

COAST WATCH

National Marine Fisheries Service Photo



Menhaden



Fertilizer, lamp oil, lipstick, chicken feed and margarine—an unlikely combination of products, but all derived from the same source. Menhaden. This bony, oily fish fertilized Pilgrim farm-

land. And since those times, the nation's largest fishery has seen a lot of change. Oil is no longer extracted from the fish in boiling kettles. Purse seines replaced gill nets and haul seines. Steel, diesel-powered vessels ply the same waters once fished by wooden schooners and steamers. Power blocks and winches replaced the muscle and the song of man.

But the menhaden can't always be found in the same huge numbers they once were. Some say North Carolina fishermen are catching too many small menhaden. But North Carolina processors are worried that strict regulations may put them out of business.

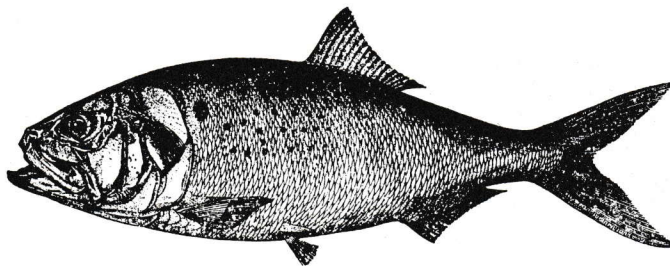
This month, *Coastwatch* takes a look at the menhaden fishery in North Carolina.

Menhaden today. Pogies, mossbunkers, bunkers, alewives, whitefish, bonyfish, fatbacks and shad to those who have fished for menhaden from Maine to Florida during the fishery's 300-year history.

Menhaden have collected more than 30 common names. In North Carolina, they've most often been known as fatbacks, shad and pogies. Scientifically, their names are *Brevoortia tyrannus*, the Atlantic menhaden, or *Brevoortia patronus*, the Gulf menhaden (the two species sought by fishermen). But no matter what you call them, all the names apply to the same bony, oily fish.

In a book written a century ago, George Goode aptly described the menhaden's ecological niche: "It is not hard to surmise the menhaden's place in nature: swarming our waters in countless myriads, swimming in closely-packed unwieldy masses, helpless as flocks of sheep, close to the surface and at the mercy of any enemy, destitute of means of defense or offense, their mission is unmistakably to be eaten."

Sharks, whales, striped bass, bluefish and countless other fish seek out the menhaden for their next meal. Bluefish slash and kill thousands of fish in a single, ruthless attack. Occasionally, bluefish will chase schools of menhaden into shallow surf, where they become stranded and die on the beach. And schooling, the menhaden's one defense against natural enemies, is their undoing with fishermen.



Bunker Biology

With so many predators, how does the menhaden survive? Prolific reproduction. An individual female may spawn from 40,000 to 700,000 eggs each year.

Along the mid-Atlantic, the spawning occurs in late fall and winter over the continental shelf. Once the eggs are fertilized and

hatched, currents sweep the young menhaden to the estuary. Juvenile menhaden spend about eight months in the estuary before leaving in the fall.

From May to October, Atlantic menhaden one year old and older are stratified by age and size along the Atlantic Coast. The older and larger fish are found in northern waters, while the younger, smaller fish remain to the south.

As fall approaches, the larger menhaden begin a southward migration that culminates in the congregation of all fish south of Cape Hatteras by early winter. In late December or early January, the schools disappear. It is uncertain where the menhaden overwinter, but many scientists believe it's in deeper, more offshore waters.

As filter feeders, menhaden swim with their mouths agape, swallowing tiny organisms in the water. These fish have no teeth. An angler could cast all day in a school of menhaden without a single nibble.

By feeding itself, menhaden frequently feed a crab-like parasite, which makes its home in the menhaden's mouth. Fishermen call the parasites "bugs"; hence the name bugfish has joined the list of menhaden names.

Of purse seines and spotter planes

Every American school child knows the story of how the Indian Squanto saved the Pilgrims from starvation by showing them how to fertilize their crops with fish. This fish was probably Munnashatteaug, a word meaning fertilizer. The English pronounced it menhaden.

Historians have long believed the Indians taught America's colonists how to fertilize fields with fish. But a New York anthropologist raised some doubt in a 1975 article in *Science* magazine. The anthropologist suggested that Squanto, who had been kidnapped and taken to Europe, may have learned about the value of fish as a manure from the English.

But whether the practice was European or Indian, it was soon common for New England farmers to manure their fields with menhaden and other fish. As bait, menhaden were used to catch haddock, cod, mackerel and other fish.

And early American historians say that menhaden were eaten as food. John Lawson's *History of North Carolina*, written in 1714, called fatbacks (one of the many names for menhaden, see story, page 2) an "excellent sweet food." And Sir Walter Raleigh's Roanoke Island colony is believed to have dined on menhaden.

During the 1700s and 1800s, menhaden were salted and eaten like herring, says John Reintjes, a fisheries biologist, who spent 25 years with the National Marine Fisheries Service studying menhaden and other fish. Menhaden were considered a poor man's food or famine food in the Carolinas, Reintjes says.

"It's a bony fish, but it's the best tasting fish in the ocean when it's fresh," says 77-year-old Berkeley Simpson of Beaufort, a man who spent 42 years aboard a menhaden boat. "You split 'em, salt 'em and dry 'em awhile. Then you cook 'em over charcoal."

Menhaden roe has long been considered a delicacy. Stripped from the large mammy shad, also called roe shad, during the fall runs, the roe is salted and fried. During World War II, E.W. Copeland of Morehead City tried canning the roe, but couldn't meet the demand because of erratic availability.

During the early 1800s, fishermen discovered the value of menhaden oil as a substitute for whale oil in lamps, paints and tanning solutions. At first, the fish were allowed to rot in barrels, and the entire contents were pressed in hogsheads so the oil would rise to the

surface. Eventually steam cooking replaced the rotting process and, during the 1850s, the mechanical screw press was introduced.

During the Civil War, a greater demand for menhaden oil spurred the fishery to expand rapidly. Before the war, menhaden were caught only in the North. But Union soldiers stationed in North Carolina noticed the abundance of menhaden in in-shore waters. When they returned home with the news of the bounty, several opportunists traveled south to cash in on this oily wealth.

But all efforts to establish a fishery in North Carolina between 1865 and 1887 failed. George Goode and Howard Clark wrote in an 1887 report that it was doubtful a fishery could be established in this state. They cited problems with spoiling catches, fickle inlets and shallow sounds.

But just two years after the Goode and Clark report was published, the menhaden fishery had begun to thrive in this state. By 1889, seven factories were operating near Beaufort. And by the turn of the century, the fishery had expanded to include plants near the Cape Fear River. During the 1902 season, more than 18 million pounds of menhaden, valued at over \$30,000, were caught in North Carolina.

When the fishery moved south, it brought with it some northern innovations. One of those, the purse

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N.C. Division of Archives and History Photo

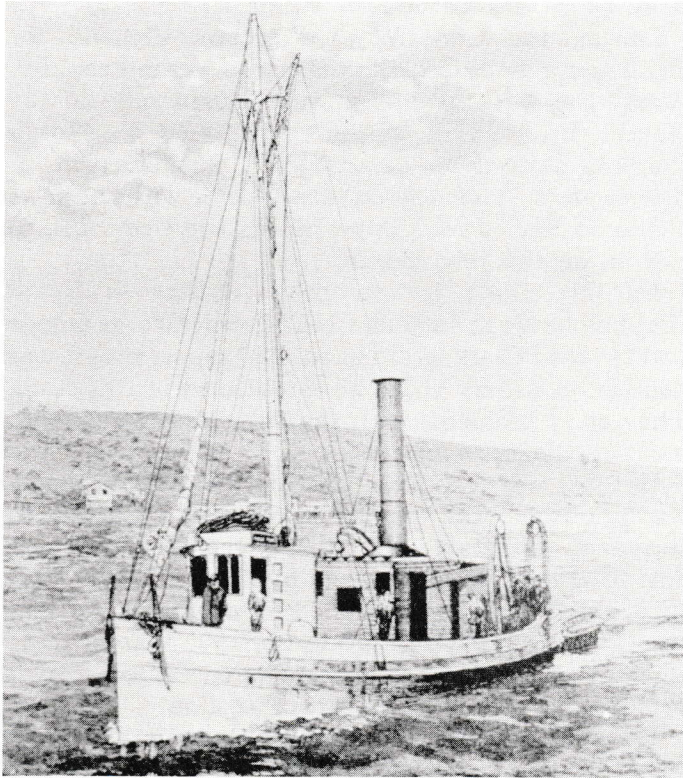


An 1889 catch of menhaden from the Albemarle Sound

seine, developed in the 1830s, allowed fishermen to net large quantities of fish. Before development of the purse seine, fishermen caught menhaden in gill nets or haul seines they worked from the beach.

A purse seine is a large "curtain" type net, hung between surface floats and weights along its base. Two boats, called purse boats, drop the net in a circle. When a school of fish is enclosed, a heavy weight called a "tom" is attached to the purse line and dropped overboard. The purse line is then pulled in, causing the bottom of the seine to close like a purse.

Sailing sloops and schooners were the first boats to



use purse seines to catch menhaden; purse boats were oar-driven yawls. After the Civil War, coal-fired steamers were introduced and, during the 1930s, diesel-powered vessels began to replace steamers.

"The first boat I worked on when I started working in 1929 was a diesel," says Simpson. "They were small boats, only held about 300,000 to 400,000 pounds. We didn't go out far, to Hatteras or Frying Pan Shoals. And we came in every night because the boats weren't refrigerated then and the fish would spoil."

Simpson started work as an engineer aboard his first boat and within two years made captain. "We used to spot schools from the masthead," he says. "We might run all day without finding a school. We looked for a dark spot or a ripple on the water. When we found a school, we dropped the striker off and put him on the fish. Then we dropped the purse boats and the striker guided the boats to the school."

The men in the purse boats would set the net, then begin hauling it in by hand (see chantey story, page 6). As more and more of the net was hauled aboard the purse boats, the fish were compressed into the butt of the net. Then the large boat, called the mother ship, would come alongside the net and the purse boats would form a triangle against her side. A large dip net was used to scoop the fish out of the purse net and into the ship's hold.

"If we had a fast crew and the catch wasn't too big, we could get the fish on the boat in half-an-hour," says Nathaniel Jackson of Beaufort. Jackson worked his way from cook to captain during his 50 years of working menhaden boats from New York to Texas. "All the work was done by hand when I first started working on the boats. It was a back-breaking job, but I wouldn't have done anything else."

Simpson says that if the set was a large one crews from other boats would help to pull in the net, even if they worked for another company. "But even with

N.C. Division of Archives and History Photo

An early steam-powered fishing boat plies the waters in search of menhaden. Steam-powered vessels replaced sailing sloops and schooners shortly after the Civil War (above).

Before purse seines, fishermen used haul seines like the one at right to catch menhaden. During this big haul at Sutton's Beach along the Albemarle Sound, everyone turned out to help.



the extra help, lots of times we would bust a net. A cotton net just couldn't hold as much weight as the nylon ones do now," he says.

By the time Simpson was working the menhaden boats, the fish were no longer being used for fertilizer. During the turn of the century, the dried fish scrap was being mixed into feeds for poultry, swine and cattle. Menhaden oil was used in the manufacture of soaps, paints, linoleum and waterproof fabrics.

Following World War II, the industry grew rapidly and reached peak production between 1953 and 1962. By then, spotter planes were used to sight the "purple" schools of menhaden from the air. Nylon nets replaced cotton nets. Pumps sucked the fish from the nets through hoses to the hold. And hydraulic power blocks winched aboard the nets.

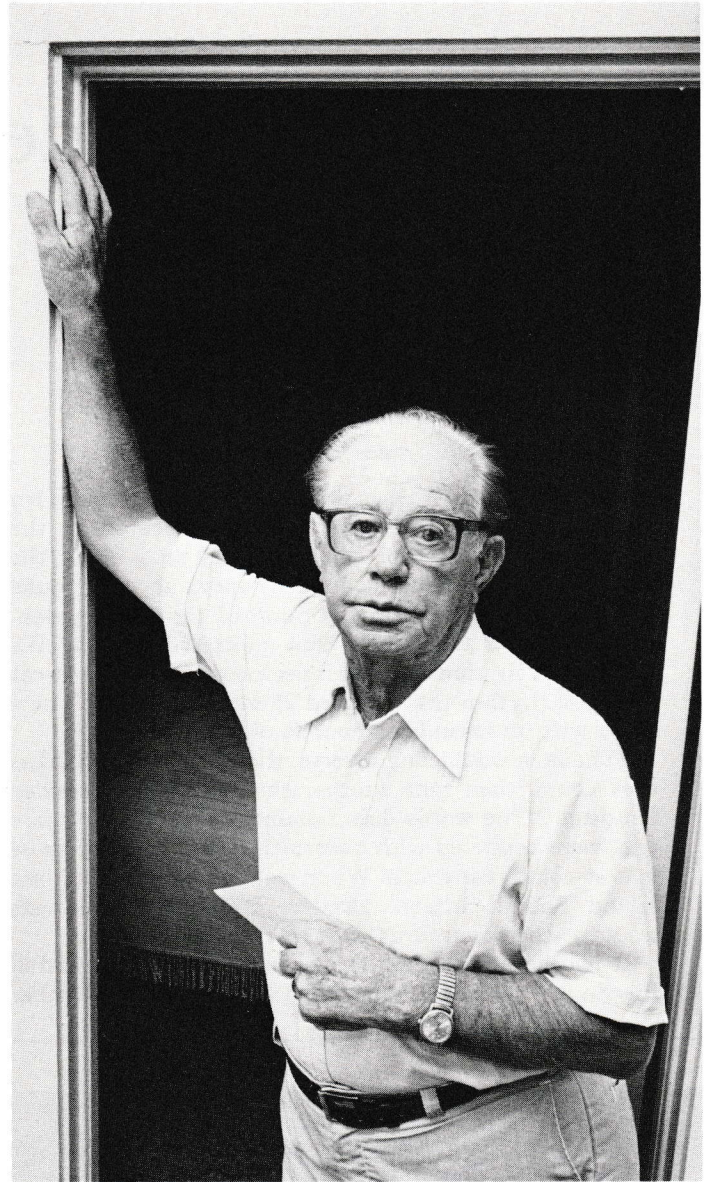
In 1961, eight menhaden plants were operating in North Carolina, most of them in the Morehead City/Beaufort area. During North Carolina's fall fishery, which lasted from mid-October until December, menhaden boats crowded into Beaufort, many hailing from northern states.

"They'd have a big parade in Beaufort when the boats came back during the fall," says William E. Edwards, manager of Standard Products' North Carolina plants. "There'd be 50 menhaden boats tied up along Front Street. The boats bought their groceries here, their fuel here. The people of Beaufort were glad to see us."

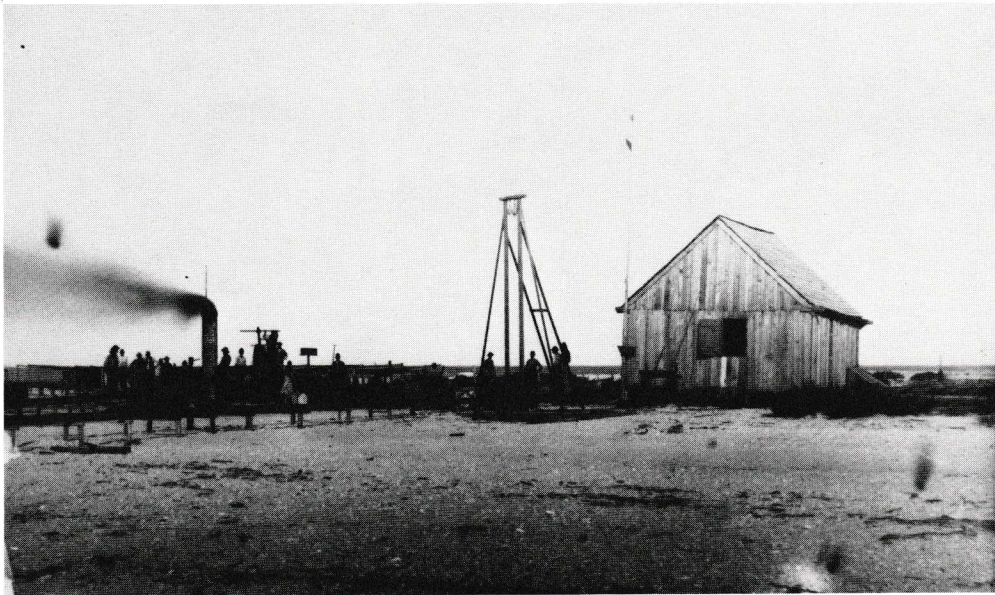
But after 1962, sharp declines in catches closed several factories and reduced fleets in North Carolina. The fishery stabilized during the early 1970s, but never recovered its former production. Substantial catches in the Gulf of Mexico fishery, begun during early 1900s, had drawn most of the big companies southward, taking with them some of the Carteret County families who worked in the fishery.

—Kathy Hart

Photo by Scott Taylor



N.C. Division of Archives and History Photo



Berkeley Simpson, above, captained a menhaden boat for forty years. He remembers the days of striker boats, cotton nets and chanteys.

This 1884 photograph, at left, shows an old menhaden scrap-and-oil factory near Beaufort. Today, menhaden are pressed, dried and ground into chicken feed. The oil is extracted and shipped to Europe for use in margarine.

To hear the men sing

Chanteyman:

*I left my baby standin' in the back door cryin',
Honey, don't go!*

Fishermen:

Lawd, lawd, don't go!

Chanteyman:

I'd go home but ain't got no money!

Fishermen:

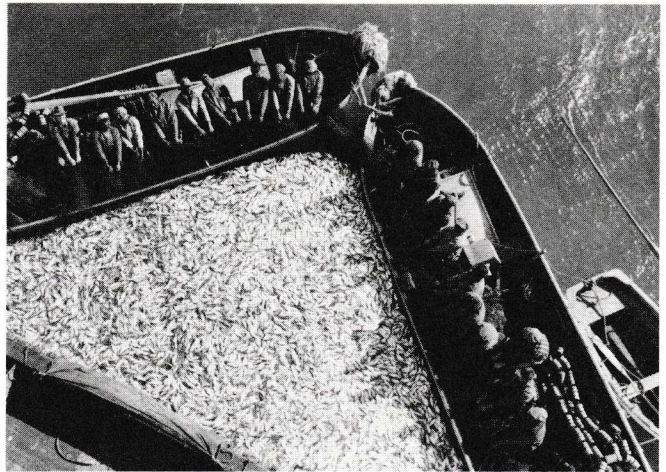
Lawd, lawd, ain't got no money!

The menhaden fishermen sang. In unison, menhaden fishermen heaved their nets, heavy with catch, to the rhythm of their song or chantey. They sang about the women they left behind, about money, about a mule, about whatever came to the mind of the chanteyman. But it wasn't the words that mattered; it was the rhythm—a rhythm that set muscles straining and sweat rolling, a rhythm that enabled 25 men to “harden” nets laden with thousands of pounds of menhaden.

“The men would sing a verse, then pull just as hard as they could, then take another chantey,” says Berkeley Simpson. “The words didn't sound too good (the chanteys were peppered with obscenities), but some of those fellows could really sing. When we were working in Long Island Sound, fifteen, twenty, twenty-five sailboats would gather around us to hear the men sing.”

It is believed that the menhaden chanteys originated in the South, most likely in North Carolina. Like other

Hampton Mariners Museum Photo



work songs, they provided the rhythm to coordinate the efforts of the workmen. Today no song is heard from the men working the purse boats. Instead it's the hum of motors, winches and hoses, doing the work done twenty years ago by the muscles of men.

Only a few recordings of the chanteys were made; most of the colorful chanteys will be lost as the fishermen who sang them die. A few of the chanteys (the above included) can be found in John Frye's book, *The Men All Singing*.

Photo by J. Foster Scott



The mother ship waits as two purse boats make the final set of the day off the beach at Rodanthe

Atlantic fishery faces hard times

Last year, fishermen from Maine to Florida landed over 382,000 metric tons of Atlantic menhaden. These catches, combined with those from the Gulf, make menhaden one of the country's largest fisheries. But the statistics don't tell the whole story. While the menhaden fishery is one of the most productive in the nation, it's also one of the most troubled.

Consider the evidence. In 1956, 712,000 metric tons of Atlantic menhaden were landed by purse seine. In 1969, the fishery bottomed out at 161,000 metric tons. While the catch increased in 1972 to 363,000 metric tons, it decreased again in 1973 and 1974. Since then, landings have gradually increased, but have never reached the "peak" set in 1956.

Large fluctuations like these have fisheries biologists worried—could the bottom drop out again? Probably not, they say. But, they add that we need to have a management plan for Atlantic menhaden.

Up until the mid 60s, the catches were composed of older, larger fish. Then the larger fish suddenly disappeared. Maybe environmental conditions were bad. Maybe overfishing drove the numbers down.

In 1982, the Atlantic States Marine Fisheries Commission (ASMFC) recommended some regulatory actions intended to protect the younger fish so they could contribute to the catch in later years.

The proposed regulations were:

1. Regulating the mesh size of the purse seine, with different mesh sizes for different parts of the coast.

2. Closing a one-mile corridor off the beaches from Cape Henry, Virginia to Cape Fear in North Carolina.

3. Reducing the fishing season by varying amounts along the coast. Under the proposal, menhaden fishing in North Carolina would be prohibited after mid-December.

Implementation of the proposals is voluntary. The states have jurisdiction in waters out to three miles—the area in which most menhaden are caught. The N.C. Division of Marine Fisheries decided the proposals for regulating the mesh size and for closing a corridor needed more study.

Influenced by the findings of a study by Sea Grant researcher Vito Blomo, the Division of Marine Fisheries decided not to implement the recommended shortened season in North Carolina. (Blomo has begun a second Sea Grant study on the impacts of a closed corridor.) So far, New York and New Jersey are the only states to implement the dates for a shortened season in their area.

Bob Mahood, Director of the Division of Marine Fisheries and a member of the Menhaden Management Board of the ASMFC, says there was a trade-off involved in that recommendation. "Biologically, the Division of Marine Fisheries felt that proposal was valid.

But the socio-economic impacts may outweigh the biological."

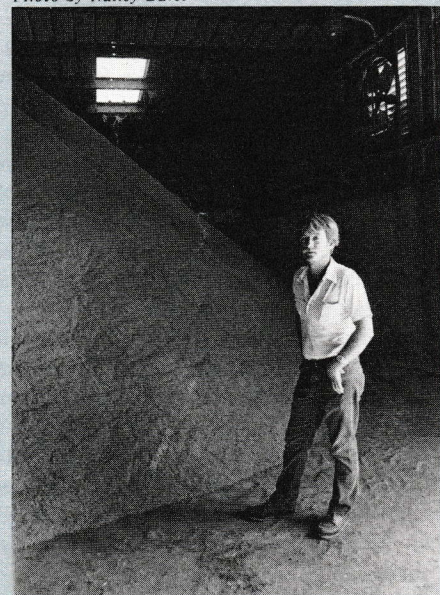
Blomo's study confirmed that trade-off. He found that it was more than a problem of managing fish. He studied the socio-economic impacts of a shortened menhaden season and found that the people who make their livings in the industry could suffer. (Blomo's findings are published in Sea Grant Working Paper 83-4.)

Blomo estimates that, during the first five years of the shortened season, North Carolina companies could face a 20 percent loss. (Biologists estimate it will take five years for the menhaden population to adjust to the new fishing pressures.) And, even if those companies were able to survive that initial period, the permanent loss would likely be five to six percent.

Blomo says that shutting a plant down, even for a short time, would be too costly. He estimates that about half of a company's operating costs are

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Photo by Nancy Davis



"There have been a lot of years when there wasn't any fishing until the fifteenth of December."

—Billy Tickle

fixed. Even if there is no fishing, the companies would have to pay those costs.

North Carolina fishermen oppose the recommended shortened season. Here, the season is divided into the summer fishery and the fall fishery. Beginning in late November or early December, large schools of menhaden migrate south and gather off the North Carolina coast, concentrating in December (see biology story, page 2). North Carolina is the only state with a fall fishery. In the past, the December

and January catches have accounted for a large portion of the annual catches. But recently, most of the catches have been composed of "peanuts," menhaden less than six inches. Fisheries biologists are concerned that not enough small fish will reach the spawning age.

Billy Tickle, general manager of Sea and Sound Processing Company in Beaufort, says the industry is already economically shaky and a shorter season would mean disaster for his company. "It would destroy us down

here. There have been a lot of years when there wasn't any fishing until the fifteenth of December."

Jule Wheatly, president and general manager of Beaufort Fisheries, agrees with his competitor. "The bulk of our fishing is in mid-December. Unfortunately, the fish just don't read regulations; Mother Nature is the main controller in our industry. Some companies are hanging on by a thread. I don't think North Carolina is going to sell us down the river to help the fishermen in New Jersey."

Menhaden—food for tomorrow

Menhaden—known for years as a trash fish, the poor man's fish, an industrial fish—may be on its way toward an improved image. Tyre Lanier, a Sea Grant researcher in the NCSU Food Science Department, says menhaden may become the soybean of the sea.

At the turn of the century, soybeans were used mainly for animal feed, says Lanier. Now, the protein from soybeans can be found in many items on the grocer's shelves. And, Lanier predicts a similar future for the lowly menhaden.

He's been experimenting, mincing menhaden to make surimi, a product developed by the Japanese. By water-washing the mince, the Japanese end up with a protein concentrate suitable for use in restructured seafood products. For the consumer, Lanier's research could mean a fish product high in food value but low in cost.

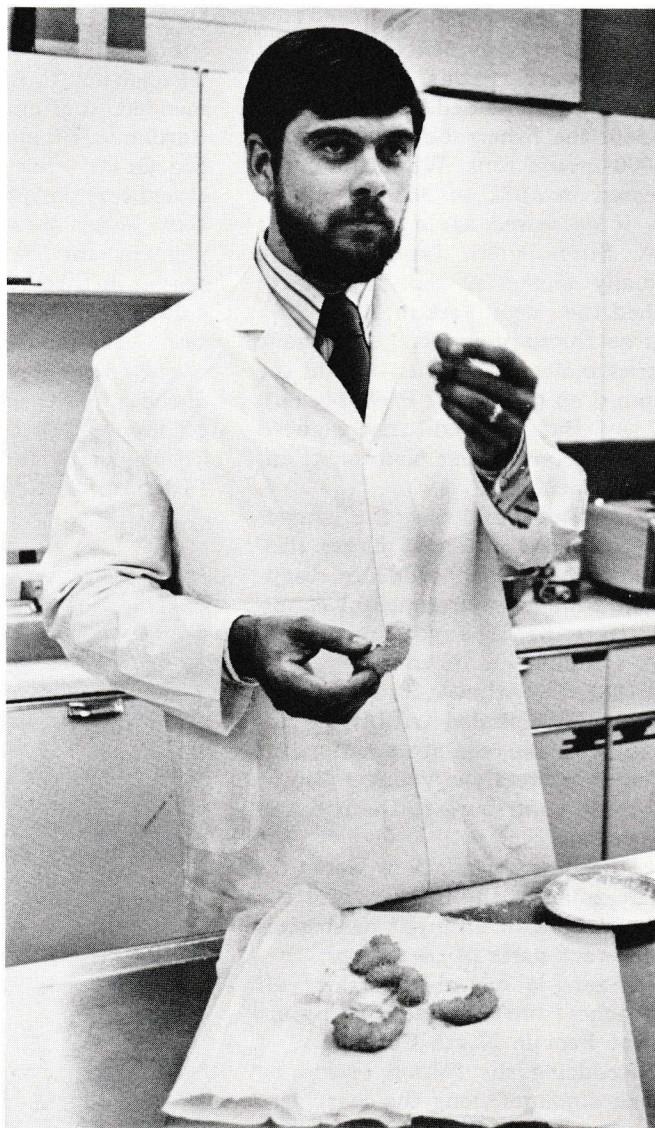
"Nutritionally, surimi is far superior to soy," says Lanier. "And, functionally, it's much better than soy. It has a bland flavor so that other flavorings can be added." One of the problems with soy is the "beany" flavor that it contributes to the product.

The surimi process transforms the bony, fatty menhaden into an edible fish. A mechanical deboner removes the bones, and all but two percent of the fat is removed during the washing process. Along with the fat goes the strong, fishy taste characteristic of menhaden.

The surimi process uses only 20 percent of the fish. The remainder of the fish could still be used for fish meal and fish oil. Lanier says there's already a large, well-established industry equipped to handle the by-products of the surimi process.

If menhaden were used to make a food for human consumption, processing plants would have to upgrade their equipment and impose rigid sanitation conditions. Lanier suggests that two boats, one for food fish and one for feed fish, would operate on the fishing grounds. Some of the catch would be pumped onto each boat. From then on, the processing would be separate until the waste from the surimi would be pumped back into fish meal and solubles processing.

Photo by Cassie Griffin



Tyre Lanier samples a surimi product

For North Carolina fishermen, a shortened season could mean a loss of most of their incomes. Their earnings are tied to the amount of fish they catch. If a shorter season means fewer fish, it also means fewer dollars in the pockets of fishermen.

Many of the workers that would have been affected are black. John Maiolo, a Sea Grant researcher and sociologist at East Carolina University, assisted Blomo with the sociological aspects of the study. Maiolo says that blacks have traditionally been excluded from the "glamour" fisheries, such as shrimping, because they lacked the capital and the connections necessary to market their catch.

"For poor whites and for blacks, menhaden fishing has offered an opportunity to make money. In a good year, a fisherman could make as much as \$20,000 for six months of work," says Maiolo.

"A shortened season would have displaced these people and society would have to pick up the tab, either in the form of training for new jobs or welfare payments. The economy is poor, there aren't many unskilled jobs around, and they don't have the background for an eight-to-five job," says Maiolo.

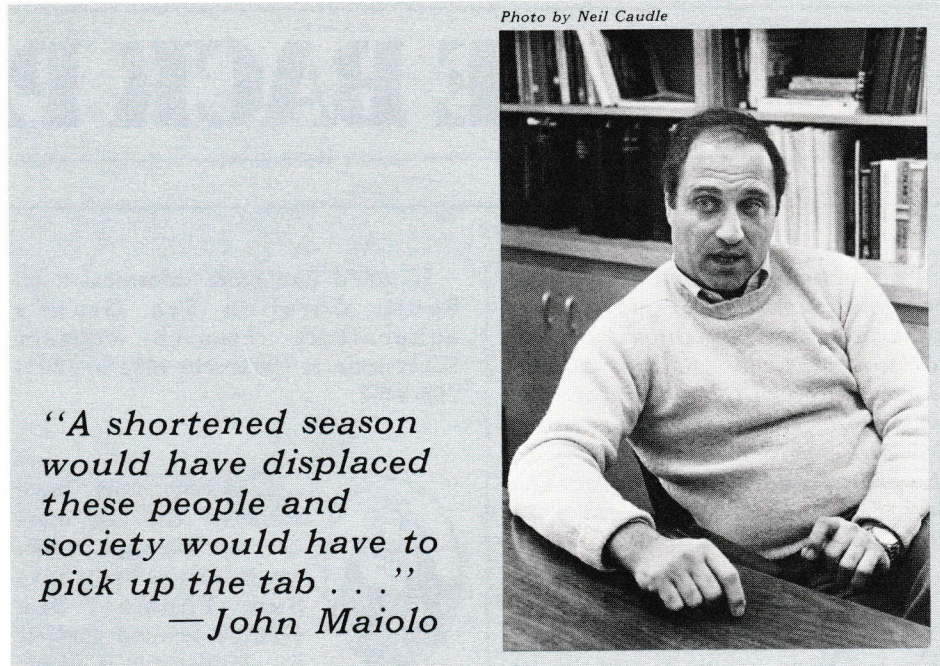


Photo by Neil Caudle

"A shortened season would have displaced these people and society would have to pick up the tab . . ."
—John Maiolo

A shorter season in North Carolina could eventually improve the fishing in northern states. National Marine Fisheries Service tagging studies illustrate the stratification of the fish by size along the coast. The older, larger fish migrate farther north. Robert Chapoton has spent 20 years with the

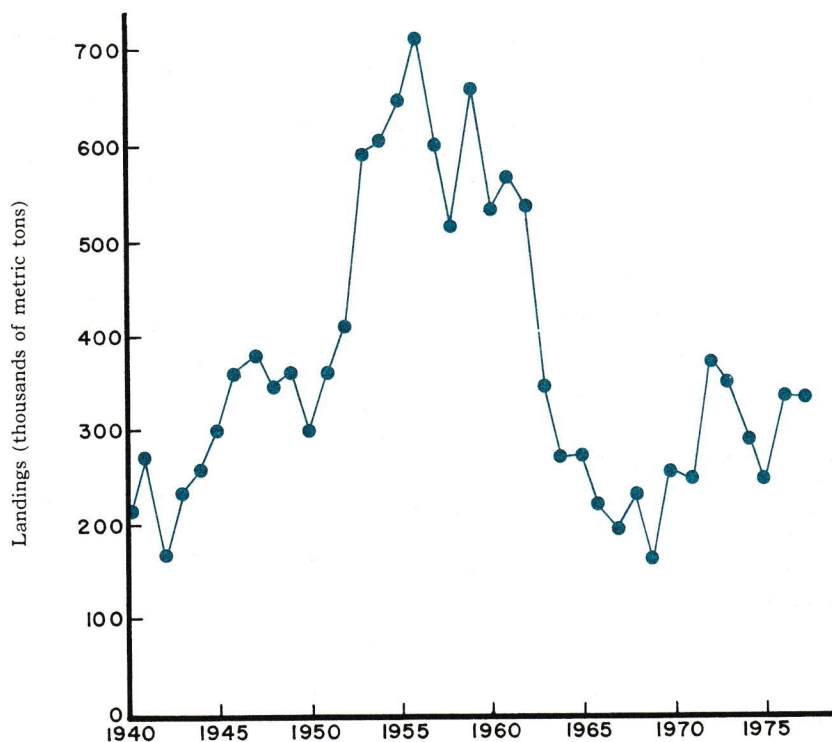
federal research program for menhaden. He says reaction from North Carolina fishermen is not surprising. "If you save a fish from North Carolina, it will be in Virginia or maybe in New Jersey in the next two or three years."

But Chapoton says National Marine Fisheries Service wants to ensure that there's no immediate danger to the stocks of menhaden and to improve the long-range stability of the fishery. "The whole coast would do better if we reduced the catch of the younger fish now and let them become older fish."

The decision not to shorten North Carolina's menhaden fishing season doesn't please fishermen in the North. They say North Carolina fishermen are catching the fish that would eventually migrate north. On the other hand, North Carolina menhaden fishermen say they'd have nothing to catch if they left the peanuts in the water.

But, North Carolina is a key state, says Paul Perra, Interstate Fisheries Program Coordinator with the Atlantic States Marine Fisheries Commission. "North Carolina is the state fishing the small fish. They're taking the peanuts and excluding those fish from the rest of the industry and from future years. By not going along with the plan, North Carolina stopped the interest of the plan. If the state doesn't comply, the plan will be useless."

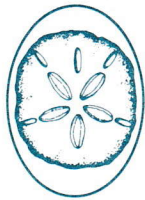
—Nancy Davis



Graph illustrates fluctuations in menhaden catches

THE BACK PAGE

"The Back Page" is an update on Sea Grant activities—on research, marine education and advisory services. It's also a good place to find out about meetings, workshops and new publications. For more information on any of the projects described, contact the Sea Grant offices in Raleigh (919/737-2454).



There are thousands of acres of old rice fields in South Carolina and much of that impounded land hasn't been used in 70 or 80 years. But researchers with the South Carolina Sea Grant Consortium are studying the feasibility of using that old agricultural land for aquaculture.

They're flooding the abandoned rice paddies, then allowing Mother Nature to stock and feed the crop. Fields that once produced rice are now yielding 40 or 50 pounds of shrimp per acre.

Jack Whetstone, marine extension specialist with the South Carolina Sea Grant Consortium, spoke to aquaculture experts and advisory personnel at UNC Sea Grant's aquaculture project in Aurora on October 10. Whetstone told the group that shrimp are just one species that shows promise for aquaculture. In freshwater impoundments, they've been able to grow crawfish, establishing a new industry in South Carolina. This year, about 525 acres will be farmed in the production of crawfish, and Whetstone estimates that each acre will produce 1,000 pounds.

Whetstone says aquaculture in his state will be similar to truck farming. There will be a variety of species cultured in a variety of environments. And aquaculture won't be limited to the coast. In the central part of the state, soybean farmers have been successfully raising freshwater shrimp. "They say they're making more money per acre off shrimp than they are off of soybeans," says Whetstone.

If you'd like more information on South Carolina Sea Grant's aquaculture research, contact Whetstone at (803) 546-4481 or (803) 795-8462.



Chickens may have cornered the egg market, but fish eggs, or roe, can be just as tasty, says Sam Thomas, Sea Grant's seafood specialist. Mullet roe is popular with coastal Carolinians, he says. In late October and early November, the fish begin a fall run along the North Carolina coast as they head south to spawn. Fishermen who catch the mullet extract the egg sac containing the eggs from the fish.

Coastal cooks roll the roe in salt, press it between two planks for about 24 hours, then wrap it and freeze it for later. For cooking, Thomas recommends baking or frying without a batter.

Don't expect to love your first bite, warns Thomas. You have to acquire a taste for mullet roe. He enjoys nibbling the cooked roe as a snack or for a meal.



How about serving shark for dinner? A fledgling shark fishery is gearing up along our coast. But a lot depends on public acceptance of this shunned fish. During 1982, landing figures show that U.S. fishermen caught 24.6 million pounds of shark, valued at \$4.8 million. Most of the catch was shipped out of the country. Shark is commonly eaten in Europe, Australia and the Orient.

Shark has a firm flesh that tastes much like swordfish. It is an excellent source of protein, vitamins and minerals. And shark can be cut into steaks or fillets.

But shark must be handled properly

at sea if it is going to be tasty on the table. A shark should be bled soon after being caught, because its blood contains urea, which can alter the taste of the meat as it deteriorates. A properly handled shark can have a shelf-life of 18 days.

"I have no doubts that, if there is some quality control put onto shark, that sooner or later it'll become readily accepted," says Pete Whiting of Ottis Fish Market in Morehead City. "Grouper, years ago, was thought to be a trash fish. And now all the finest restaurants serve grouper."

Whiting says he would like to see shark sold in supermarkets for just over a dollar a pound—making shark a better buy than hamburger.



The Christmas tree that decorates your home during the holidays, can be the base of tomorrow's sand dune. Natural Christmas trees can be used to repair dunes worn down by vehicle and pedestrian traffic, says Spencer Rogers, Sea Grant's coastal engineering specialist at the N.C. Marine Resources Center at Ft. Fisher.

The trees' branches help to trap the blowing sand and become the skeleton of a new dune. While Rogers says the trees can be used to repair dunes damaged by people and vehicles, trees shouldn't be used to repair dunes eroded by wave action.

Each year, Sea Grant and the N.C. Marine Resources Center at Ft. Fisher sponsor a dune-repair program. To participate in this year's program, bring your tree, stripped of its ornaments, to the center January 1 at 2:30 p.m.

Spencer Rogers traveled to Texas to see what North Carolina could learn from a hurricane named Alicia. The hurricane, which struck the Texas coast September 18, was classified as a minimal category three storm

(category one is the mildest storm and category five is the most fierce).

Rogers says most of the damage to homes and buildings was caused by Alicia's 110 mph winds, moderate by hurricane standards. He estimates that in small coastal towns as many as 75 percent of the buildings received substantial damage. And the damage resulted not just from the strength of the winds, but also from poor construction techniques, he says.

"Most of the failures that we looked at were due to poor connections between the roof, the rafters and the side walls, and the side wall connections down through the floor beams and joists," he says. "After viewing the damage we learned you can't emphasize enough the importance of good connections in coastal construction."



Seafood may be on its way to the baby-food shelves. Laura J. Mackintosh, a master's student in food science at NCSU, has completed initial research on a project, funded jointly by Sea Grant and the National Fisheries Institute, that will develop a baby food made out of seafood.

So far, there are no baby foods that use fish as a main ingredient. But Mackintosh has already developed a meat stick using surimi, or minced fish, made for toddlers from sea trout. Mackintosh says the product proved acceptable in nutritional, textural and sensory qualities. Frank Thomas, extension professor in Food Science at NCSU and Mackintosh's adviser, presented the results of her work at the Atlantic Fisheries Technological Conference in August.

Mackintosh says she is continuing work on fish chowders and meat dinners for toddlers, and also on the strained version of these products for infants. The final results of her project will be presented next August at the Atlantic Fisheries Technological Conference.

Frank Thomas, who is also project director for Sea Grant's work at the NCSU Seafood Laboratory in Morehead City, has been chosen as the 1984 chairman of the Atlantic Fisheries Technological Conference.

The conference is an annual open forum on technological progress in the fisheries.

Joyce Taylor, Sea Grant's marine advisory agent at the lab, will serve as secretary for the conference, which will be held next August in Wilmington.



Sea Grant researcher Wayne Skaggs will speak to the annual meeting of the National Association of State Universities and Land-Grant Colleges (NASULGC) in Washington, D.C., November 15. Skaggs is one of three scientists who will address a symposium for university and college administrators about the problems of land use near estuaries. NASULGC recently created a marine division to go along with its agriculture and urban affairs divisions.

Skaggs will explain his Sea Grant research into agricultural drainage in North Carolina's coastal zone. Skaggs and researcher Wendell Gilliam are developing a mathematical model to predict the amount of drainage into estuaries from farmland as a function of land activities and rainfall.

State Senator Melvin R. Daniels Jr. of Elizabeth City has been elected chairman of the South Atlantic Fishery Management Council. Daniels has served four years as a Council member and was vice-chairman of the Council last year.

The South Atlantic Fishery Management Council develops and monitors management plans for the fisheries from the territorial waters of North Carolina, South Carolina, Georgia and Florida's east coast out to the 200-mile limit.



Jerry Schubel, director of the Marine Sciences Research Center at the State University of New York at Stony Brook, will travel to North Carolina December 5 and 6 for a series of seminars and lectures. Schubel, an internationally renowned oceanographer, has extensively studied pollution problems in the New York and Long Island Harbors and waste disposal in the New York Bight.

He will present a seminar at the In-

Continued on next page

Coastwatch is a free newsletter. If you'd like to be added to the mailing list, fill out this form and send it to Sea Grant, 105 1911 Bldg., NCSU, Raleigh, N.C. 27650.

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Coastal property owner yes no Boat owner yes no

stitute for Coastal and Marine Resources at East Carolina University December 5, then travel to Raleigh where he will meet informally that evening with North Carolina State University students. On December 6, Schubel will speak to an NCSU interdisciplinary "Oceans" class, taught by Lundie Spence, Sea Grant's education specialist.

If you would like to arrange a time to talk with Schubel, contact the Sea Grant office in Raleigh at 737-2454.

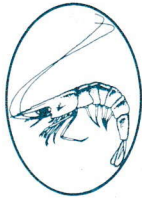


If you own beachfront property that is subject to erosion, you're probably hesitant to build on it. But Walter Clark, Sea Grant's coastal law specialist, says your land may still be worth something.

In its 1983 session, the North Carolina General Assembly passed a law that allows a tax credit for land donated to the state, a local government or to a conservation organization. Clark says you'll be giving yourself a tax credit and providing the public with access to natural resources.

Clark says the land must be in North Carolina and must be useful for public beach use, public access to public waters or trails, fish and wildlife conservation or similar land-conservation purposes. The N.C. Department of Natural Resources and Community Development will determine if your property is suitable for those uses.

The amount of the tax credit is limited to 25 percent of the value of the donated land, up to a \$5,000 maximum, says Clark. For more information, contact Clark at UNC Sea Grant, 105 1911 Building, North Carolina State University, Raleigh, N.C. 27650.



It looks like a miniature crab pot, but it's really a shrimp trap. Jim Bahen, the Sea Grant marine advisory service agent at Ft. Fisher, is experimenting with the trap to see how well it works. The traps have been used along the Gulf Coast and in Maine, but never in North Carolina.

The trap is a 16-inch cube made of fine wire mesh. It has two side openings, a central bait well and two passages to the main body of the trap.

Bahen has been experimenting with different baits—fish meal, commercial catfood, cornmeal and fish pellets—to see which works best. He's learned that a combination of catfood and fish meal attracts the most shrimp. Bahen estimates the trap will catch up to two pounds of shrimp per night. And he says the trap seems to catch more brown shrimp than white shrimp.

Like crab pots, the traps are placed in shallow water, away from areas with a strong tidal flow. By using the traps, fishermen could fish areas they are unable to reach with trawls.

But Bahen cautions that no rules have been established and any fishermen wishing to purchase a trap should

check with his local fisheries enforcement officer.



Leon Abbas, Sea Grant's marine recreation specialist, has written a publication to help marina operators manage their fuel inventories. The booklet offers a simple procedure to determine how much fuel to order and when to order it.

For a copy of *How to Manage Your Marina's Fuel Inventory*, write UNC Sea Grant, 105 1911 Building, North Carolina State University, Raleigh, N.C. 27650. Ask for UNC-SG-83-04.

Sea Grant in North Carolina, 1981-1982, by Neil Caudle, Kathy Hart and Nancy Davis, is a biennial report of Sea Grant research, education and advisory service activities. For a free copy of the 46-page report, write UNC Sea Grant. Ask for UNC-SG-83-05.

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