



COAST WATCH

Here's looking at coastal Carolina

A fisherman ambled up to UNC Sea Grant Director B.J. Copeland at a meeting and said, "I've been hearing about this Sea Grant Program. Just what do you do?"

"Well, a lot of things," Copeland replied. "We research problems, hand out advice and write publications that can help people like you."

The fisherman thought for a moment. "Research?" he said. "What kind of research can help me?"

"Take farm drainage, for instance," Copeland said. "When farming increased in the Pamlico peninsula, fishermen perceived that their catches

were declining. The fishermen got mad at the farmers and farmers got mad at the fishermen. Both said they were just trying to make a living—put food on the table.

"We came up with a research program to find out what that relationship was really like."

Land drainage is just one of the problems Copeland and Sea Grant scientists tackle through research. Sea Grant researchers study shellfish contamination, seafood innovations, aquaculture, erosion . . . And when the results start coming in, it's up to the Marine Advisory Service and communications to get the word out.

This month *Coastwatch* will introduce you to Sea Grant and the problems we study. Inside are the research projects we are just beginning. In future issues we will report the results.

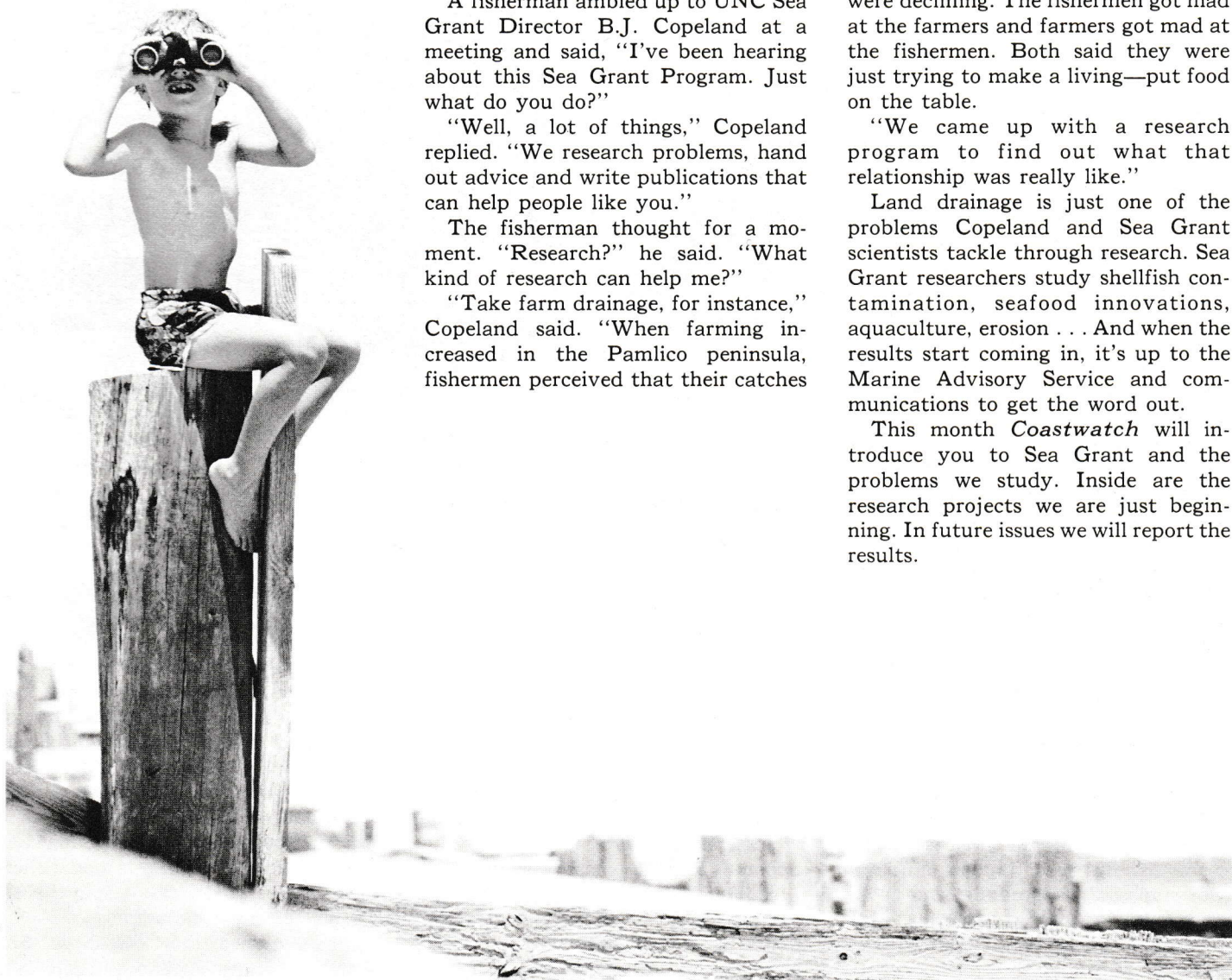


Photo by Gene Furr

A sea of sound research

Sea and sand

Erosion is one of coastal North Carolina's biggest problems, eating away at oceanfront properties and hampering development of residential, commercial and recreational areas. Little can be done to stop this gnawing problem, but knowledge of the process may aid in predicting rates of erosion and shoreline changes.

John Fisher, Margery Overton and Spencer Rogers are developing a model that will estimate erosion rates during storm periods. This year, they will build a test dune to monitor the erosion and wave and surge conditions. This data, along with information gathered from a wave tank, will be used to refine their model. With this, property owners, coastal managers and developers should benefit, as the long-term predictions outline suitable areas for construction.

Improved coastal management is the aim of another Sea Grant project. David Brower will continue a university program that studies legal and policy issues such as beach access, impacts of off-road vehicles, public trust rights and effects of the condominium boom on local government.

And since ocean policy graduate students do much of the research, the program trains tomorrow's managers.

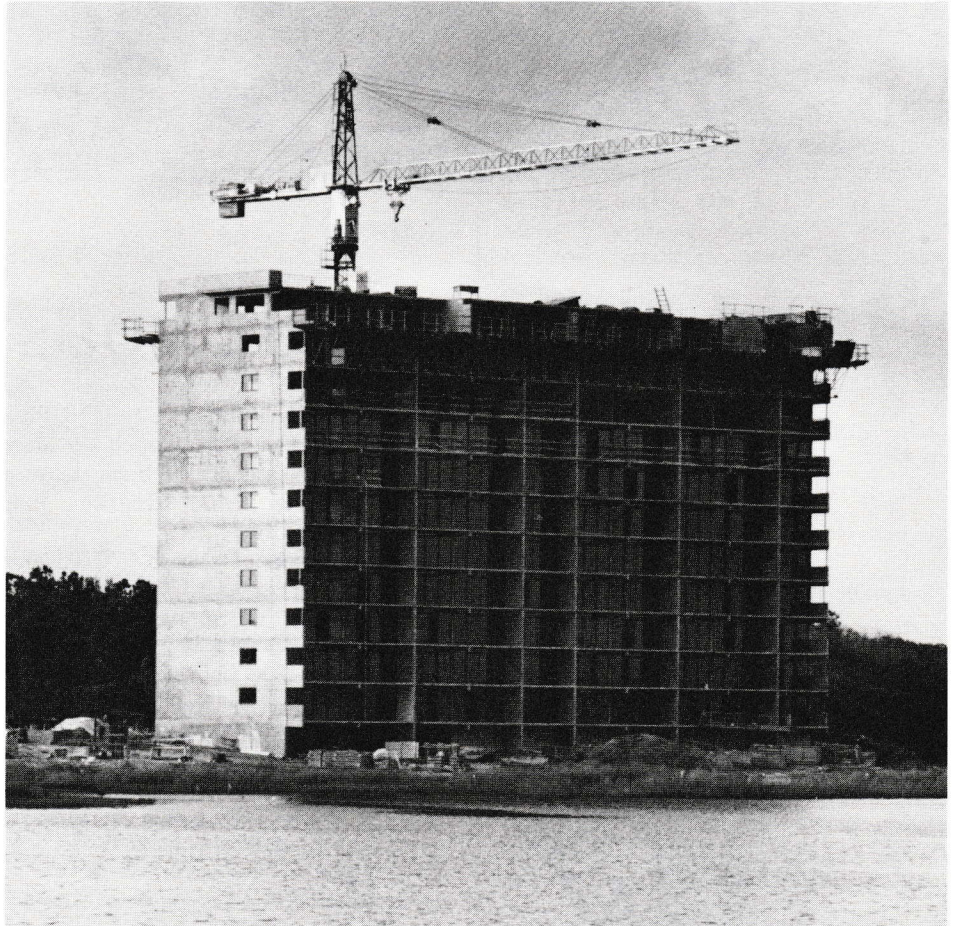
Research doesn't stop at the shoreline. Scott Snyder and Stan Riggs make their discoveries hundreds of feet below the ocean's surface. They seek out mesas rich in hardgrounds, phosphates and mineral deposits.

Hardgrounds attract great numbers of fish because they serve as attachment sites for food sources such as algae, sponges, coral and other organisms. To help commercial and recreational fishermen locate these prime fishing areas, Snyder and Riggs will map the hardground formations.

In addition, the escarpments contain potential mineral resources such as shell and quartz gravels, cobalt, nickel, platinum, gold and uranium.

Snyder and Riggs also will study

Photo by Nancy Davis



The condominium boom means added pressures on local government

the development and formation of phosphates. They want to learn the distribution of the sediments, which will help in classifying hardgrounds and determining their age and origin.

The researchers:

John Fisher, Department of Civil Engineering, North Carolina State University

Margery Overton, Department of Civil Engineering, North Carolina State University

Spencer Rogers, coastal engineering specialist, UNC Sea Grant College Program

David Brower, Center for Urban and Regional Studies, University of North Carolina at Chapel Hill

Scott Snyder, Department of Geology,

East Carolina University
Stan Riggs, Department of Geology,
East Carolina University

Minding the nursery

In eastern North Carolina, farmland is lowland. And that's a potential problem. To make the land fit for farming it must be drained of the water that accumulates there. And that's a problem too. Much of the freshwater drainage funnels into brackish estuaries where young fish grow. Resource managers and fishermen believe this outflow may be affecting fisheries production.

To alleviate this dilemma, Sea Grant is using science to find solutions that will allow the fisherman and the farmer to reap their harvests. Two Sea

Grant projects concentrate on the relationships between freshwater drainage and the estuaries. (The studies are coordinated with the state-funded Broad Creek Project, which is also focusing on freshwater drainage.)

In one study, Wayne Skaggs and Wendell Gilliam will examine the effect of land development, drainage methods, precipitation rates and soil properties on the rate and quality of water entering the estuary. Using this information, the team will develop a model that can predict how different drainage methods affect freshwater outflow. And researchers will be able to suggest which drainage methods lessen outflow rates.

In another study, Len Pietrafesa will finish his work on the processes affecting salinity changes in the estuary. Salinity changes can drive juvenile fish from the estuary (making them vulnerable to predation) or cause their death.

In examining the changes, Pietrafesa is studying how freshwater drainage and natural processes such as current directions, water speed and direction and temperature affect salinity. His results will be plugged into a model that can predict the effects of salinity changes on juvenile fish.

In other estuarine research, John Miller will examine the transportation patterns of juvenile fish across Pamlico Sound to estuarine nurseries. Miller wants to find out if juvenile fish "ride" wind-driven currents to their estuarine nurseries or swim to their destination. And he plans to determine the abundance of these baby fish and their ability to grow and survive.

The success of a productive estuary is dependent on the ability of the juvenile fish to survive. Larry Crowder will follow the interactions between young fish and their predators in Rose Bay. Crowder believes predation is a major factor determining survival and habitat choice of juvenile fish in the nursery areas.

The researchers:

J. Wendell Gilliam, Department of Soil Science, North Carolina State University

R. Wayne Skaggs, Department of Agricultural Engineering, North Carolina State University

Len Pietrafesa, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University

John M. Miller, Department of Zoology, North Carolina State University

Larry B. Crowder, Department of Zoology, North Carolina State University

Downstream dilemma

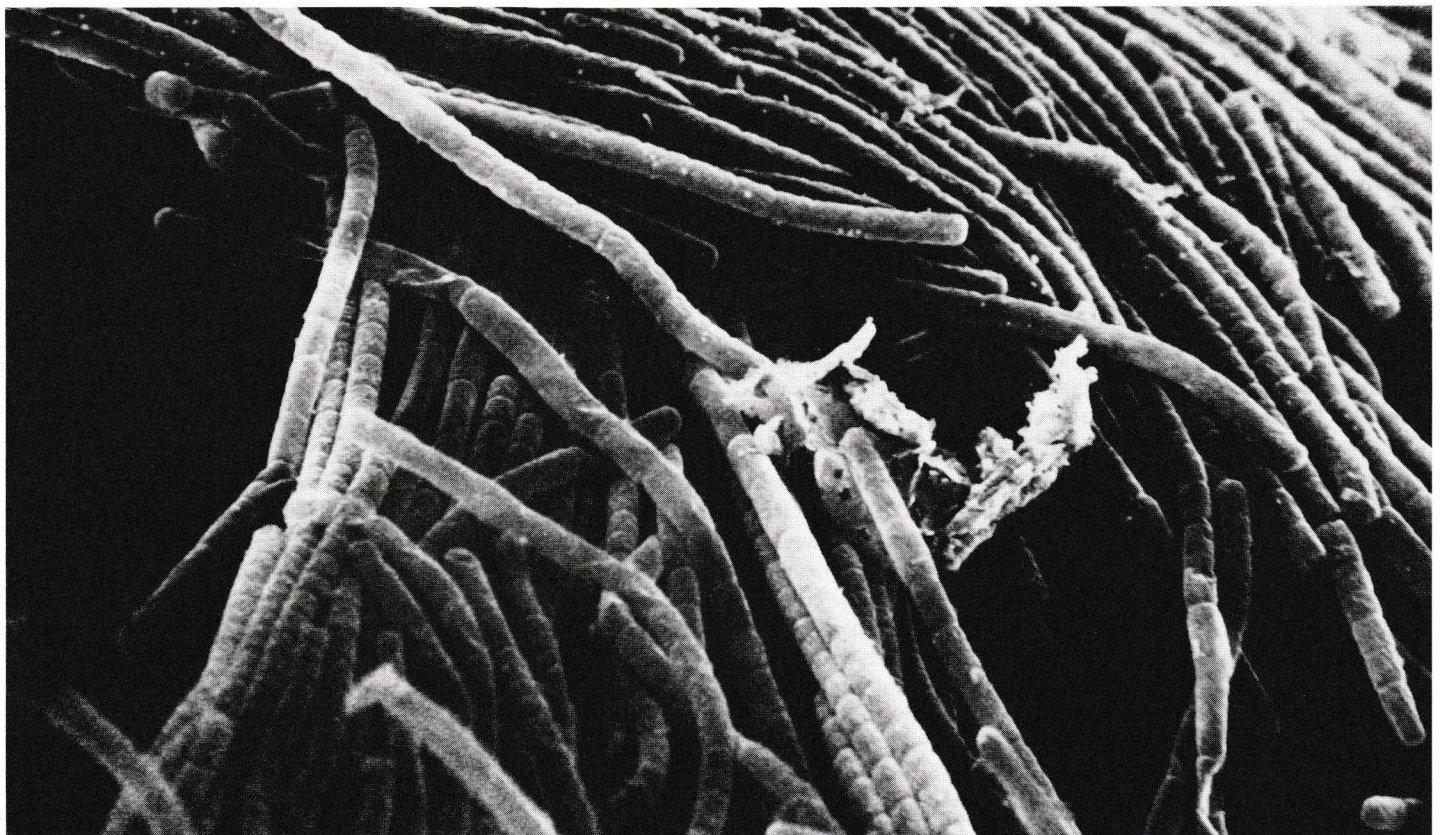
Upstream municipal wastewater treatment plants and industries pump effluent rich in nutrients into the Neuse River. Downstream the river blooms.

Upstream runoff from Durham, Raleigh, Wilson, Smithfield, Kinston and Goldsboro adds more nutrients to the Neuse. Downstream the river blooms.

Upstream farmers regularly dose their fields with inorganic fertilizers, which the rain washes into the river. Downstream the river blooms.

This upstream overload of nutrients such as nitrogen and phosphorus is nourishing massive blooms of blue-green algae downstream when conditions are favorable. The blooms form a malodorous scum that can do more than just hinder recreational activities.

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A form of blue-green algae found in the surface waters of the Neuse River

To determine how the Neuse River and blue-green algae respond to changes in nutrient levels, Don Stanley and Bob Christian will be studying the role of "new" nitrogen and recycled nitrogen in the blue-green algal blooms. New nitrogen originates from sources such as wastewater effluent and urban or agricultural runoff. Recycled nitrogen has been used by animals and organisms in the estuary and excreted as ammonia.

With information generated by this project, managers can determine what effects reduced nutrient inputs will have on the Neuse River and algal blooms. And they can incorporate this knowledge into the management plans proposed for the basin.

While Stanley and Christian focus on what causes blue-green algal blooms, Hans Paerl and Rolland Fulton will examine how the blooms affect the estuarine food chain. Evidence already gathered by Paerl indicated blue-green algae may be toxic or inedible to lower levels of the food chain—zooplankton. And lower level changes may affect organisms higher on the food chain—namely important commercial and recreational species of fish.

Paerl and Fulton believe the algae may decrease the efficiency of the estuarine food chain and alter the kinds of fish living at bloom sites. They will test these hypotheses in laboratory and field experiments.

In a laboratory at UNC-Wilmington, Ron Sizemore will employ biotechnology techniques to examine marine *vibrio*, a bacteria common to North Carolina's coastal waters. He will study bacteria taken from polluted and nonpolluted sites along the state's coastal waters. Sizemore may be able to use his techniques to "construct" a bacteria that will break down complex pollutant mixtures.

The researchers:

Don Stanley, Institute for Coastal and Marine Resources, East Carolina University

Bob Christian, Department of Biology, East Carolina University
Hans Paerl, Institute of Marine Sciences, University of North Carolina at Chapel Hill

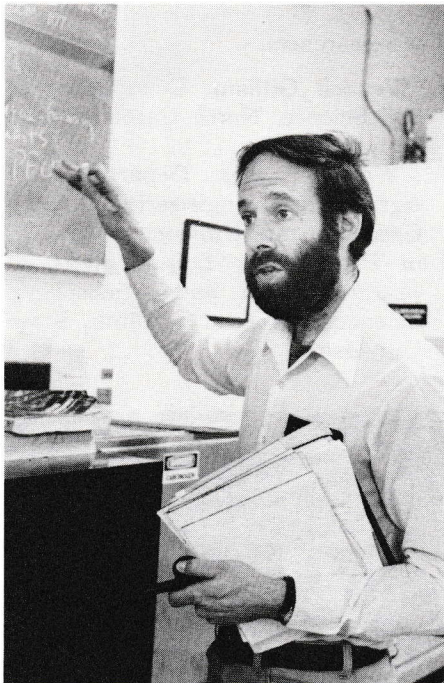
Rolland Fulton, Institute of Marine Sciences, University of North Carolina at Chapel Hill

Ron Sizemore, Department of Biological Sciences, University of North Carolina at Wilmington

Shelling out results

During the mid-1970s, North Carolina fishermen discovered a lode in the state's estuaries—hard clams. With northern clams frozen in their beds, southern mollusks brought prices that sent fishermen raking, tonging and dredging for the valuable nuggets. In Core Sound, fishermen forsook traditional harvest methods, turning instead to efficient mechanical harvesting methods. By 1981 hard clam catches had increased fivefold.

Photo by Neil Caudle



Mark Sobsey

Fishery managers worry the intense harvest is depleting hard clam stocks. The N. C. Division of Marine Fisheries already imposed some restrictions. But they may consider more.

Charles Peterson will supply managers with more facts about hard clams as he continues to research the mollusks. He will focus on the survival and growth of clam larvae in different habitats and test the hypothesis that removal of adult clams enhances larval survival. Similar tests will be conducted for bay scallop larvae.

To help clam gardeners (fishermen who raise clams on leased bottomland) with predation problems, Peterson will study two of the the clam's greatest

enemies—blue crabs and snapping shrimp. Using field tests, Peterson will estimate the predators' abundance and appetite in areas suitable for clam gardening. And he will test methods for excluding the predators from gardens.

Overfishing isn't the only problem facing the clam fishery. Pollution also poses a hazard. Clams and their relatives, oysters, become contaminated when their habitat is polluted. Sewage treatment plants, faulty septic systems, land runoff and boats discharge waste that can carry enteric viruses and bacteria.

In his Chapel Hill laboratory, Mark Sobsey will continue to study one of the most serious viral contaminants—hepatitis A. Using sophisticated detection methods, Sobsey will study the occurrence of hepatitis A in field samples of shellfish, the relationship between bacteria levels and virus levels, the uptake and elimination of the virus, and its inactivation by heat.

Under controlled conditions, Sobsey will examine the elimination of hepatitis A and other viruses in depuration systems. In depuration plants, polluted shellfish are placed in tanks of clean water where they purge their contaminants. Sobsey will study the length of time and optimal conditions (water temperature, flow rate, density) for viral elimination in depuration systems.

The researchers:

Charles Peterson, Institute of Marine Sciences, University of North Carolina at Chapel Hill

Mark Sobsey, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill

On the job

When it comes to supplying resource managers with answers, most research is aimed at understanding complex ecological and biological factors. But there's a people side of management. And understanding fishermen is just as important as understanding fish.

That's why Mike Orbach and Jeff Johnson are learning more about North Carolina fishermen who ply this state's waters and other states' too. North Carolinians are among the most mobile, aggressive fishermen on the East Coast, fisheries managers report.



A bounty of Florida scallops lured North Carolina fishermen south

And their mobility has implications for fisheries management plans inside and outside North Carolina.

Orbach and Johnson want to learn what factors influence the fishermen's movement and how their mobility affects the fishing industry and other businesses—processors, distributors and marine supply companies. And the team will examine management networks to see what consideration migratory fishermen are given when plans and policies are made.

With information from this project, fisheries managers can do a better job of assessing the impacts of management plans on all fishermen.

In another study, David Griffith will size up the labor needs of the state's seafood processing industry. The industry is labor intensive, and the work force is based on community and kinship ties. But the seafood processing industry is growing. Is there enough labor available for its expansion?

That's what Griffith wants to find out. He will work with the shellfish and finfish processing industries to determine how socioeconomic, demographic and social factors affect labor availability. By using this information, he can assess and predict the labor supply at various locations.

New industries can use Griffith's

results to choose locations for new plants; older plants can make better decisions about expansion. And management agencies can predict how policy decisions (catch limits or shortened seasons) in one sector of the fishery will affect other sectors (the processing labor force).

The researchers:

Mike Orbach, Department of Sociology, Anthropology and Economics, East Carolina University

Jeff Johnson, Institute for Coastal and Marine Resources, East Carolina University

David Griffith, Institute for Coastal and Marine Resources, East Carolina University

Catch of the day

North Carolina menhaden fishermen are worried about the future of their business. In 1983, they landed 177,973,000 pounds of menhaden for a dockside value of \$6,168,000—an average of about 3 cents per pound.

The statistics tell the story. While the menhaden fishery is the nation's largest in terms of volume, its value per pound ranks well below other species. The reasons are simple: the menhaden is an industrial fish. This oily fish has been used for fertilizer and for chicken feed, but it's never made it to the nation's dinner tables.

Sea Grant research may change that. In a previous study, Tyre Lanier, Donald Hamann and Frank Thomas showed that the menhaden could be transformed into surimi—a minced fish product developed by the Japanese. By water-washing the mince, they end up with a protein concentrate suitable for use in restructured seafood products such as shrimp, scallops and crab legs. The natural counterparts of these foods are high in demand and in price. But the restructured product is low in cost and high in food value.

The researchers found that a light, bland and excellent gel-forming surimi could be produced from menhaden. A mechanical deboner removes the bones, and the washing process eliminates all but 2 percent of the fat. Along with the fat goes the strong, fishy taste characteristic of menhaden. Since the surimi process uses only 20

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percent of the fish, the remainder can be processed for fish meal and fish oil.

Researchers will continue to refine the process used to make surimi out of menhaden. They'll also be examining the biophysical-biochemical basis for the extraordinary heat-gelation properties of fish muscle proteins.

To make surimi production more feasible, Allen Chao will try to minimize the amount of water necessary for surimi production. The conventional washing process requires a water volume 9 to 15 times the volume of the finished product, and it generates a large effluent treatment load. But a proposed counter-current process may reduce the water requirement by up to two-thirds.

The researchers:

Tyre Lanier, Department of Food Science, North Carolina State University

Donald Hamann, Department of Food Science, North Carolina State University

Frank Thomas, Department of Food Science, North Carolina State University

Allen Chao, Department of Civil Engineering, North Carolina State University

Carolina to Maine caught 14.7 million pounds of striped bass. By 1980 the commercial catch totaled less than 5 million pounds. Sport fishermen reported similar catch declines.

Previously, Sea Grant researchers demonstrated the potential of a striped bass hybrid (striped bass x white bass) as an aquaculture candidate. The hybrid exhibited superior growth rates, improved survival, greater disease resistance and general hardiness and adaptability.

Now, researchers will tackle the task of turning that potential into reality. In an effort to launch aquaculture as a viable industry in the state, they'll combine research with demonstration.

Howard Kerby and Melvin Huish will work to improve the culture characteristics of hybrids through genetic manipulation.

Ronald Hodson, director of Sea Grant's aquaculture research, and marine advisory agent Randy Rouse will transfer that research to a demonstration project designed to work out the details of intensive culture and to transfer the results to industry.

The success of an aquaculture industry also will depend on a low-cost nutritional feed for the fish. Margie Gallagher will focus her efforts on finding the right food for the commercial culture of striped bass. She'll be evaluating various protein/energy ratios and the effects on growth, body

composition, metabolism and the digestion of protein.

An additional prerequisite to the development of a successful striped bass hybrid production facility is the control of disease problems. This is especially important in intensive aquaculture systems where disease problems are often magnified because of the close confinement of the fish. Aquaculturists estimate parasites cost them \$50 million annually. Ed Noga will develop culture methods for ectoparasites of fish in an effort to reduce disease problems.

The researchers:

Howard Kerby, Department of Zoology, North Carolina State University

Melvin Huish, Department of Zoology, North Carolina State University

Ronald Hodson, Associate Director, UNC Sea Grant College Program

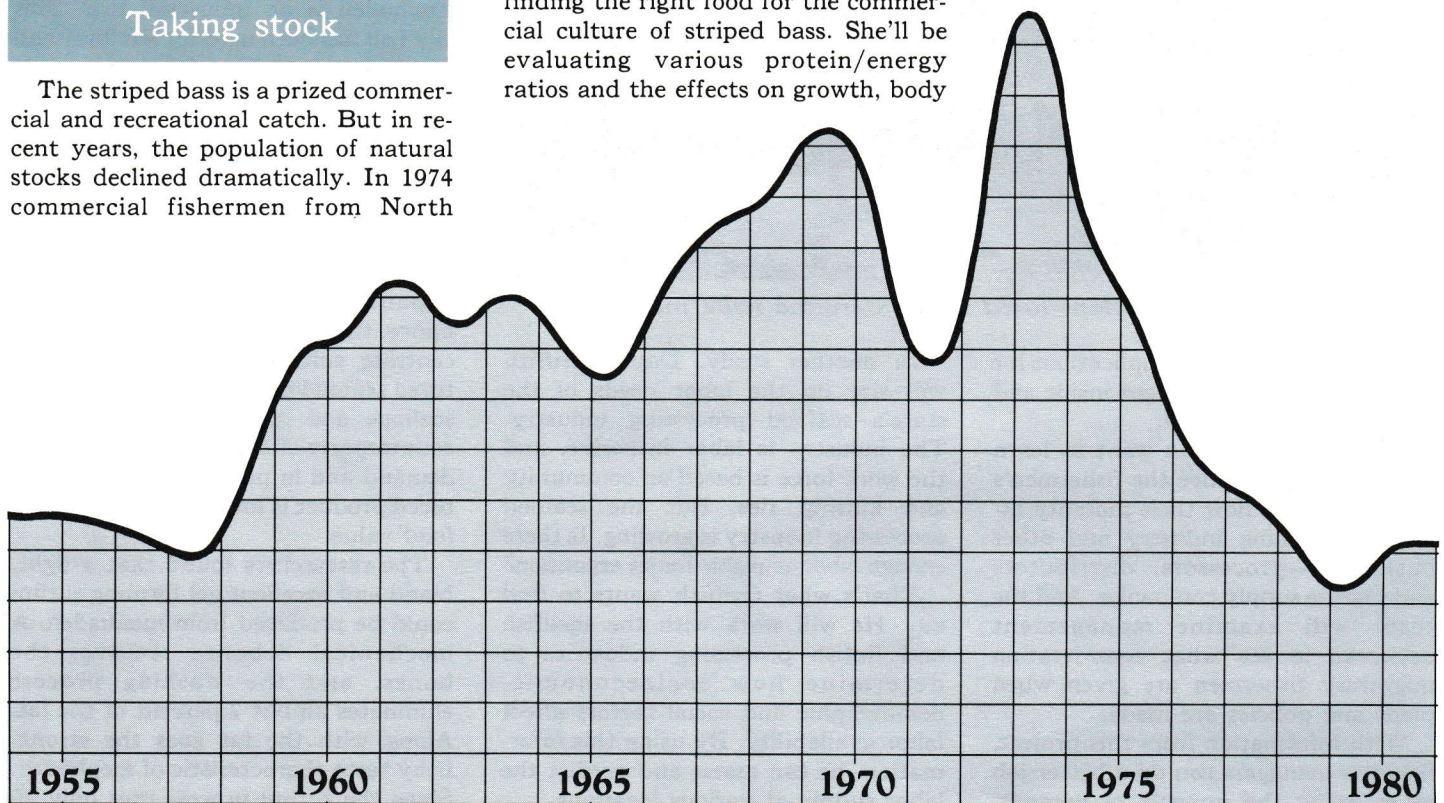
Randy Rouse, marine advisory agent, UNC Sea Grant College Program

Margie Gallagher, Institute for Coastal and Marine Resources, East Carolina University

Ed Noga, School of Veterinary Medicine, North Carolina State University

Taking stock

The striped bass is a prized commercial and recreational catch. But in recent years, the population of natural stocks declined dramatically. In 1974 commercial fishermen from North



Commercial catches of striped bass have declined dramatically

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). For copies of publications, write UNC Sea Grant, NCSU, Box 8605, Raleigh, N.C. 27695-8605.

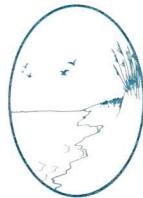


North Carolinians are gaining a reputation for knowing how to shed crabs, and folks are asking us for advice. In February, a team of North Carolina experts will travel to Biloxi, Miss., to share some of its knowledge of the soft-shell delicacies with participants at the Inter-regional Soft Crab Symposium. Sponsored by the Mid-Atlantic and Southeast Marine Advisory Services, the symposium is designed to keep Sea Grant advisory agents up-to-date on the latest technology in crab shedding. UNC Sea Grant marine advisory agent Wayne Wescott will describe the North Carolina soft crab industry, including peeler harvesting, economics and marketing, and facility design and water quality. Terry Sholar of the N.C. Division of Marine Fisheries will discuss the management problems associated with the soft crab industry. Sea Grant researcher Ronald Sizemore will explain the role of bacteria in soft crab mortalities.

European seafood lovers soon may be popping the top on a can of North Carolina squid. Sam Thomas, UNC Sea Grant's seafood specialist at the NCSU Seafood Laboratory in Morehead City, recently worked with a North Carolina processing firm interested in marketing squid abroad.

Thomas helped the company perfect its canning operation for squid. He recommended what percentage of

brine to use and ways to prevent moisture loss. Already, the company has processed 40,000 pounds of canned squid.



To many students, the ocean is a world of wonder ready to be explored. Often it's an appreciation they learn from teachers captivated by the sea. UNC Sea Grant recently recognized six such educators who displayed their knowledge and enthusiasm for the coast and its resources.

These North Carolina educators were selected this year on the basis of their involvement and leadership in marine education at school and in other settings. Each will receive a UNC Sea Grant College Program Marine Certificate as an award.

Recipients include: Hilda Bayliss, education coordinator for the N.C. Marine Resources Center in Manteo; Tom Bell, teacher and science chairperson at Lewis Chapel Junior High School in Fayetteville; Mark Joyner, aquarium specialist with the N.C. Office of Marine Affairs in Raleigh; Gerry Madrazo, science supervisor for Guilford County; Judith Spitsbergen, curator of education at the N.C. Maritime Museum in Beaufort; and Sally Zimmerman of Wilmington, former education specialist for the N.C. Marine Resources Center at Ft. Fisher.



Become submerged in the undersea world at the fifth annual SEAS (Southeastern Atlantic States) Diving Conference Festival Feb. 22 to 24 in Raleigh at the Radisson Hotel.

The event offers divers and underwater enthusiasts three days of films, demonstrations, socials and workshops. Programs this year include such topics as underwater photography, sharks, diving medicine

and underwater archaeology. Participants will also have the opportunity to put on a wet suit and tank and try diving pool-style. In addition, a trade show with about 40 exhibitors will be held at the Radisson.

Keynote speakers for the weekend are Stan Waterman, renowned underwater cinematographer, and Sylvia Earl, a popular marine scientist.

More than 500 people from 10 southern and southeastern states are expected to attend the conference. The public is invited to all events, and there are registration fees.

The conference is co-sponsored by the N.C. Marine Education and Resources Foundation, UNC Sea Grant, the N.C. Wreck Divers Association and the N.C. Office of Marine Affairs. For more information, write Doug Young, SEAS '85, P.O. Box 31186, Raleigh, N.C. 27622. Or call 919/733-2290.



The Crystal Coast Civic Center in Morehead City is going to look like a gigantic boat dock March 15 to 17. That's when the fifth annual North Carolina Commercial Fishing Show will display commercial fishing boats and gear for fishermen and the public to view.

Dealers and manufacturers will show the latest in fishing boats, nets, motors, traps, pots, engines and accessory gear. And seminars will be offered during the three-day event on such topics as fiberglass repairs, basic engine maintenance, marine fisheries policies and seafood preparation.

For merchants interested in participating, space inside the civic center can be rented for \$50. To exhibit boats, merchants must pay a fee of \$1.50 per foot for their first and largest boat and \$1 per foot for each additional one. Participants are also asked to complete an entry form, available from Bob Hines, UNC Sea Grant marine advisory agent in Bogue Banks.

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The show, which is free, is sponsored by UNC Sea Grant, N.C. Division of Marine Fisheries and the N.C. Agricultural Extension Service. Hours are 6 p.m. to 9 p.m. Friday, 10 a.m. to 5 p.m. Saturday and 11 a.m. to 5 p.m. Sunday. For more information, write Hines at the Marine Resources Center in Bogue Banks, P.O. Box 896, Atlantic Beach, N.C. 28512. Or call 919/247-4007.

With an increasing demand from pharmaceutical, cosmetic and food processing industries for substances found in seaweed, researchers are looking for cost-efficient ways to harvest natural populations of seaweed.

In a UNC Sea Grant mini-grant, Donald Kapraun and Frederick Zechman, of the Department of Biological Sciences at the University of North Carolina at Wilmington, will test a seaweed culture system. The researchers will set up a small demonstration system to determine monthly growth rates of the seaweed and to estimate production costs for such an investment. Kapraun and Zechman hope to answer the question: How much does it cost to grow seaweed in North Carolina?

Spencer Rogers, UNC Sea Grant's coastal engineer, and Alan Stutts of the University of Nevada at Las Vegas have been awarded mini-grant funds to study factors influencing the decision to locate permanent structures in ocean hazard areas of coastal North Carolina.

In a recent analysis of oceanfront development in North Carolina, Rogers found that about 50 percent of the permanent structures permitted for ocean hazard areas might be seaward of the vegetation line in 35 years or less. Rogers and Stutts want to determine how perceived risk influences decisions to build or purchase a building in an ocean hazard area. With their results, the investigators may be able to suggest ways public policymakers can influence the decision-making process of property owners planning to build in a hazard area.



The Mid-Atlantic Fisheries Development Foundation awarded two grants to Frank Thomas, director of Sea Grant's work at the NCSU Seafood

Laboratory in Morehead City, and to Joyce Taylor, Sea Grant's seafood agent at the lab.

In a grant to increase seafood utilization, Thomas and Taylor will conduct workshops for economics extension agents and food professionals. Their programs will include dressing, handling, transporting, preserving and preparing the seafood catch.

Another grant will allow Thomas and Taylor to prepare seafood consumer information for the visually impaired. Seafood has traditionally been neglected from the menus of the visually impaired, but Thomas and

Taylor hope to change that. They'll prepare large print and cassette tape educational materials explaining the selection, care, handling and nutrition of seafoods, as well as some recipes for use by totally blind or visually impaired people.

Coastal Capers, written by Lundie Spence, UNC Sea Grant's marine education specialist, and Vivian Barbee Coxe, is a marine education primer designed to provide elementary grade teachers with activities or "capers" that introduce the marine environment. The primer also may be used by teachers with remedial or special education students, or by 4-H and scout leaders. The 20 capers are designed to motivate students to learn basic skills in science, math, language arts, social studies and art.

To order the illustrated primer, write UNC Sea Grant. Ask for UNC-SG-84-05. The cost is \$3.50.

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105 1911 Building
Box 8605
North Carolina State University
Raleigh, NC 27695-8605

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