UNC Sea Grant January 1983

COASTWATCH

Photo by Steve Murray

Sunrise at Core Banks

Science with an eye for seas, sands and seafood

Understanding anything as complex and everchanging as the North Carolina coast requires research. Research can be the key that unlocks the mysteries of the past, explains the changes of the present or solves the problems of tomorrow. Sea Grant is in the business of research. Every year Sea Grant sponsors research projects that answer to the problems and issues of the North Carolina coast—wastewater disposal, algae blooms, shellfish contamination, innovations in seafood technology and more.

And with results in hand, Sea Grant reports back to the people—fishermen, landowners, seafood processors, fishery managers and others—through advisory agents, educational programs and publications. This year Sea Grant is sponsoring 22 research projects that will chip away at the problems nagging our coast.

Getting down to the nitty-gritty of building on sand

The problem: predicting erosion rates and disposing of sewage in sandy coastal soils

Sand. It moves, washes, blows and erodes. And it is not always the best soil under permanent structures or waste-treatment systems.

Many who own beachfront property risk loss or damage to their homes, either because of rapid beach erosion during storms, or because of long-term recession of the shoreline. In both cases, the loss of sand can mean undermined foundations, collapsing buildings. State officials are trying to find ways to protect both the property and the property owner. But they lack some key information about what parts of the shoreline are most vulnerable. Few reliable guidelines are available to predict how beachfront land might erode during severe storms.

Sand is also a culprit in the problem of sewage disposal. Conventional septic systems perform poorly where soils are porous and water tables are high. To compound the problem, the freshwater "lenses" that supply many of our barrier islands with drinking water may sometimes be tainted by effluent seeping through the soil. Island communities have often viewed alternatives to septic systems as either too expensive (ocean outfalls and central treatment plants) or too restrictive (outright bans on new construction). State agencies need hard facts to help them protect the quality of drinking water, and also the quality of nearby estuaries and shellfishing grounds.

The research: to develop models that will predict erosion and to test alternative waste disposal systems in the shallow sandy soils of the barrier islands

On the beachfront, John Fisher, Margery Overton and Spencer Rogers will study the problems of short-term erosion. So far, the complex interplay of storm waves, storm surge and sediments has not yielded to the tools of numerical "modeling." To develop such models, Fisher's team will compile erosion records from a number of barrier-island storms, and will use them to test and perhaps improve the formulas used now for predicting long-term erosion. The results will help state officials evaluate the level of risk for many coastal structures and building sites. The study will also help improve the design criteria builders and architects use for beachfront construction.

Sea Grant research into the problems of failing septic systems and the viral contamination of shellfish has already created something of an underground revolution in the Southeast. Research by Bobby Carlile led to the development of two "alternative" septic systems that often work where conventional systems fail, in the stubborn, wet clays along estuarine shorelines. Coupled with Mark Sobsey's studies of viral contamination, the research showed that effluent could be controlled and treated without endangering shellfish in nearby waters.

Photo by Steve Murray

One beach losing sand

Communities as far away as Texas now employ the designs to help solve their own waste-treatment problems. (Two manuals on the design of these systems are available from UNC Sea Grant.)

This year, continuing research by Craig Cogger, who assisted Carlile on the earlier project, is extending the study to the coarse and sandy soils of the barrier islands. Cogger is testing the designs, which employ low-pressure pumps to "dose" effluent evenly into shallow soils, to see how much vertical separation is required between the pipes and water tables. Meanwhile, Sobsey continues to monitor the sites, tracing the movement of harmful viruses through the soils. The results should help officials set guidelines for the use of so-called on-site treatment systems. And, some island homeowners may eventually have safer, more-effective waste-treatment systems.

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
Craig Cogger, Department of Soil Science, North Carolina State University
Mark Sobsey, Department of Environmental Science and Engineering, University of North Carolina at Chapel Hill

Mapping the way To a buried treasure

The problem: information needed about the valuable minerals that lie buried on the continental shelf and how to extract them safely

Much of our nation's wealth of fuels and minerals lies buried under ground and water on the continental shelf. The search for these treasures has already posed tough questions about how they can be tapped without severely disrupting the productivity and quality of coastal waters.

Sediments off North Carolina, for instance, contain important deposits of phosphate—a fundamental element in the production of fertilizers. But so far, the pattern and extent of these deposits are largely unknown. For this reason, assessing what impact mining them might have on North Carolina has so far been a matter of guesswork.

The research: studies into the phosphate formations of Onslow Bay—where the largest deposits lie, how they were formed and how they relate to other formations

Scott Snyder and Stan Riggs will begin a project designed to increase the understanding of phosphate formations in Onslow Bay, an area of nearshore waters cradled in the bow of land between Cape Lookout and Cape Fear. Previous studies by Riggs have already shown that significant phosphate deposits lie under the bay. But the team's new research will use sediment samples to extract answers for several key questions: When and under what conditions were these deposits formed? How do they fit into regional patterns of phosphate deposition? The answers will help geologists learn more about the formation of phosphates, and therefore what conditions are good phosphate predictors. Using the results, planners will be better able to determine where the greatest phosphate reserves might be, and which deposits should be more carefully explored—major steps toward an understanding of one of North Carolina's most valuable resources.

The researchers:

Scott Snyder, Department of Geology, East Carolina University

Stanley Riggs, Department of Geology, East Carolina University

The Legal Angle

The problem: to answer tough legal and planning questions concerning coastal issues

Agencies charged with regulating the use of North Carolina's coastal resources face a host of questions when they write or implement new policies. Many of these questions involve the complexities of law or community planning. They include such topics as ownership, access and public rights. Often, answering these questions demands more research than the agencies themselves can provide. And the problem is not only how to find the expertise to advise officials on the fine points of, say, the leasing of public bottomlands under public waters. It is also one of how to develop a pool of talent for the future, people well-versed in coastal issues and ready to take positions of leadership.

The research: a study that answers to legal and planning problems while developing a pool of talent for the future

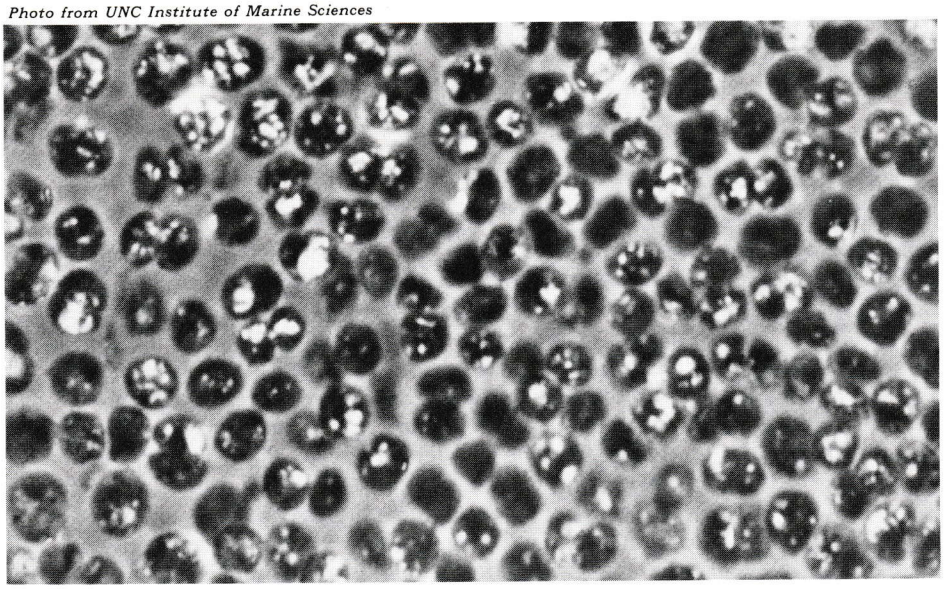
For several years now, Sea Grant's program in coastal and ocean policy has produced both answers and new talent. The research, conducted by students in university law and planning programs, has helped state and federal agencies deal more effectively with such issues as public access to beaches, the establishment of estuarine sanctuaries, the use of submerged lands and methods for managing coastal development. And, a number of students have used the program to launch careers as leaders in the management of the state's coastal resources.

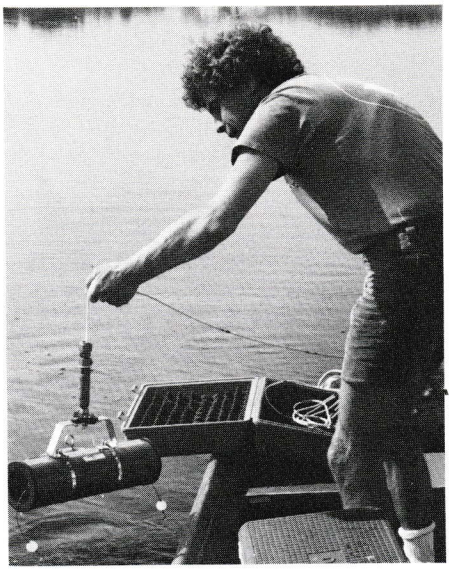
This year, David Brower will continue to encourage and direct law and planning students into research of immediate, practical value to coastal resource managers and planners.

The researcher:

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

Photo from UNC Institute of Marine Sciences





Microcystis aeruginosa, *under the microscope; Paerl sampling bloom-prone Neuse*

Two new looks At a deadly bloom

The problem: blue-green algae blooms on coastal rivers which may alter the ecosystems downstream in the estuary

During the summer the pungent odor of decaying algae pervades the air along the Neuse River. The paint-like scum invades the river from Kinston to New Bern. Citizens, scientists, fishery managers and state officials are concerned about the blue-green algae blooms, hoping to prevent the problems occurring on the Chowan River, further to the north.

Scientists believe high levels of two nutrients, nitrogen and phosphorus, trigger the blooms. And the Neuse River is chocked full of nutrients. Known point sources of nutrients, such as city waste treatment plants and industry, dumped 2.37 million pounds of nitrogen and 1 million pounds of phosphorus into the Neuse in 1981. And no one knows the levels of nutrients that arrive in the rivers from non-point sources such as land run-off.

Earlier studies that focused on algal blooms on the Chowan will provide a foundation for research beginning on the Neuse. In a Sea Grant study begun last year, Hans Paerl studied how far into the Neuse estuary the blooms penetrated and how factors like salinity and nitrogen-availability limited the penetration. Donald Stanley and Robert Christian examined the factors that trigger algal blooms and the effects of reduced nutrient-loading on bloom formation in the Neuse River.

But Paerl, Stanley and Christian have just scratched the surface of a very complicated ecological problem. More research is needed to learn how these massive blooms affect the estuaries and subsequently the fisheries production downstream.

The research: studies into the chemical and biological fate of blue-green algae blooms in the estuary

Upstream blue-green algae paints the river in a foul-smelling scum, making it unfit for recreation and, occasionally, fatal to fish. Downstream in the estuary no evidence of the bloom is evident. But beneath the water's surface, the decaying bloom may be causing drastic changes in the chemical and biological makeup of the estuary. And Paerl wants to find what kind of biological changes are occurring.

Zooplankton, a major food source for many developing fish and shellfish in the estuary, feeds on phytoplankton. But during the past five years the phytoplankton community, which serves as the base of the food chain, has undergone major change. Blue-green algae now makes up the bulk of the phytoplankton present in the lower Neuse River between May and September. And early studies indicate blue-green algae may not be a nutritional food source for zooplankton.

Paerl will be studying blue-green algae's impact on the food chain. He wants to find out if the zooplankton can digest the algae or whether they shun it, perhaps creating a break in the food chain.

The findings of Paerl's studies will not only reveal how the algae affects zooplankton food sources, but will also show how algae changes food sources further along the food chain. Today's algae blooms could have profound effects on tomorrow's fish and shellfish populations.

In a sister study, Stanley and Christian will be studying the chemical fate of blue-green algae blooms in the Neuse River estuary. They will be taking a special look at what happens as the blooms are carried downstream to where fresh water and saline water meet. Earlier studies indicated algae are intolerant of even low salinities. Biogeochemical changes are believed to cause the algae's intolerance. Stanley and Christian will be testing this hypothesis.

The research team will also study what happens downstream in the estuary after the algae decays. Blue-

green algae contains large amounts of carbon and nitrogen. Large blooms and their subsequent decay could significantly alter the carbon and nitrogen in the estuary. Such alterations could in turn upset the production and abundance of fish and shellfish.

The researchers:

Hans Paerl, Institute of Marine Sciences, University of North Carolina at Chapel Hill

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

Robert Christian, Department of Biology, East Carolina University

Two costly diseases

The problem: contaminated shellfish and red-sore disease in fishes

Contaminated shellfish and disease-ridden fish are lost resources to North Carolina's fishermen. Fishermen are prohibited from harvesting contaminated oysters and clams. And fish stricken with diseases such as red-sore usually die or are unsellable to seafood processors.

Shellfish contaminated by discharges from sewage treatment plants, faulty septic systems, land run-off and boat waste discharges can carry serious viruses. Hepatitis A is one of the most serious viruses they transmit. Last year in the state of New York, forty people contracted hepatitis A after eating contaminated clams. Another 300 to 400 people came down with gastroenteritis. After finding a portion of the clams harvested from approved open waters, state health officials warned New Yorkers not to eat any raw shellfish. While the outbreak was limited to New York state, officials from the Center for Disease Control believe outbreaks may be occurring in other areas, yet going unreported.

The research: studies into how shellfish are contaminated with hepatitis A and how fish are afflicted with red-sore disease

Being surrounded by vials of cultivated viruses might make some folks nervous, but for Mark Sobsey it's part of the job. Sobsey has been conducting Sea Grant studies into the detection, occurrence, survival and fate of enteric viruses and bacteria in shellfish since 1976. But his latest project focuses on a single virus—hepatitis A.

After a stint at the National Institute of Health in Bethesda, Md., Sobsey brought back to his Chapel Hill laboratory the ability to cultivate and assay hepatitis A. Until 1979 such cultivation was impossible and Sobsey's laboratory will be one of the few in the country capable of cultivation.

With his new knowledge in hand, Sobsey will be studying hepatitis A contamination in oysters and clams. He will be testing current detection methods to see if they accurately determine the levels of hepatitis A in shellfish and in the waters and sediments of their habitat. Scientists, including Sobsey, have questioned the accuracy of the present methods used to detect viruses in shellfish.

Levels of hepatitis A in shellfish may depend on how much contamination is present in the water. Sobsey will be measuring this relationship as well as the relationship between levels of hepatitis A and other viruses and bacteria in the water and sediment.

Sobsey also wants to find out how fast oysters and clams take up and eliminate hepatitis A. Oysters and clams will cleanse themselves of contamination if they are placed in clean water. But factors such as water temperature and salinity may affect their rate of cleansing.

One hope for fishermen may be depuration plants where large quantities of contaminated oysters and clams can be placed in tanks of clean water to free themselves of their contaminants. Sobsey will be setting up a pilot-scale depuration system to study hepatitis A elimination.

While Sobsey concentrates on contaminated shellfish, Ed Noga will be studying red-sore disease in the fishes of the Albemarle Sound. Fisheries officials estimate that up to 20 percent of the commercially important fishes in the Albemarle Sound may be affected by red-sore.

Noga wants to find out what causes red-sore in fishes and what characteristics, either in the fish or its habitat, indicate an impending outbreak of the disease.

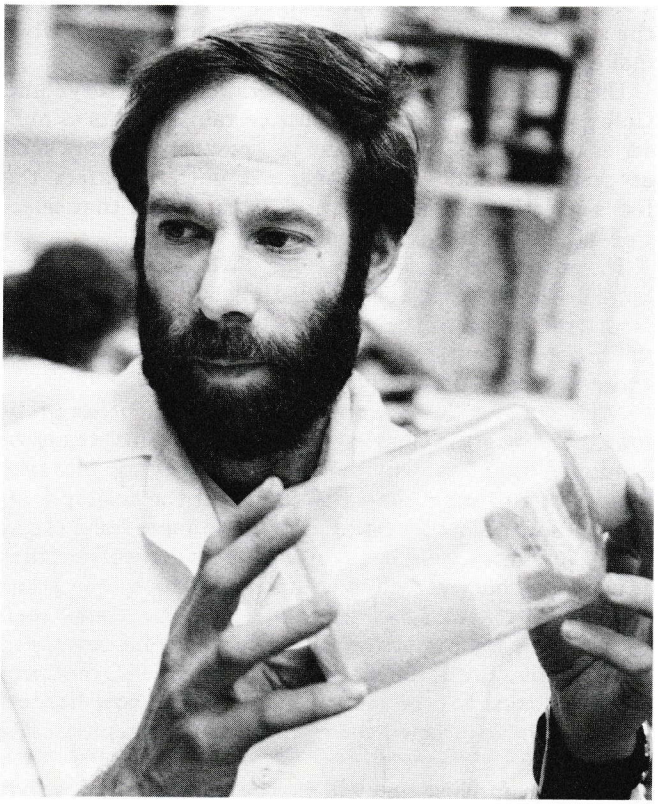
Learning more about red-sore could mean finding ways to control its outbreak. And the study will be the first step in building a veterinarian ability in this state to deal with the problems of disease in fish.

The researchers:

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

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

Photo by Neil Caudle



Mark Sobsey with bottled virus

For a better harvest, Today and tomorrow

The problem: scientific information needed so fisheries managers can make better management decisions

Are North Carolina's fishermen overfishing the state's stocks of hard clams? Is the opening date for scallop season timed so that fishermen make the best harvest? Are valuable estuarine nursery areas adequately protected? These are the kinds of questions fisheries managers face every day. Managing wild stocks of fish for the good of all, managers must look out for today's harvest as well as tomorrow's. To do so, they need to know more about the resource as well as about the people who use it.

The research: studies that will look into the biological, economic and social aspects of the state's fisheries, providing managers with a clearer idea of how their policies affect those they manage

Nothing is more important to tomorrow's fisheries than estuarine nurseries. Kenneth McKaye and David Colby want to know what factors in the nursery affect the survival of young fish. And, they want to learn what makes an estuarine nursery a nursery.

Using laboratory and field experiments, McKaye and Colby will study why fish choose certain habitats as nurseries over others. They want to know how factors such as predation and water-movement patterns affect the fish's selection of a nursery, and, in turn, how that selection affects their chances for survival.

In answering these questions, McKaye and Colby hope to learn what factors distinguish a nursery area from other parts of the estuary. And arriving at a better definition of a nursery could help fisheries managers keep those nurseries productive.

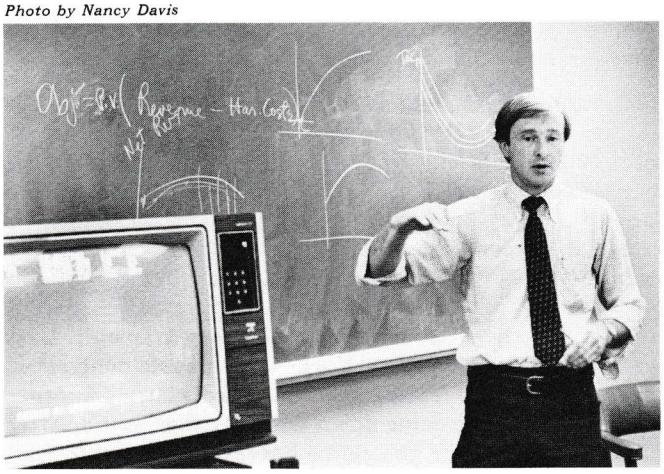
McKaye and Colby won't be the only scientists probing the estuary; Charles Peterson and his team of graduate students will be there too, prying into the secrets of two mollusks—the clam and the scallop.

Fishermen are harvesting five times more hard clams today than they were in 1976. Managers are worried that this intense harvest will eventually take its toll on adult populations. And fewer reproducing clams could spell fewer clams for tomorrow. Using methods he developed to determine the age of clams in an earlier Sea Grant project, Peterson will be testing clams to see how harvest pressures have affected the clam's ability to replenish its numbers.

Peterson and his team will also be testing methods that could be used to increase hard-clam abundance. During his first project, Peterson found that under predator-exclusion cages in sandy areas the number of baby clams that set and survived increased 20-fold. Peterson wants to test the cages in other habitats and determine their economic feasibility. If it is cost-effective, caging could become an alternative to clam hatcheries.

Testing seed-clam survival rates is another of Peterson's goals. Some fishermen plant seed clams (baby clams) on leased bottomland to assure themselves of a ready harvest. But a sure payoff can sometimes end in a pile of crushed shell if predators invade the beds. Peterson will be working with seed clams to see what combination of clam size, clam density, planting schedules, habitat and anti-predation measures are needed to maximize seed-clam survival.

Photo by Nancy Davis



Jim Easley

Questions about another valuable mollusk, the bay scallop, will also occupy Peterson in the estuary. As an annual crop, the bay scallop fishery could be eliminated with a single harvest. Good management is crucial to the fishery's survival. Management plans call for a limited season with managers setting opening and closing dates to maximize the fishermen's harvest.

But present management schemes don't take into account bay scallop natural mortality rates, perhaps falling short of their goal to maintain stocks and maximize the fishermen's harvest. Peterson will study bay-scallop mortality, concentrating on the fall and winter months.

All fisheries research doesn't have to be done in the laboratory. Jim Easley, Ann McDermed and Tom Johnson do their work at the computer. They are using computer programs to test new fisheries' management policies before those policies leave the drawing board.

Business administrators use computers everyday to increase their company's profits or efficiency. Why not apply the same technology to fisheries management?

The research team will be plugging in a number of variables—fish growth rates, mortality, dockside values—so that managers can numerically "model" such problems as when to open shrimp season. The team will be modeling four fisheries—bay scallops, New River shrimp, hard clams and blue crabs in Pamlico Sound.

The computer won't untangle all the fisheries problems. But it can give managers a better idea of how their management schemes affect the resource and the people they manage.

Managing people means getting out the word about changes in seasons, gear restrictions or regulations to the fishermen who must abide by them. How do fishermen pass the word about regulations changes or a new piece of gear? That's what Jeffrey Johnson wants to find out.

He will be talking to fishermen to find out how they transfer information among themselves and how they seek information from other sources. Johnson wants to know if certain fishermen are looked to as innovators and information sources. And he'll want to find out what makes a fisherman a leader—age, education, fishing success or wealth.

Johnson's findings will be particularly helpful to Sea Grant marine advisory agents who try to keep fishermen abreast of the latest changes in fishing gear, markets and safety equipment. And a fisherman equipped with the latest fishery innovation may just bring a few more fish back to the dock.

And it's not just commercial fishermen who use the resource. What about the thousands who fish for fun? Peter Fricke, Leon Abbas and Jim Sabella have been finding out more about the recreational angler who fishes the North Carolina sounds. And this year, the team will be completing a study started in 1981. They want to know how many fishermen use the state's sounds, what they fish for, how they fish, where they fish, how much money they spend, what their attitudes are toward fisheries management and more. Using the team's findings, fishery managers will know which recreational species are in greatest demand and how great the demand is. The findings can also be used by local and regional governments to plan for boat ramps, access areas and zoning regulations that promote the economic activities that surround recreational fishing.

The researchers:

Kenneth McKaye, Duke University Marine Laboratory, Duke University

David Colby, Southeast Fisheries Center, National Marine Fisheries Service

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

Jim Easley, Department of Economics and Business, North Carolina State University

Ann McDermed, Department of Economics and Business, North Carolina State University

Tom Johnson, Department of Economics and Business, North Carolina State University

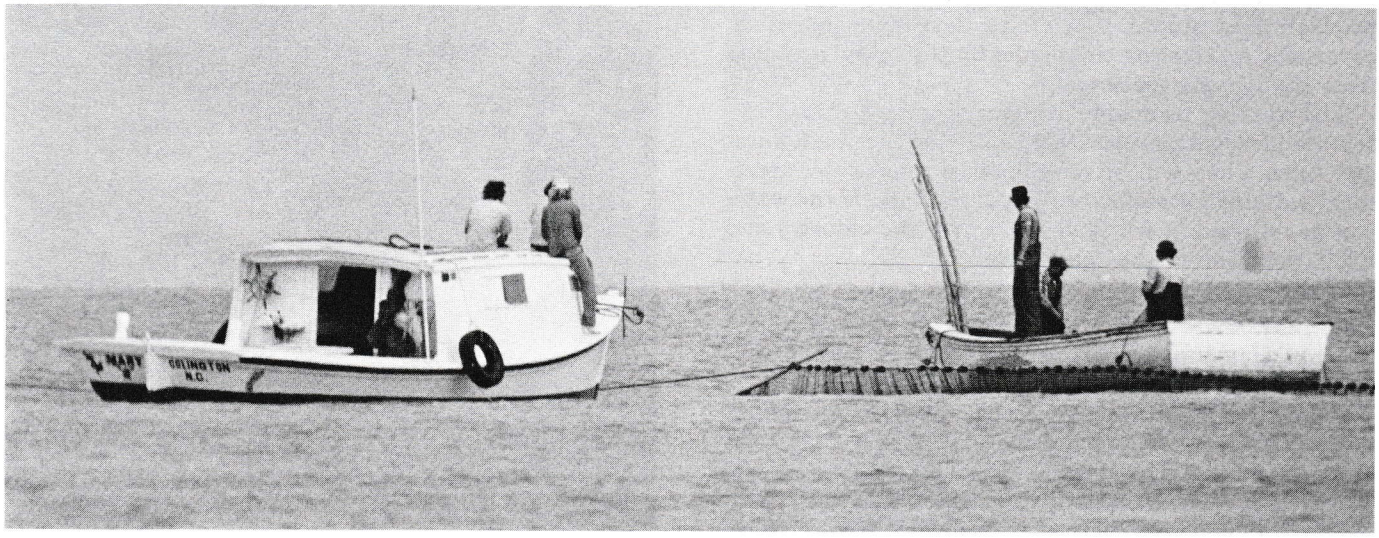
Peter Fricke, Institute for Coastal and Marine Resources, East Carolina University

Leon Abbas, UNC Sea Grant, North Carolina State University

Jim Sabella, Department of Sociology and Anthropology, University of North Carolina at Wilmington

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

Photo by J. Foster Scott



Longhauling in Dare County: Managing fisheries sometimes means managing fishermen

Menhaden worth more Than chicken feed

The problem: how to get underutilized species of fish on the dinner table

In 1981, North Carolina fishermen caught over 309 million pounds of menhaden, a fish used mainly for fertilizers and chicken feed. Each pound of menhaden brought fishermen less than 3 cents.

There are other underutilized species like the menhaden. If researchers could devise a way to process these fish into an edible form, the traditional seafood industry in North Carolina could expand. Researchers want to determine how to process the fish, what species to use and what to do with all the wastewater generated by the process.

The research: developing a washed minced fish product using underutilized species that can be reconstructed into seafood products, and developing a system for dealing with the wastewater from seafood processing

For years the Japanese have prepared a refabricated product of minced fish called surimi. By water-washing the mince, they end up with a protein concentrate suitable for use in restructured seafood products.

This year, Sea Grant will continue its work with surimi. Since mince depends upon a gelling agent to bind it into simulated shellfish products, Don Hamann and Tyre Lanier will be investigating the protein interactions which occur during gelation of fish proteins. Along with this, they'll be looking at the textural qualities of the simulated shellfish meats. For the consumer, this research could mean a fish product high in food value but low in cost.

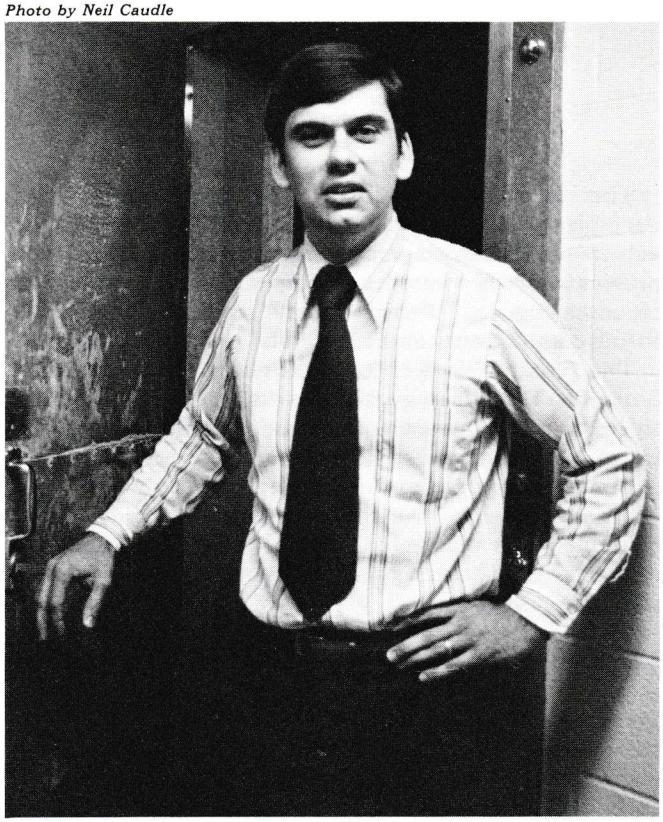
Frank Thomas and Lanier will evaluate various underutilized species, particularly menhaden and other fishes in the Atlantic and Gulf of Mexico, for use in the production of surimi. They'll be developing handling, processing and storing techniques for the surimi prepared from the various species.

The washing technique necessary to make surimi presents additional problems. Where does the wastewater go? Allen Chao will be developing a wastewater treatment suitable for seafood processing plants. If the water can be recycled, it will save money for the industry and avoid pollution of the coastal waters.

The researchers:

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

Photo by Neil Caudle



Tyre Lanier

Photo from National Marine Fisheries Service

Fishermen corralling menhaden

Using sun to stretch The aquaculture season

The problem: developing a year-round aquaculture industry based on species that are feasible and economical to grow

Aquaculture, like farming, is a seasonal business in North Carolina. But if year-round fish farming were possible, the way would be open for a new aquaculture industry here.

Although the state has numerous sites where aquatic farms could locate, so far only a limited amount of private capital has been invested in aquaculture. With a growing-season of only seven to eight months in outdoor pools and ponds, aquaculturists face the possibility of shutting down during the winter months. Moving culture operations inside is one solution but the cost of heating large volumes of water is generally prohibitive.

And, not all species are economical to culture. Aquaculturists need to know what species to culture and how to produce those species with the lowest possible costs.

The research: studies into developing a passive solar greenhouse for year-round culture, developing hardier species of fish for culture and creating low-cost nutritional feeds for fish

Because of the advantage of culturing fish year-round, Sea Grant is developing a passive solar greenhouse that will store the heat it collects during the day. "We want to demonstrate that it will work and that we can have year-round aquaculture in a temperate area like North Carolina," says Ron Hodson, project director.

Herbert Eckerlin will design and construct the greenhouse at the Sea Grant Aquaculture Research and Demonstration Center near Aurora, N. C.

Since water serves as the main heat sink for the greenhouse, Albert Rubin will design a recirculation system to maintain water quality and to reduce heat loss. Once the greenhouse is completed, Sea Grant will stock it with striped bass hybrids or American eels to test its efficiency. Larry Giardina will provide advice for making an economic analysis for the greenhouse.

But, even a greenhouse isn't enough to make aquaculture into an industry. Now, you need a crop. This year, Howard Kerby and Mel Huish continue their work with a striped bass hybrid. The striped bass is a prized sport fish as well as a highly desirable commercial species, but its populations have declined in recent years. Previous studies showed the hybrids were hardier than the striped bass and raised the possibility of growing the fish for commercial sale.

The establishment of an aquaculture industry will also depend on a low-cost nutritional feed for the fish. Margie Gallagher will study the effects of protein-energy ratios in the diets of cultured fish. By finding out what kind of use the fish make of their food, Gallagher will determine which foods can best support the growth of fish raised commercially.

The researchers:

Ronald Hodson, Associate Director, UNC Sea Grant College Program

Albert Rubin, Department of Biological and Agricultural Engineering, North Carolina State University

Larry Giardina, Marine Advisory Services agent, UNC Sea Grant College Program

Howard Kerby, Department of Zoology, North Carolina State University

Melvin Huish, Department of Zoology, North Carolina State University

Margie Gallagher, Department of Home Economics and the Institute for Coastal and Marine Resources, East Carolina University

Photo by Howard Kerby

Curry Woods samples striped-bass hybrids in pools at Aurora lab

How freshwater in big doses threatens fisheries

The problem: freshwater drainage into saline estuaries

Coastal lowlands, once thought to be wastelands of soggy mire, are being cleared and drained at an increasing rate. Farmers have learned that drained wetlands can be among North Carolina's most productive agricultural acreage.

The water drained from these wetlands usually ends up in the estuaries, and can affect nursery areas for most of the state's commercial and recreational fishes.

Scientists, resource managers, fishermen and others are worried the freshwater influx is affecting the makeup of the estuaries (salinity levels, turbidity and nutrient levels) and in turn affecting fisheries production.

The research: studies to measure the volume of freshwater influx, changes in salinity and the effects on fishes

Three new UNC Sea Grant projects will study land drainage, focusing the efforts of scientists from different fields to provide the missing links in the land drainage-estuarine knowledge available.

Wendell Gilliam and Wayne Skaggs will be examining the rate of freshwater influx into the estuaries. They will measure the rate and volume of freshwater flow from drainage ditches into the estuaries over a variety of conditions—soil type, rainfall, canal construction. The team will also be looking at different ways for farmers to drain land while minimizing the effects of drainage on the estuaries.

Len Pietrafesa will be using Gilliam and Skaggs' findings to study the effects of drainage on salinity patterns in the estuary. In turn, John Miller and Jim Reed will be examining the effects of salinity changes on the production of juvenile fishes and shrimp in the estuary.

(Watch for more on the land-drainage problem in future issues of *Coastwatch)*

Drainage canal under construction

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 Miller, Department of Zoology, North Carolina State University

Jim Reed, Department of Zoology, North Carolina State University

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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, Box 5001, Raleigh, N.C. 27650.

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Address _____

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Coastal property owner __yes __no Boat owner __yes __no

I am in the following line of work:

__Boatbuilding/Repair
__City/County government
__Commercial fishing
__Educator
__Farming
__Homemaker
__Lawyer
__Marina operator
__Marine recreation
__Mass media
__Seafood processing/marketing
__State government
__University professor/researcher
__Other _____

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).

Cold water can be a killer no matter how well you swim. The loss of body heat is probably the greatest hazard to the survival of a person in the sea because water cools the body 25 percent faster than air. As the body's core (inner) temperature begins to fall, the victim experiences the condition called hypothermia. Signs of pain, tiredness, poor coordination, numbness, poor speech and mental confusion appear. When the core body temperature falls below 90° F, the victim becomes unconscious. At 85° F, heart failure occurs.

Your survival in cold water depends on several factors including water temperature, body size, body fat and activity in the water. For example, fat people cool more slowly than thin people, and children cool faster than adults. Whatever the factors, there are some steps you can take to improve your chances of survival until you're rescued.

Don't swim. A person cools 35 percent faster by swimming. Instead, keep your head and neck above water. If you're wearing a life vest, assume the fetal position, or if there is another person in the water, huddle together. If you're not wearing a life vest, tread water just enough to keep your head above the water. And remember, your will-to-live will make a difference. Keep a positive attitude about your rescue.

To treat a hypothermia victim, rewarm him carefully. Do not massage his arms or legs since cold blood could flow to the core, further lowering the body temperature. Move the victim to shelter and warmth as soon as possible. Apply warm, wet towels to the head, neck, groin, chest and abdomen. Again, do not heat the arms or legs. If a victim needs cardiopulmonary resuscitation, place him on a hard, flat surface. All hypothermia victims should be seen by a doctor.

Even if a victim appears drowned, administer heart massage and mouth-to-mouth resuscitation. Cold-water drowning victims have a good chance of survival.

For more information on cold-water drowning, write Sea Grant, Box 5001, Raleigh, North Carolina 27650-5001. Ask for *Cold Water Drowning: A New Lease on Life*.

A new 90-foot weather tower is operating at the N. C. Marine Resources Center at Ft. Fisher. Since December, fishermen from as far as 55 miles offshore have been reporting back sea conditions to Sea Grant staffers at the center via VHF radio (Channel 68). In turn, the Sea Grant staff passes the information along to the National Weather Service office in Wilmington where the reports are incorporated into the marine weather forecast and broadcast over the 24-hour National Oceanic and Atmospheric Administration (NOAA) weather radio.

All this adds up to the Marine Weather Relay Program (MAWREP). And it means fishermen are helping predict sea conditions, and improving weather forecasting for offshore areas. They won't waste valuable time and fuel if conditions are too rough for fishing.

John Foster at the Sea Grant Aquaculture and Research Demonstration Center is compiling the annual lists of elver harvesters and buyers. The aquaculture center itself is on the list of interested buyers of the baby eels. If you'd like to be added to that list or to the list of sellers, call (919) 322-4054 or send your name, company name, address and telephone number to: John Foster, Sea Grant Aquaculture and Research Demonstration Center, Route 2, Box 305, Aurora, N. C. 27806. Indicate whether you plan to sell or buy elvers.

If you're on a list, you will automatically receive copies of both. If you're not, you can request copies from the same address.

The third annual SEAS (Southeast Atlantic States) Diving Conference and Underwater Film Festival will be held in Raleigh, Feb. 25-27 at the Radisson Plaza. The conference includes workshops on diving-accident management, sharks, wreck diving, fish printing, seafood preparation, the Atlantis III Project, diving on the Andrea Doria, fish-and-shell identification and more.

A Saturday evening film festival will be presented in Memorial Auditorium featuring Jack McKenney, an underwater cameraman, film producer, stuntman, writer and photographer.

And you'll be able to check out exhibit booths displaying the latest in scuba diving equipment, underwater photographic gear and diving resort areas in the Caribbean.

The conference is co-sponsored by UNC Sea Grant, the N. C. Office of Marine Affairs, N. C. Marine Education and Resources Foundation and N. C. Wreck Divers Association.

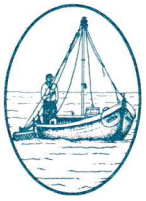
For registration information, write SEAS '83, P. O. Box 31186, Raleigh, N. C. 27622, or phone (919) 733-2290.

Mini-grant funds have been awarded to Alan Stutts and Chrystos Siderelis of the NCSU Department of Recreation Resources Administration and Leon Abbas, UNC Sea Grant's recreation specialist, to study public policy concerning recreational boaters.

Continued on next page

The number of recreational boaters has been steadily increasing in North Carolina, creating greater demands for access ramps and public docking facilities as well as demands on the environment.

Stutts, Siderelis and Abbas will use boater registration forms and group interviews to find out more about North Carolina boaters. They will also be looking at the state's present policies for handling boaters and the policies used in other states. The proposed work should help policymakers make better decisions about managing boater congestion, activity, conflicts and environmental impacts.



Winter weather is rough on skin and it's a special problem for fishermen. Wet hands and cold, dry air mean cracked, scaly skin—skin that is susceptible to infection. For years fishermen have dipped their hands and work gloves in bleach to kill the bacteria and fungus that can enter the cracked skin.

But this only dries the skin more, says Jim Patterson, a Burlington dermatologist. Instead of the bleach, he recommends a mild solution of betadine or peroxide. Then mix a quart of water with a few capfuls of bath oil and soak your hands for about 15 minutes. Follow with a heavy lotion or cream to trap the moisture in the skin.

Faces also need extra care in cold weather. For a case of windburn, wet a washcloth and place it over your face for a few minutes to soothe the skin. Then apply the same lotion as you do to your hands. And for chapped or cracked lips, use lip balm frequently.

Always consult a doctor if sores or rashes persist.

Modeling the Relationship between Catch Biomass and Revenue in a Regional Setting with an Example from the Brown Shrimp Fishery in North Carolina, by Marcdavid Cohen and George S. Fishman in the Curriculum in Operations Research and Systems Analysis at the University of North Carolina at Chapel Hill, develops models for evaluating the impact of fishery management decisions on catch biomass, revenue and profit.

For a copy of this 72-page publication, write UNC Sea Grant, Box 5001, Raleigh, N. C. 27650. Ask for UNC-SG-WP-82-3. The cost is $2.25.

UNC Sea Grant's share of the 1983 federal budget will be $1,175,000, approximately the same amount of funds received in 1982. Director B. J. Copeland says he is pleased with UNC Sea Grant's allotment, especially in light of recent cutbacks in other federal programs.

John Doughty, a manager with the Weyerhaeuser Real Estate Company in New Bern, credits two Sea Grant specialists with saving his firm $25,000. The company was planning a water-front, second-home community complete with a 200-boat marina for its residents.

Since the firm didn't have much experience with water-front development, Doughty called on Leon Abbas, Sea Grant recreation specialist, and Spencer Rogers, Sea Grant coastal engineering specialist, to provide a little know-how. They made suggestions on dock layout, parking and access—all which made the company's project more acceptable to regulatory agencies, Doughty said.

With the help of Abbas and Rogers, the company "saved time and money . . . and provided a sound economic product that is sensitive to the environment," says Doughty.

Coastwatch is published monthly except July and December by the University of North Carolina Sea Grant College Program, 105 1911 Building, North Carolina State University, Raleigh, NC 27650-5001. Vol. 10, No. 1, January, 1983. Dr. B.J. Copeland, director. Neil Caudle, editor. Kathy Hart and Nancy Davis, staff writers. Second-class postage paid at Raleigh, NC 27611.

COASTWATCH

105 1911 Building
North Carolina State University
Raleigh, NC 27650

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at Raleigh, NC 27611
(ISSN 0161-8369)