authorities having declared the oysters of the best approved quality. The absence of any large towns—New Bern and Washington twenty miles away being the nearest to the oyster beds—relieves virtually all danger of pollution.

Core and Bogue Sounds are the farthest south of the larger coastal bodies of water. Both of the bodies are shallow and have good haul net fishing. Bogue Sound is especially noted for the number of scallops, playing a leading part in placing North Carolina among the leading producers of this seafood. The yield of the scallop beds often runs as high as \$200,000 in value annually, most of which are shipped from Morehead City and Beaufort.

South of Bogue Sound, the coast is fringed virtually the entire distance to the South Carolina shore with small sounds such as Bear, Brown, Stump,

Topsail, Myrtle Grove and Wrightsville, which furnish a considerable supply of fin and shellfish for the market. The large mouths of such rivers as the Chowan, Roanoke, Perquimans, Pamlico, Neuse, New, and Cape Fear are among the most important waters for commercial fishing.

Many points along the outer shore line of the coast are worked actively by fishermen, and furnish great quantities of food fish, chiefly of the migratory variety, most important of which from the standpoint of quantity of production, is the mullet. In one season, as much as a million pounds of this fish have been marketed. Cape Lookout, a projecting shelf into the ocean, near Morehead City and Beaufort, is known as the best year-'round fishing point on the Atlantic Coast.

CLASSIFICATIONS OF FISHES

Endowed by nature with varied topography and a wide range in climate, waters of North Carolina are the habitat of a fish fauna rich in species and individuals.

Her coast-wise fringe of sounds, numerous rivers, natural and artificial lakes, gives the State as great a range in her waters as the varied characteristics of the land and as a result the fish life is as rich as the opportunities afforded for their existence.

From the headwaters of the Alleghany watershed to the coastal waters of the Atlantic, each physical characteristic of the waters has its indigenous fish, many species of which were first known from North Carolina waters. The headwaters in the mountains; the broad, slow-moving river mouths; the sounds and the outer shores each have species known to commerce and sport.

Because of her almost central geographical location among the coastal states and her variety of climatic conditions, North Carolina enjoys a number of prominent features relating to her fish fauna, which, as listed by Hugh M. Smith in Volume II of the "Fishes of North Carolina" include the following:

1. Abundance of some anadromous fishes, whose numbers are scarcely surpassed in any other waters, the chief of these being shad, the alewives and the striped bass.
2. Variety and abundance of suckers, minnows and sun-fishes in the fresh waters generally and of darters in the headwaters of the streams on each side of the Alleghanies.
3. Occurrence in the sounds and the outer shores of immense schools of mullet, squeteague, menhaden, blue-fish, croaker, spot, pig-fish, pin-fish, and other food fishes.
4. Extension to the North Carolina coast of many species which are characteristic of the West Indies or Florida.
5. A few species of the Atlantic coast reach their southern limit in North Carolina (such as the cod and tautog) or do not occur in noteworthy numbers farther south (such as the white perch and striped bass).

The latest available classification of fishes of North Carolina waters gives 345 species, not including several which have been introduced and have become more or less frequent. There are 99 families of native fishes and 215 genera, an average of 3.5 species a family and 1.6 species per genus.

Following is the tabulation by Mr. Smith of the twelve largest fish families according to species and genera.

Cat-fishes	12 species in	4 genera
Suckers	18 species in	5 genera
Minnnows	36 species in	9 genera
Killi-fishes	9 species in	5 genera
Mackerels	8 species in	6 genera
Carangids	17 species in	8 genera
Sun-fishes	17 species in	10 genera
Perches	24 species in	12 genera
Sea basses	11 species in	7 genera
Sparids	7 species in	6 genera
Drums	14 species in	10 genera
Flounders	11 species in	7 genera

In number, the salt or brackish water species lead with 209; fresh-water species come next with 125; and the last group which inhabits both types of water at times, known as anadromous or catadromous, is third with 11.

By dividing the fresh-water fishes into species according to the waters to which they are peculiar, it is found that 85 are from the Atlantic slope; 36 from the Mississippi basin on the western slope of the Appalachians, and 15 are common to both.

The following figures give an idea of the value and extent of the fisheries, exclusive of shellfish and menhaden, of North Carolina for the biennium July 1, 1924, to June 30, 1926:

<i>Kind</i>	<i>Number of Pounds</i>	<i>Value</i>
Trout	6,919,969	\$ 426,786.58
Sea mullet	860,899	40,588.49
Blue-fish	1,279,946	98,566.34
Mulletts	3,657,179	220,884.88
Croakers	3,140,374	78,181.57
Spots	1,300,757	45,199.57
Hogfish	103,328	2,076.25
Mackerel	428,182	41,697.41
Shad	3,007,432	902,229.60
Herring	5,849,628	210,042.71
Butters	656,311	33,707.73
Bass	698,960	119,741.85
Jacks	495,276	49,050.25
Rock	552,930	165,879.00
Bonitos	10,894	359.30
Flounders	155,175	14,231.74
Pompano	21,448	3,470.30
Sheepshead	1,652	84.77
Drum	81,730	4,367.31
Catfish	302,996	20,599.54
Robin	54,382	3,153.53
Trash	59,500	713.06
Carp	35,115	2,241.90

FISHING IN NORTH CAROLINA

Pike	25,128	2,626.33
Perch	481,453	36,894.35
Chub	1,589	126.79
Sturgeon	12,894	2,835.09
Assorted	1,824,638	149,145.09
	32,119,765	\$2,675,481.03

SIZE LIMIT FOR COMMERCIAL FISHES

The following minimum size limits for commercial fish have been set by the Board:

Sturgeon, moose or pegging awl.....	5 feet
Mackerel	12 inches
Rockfish	12 inches
Hickory shad	12 inches
Gray trout	9 inches
Speckled trout	11 inches
Bluefish	10 inches
Sheepshead	9 inches
Sea mullet or kingfish.....	10 inches
Red drum	12 inches
Flounders	9 inches
Mulletts	8 inches
Black bass	12 inches
Ring perch	7 inches
Croakers	8 inches
Pompano	8 inches
Spots	7 inches
Hogfish	8 inches
White perch	7 inches

Regulations establishing these limits provide that the measurements be taken from the tip of the nose to the tip of the tail. They also specify that these measurements do not apply to catches of smaller fish for sport or personal use.

SEASONS

North Carolina is fortunate in possessing waters that furnish fish for virtually the entire year with variations in the variety according to the season.

Beginning near the first of the year or around the latter part of January to the first part of February, depending upon the "run," shad and herring seasons open.

Open season for these varieties extends to May 1, south of a line from Batt's Island to Laurel Point on Albemarle Sound, and north of this line the closed season begins on May 10.

Summer fishing for trout, croakers, butterfish, and all other salt water fish caught in pound nets begins on June 10 at Hatteras, Ocracoke, and Portsmouth, and at all other points the season begins June 20, both con-

tinuing without restrictions as to time until around the latter part of October or the first of November. The only closed season on summer pound net fishing extends from May 1 to June 20, except at Hatteras, Ocracoke, and Portsmouth, where the season is closed from May 1 to June 10.

Oyster season starts October 1 and extends until April 1 of the following year, the season having been advanced 15 days by the Board at its last meeting.

Escallops are taken during the period between January 1 and May 1, but regulations limit the days in which they may be taken to three each week, Mondays, Wednesdays, and Fridays, with the Fisheries Commissioner being authorized to allow scallop fishing on Tuesdays and Thursdays at such times within the open season as he may deem advisable. The Commissioner is also empowered to permit the taking of escallops on Tuesdays and Thursdays between June 1 and August 15 for home consumption.

A closed season on the shipment of soft-shell crabs is set from October 1 of each year to March 1 of the following year, and a general minimum size limit of two and one-half inches, measuring from tip to tip of spike, is provided. However, between March 1 and April 10 the size limit is dropped to two inches, and the use of one crab float, four by four feet, to each crab fisherman is allowed until April 15 and after that date two floats of the same size to each man for the purpose of floating fat crabs only.

GENERAL CLASSIFICATION

Generally speaking, the fishing industry of North Carolina may be divided into two classes, food and commercial.

From the standpoint of returns to the fisherman, the food fishing activity is the more important, the returns to the fishermen for the period from July 1, 1924 to June 30, 1926 showing a value of \$2,675,481.03, and a total production of 32,119,765 pounds of food fish, exclusive of shellfish.

Records of Captain J. A. Nelson, Fisheries Commissioner, show an increase in the catch of these fish for the past biennium of approximately six million pounds over that of the preceding period and \$424,000 more in value.

The largest poundage of fish yield was the trout, 6,919,969 pounds, which yielded a return of \$426,786.48, and the next largest catch was herring with 5,849,628 pounds, valued at \$210,042.71.

Mullets came third with a total yield of 3,657,179 pounds, which returned a value of \$220,884.88, and 3,140,374 pounds of croakers brought to the fishermen \$78,181.57.

Shad is the most important catch in value, bringing to the fishermen \$902,220.60 in the biennium from a total poundage of 3,007,432, or a revenue more than double that of any other food fish.

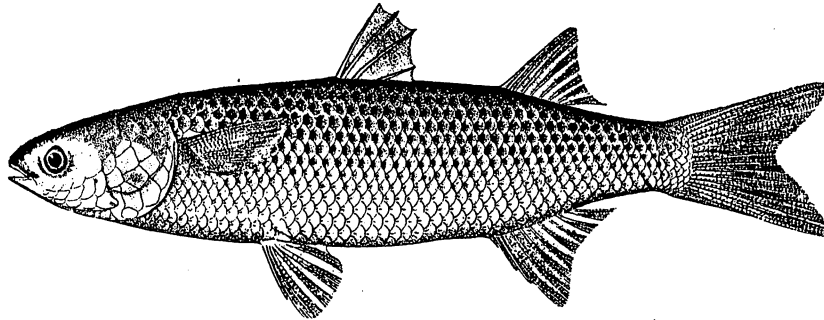
The figures shown on pages 11 and 12 give a comprehensive review of the value and number of pounds of the catches of commercial fish during the 1924-26 biennium, exclusive of the menhaden and shellfish.

The menhaden or fatback is the principal fish product of North Carolina waters used in manufacturing processes, and is of great commercial value. This species of fish is caught by the tens of millions off the coast, and its importance is increasing as the uses of its products grow.

Scrap and oil, the two products of the fish, are being used for many purposes. Menhaden oil is deodorized and refined and turned into many channels of trade so numerous that it would be difficult to enumerate them.

As in the case of oil, uses of scrap from the menhaden are being rapidly increased. Formerly its sole place was in fertilizer, but now even poultry and stock feed are made from this product.

North Carolina waters, according to the last biennial report of the Fisheries Commissioner, yielded during the two-year period to licensed fishermen a total of 300,200,000 menhaden, bringing a return of \$451,000 to the fishermen. Oil produced from the fish during the biennium amounted to 2,090,000 gallons, valued at \$1,003,250; and 40,200 tons of scrap, valued at \$1,006,900.



The striped mullet is one of the most abundant saltwater fishes of North Carolina waters. Some attain a length of two and a half feet, but the average is less than one and one-half feet. The mullet is found on the ocean beaches, and in the sounds and estuaries during a large part of the year.

(Courtesy U. S. Bureau of Fisheries)

SHELLFISH

The oyster industry in North Carolina last season was reported to have been the best since 1924, in which year there was heavy depression of the trade due to unwarranted propaganda, concerning the sanitary qualities of the bivalve.

Immediately after the scare which followed the wide publicity given to this subject, there was a falling off in the output of the shellfish of North Carolina due to a slackening of the markets.

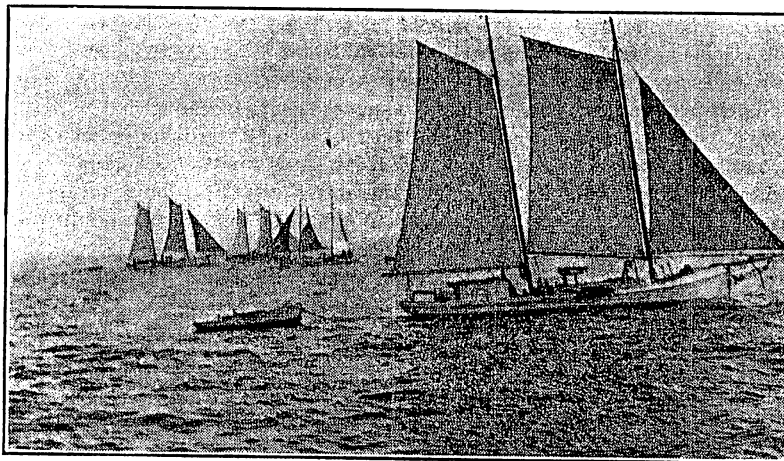
The present upward trend of the industry is a striking example of sanitation work on the part of the various health and fisheries officials. In rebuilding the output and reestablishing public confidence, the United States Public Health Service and the State Board of Health have joined with the fisheries officials, rendering service that has been the salvation of a depressed industry.

To reestablish the markets, the consuming public is given the assurance that it is getting shellfish from approved beds only, and that the product is handled and shipped under the best of sanitary conditions. Bacteriological examinations are made on the shellfish beds, the water is tested with care, the houses where they are handled assure cleanliness, and the finished products of the plants are examined to give the final assurance to the consumer.

The water used in the plants is examined with the same degree of care, the food handlers are given a strict medical examination, and lastly, the shellfish on the markets are inspected by the State Board of Health and by various officials of the State Dairy and Food Inspectors' Association.

The following figures give an illustration of the decline of oyster production, owing to market conditions, and the subsequent upward trend as a result of absolute health safeguards:

<i>Season</i>	<i>Bushels</i>
1922-23	500,000
1923-24	972,438
1924-25	418,035
1925-26	185,960
1926-27	300,390



Fleet of sharpies dredging oysters in Pamlico Sound. Such a sight as this is common during the oyster season.

SHELLFISH PLANTING

An angle of the work of the Department probably least known to the public, but which is of primary importance, is the program designed to encourage the natural development of the fish supply.

Researches and studies of the physical, climatic, biological, and other conditions that affect the natural supply of fish life are constantly being carried on under the direction of the Department and with the assistance of other agencies. This work has had the whole-hearted support of the United States Bureau of Fisheries. The Bureau's station at Beaufort coöperates fully with the Department, and the researches carried out there have proved highly valuable in forwarding this program.

One of the fields which has received much attention is the development of the oyster bottoms. This State is one of the leading producers of oysters, and to quote from an old report of the Fisheries Commissioner, "The oyster

business offers the best future for development of any branch of the industry, (fishing), and with a little financial help from the Legislature, North Carolina can be made the leading oyster-producing State in the Union."

This statement was made in a report to the 1923 General Assembly, which later appropriated \$500,000 for the development of the commercial fisheries, but directed that part of this fund should go toward the construction of the fish hatcheries for the propagation of trout, bass, and other game fishes for the inland streams. An account of the activities of the construction and operation of the hatcheries is given in another section of this publication dealing with game fishing.

Since the 1923 appropriation, 1,611,956 bushels of oysters and shells have been planted, the larger part of this work having been done in the springs of 1923 and 1924. The planting was accomplished at an expenditure of \$146,212.50, an average of 9.4 cents per bushel.

Most of the shells were planted in the waters of Pamlico Sound or in the smaller bodies adjacent to the sound. Bottoms were selected for their suitability for oyster growth, while some experimental plantings were made on virgin bottoms that are now being oystered as natural oyster rocks.

The heaviest plantings were made in the biennium of 1922-24 during which time 1,413,504 bushels were set and last biennium 198,452 bushels were planted. Sixty-four oyster beds were set in the first named biennium and twenty in the second.

DIAMOND-BACK TERRAPIN

Prompt measures—perhaps considered by some as drastic—by the former Fisheries Commission Board in April 1924 were required to save the diamond-back terrapin industry from complete destruction through the depletion of the supply.

An order from the Board at this meeting closed the season on the taking of diamond-backs for a period of five years.

The great demand for this delicacy and the high market value caused intense efforts on the part of fishermen to catch the turtles, and as a result the North Carolina coast was virtually "fished to death" of the terrapin, and the resolution of the Board was necessary to give a new start to the industry.

Twenty years ago, the diamond-back was considered plentiful, but the rising price and large demand caused the grounds to be overworked. Many epicures declare the diamond-back to be one of the choicest of seafoods, and the article was the *pièce de résistance* for many a fashionable banquet table.

The large price of the diamond-back made its capture a lucrative occupation. The demand assures a good market when the ban is lifted. Present prices are said to range as high as \$90 a dozen for the animals, and a frequently quoted price is one dollar an inch, under shell measurement.

After prohibiting the taking of the terrapin, the Fisheries Board joined with the United States Bureau of Fisheries in a program of rearing young terrapins with which to give a new start to the industry. A large hatchery is being operated at Beaufort through the coöperation of the two agencies.

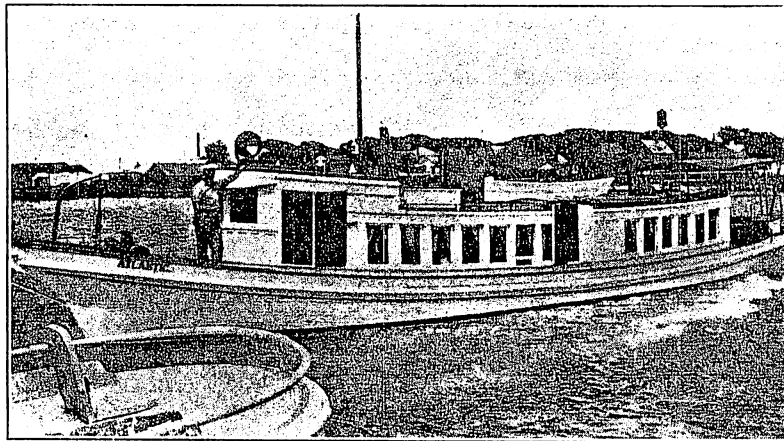
The station at Beaufort since 1924 has been releasing a number of the young animals each year. The most recent planting consisted of approximately 2,100. These are marked and it has been noted that those that have survived have gained considerable growth.

The coöperating arrangement of the hatchery at Beaufort began in 1925, and it is the purpose of the two forces to increase the output within the next few years to between 20,000 and 30,000 annually.

The terrapin is slow-growing, requiring from five to fifteen years to reach maturity, and, as usually is the case, especially among cold-blooded animals, the rate of growth of individuals is uneven.

Several lines of experiments are now under way with the idea of developing a larger and a faster growing stock in which the rate of growth will be more uniform. Methods more or less similar to those used in stock breeding are employed. For example, experiments in cross-breeding have been undertaken; selective breeding is practiced; and line breeding will be engaged in as soon as the necessary generations become available.

Fish culturists see a promising outlook for building a large industry on the remnants of the old one, and a source of considerable revenue to the fishermen.



The "Atlantic," familiarly known as the flagship of the North Carolina Fisheries fleet. This vessel is used by Capt. John A. Nelson, Fisheries Commissioner, in the inspection of the fishing grounds, the enforcement of regulations, and the collection of licenses.

STATE FISHERIES PATROL FLEET

For the work of collecting licenses, enforcing regulations, studying the condition of the industry, and maintaining a general supervision over the fishing waters of the State, a fleet of seven vessels is provided for the Commissioner and his assistants.

These boats are distributed in strategic locations so as to facilitate covering the various fishing grounds. The *Atlantic*, sometimes called the flagship of the fisheries fleet, is used by the Commissioner for general supervision over all patrol and inspecting forces.

The *Albemarle*, with headquarters at Manteo under the direction of an assistant commissioner is used in patrolling Albemarle, Croatan, and Roanoke Sounds. The *Neuse*, with headquarters at Swanquarter, patrols Pamlico Sound and its tributaries; and the *Chowan*, from Edenton, covers upper Albe-

marle Sound. The patrol of Bogue and Core Sounds and Newport River is carried on by the small speed boat, *Roanoke*, and the *Croatan* aids the *Albemarle* in staking off fishing limits.

A completely equipped laboratory has previously been maintained on board the *Pamlico*, which has covered all of the shellfish bottoms during the seasons. However, lately this laboratory has been set up at headquarters' building at Morehead.

In addition to these patrol boats, the Department has two automobiles for the use of the Assistant Commissioner at Wilmington and the Sanitary Engineer at Morehead City.

By the use of an automobile, the Sanitary Engineer facilitates his movements to the points of shellfish production to aid in the problems of marketing as well as investigating the biological features of the shellfish, and in exercising sanitary control over the industry with the view of enabling the dealers to maintain the prestige of their products on the markets.

Heretofore this work has been carried on by boat. Besides being slow and costly it was dependent, to a great extent, on the weather, but now with the advent of good roads, it is expected that impetus will be injected to effect a greater development in the oyster and clam industry.

The boats under the direction of the Commissioner, represent a capital outlay of \$23,251.84, according to the report of June 30, 1926. They are manned by experienced sailors, and are well cared for. They form an important cog in the administration of the fishing laws and regulations, and are the watchmen of the industry.

RECENT CHANGES IN FISHING LAWS

The recent General Assembly by amending section 1966 of the Consolidated General Statutes makes it lawful for non-residents of the State to take menhaden (fat-backs) from North Carolina waters north of Cape Hatteras by levying a tax on these fishermen.

Previously it had been unlawful for these non-residents to engage in fishing for menhaden in these waters, but owing to the expense it was impossible to maintain a sufficient patrol to enforce this law.

Under the new law, a license amounting to 75 cents a ton on the gross tonnage of these fishing boats, is provided and it is estimated that there will be a possible revenue of approximately \$7,500 to \$10,000 from such license fees.

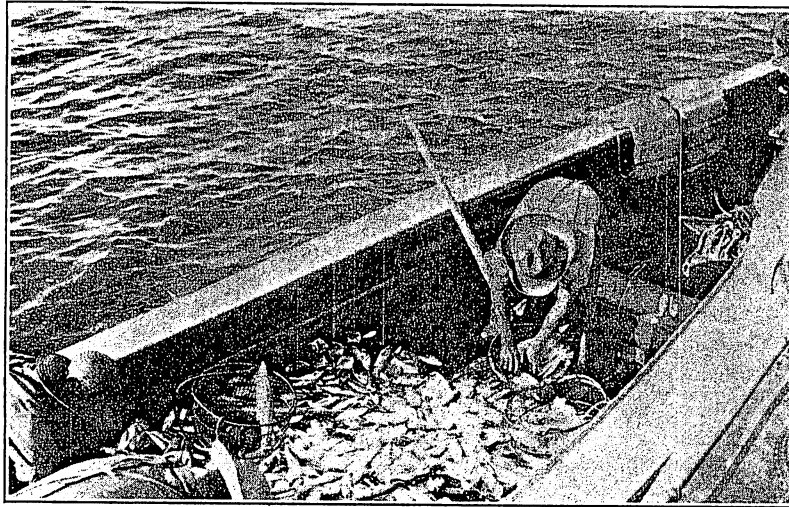
The Assembly also authorized changes in several tax rates on shellfish, raising the levies in order to furnish a larger sum for shellfish sanitation work. The following raises were made: clams from five to eight cents per bushel; round oysters from two and three-quarters cents to four; and coon oysters from one to two cents.

One of the most important steps toward simplifying and clarifying fishing regulations in the State was taken by the Board of Conservation and Development at its last meeting in designating "Commercial and Inland Fishing Waters."

By setting out the two divisions, the Board fixes a standard by which regulations may refer to either group and obviate the necessity of naming specific waters as has been the practice heretofore.

Under the new classification, the "Commercial" fishing waters of North Carolina are: All that portion of the Atlantic Ocean bordering on the coast and all sounds and bays lying between the mainland and the Atlantic Ocean; also certain portions of the following rivers and their tributaries:

North river below Coinjock; Pasquotank river below Elizabeth City; Little river below Nixonton; Perquimans river below the bridge at Hertford; Chowan river below Tunis; Alligator river below Gum Neck; Pungo river below Leachville; Pamlico and Tar rivers below Grimesland; Roanoke river below Weldon; Neuse river below Goldsboro; South river, a tributary of the Neuse river, below the Forks; Upper Broad creek, a tributary of Neuse



Pound-net fishermen are shown here culling their catch for the market. The success of the haul is shown by the well-filled bottom of the boat.

(Courtesy U. S. Bureau of Fisheries)

river, below the lower side of Flatty creek; Goose creek, a tributary of Neuse river, below the Narrows; Slocumb's creek, a tributary of Neuse river, below the Beach Haven farmhouse; Newport river below the Narrows; North river below Lynch's bridge; White Oak river below Stella; New river below Jacksonville; Trent river below Brice's creek; Cape Fear river below the locks; Lockwood Folly river below Supply; Yadkin river below Bluit Falls; the north prong of North creek, a tributary of Pamlico river, below Frank Creedle's landing; South creek, a tributary of Pamlico river, below a line on the north side of Tuoley's creek to the east side of Long creek; Lower Goose creek, a tributary of the Pamlico river, below a line from Pasture Point to Long Neck Point.

"Inland" fishing waters consist of the following: All inland rivers and their tributaries or portions of same, together with all ponds and lakes in the State, not included or specifically named in the list above mentioned under the head of "Commercial" fishing waters.

PROBLEMS OF COMMERCIAL FISHERIES

Problems which face the commercial fishing industry, all of which have a vital bearing on its welfare, may be classed in three divisions—physical as applied to the geographical, climatic and local conditions; regulatory, covered by laws and the regulations set down under the law by the Board; and marketing of the products.

Because of the suitability of certain fishes to particular localities affected by the temperature of the water, the salinity, food sources, quality of water, and other features, the physical problem of the industry is fundamental. Observations have proven that sudden or radical changes in the conditions under which fishes live, tend to drive out the regular inhabitants, leaving either uninhabited waters or replacement by other varieties.

These factors are kept constantly under observation by the fisheries officials and the Board with the view of adapting the industry to changes or rectifying, wherever possible, those conditions that affect the supply.

As has been mentioned previously, climatic and physical conditions of this section of the Atlantic coast bring real problems before the fishermen and the State. Probably the most important problem is that of maintaining the quality of fishing waters in their normal proportions. Certain of the inland waters supply fresh water fishes and other salt or brackish; and when these conditions change there is resultant injury to the fin and shellfish. Both natural and artificial causes have a direct bearing on these conditions.

Excessive flows of fresh water over the shellfish beds have at various times brought great losses to this branch of the industry. This point is well illustrated by the destruction of large quantities of scallops in Bogue Sound in 1924 because of excessive rainfalls.

Salt water coming through the locks of the Chesapeake and Albemarle Canal into Currituck Sound during late months has had a harmful effect on the bass supply. Officials have taken cognizance of this situation and are directing efforts toward rectifying the situation by seeking the closing of locks near the head of the sound.

Another problem that has received a considerable degree of attention from the officials is that of providing ample inlets for upper Pamlico Sound. Shifting sands borne by strong winds have closed the inlets on the upper part of this body of water.

It is the general belief of most of those who have studied this situation that the opening of an inlet in this section will promote the growth of clams and oysters by letting in salt water, and that it will provide easier access to the upper sounds and their tributaries for shad and herring for spawning.

An effort to provide this inlet was made during the last biennium, and \$126,372.64 was spent in reopening New Inlet. The work was carried out under the supervision of competent engineers and responsible contractors, but

the opening was closed as a result of the sands driven under the force of prevailing northeast winds.

Although this effort did not result successfully, there are some who think that some method of bringing about a new inlet may be worked out. With this thought in view, the recent session of the General Assembly directed that further scientific studies be carried out in that section.

The General Assembly of 1915, simultaneously with the creation of the Fisheries Commission Board, granted authority to this body to promulgate regulations for the protection of the fish supply, and under the authority of the most recent General Assembly this duty has been passed to the Board of Conservation and Development. In order to allow a closer study and observation of the various functions of the Board, the members have divided themselves into committees or groups, one of which is for the commercial fishing industry.

The Board has authority to pass rules and regulations to safeguard and protect the industry such as setting size limits, closing certain waters whenever the welfare of the industry demands, declaring closed seasons, prohibiting methods of fishing that are detrimental, and to recommend needed legislation. All action on the part of the Board is taken only after careful consideration has been given and an opportunity has been offered for interested persons to be heard.

The question of markets, always an important item in commerce, has the same relation to the fishing industry. It would appear that a more stable outlet for the fisherman's product would be a great benefit.

The fisherman himself through various organizations and individually is paying increasing attention to securing the best market possible. He is attempting to keep down losses from possible temporary slack demands, and to assure himself of a fair return for his toil. Organized campaigns are being carried on to teach the value of fish as an article of food, and the outlook for the industry appears promising.

COASTAL GAME FISHING

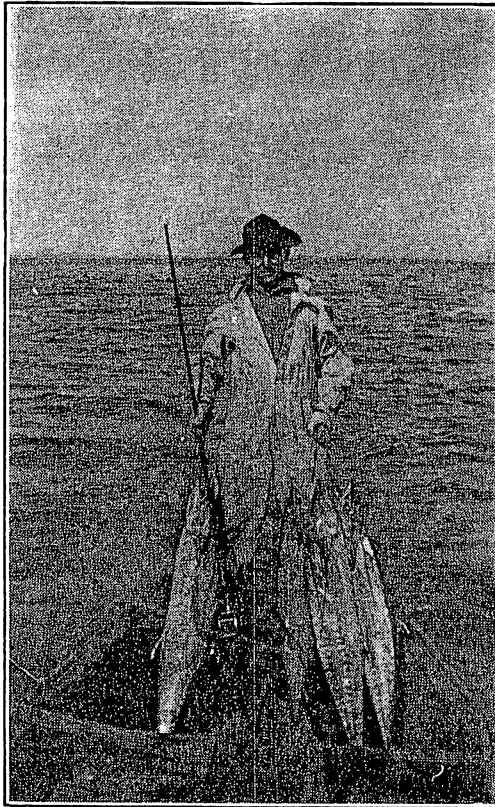
North Carolina coastal waters furnish a sport that is the favorite pastime for hundreds of anglers. For the enjoyment of this pleasure thousands of dollars have been invested in boats and equipment by sportsmen in this and other States.

For outside deep sea fishing, the ports of Beaufort, Morehead City, Wilmington, and Southport are favorites, while most of the coastwise towns including New Bern, Washington, Edenton, Elizabeth City, and a number of others are headquarters for large numbers of "inside" game fishermen.

Probably the most spectacular and popular of salt water game fishing is for the drum or channel bass, which is caught in large numbers along the

"banks" near the inlets, Ocracoke and Hatteras being especially well known by fishermen.

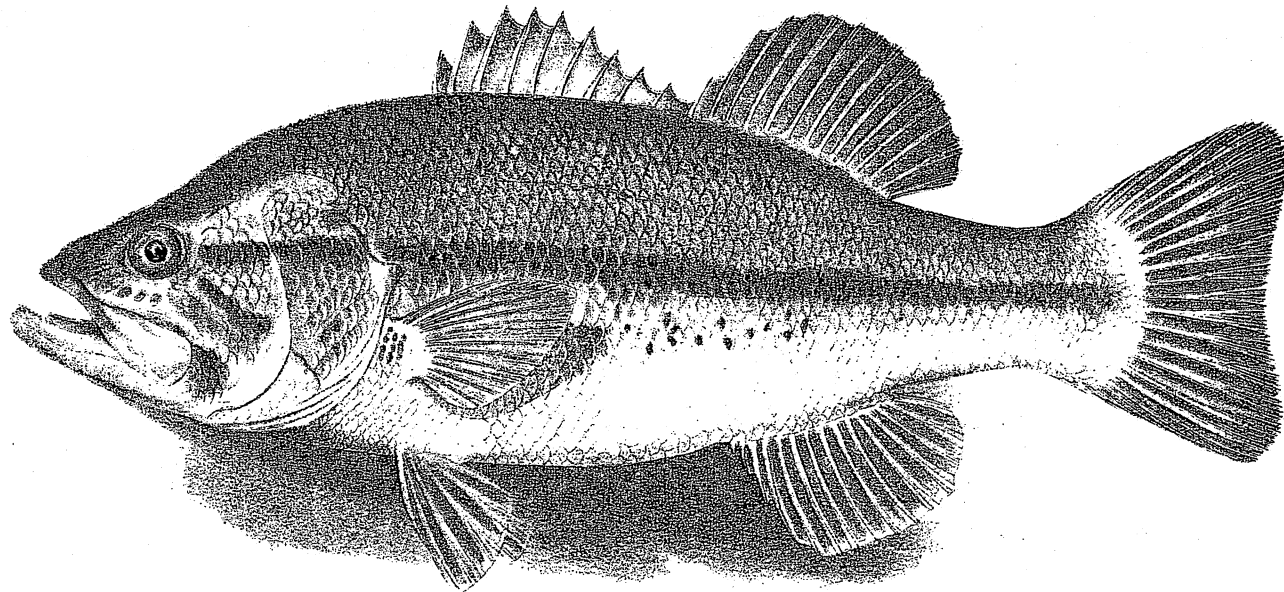
The drum usually gives a sharp fight and at times has been known to furnish plenty of interest for as much as an hour. Drum weighing as much



Luck was with this deep-sea fisherman, who has landed four fine specimen of cero (kingfish). This fish is one of the favorites of deep-sea fishermen. Two of the fishes weigh 20 pounds each; one, 25; and the fourth, 30. The grounds from which these cero were taken are off the coast at Beaufort and Morehead City.

as 60 pounds have been landed along the coast, while smaller ones ranging from 20 to 40 pounds are common.

Among the most popular of the fishes caught in the outside waters are the cero, known also as the kingfish, and the Spanish mackerel. These are great favorites with the fishermen because of their fighting qualities and are a very attractive fish. Other fishes that are caught in large numbers on the coastal fishing grounds include the bluefish, sheepshead, trout, and rock or striped bass.



LARGE-MOUTH BLACK BASS; WELSHMAN (MICROPTERUS SALMOIDES)

A. HOEN & CO.

PLATE 10

GAME FISHING

WHY PROPAGATION AND PROTECTION ARE NECESSARY

Natural reproduction has long since ceased to furnish game fish in sufficient numbers to provide a satisfactory amount of sport for the great horde of out-of-doors lovers, who find their principal diversion from toil in the forests and along the streams.

Greater numbers of fishermen, good roads which give access even to the remotest waters within a comparatively few hours, more enticing lures for the prey, pollution of many waters by domestic and trade waste, and the destruction of parent fish during spawning seasons have added weight to the problem of the diminishing supply of game fish.

North Carolina is one of the States which, realizing this condition, is carrying on a definite program of stocking her streams and numerous other fishing waters with millions of fingerlings raised in State hatcheries.

The start of the work came with the appropriation of half a million dollars by the General Assembly of 1923 for the Fisheries Commission, part of which it was directed to spend for the erection of hatcheries for the propagation of game fishes and the rest for the commercial fishing operations.

From these funds, the Commission has built and equipped five hatcheries, and has coöperated in the operation of the Federal hatchery at Edenton and the Federal terrapin farm at Beaufort. The State hatcheries were started during 1924 and construction was completed the following year. The first distribution of fingerlings was made in 1925.

The names and locations of the State hatcheries are as follows: Frank Stedman hatchery, Cumberland County, near Fayetteville; Pete Murphy hatchery, McDowell County, near Marion; Morrison hatchery, Haywood County, near Waynesville; Boone hatchery, Watauga County, near Boone; and Roaring Gap hatchery, Alleghany County, near Doughton.

Cost of construction of the five hatcheries was approximately \$125,000, the least expensive one representing an outlay of around \$15,000 and the most costly amounting to approximately \$25,000. Besides State expenditures in constructing the hatcheries, a considerable sum was saved through the donation of property, pipe, and road construction by counties and individuals. It is estimated that the value of the property and improvements donated for the hatcheries will add approximately \$30,000 to the investments, giving a total valuation of around \$155,000 to the hatcheries.

Through a special arrangement, the United States Bureau of Fisheries hatchery at Edenton is being operated coöperatively with the State of North Carolina. Following this arrangement the pond capacity of the hatchery was doubled, and all of the output is being distributed in North Carolina waters, half of which fill State applications.

Two species of fish, trout and bass, are being raised in large numbers at the State hatcheries, three of which, Morrison, Boone and Roaring Gap, are devoted almost exclusively to trout culture; the Frank Stedman, to bass and bream; and the Pete Murphy hatchery to trout and bass.



"Pete" Murphy Hatchery, near Marion, located under the shadow of beautiful mountains has one of the most attractive locations of any of the State Hatcheries. At the left is the hatchery building and on the hill to the right is the superintendent's cottage. A large bass pond is in the foreground.

Trout furnished by the hatcheries consist of the rainbow, brook, steel-head, lake and Loch Leven; and the bass are divided into the large and small-mouth species.

From the first year's operation of the hatcheries there was an output of 670,260 fingerlings, divided into the following classifications: brook trout, 430,700; rainbow trout, 35,660; large-mouth bass, 203,900. In 1926 the number was increased to the following: brook trout, 1,579,971; rainbow trout, 380,458; lake trout, 27,400; steel-head trout, 35,000; and large-mouth bass, 154,450.

From indications, the output of fingerlings this year will amount to around 3,000,000, or more than for the former two years combined. It is expected that of the total there will be about 2,500,000 trout and about 500,000 bass and bream this year.

The Federal cooperating hatchery at Edenton is expected to furnish several hundred thousand bass, bream, and perch, and plans have been made to increase this number to an annual output of approximately a million of these fishes a year. For the benefit of the commercial fishing of the coast, the Edenton Federal hatchery distributes millions of shad and herring annually. These fishes are planted in the waters from which the eggs are taken.

NEW ANGLER'S LAW

The most important legislation dealing with game fishing in North Carolina to be placed upon the statute books by the General Assembly of 1927 was the act requiring a license of those using rod and reel or jointed poles for fishing in the public fresh waters of the State.

Designed for the dual purpose of protecting and propagating the game fish of the State, the law within the first few weeks of its operation, in the opinion of sportsmen, has already shown such pleasing results that it has proved its worth.

The first three months of operation of the law, coming at the beginning of the fishing season for trout, but during closed season for bass in most of the counties, showed returns of more than twelve thousand dollars, and that around eight thousand sportsmen had taken out licenses. These returns surpassed by a wide margin the expectations of the officials under whose direction its enforcement was placed, and showed real promise of what may be accomplished through its operations.

The new law requires that all of the license fees collected shall be used in enforcing the laws for the protection of game fish and for their propagation. Thus, those who take out licenses are only paying a small fee for their sport and the support of a program designed to enable them to continue to enjoy this pleasure.

Although the State has made an impressive start in the work of restocking her streams with game fish, there is still a broad field for expansion as means are furnished with which to enlarge the program. The angler's license law will go a long way toward furnishing the necessary funds with which to carry out a broadened program of protection and propagation as neither of these two duties is sufficient alone.

A clause of the 1927 law which allows the Board of Conservation and Development authority to extend the requirements of a license to all types of fishing in the mountain trout streams has already been made use of, and the provisions have been extended to cover most of the mountain counties.

Basing figures on estimates made recently by Secretary of Commerce Herbert Hoover, North Carolina's field in restocking her streams with game fish assumes proportions that are surprising to many who have not made a close study of the subject.

Secretary Hoover estimates that there are 12,000,000 fishermen in the United States. This would make an average of about one person out of every ten, who either fishes or who would fish if these opportunities were sufficient to be attractive. Using these figures as a basis, North Carolina should have around 250,000 potential fishermen.

The official also declares that to maintain interest 50 fishes should be allowed for each angler annually. This means that if the ideal of propagation is reached that North Carolina should, through both natural breeding and propagation, furnish 12,500,000 fishes annually.

State hatcheries this year will furnish about 3,000,000 fingerlings, according to preliminary estimates and thus we come to the conclusion if the goal of providing an ideal fishing State is reached that the output must be increased by a wide margin. However, this does not allow for the mortality rate of the young fingerlings that are released into the streams; and neither does it consider the number that will be added through natural reproduction, but this factor is brought out—that there is still a great opportunity to be filled through the increase of the capacity of the present hatcheries and the construction of more. The great demand for fingerlings that is evidenced through the applications to the Department show that a larger output from the hatcheries could be used to great advantage in North Carolina.

Should only half of the estimated potential fishing population, or even fewer than half by using the figure of 100,000 anglers, purchase licenses at one dollar each, a revenue of \$100,000 would be raised annually. The latest report of the operation of the five State and one Federal coöperating hatcheries shows an expense of operation of \$31,124.60 of State funds for the biennium. These figures suggest the possibilities that, providing means can be secured for their construction, at least double the number of hatcheries might be maintained from license fees, leaving a comfortable margin for enforcing the laws with the balance.

As has been mentioned before, the estimates made above point to an ideal, but nevertheless a goal toward which much can be accomplished and one from which cumulative benefits will accrue.

RESTOCKING AND FISH PLANTING

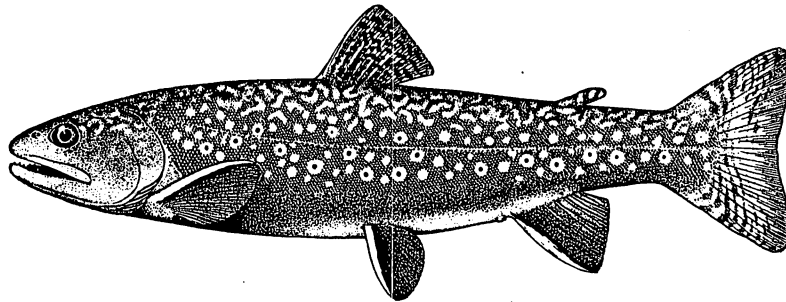
If restocking the waters of our State is to bring results commensurate with the scientific work and expense in maintaining hatcheries and protective efforts, one feature—planting—must be given the consideration necessary for the protection of the baby fishes.

In many cases hundreds of fingerlings are dumped haphazardly into streams and are a total loss, putting to naught months of care and attention

at the hatcheries. Careless or ignorant planting of the delicate brood may result, and often does, in a deplorable finish for a promising amount of sport for the fishermen.

Because of their delicacy and of an abrupt change of environment from the protection afforded in their broodery, it is extremely necessary that carefully made plans for the planting should be carried out.

Naturally, the first point for consideration is the proposed new home for the fry or fingerlings. The applicant should study the nature of the water which he proposes to stock, conferring with experienced fish culturists, if possible, for advice concerning the species most suited to the location. Some of the most important questions to consider include the quality of the water, temperature, what varieties if any are already present, whether the stream has a comparatively steady current or whether it is subject to violent freshets, the food supply for the fishes, and a number of others.



Brook trout, a native of North Carolina mountain waters and the most common game fish of that section. Streams of that section are being stocked annually with more than a million of these fishes.

(Courtesy U. S. Bureau of Fisheries)

Streams or bodies of water that dry up or become stagnant should not be considered, for the fate of the brood is practically sure if the young are placed in such waters; neither should fish be planted where there is pollution at various intervals.

It is necessary to give attention to the young fishes from the time they are placed in the shipping can at the hatcheries until they are safely ensconced in their new homes. Air is necessary for the survival of the fishes, and, therefore, the water in the cans must be aerated at regular intervals to insure the best success and the good condition of the fishes.

Pisciculturists are advocating that wherever it is possible that young fry be placed in rearing ponds until they reach a larger size because the mortality rate among the larger fishes has been found to be less than among the smaller ones, which often fall prey to other fishes or their natural enemies. It has been found by experience that more fishes mature to and beyond the size limits with this care than without. However, it is more of a problem to raise some of the fishes than others and expert advice should be sought here.

When the plan is to place the baby fish directly into the stocking waters, the temperature is an important consideration. If this feature is neglected, the entire planting may be futile since a few degrees difference in the waters

may kill all of the fry. It is well to use a small thermometer, and if there is found to be a difference, the water used in transporting should be tempered gradually. An easy and effective method of accomplishing this is found in placing the cans in the stream and replacing the water in the can gradually with a dipper.

The entire can should not be dumped in the same spot, but only one or two fishes should be placed at intervals of at least a rod. If all of the fishes in the can are placed in the same hole, it is the nature of the brood to school, resulting in the quick depletion of the food supply and often resulting in the larger ones preying upon their smaller brothers.

It is the best policy to place the young fry where they can obtain some protection from the weeds, grass or brush near the bank. Headwaters and small spring-fed streams are well suited to the distribution of the fingerlings.

Planting should always be carried out with a well-considered plan, remembering that the baby fishes are as delicate as the young of other forms of life and that scientific methods will greatly increase the effectiveness of the program.

REVIEW OF REGULATIONS

Until the passage of the 1927 angler's license law, little effort had been made to regulate uniformly the taking of game fish over the State. Previously, where local sportsmen had seen the need, there were a number of county laws setting up open and closed seasons, establishing size limits, sometimes bag limits, and providing a warden service for the enforcement of the laws and the protection of the game fish supply.

Similar to the game situation, a multiplicity of laws and regulations in the past have made a rather difficult situation for carrying on a comprehensive and effective program for the preservation of game fishing. One county where the sportsmen were especially active might well boast of all needed regulation, while another adjoining one likely had none at all and still another established different rules which made it confusing to the sportsmen. However, the passage of the new angler's license law sets up a definite policy and provides means for establishing warden protection and enforcement of regulations. With the Department Board, by virtue of the powers of the former Fisheries Commission Board falling upon its shoulders with the merger of the two agencies, having authority to pass regulations for the protection there is every indication that uniform and necessary protection will be given the sport.

At the request of residents of approximately half a dozen counties in the mountains, the former Fisheries Commission Board had fixed closed seasons for game fishing in these counties; had set size limits and passed other special regulations.

Rules adopted by the Board of Conservation and Development at its meeting in July accomplish more towards uniformity in fishing regulations that has ever been done previously in the State. These rules will become effective 30 days after legal notice of their adoption is given by advertising.

One of the most important measures passed by the Board was the regulation of the sale of black bass by limiting the size at which they may be sold

to twenty inches in all water except Currituck Sound and to twelve inches from these waters.

New open seasons as prescribed by latest action of the Board are:

Black or large-mouth bass, June 10 to April 20, following.
Brook or rainbow trout, April 15 to September 1.
Small-mouth bass (mountain counties), June 10 to October 1.

The following size limits were set:

Bass (large or small-mouth), 12 inches
Blue Bream, 6 inches
Brook or Speckled trout, 6 inches
Rainbow trout, 8 inches
Rock, 8 inches
Robin, 5 inches
Redfin, 8 inches
Goggle-eye, 6 inches.

New bag limits for game fish as set by the Board follow:

Black or large-mouth bass, 8
Brook or Speckled trout, 25
Rainbow trout, 25
Blue or Red Bream, 50
Robin, 50
Rock, 10
Crappie or Chinquapin perch, 50
Goggle-eye, 50

After designating "Commercial" and "Inland" fishing waters, the Board for the protection of game fishing, passed the following resolution:

"It shall be unlawful for any person or persons, firm or corporation to take or kill fish in any of the waters of North Carolina designated as Inland Fishing Waters, by any means or method whatsoever, except with hook and line, rod and reel, or by casting, provided: that shad and herring may be taken in said waters, with skim or stake gill nets only, from January 1 to May 1 of each year." (For description of "Inland" waters see page 19.)

ENFORCEMENT OF FISHING LAWS

In administering the provisions of the laws governing game fishing, Departmental officials have adopted a policy of tying in the work with that of the Forest Service wherever this is practicable and local conditions permit.

Of the appointments that have been made so far, a large per cent of forest wardens have also been cloaked with the authority of fish wardens in the counties where organizations previously existed.

This system so far is still in the experimental stage, but indications during the few weeks in which the fish license law has been in operation are that it will prove satisfactory.

It is believed that the taxpayers will be saved a considerable sum of money through the coöperation of the two services by cutting down the num-

ber of wardens and that efficiency of both services should be increased because of the close association of interests. Because fish life is largely dependent upon the forests as a regulator of the flow of water and its purity, and because of the fact that sportsmen are also conservationists, it is anticipated that appreciable results should come through the arrangement.

With the realization of the inter-dependence of one of these natural resources, to some degree, upon the other, it is hoped that enthusiasts on each subject will come to a greater realization of the importance of the other.

This step is the first of a plan of the Department to link the interests in all of the State's natural resources together to as great extent in the administration of laws as is practicable.

IMPORTANT GAME FISH

Among the game fishes of North Carolina, the two most important groups both from the amount of sport provided and distribution, the bass and the trout rank first.

Between these two there is a difference of opinion among the anglers as to which provides the greater amount of sport. However, studies of the waters of the State show that the bass has a wider distribution, thriving in waters where the trout and other varieties of game fish will not inhabit.

Most sportsmen declare that the small-mouth bass is the more gamey of the bass, but that the behavior of both are similar when hooked. Both are great fighters on light tackle, but the small-mouth is frequently called the more active and the large-mouth the stronger fish.

The distribution of the large-mouth bass in North Carolina is larger than its congener, the small-mouth, the temperature of the water governing largely the habitat of the fishes. The small-mouth thrives better in cooler waters, being found at high altitudes in the mountain territory. They feed largely upon minnows and crawfish.

The large-mouth bass more commonly is found in warmer waters among weeds and growth along the edges of streams and lakes, feeding chiefly upon minnows, frogs and small crustaceans. Both of the species are voracious feeders and have cannibalistic qualities.

Chief of the distinguishing characteristics between the two kinds of black bass are the mouths and the size of the fishes. The small-mouth seldom reaches a weight of more than six pounds and averages about two to two and one-half pounds. The large-mouth bass reaches its maximum size in Florida—as high as 20 to 25 pounds. In North Carolina a weight between six and eight pounds is not uncommon.

Both varieties of bass are native to North Carolina waters, while their natural distribution has been widened through artificial planting. They are excellent food fishes.

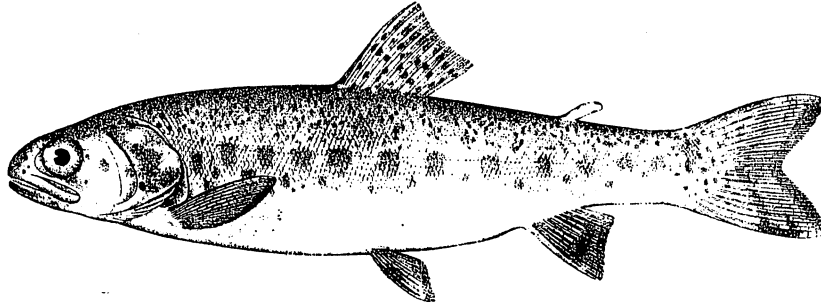
The large-mouth is known as the most important of its family because of the occurrence in greater numbers and a wider distribution. This fish is said to exist in Currituck Sound in greater numbers than in any other waters in the country, giving this State a high rating as a producer.

The large-mouth grows rapidly, reaching a length of six to eight inches under favorable conditions in a year and sexual maturity in two years. It is known by a variety of local names among which are the chub, welshman, and fresh-water trout.

However, the propagation of large and small-mouth black bass presents real problems in the hatcheries. Nearly all species of fishes raised in the hatcheries are susceptible of propagation by artificial methods with this species as an exception because the eggs cannot be artificially manipulated.

For the supply of the small fishes for stocking purposes, dependence is usually placed on natural reproduction from brood fishes held in ponds.

The cannibalistic propensities of the bass make it almost impossible to hold the young fry for a long period without large losses. Although this characteristic is not confined to this fish, its most pronounced effect in hatchery breeding is probably found here.



Rainbow or California trout, introduced into North Carolina waters and found to thrive in many mountain streams. State hatcheries are putting out thousands of this species annually.

(Courtesy U. S. Bureau of Fisheries)

The problems of propagation and rearing present difficulties of wholesale production that frequently limit the number of fry available for distribution.

Of the various varieties of trout, the brook is the most common and a native of the State. Because of this fact, the production of this variety has predominated at the State hatcheries given over to trout culture.

Among sportsmen, the brook trout, commonly called mountain trout, is the most valuable and popular game fish of the mountain section of North Carolina. In early days most of the mountain streams contained a bountiful supply of this species, but the stock has been drawn on heavily. Hundreds of thousands of fingerlings released in the streams each year, however, are adding greatly to the attractiveness of fishing in the mountains.

The brook trout is conceded to be the most beautiful of the charr class, being characterized by its markings of small crimson spots on the sides of the body. The flesh is usually white, but in some sections it has a rich salmon color, possibly due to the character of the food supply. This trout rarely grows to a length of more than 16 or 18 inches in the swift mountain streams; and where the food supply is very limited, does not exceed six or eight inches. In waters where the food is plentiful and where the waters remain at nearly a uniform temperature, it is common to find specimens weighing from 6 to 8 pounds, and occasional catches of 12 to 14 pounders are recorded.

Rainbow, commonly called California trout in eastern waters, were lightly introduced many years ago in the mountain streams of North Carolina and other Eastern States by the United States Bureau of Fisheries. Their introduction in many of these streams and waters failed to give results, but it has been found that the larger and more open waters of North Carolina which are now unsuitable for brook trout as a result of the changed condition due to the clearing of land and consequently warmer water temperatures, afford an ideal condition for this species.

The body of the rainbow trout is of a heavier and deeper formation than that of the brook trout. The color varies to some extent, depending on age, sex and the quality of waters. Under native conditions, the adult fish is of a bluish tint along the back with silvery sides containing a red lateral band extending almost from the red blotch on the head to the tail.

A limited number of lake trout have been propagated at some of the State hatcheries during the last two seasons and several waters have been lightly stocked. Encouraging reports on their development have resulted in a demand for fingerlings of this species that is far greater than the supply.

Other species of trout, such as Loch Leven and steelhead have been propagated in a limited number, and are now being distributed in suitable waters. It will be the purpose of the Department to increase the propagation of such of these that prove successful to supply the demand as nearly as possible.

Although the bass and trout have been treated more fully in this publication, there are numerous other fishes that furnish a great amount of sport and recreation. Efforts at the hatcheries are being centered on these two varieties because of their great game qualities and their favor with sportsmen, together with the natural adaptability of the waters to their propagation.

In the mountain districts, two of the most popular fishes are the pike, perch or jack, found in both the Mississippi and Atlantic slopes and which has been known to reach ten pounds in weight; and the muskallunge, also known as jack, a good game fish which has been known to reach a length as long as five feet.

The blue-gill bream is one of the most popular of the fishes of the warmer waters of the State and is the largest and finest of the sunfishes, attaining a length of twelve to fourteen inches and a weight of a pound and a half. Some work is being done with this fish in at least one of the hatcheries. The pickerel, also called pike, is found in streams of the eastern seaboard.

The carp introduced from Europe into this country is well known in the State, and although not a favorite of anglers, is found in many waters where other fish do not subsist. They are preëminently adapted to small warm water ponds.

While not classed by sportsmen as game fishes, there are other varieties that furnish considerable pleasure to anglers. Such fish as the catfish and the common bullhead, a member of the catfish family, exist in large numbers in muddy bottoms and are used extensively as food. They are able to thrive where many other species cannot; are prolific; reproduce well; and grow rapidly.

Not the least important part of sport fishing is that along the Atlantic ocean and the numerous coastal waters. This subject is treated more fully in another part of this publication.

EDUCATIONAL VALUE OF HATCHERIES

An important feature of the fish hatcheries of North Carolina is their educational value. Each year thousands of visitors call to observe at first hand the work that is being carried on by the State.

Superintendents and their assistants are courteous at all times to the visitors and are glad to explain the details of their work. In fact, they consider it not the least part of their service to disseminate information regarding fish culture.

In many instances the fisheries officials give expert advice to persons interested in the propagation and protection of fish life. They are frequently able to give information which has far-reaching effects for the fish life of the State.



Capturing school of small bass from breeding pond at Frank Stedman Hatchery at Fayetteville. These fishes are hatched in the ponds and distributed for stocking purposes.

Although many of the callers at the hatcheries may visit these places through curiosity to ascertain the work that is being carried on, virtually all go away with a deeper appreciation of the value of the life in the waters of the State. Many who have formerly had a realization of only one angle of the benefits of well stocked waters, are impressed with a deeply seated idea of what may be accomplished through their own efforts. A closer view of the beauties of inhabitants of the waters and a comparatively short time spent in their observation and study may make an enthusiastic lover of out-of-doors natural life and establish an appreciation that will bear fruits in aiding the furtherance of the program for their protection.

A study of the life, habits, and characteristics of fishes is a theme for thought that grows upon the uninitiated in proportion to the time and efforts expended. The beauties and interest unfold with study, showing possibly as great variety as may be had in the animal kingdom.

Besides the work of propagation, the greater part of the duty of the hatchery force, research and scientific studies are being constantly carried

out. This part of the work pertains largely to conditions that affect the welfare of the baby fishes that are liberated, the stock already contained in the State waters, possibilities of introducing new fishes of value and adaptable to new waters, and more efficient methods of rearing in the hatcheries.

In the selection of sites for the hatcheries, the accessibility to transportation is usually a consideration which bears weight. A majority of the hatcheries are located in the resort sections of North Carolina, and are, therefore, within reach of thousands during vacation time. All of the plants are either situated directly on a trunk line highway or within a short distance.

The Department trusts that residents of the State will continue to exhibit interest in this division of its activities and that a deeper appreciation of not only this but other natural resources will be created. Visitors will always be received courteously and all available time will be given for their benefit.

FUTURE OF GAME FISHING

Summing up the needs and future outlook for game fishing in North Carolina, it may be readily seen, that although material steps have been taken and plans outlined, there is a decided need in many lines for the realization of the hopes of enthusiasts.

It is difficult to picture the returns from both a material and social viewpoint that the fulfillment of a comprehensive program of conservation and development of the State's finny inhabitants may bring. No more direct appeal is possible to a group of hundreds of thousands of progressive and public spirited residents of our country than the knowledge of the existence of well stocked streams.

This population of sportsmen, growing annually, is constantly on the alert for word of promising angling, and the State and community which can provide such sport will be heralded far and wide, bringing numerous visitors, who in turn will spend their money and add to the wealth of the locality. There is also the likelihood of the attraction of a portion of the visitors as permanent residents.

Should the efforts of the Department in this line go no farther than provide a wide opportunity for sport and recreation for the population of North Carolina, they will have been merited and the State benefited accordingly. There is, in the opinion of thousands, no more soul-satisfying recreation than fishing under such conditions that promise a reasonable amount of sport.

One of the greatest needs in building up the sport to the desired plane is the creation in the minds of those who have not in the past had a proper regard for this asset a feeling and sense of responsibility of protecting the sport with consideration for the future. Regard for the law and the privileges of the other person is absolutely necessary if hopes are to be held out for an improved condition of sport.

The purchase of a license, according to the requirements of the law, is a primary evidence of good faith on the part of the game fishermen to observe the law and exercise diligence in carrying out the regulations for taking

fish. The license fees provide funds with which the laws are enforced against those who have no regard for the sport and with which the natural supply may be augmented by hatchery operations.

A disregard for existing regulations by the taking of all sizes and by methods prohibited by law is a demonstration of selfishness which hurts the sport and those committing such acts. Dynamiting and such criminal practices are offenses against the whole people and aid in suppressing such an act is a duty of the sportsman.

So far as is within the power of the Board of Conservation and Development, regulations necessary for the perpetuation of the sport will be set up with a due consideration of the interests of all concerned. Future General Assemblies will, as representatives of the people, supply necessary laws to such an extent as public opinion desires, and therefore, it is paramount that the public conscience be aroused to the importance of pursuing a well-defined program with bright hopes for the future, and the maximum amount of wholesome recreation, a contented population, a more attractive State.