

# COASTWATCH

Photo by Steve Murray



Researchers are studying ways to enhance recreational fishing

## Fishing for ways to improve catches

Although anglers have no trouble catching king mackerel and spotted trout today, tomorrow may be a different story. Populations of some species are declining, and increased numbers of recreational and commercial fishermen are putting more pressure on favored stocks.

To vent the pressure, researchers are introducing the angler to unfamiliar and misunderstood species—puffer, stingray, shark and sea catfish. Many sportsmen shun these species, unaware of their food value or fighting qualities. Armed with accurate information, researchers can dispel

myths and convince the angler to sample thick shark fillets or the white, flaky meat of triggerfish.

To enhance the habitat of favored and underutilized species, state and local governments and private organizations are footing the bill for construction of artificial reefs. Made of old tires, scrap concrete and sunken ships, the reefs turn unproductive ocean floor into protective havens for fish and prized fishing holes for anglers.

This month, *Coastwatch* will focus on new ways to enhance the recreational fishery.

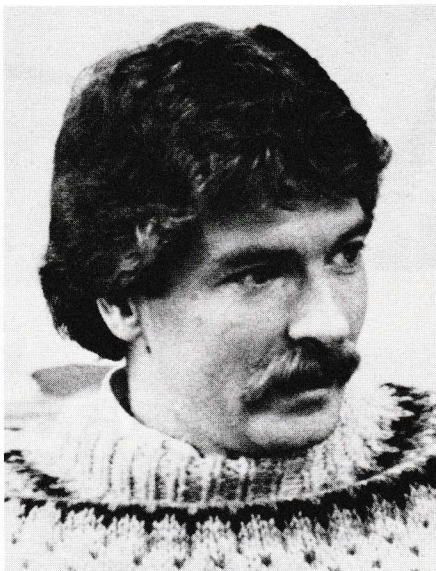
Looks aren't everything

# Shunned fish shake poor image

A sport fisherman casts a line over an old wreck off Wrightsville Beach. Instead of reeling in the red snapper he hoped to lure, he finds an amberjack at the end of the line. Remembering that he heard somewhere these fish have worms, he throws the fish aside to die.

This scenario is repeated frequently throughout North Carolina's coastal waters and those of the Southeast. As anglers pursue snappers, groupers, king mackerel and spotted trout, they cast aside their incidental catch—the sea catfish, puffers, sharks, sea robins and stingrays.

But the species that sportsmen throw away today may be tomorrow's prized catch. At least that's what Jim Murray and Jeff Johnson are planning. In the first part of a National Marine Fisheries Service project, Murray and Johnson studied why anglers prefer some species of fish over others. They surveyed fishermen from North Carolina, Florida and Texas to find the answers.



Jim Murray

"Basically, we learned that any fish that doesn't look like a fish isn't used by recreational fishermen," says Johnson, a Sea Grant researcher and an anthropologist at East Carolina

University. "Fish with feelers, spines or skin instead of scales were perceived as ugly. Many fishermen equated ugliness with being poisonous or dangerous. And that meant these fish weren't utilized."

The team found that most anglers prefer species that have white, flaky meat and are easy to catch, clean, store and eat. Sport fishermen did include several dark meat species on their preferred lists—bluefish, mackerel and mullet. And some fish are sought because of the challenging fight they offer when hooked.

The researchers also found that preferences varied from region to region, says Murray, director of UNC Sea Grant's Marine Advisory Service. North Carolina sportsmen valued smaller species—croaker, spot and perch—more highly than fishermen in Florida or Texas.

Johnson says this occurred because of the lack of access to larger species (usually found offshore 40 to 50 miles in the Gulf Stream) and because of North Carolina's extensive sound system. Anglers here fish inshore waters more than Florida or Texas fishermen.

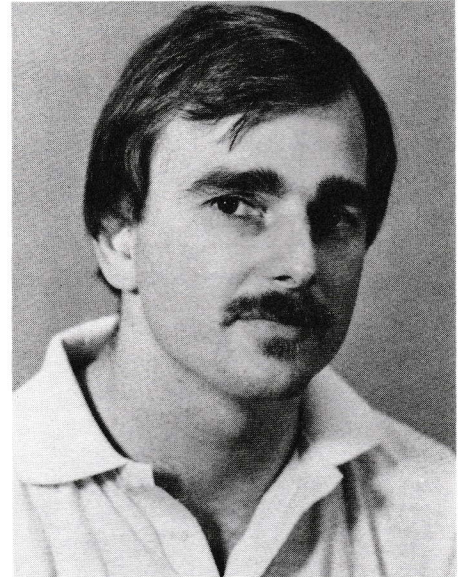
But recreational fishermen reject fish they perceive as ugly, difficult to clean, dangerous to handle and poisonous, or fish with dark meat. More often than not, this rejection is based on hearsay and rumor, rather than actual experience with these species, says Johnson. And, he says, the rumors are often misleading or incorrect.

For example, sea robins often are perceived as poisonous by sportsmen because they are ugly. But in Europe the sea robin is called *grondin*—an ingredient in classic French *bouillabaisse*.

When anglers aren't discarding species because of misconceptions, they cite the ready availability of better species as the reason for neglecting less-favored fish. But these preferred fish may not always be abundant.

"Many of the popular recreational species—flounder, grouper, red drum—are becoming overfished," says

Murray. "The size of some fish populations are down, and the number of fish caught per fisherman is down because so many people are fishing. We need to spread out the species we're targeting."



Jeff Johnson

A number of these underutilized species are good to eat and fun to catch. They're just non-traditional."

Getting recreational fishermen to target underutilized species is one reason why NMFS funded Murray and Johnson's project. NMFS has been encouraging commercial fishermen to net underutilized species for years. But until now, no effort has been directed at recreational fishermen, who number over five million individuals in the Gulf and South Atlantic. NMFS statisticians estimate anglers reel in 30 to 35 percent of the total finfish poundage harvested for food in the United States.

By encouraging recreational fishermen to catch underutilized species, resource managers are hoping to lessen the demand for and conflict over traditional species sought by commercial and recreational fishermen. And if anglers begin to favor shark or amberjack, consumer demand for commercial quantities may not be far behind.

In the second part of Murray and

Johnson's study, the team will develop educational materials about underutilized species. The materials—brochures, a cookbook and slide shows—will dispel misconceptions and teach anglers how to clean, prepare and cook these neglected species.

Johnson says education will be the key to getting recreational fishermen to target underutilized species. "Often we found that people didn't deal with these fish because they didn't know anything about them," he says. Education can help here. And since many of the misconceptions about underutilized species are based on heresay rather than experience, education can go a long way to alleviate those problems, too.

"Amberjack isn't targeted because fishermen say they have worms, and they sometimes do. But lots of preferred fishes have worms. You can cut them out." When amberjack is fried the day it's caught, it tastes like grouper—a highly sought fish.

Amberjack is gaining acceptance in West Florida, where it is served in a few restaurants. And information about the species' thick fillets and white, firm meat may gain amberjack a place on more sportsmen's plates.

But amberjack isn't the only shunned fish to share common charac-

teristics with valued species. Johnson says many non-traditional fish share good and bad qualities with their favored cousins. In Texas, redfish, a prized fish, shares almost every positive and negative trait with the ignored black drum and sheepshead. In North Carolina, small, overlooked species such as pinfish and pigfish are very similar to sought-after croaker and spot.

Likewise, Johnson says a fisherman's rejection of a species often is based on one or two negative aspects. Frequently underutilized species possess as many, or more, positive characteristics. For example, shark takes extra preparation time, but its meat yields thick fillets that have few bones. And the darker meat of tuna and bonito make them excellent fish for chowders and smoking.

Murray and Johnson plan to stress these common characteristics and positive qualities as they urge anglers to target spurned species. They plan to:

- develop six to eight brochures describing how to clean and prepare non-traditional species.

- encourage fishing tournament organizers to add underutilized species to their prize lists. The Scotts Hill King Mackerel Tournament is plan-

ning to offer prizes for amberjack this year.

- organize an underutilized species cookbook for anglers.

- provide training programs for Sea Grant marine advisory agents in the Southeast.

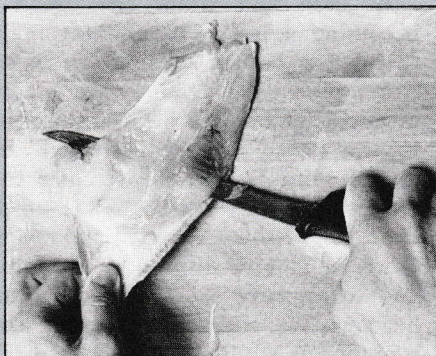
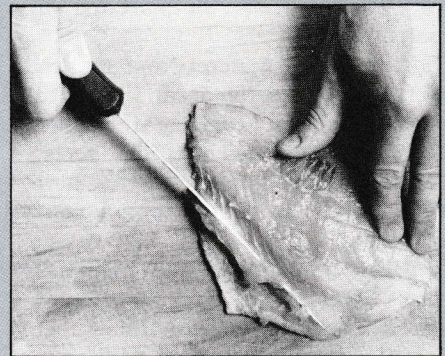
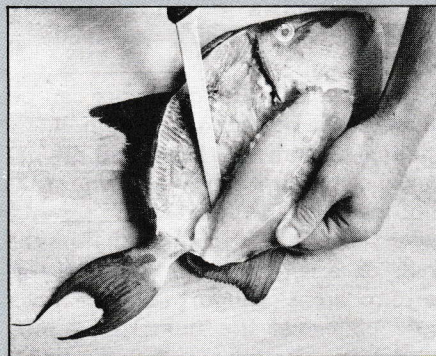
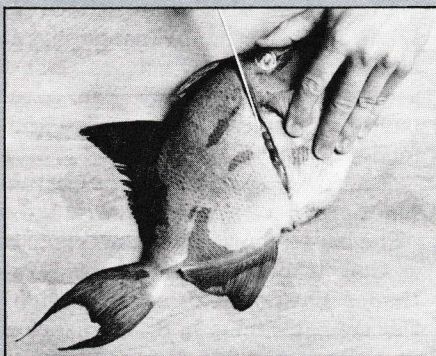
- develop a slide-tape show for sportfishing clubs, Sea Grant programs and fisheries managers.

"The concept is not to target individual fishermen, but to target sportfishing opinion leaders—marina operators, charter and headboat captains, bait and tackle shop owners, pier owners, outdoor writers, fishing club presidents and MAS agents," says Murray. "If we target these people and change their opinions about these species, they can spread the word."

Murray says he and Johnson plan to eventually reach 50 percent of the recreational fishermen in the Southeast with information about these neglected species. "We're not being naive about this effort," he says. "We don't expect everyone to know about underutilized species as soon as the project ends. Like any educational project it will take years for the information to diffuse. But we feel like we will have laid enough groundwork for that process to continue."

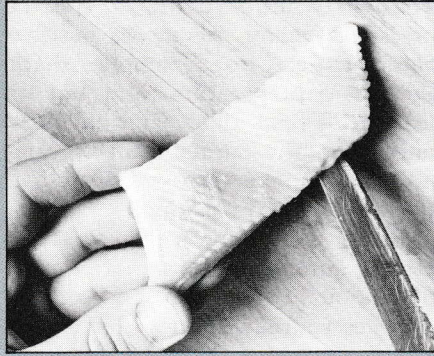
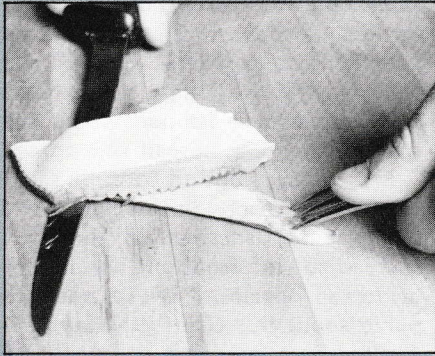
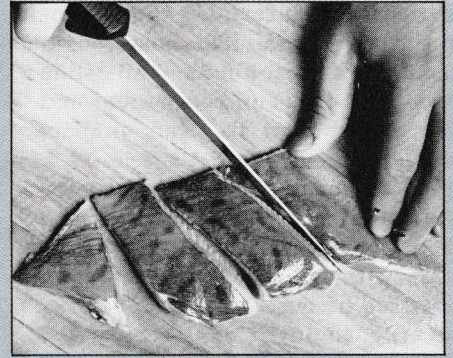
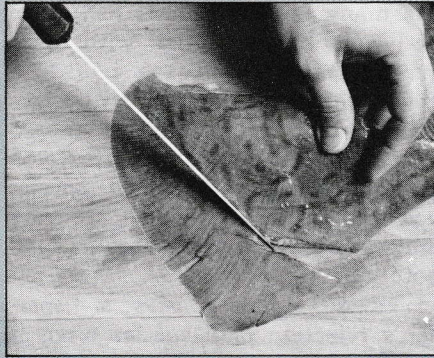
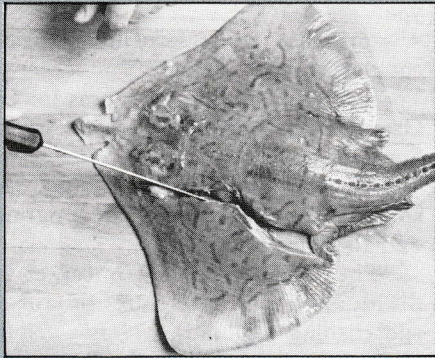
—Kathy Hart

Photos by Steve Wilson



*Dressing a triggerfish:*

1. Make a diagonal slice behind gill.
2. Run knife along backbone of fish, beginning at slit and working toward tail.
3. Cut away rib bones from fillet.
4. Skin the fillet.
5. White meat fillet.



*Dressing a skate:*

1. Cut away wing.
2. Remove thin outer edge around the wing.
3. Slice into strips.
4. Remove skin from both sides.
5. Skate meat that can be fried.

# Reefs—underwater development

The most desirable neighborhood for North Carolina fish may be a community founded on the garbage of humans.

Old tires, scrap concrete and sunken ships transform barren ocean floor into some of the best real estate under water. They're called artificial reefs, and fish are moving into the new homes as fast as the state can construct them.

Jim Brown, chief of the Fisheries Services Section with N.C. Division of Marine Fisheries, says an artificial reef is "an effort by man to improve the environment and habitat so that it will support more fish." Brown is in charge of the state's artificial reef program. Since 1973, the program has established 11 ocean reefs and four estuarine reefs with more on the drawing board.

Brown says it's not hard to prove the value of an artificial reef. For anglers, man-made reefs can turn a questionable day of fishing into an almost sure bet. A study of a reef off Wrightsville Beach showed 29,000 man hours of fishing yielded 90,000

pounds of fish—about three pounds per hour. Brown says that without a reef, an hour's worth of fishing probably would result in about a pound of fish.

The reason for the difference can be found on the ocean floor. Brown likens a sandy bottom to a biological desert. "I can swim on a sandy bottom for 30 minutes in 50 to 100 feet of water and never see a fish. But I would see hundreds on a rock bottom. These rocky bottom areas support many times more biological life than sandy bottoms," says Brown.

Natural reefs attract great numbers of fish because rock outcroppings serve as attachment sites for food sources such as algae, sponges, coral and other organisms. UNC Sea Grant researchers Scott Snyder and Stan Riggs are studying rock outcroppings in Onslow Bay. To help commercial and recreational fishermen locate these prime fishing grounds, Snyder and Riggs will map the hardground formations.

When a natural reef can't be found, neither fish nor fishermen are par-

ticularly discriminating. They'll usually settle for an artificial reef.

Steve Ross, a biologist with the N.C. Division of Marine Fisheries, says fish are attracted to man-made reefs for the same reasons they like natural reefs—the availability of space and of food.

Brown says an artificial reef actually functions better than a natural reef. "The big advantage of an artificial reef is that it provides far more habitat than a natural reef, in proportion to the area it covers and the nooks and crannies it provides," says Brown.

In case you think the ocean is becoming a burial ground for man's castaways, Brown says you're wrong. An artificial reef takes care of two problems at one time. Disposal of old tires is costly and complicated, and out-of-commission ships cost taxpayers each day the vessel is at the dock, says Brown. An artificial reef offers a chance to dispose of the refuse and to improve the fisheries habitat, he says. He adds that the reef construction is environmentally safe.

(Don't assume you can dump your

old tires into the ocean. Federal and state governments require permits for artificial reef construction.)

Traditionally the state has constructed artificial reefs out of old tires, concrete rubble and ships. But tires are expensive in terms of manpower, and it's difficult to transport heavy concrete rubble to the dumping sites. Some states have even used old cars, but they deteriorate too quickly. Brown says ships offer the most shelter and extend the greatest distance above the ocean floor.

The newest addition to the state's artificial reefs will be a World War II Liberty ship. In 1972 Congress made the Liberty ships available to states for reef projects. But stripping, towing and demolition costs run high. The ships must be taken out of storage at the Maritime Reserve Fleet in Virginia and cleaned to meet Environmental Protection Agency standards. All grease, oil and floating objects must be removed. In some cases, the ships must be cut down to facilitate passage of other vessels overhead once the vessel is sunk. The value of the scrap metal was once used to offset the cost of preparing the ship for sinking. But the value of the scrap has dropped, and it is no longer economical to cut ships down.

The state must contract with a firm to tow the ship—probably about \$40,000. In all, Brown estimates it will cost \$100,000 to \$140,000 to sink the Liberty ship off the Carteret County coast.

But the Division of Marine Fisheries' 1984 budget for artificial reef construction and maintenance was approximately \$120,000—not nearly enough to cover the cost of such projects. From 1973 to 1977, one-eighth of a percent of the unrebated boater-paid road tax on gasoline was allocated for artificial reef construction. The tax provided as much as \$275,000 per year for man-made reefs. But, in 1977 the legislature abolished that tax. Division of Marine Fisheries officials hope the expanded Dingell-Johnson bill will help fill in the gaps.

This Liberty ship was sponsored by the Carteret County Chamber of Commerce. And cash has flowed in from fishing clubs, local businesses and from individuals as far away as Anchorage, Alaska. In addition, the legislature allocated \$100,000 for the project.

Brown believes the investment will be worth it. "If you increase the num-

ber of fish, that carries over into the economy of the state. It's like putting a big deposit in the bank and then living off the dividends," he says. "From that day forward, we'll be drawing returns from the fishermen who spend a lot of money getting there and then fishing."

Brown cites a study of reefs in South Carolina. For every dollar spent in construction of the reef, approximately \$10 is returned annually to the economy.

The Japanese invest millions of dollars in artificial reef research each year. Their program is so advanced that they actually develop special reefs for particular types of fish. They've found that the way a reef is put together and the complexity it has

determine which fish make it home.

It won't take long for North Carolina fishermen to see a return on the investment in the Liberty ship. Within days after it settles on the ocean floor, a food chain will begin to develop, says Ross. At first, some fish will be attracted simply because there's an object in the water column.

Then, encrusting organisms such as barnacles attach themselves to the hull. Eventually, algae grows if the water is clear and currents aren't too strong. At the same time, fish begin to move in, hiding in the nooks and crannies and nibbling on the slime collecting on the hull. The housing project nears its completion when fish such as king and Spanish mackerel,

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*Photo by Mark Hooper*



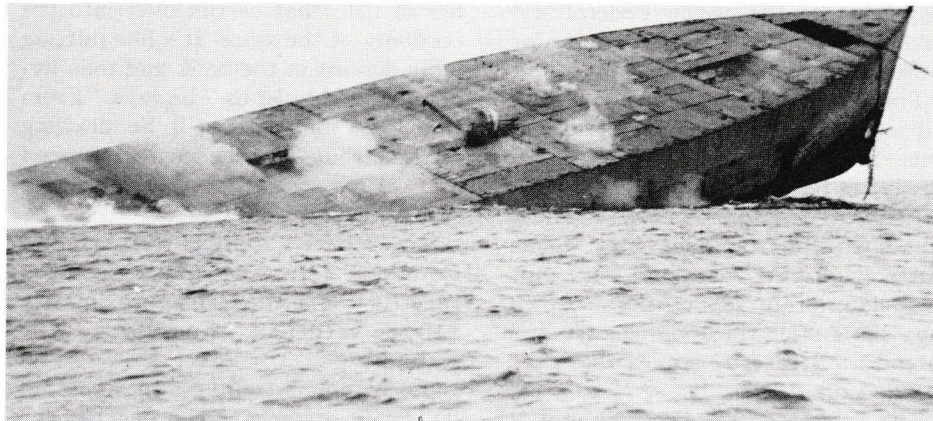
*Artificial reefs attract small bait fish and, in turn, larger fish*

bluefish, cobia, sheepshead, gray trout and flounder take up residence. Finally, the fishermen arrive, dangle baited lines and lure fish from their protective homes. As he pulls in a hefty catch, the fisherman proves that one man's trash may yield a fishing treasure for another.

For more information on the state's artificial reef program or the location of the reefs, contact the N.C. Division of Marine Fisheries, Box 769, Morehead City, N.C. 28557, or call 919/726-7021.

—Nancy Davis

Photo from N.C. Division of Marine Fisheries



*Sinking a Liberty ship*

## A FADish attraction

Small bait fish are always hungry for a meal. Often they find their dinner attached to reefs, piles and sunken wrecks. But the new restaurant in town is the fish aggregating device.

As these underwater cones of nylon mesh become fouled with barnacles and tiny organisms, they attract small fish and, in turn, may attract larger fish such as king and Spanish mackerel. And mackerel are favored fish for anglers.

Last summer Jim Murray, director of UNC Sea Grant's Marine Advisory Service, and David Lindquist, a biologist at the University of North Carolina at Wilmington, tested 18 fish aggregating devices. The miniature artificial reefs were suspended in 30 feet of water 750 feet off the end of two piers in New Hanover County.

After obtaining the necessary permits from the U.S. Army Corps of Engineers and N.C. Office of Coastal Management, the researchers installed the devices off the end of one of the piers. Every six weeks, they alternated the FADs between the piers to avoid having people fishing off just one pier and to establish an experimental control.

Before beginning the project, Murray and Lindquist gathered catch-per-unit-of-effort data for each pier. They compared that data with catch information obtained after the FADs were installed to see if fishing off the piers improved. A preliminary analysis showed no significant difference in catch rates.

From visual observations Murray and Lindquist say the devices attracted bait fish but not as many large fish as they had hoped.

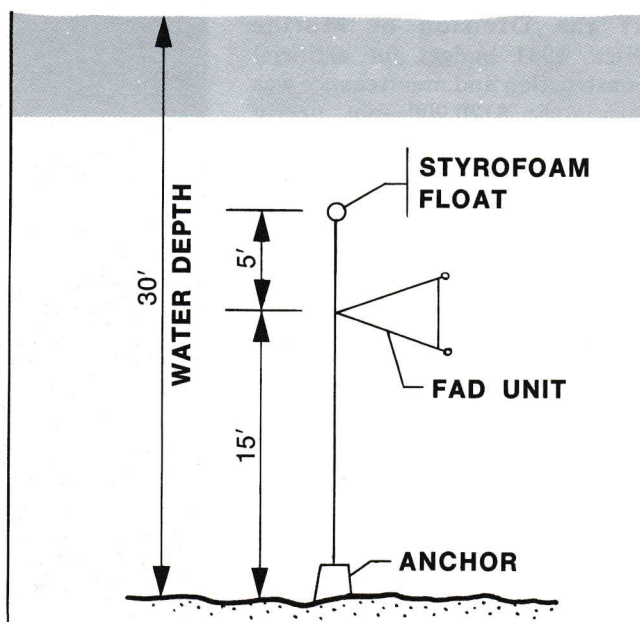
Jeffrey Howe, a graduate student working with Lindquist on the project, made four to six dives each week to observe the devices. He found large numbers of five- to six-inch fish aggregating around the surface buoys, the cement-filled tires anchoring the devices, and the devices themselves. In contrast, the pier without a FAD usually had no fish in the water column.

In all, Howe spotted 35 different species around the

FADs, including a few large schools of blue runners and Spanish mackerel. But he adds that the schools didn't appear to be feeding on the smaller fish.

Howe isn't sure how to explain the absence of larger fish. They may have been more skittish than the smaller fish or they may prefer the cooler water temperatures of the deep, offshore waters.

Murray thinks the FADs may perform better if they are positioned closer to the piers. Despite the disappointing results of this first test, Murray and Lindquist aren't giving up on the FADs yet. They think the bait fish may ultimately attract more of the larger fish. They'll be analyzing their data in the coming months to see if the devices might prove economical for pier owners.



*Diagram of a FAD in water*

# 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.



Take a tour through colonial history March 8 to June 6 at the "Raleigh and Roanoke" exhibit at the N.C. Museum of History in Raleigh. A collection of 157 artifacts and documents from the British Library in London will be on display, depicting life on and around Roanoke Island 400 years ago.

"Raleigh and Roanoke" will show an armor from the Tower of London; drawings and paintings by John White, governor of the "lost colony;" Renaissance maps and navigational instruments; coins; medals; books; letters and more. It will be one of the largest museum exhibits ever in the Southeast.

The display is part of the state's ongoing 400th anniversary celebration of the first English settlement in America. It traces the lifestyles of the English, Spanish and Indians at the time of Sir Walter Raleigh and the attempts to explore North Carolina's Outer Banks.

In conjunction with the exhibit, seminars; a lecture series, "Archaeology in North Carolina;" demonstrations; films; performances; and workshops will also be offered.

Children can participate, too, by visiting the museum's Discovery Room, where they can try on Elizabethan clothing and armor, use a cross staff to determine latitude and learn nautical terms and Indian words.

The exhibit is free to the public. For tours, interested school groups should call the Capital Area Visitors Center at 919/733-3456. Other groups are asked to call the museum at 919/733-3894. For further information, write the museum at 109 E. Jones St., Raleigh, N. C. 27611.



Some people feel so at home on the sea that they're making the move to live there permanently. Floating homes, which combine the atmosphere of the sea and the comforts of home, are becoming increasingly popular all over the world, including North Carolina. If you're interested in owning a floating home, there are a few things you need to know.

A new UNC Sea Grant Blueprint, *Living on the Water*, provides this information. Written by Walter Clark, Sea Grant's coastal law specialist, this publication explains the latest laws and regulations concerning floating homes in North Carolina. There are, for example, certain restrictions on mooring sites and sewage and wastewater disposal. The Blueprint also includes the addresses of several state and local government agencies for those who would like more information.

For a free copy of Clark's Blueprint, write UNC Sea Grant. Ask for publication number UNC-SG-BP-85-1.

In 1983, Hurricane Alicia hit the Texas coast near Galveston with 100 mph sustained winds. Many buildings received major damage, often from failures of poor connections in the buildings.

But in some buildings, wooden wind anchors effectively connected floor joists to floor beams without any failures. Wooden wind anchors are formed by nailing a short length of board as a spacer between a double floor beam and every other floor joist.

Spencer Rogers, Sea Grant's coastal

engineer, has written a Blueprint describing wooden wind anchors and their installation. For a free copy, write Sea Grant. Ask for UNC-SG-BP-84-3.

Seafood extension specialist Sam Thomas has left the UNC Sea Grant Program to join a private seafood company in Beaufort, N.C. Thomas had worked for seven years at the N.C. State University Seafood Laboratory in Morehead City.

As a specialist, Thomas worked with seafood processing plants on North Carolina's coast in such areas as quality control, plant expansion, and development of new products and processing techniques. He also worked extensively with blue crabs and smoked fish.

Dave Hill, a Sea Grant research technician at the North Carolina State University Seafood Laboratory in Morehead City, has retired. Hill spent much of his time at the drafting table, sketching seafood plants. He made line drawings of new plant layouts and expansions of old plants. In 1982 and 1983, 21 companies asked the seafood lab for help. Of those, seven plants are completed and operating.

Hill had been with Sea Grant since 1970.



What do you get when you cross a striped bass with a white perch? The answer: a hearty, fast-growing hybrid. You can learn how to raise striped bass hybrids in a hands-on workshop May 6 to 8 at the UNC Sea Grant Aquaculture Center in Aurora.

The workshop will offer small-group instruction on how to cross striped bass with white bass or white perch to produce a larger, more disease-resistant hybrid. Ron Hodson, project director of the center; Randy Rouse, marine advisory agent; and Howard

*Continued on next page*

Kerby, a UNC Sea Grant researcher, will conduct the programs. Anyone interested in aquaculture is invited to participate.

Cost for the workshop is \$60. The fee includes the sessions, publications, some meals and lodging. A maximum of 15 people will be accepted on a first-come, first-serve basis. For registration information, write Hodson at Sea Grant, or call 919/737-2454.



North Carolina's coastal resources extend beyond the sand and surf to an extensive estuarine system that serves as nursery grounds for commercially important fish and shellfish. The system is complicated, and many people do not understand it. That's why scientists and resource managers offered a public symposium on the Pamlico River Estuary March 19 in Washington, N.C.

The three-part program offered discussions on the river's fisheries, with Terry Sholar, a marine biologist at the N.C. Division of Marine Fisheries; the estuarine ecosystem and how it functions, by UNC Sea Grant Director B.J. Copeland; and how people concerned about the estuary can get involved in the decision-making process, with John Phillips, executive director of the Pamlico-Tar River Foundation.

The symposium was sponsored by UNC Sea Grant, the N.C. Division of Marine Fisheries and the Pamlico-Tar River Foundation. For more information about the foundation, call Phillips at 919/975-3680.

North Carolina Gov. James G. Martin recently appointed three UNC Sea Grant scientists to the state Marine Fisheries Commission. Sea Grant Director B.J. Copeland; Charles Peterson, marine biology professor at the University of North Carolina at Chapel Hill; and Michael Orbach, an anthropologist at East Carolina University, were among 14 selected to serve on the commission. The commission, which is made up of commercial and recreational fishermen, researchers and processors, is responsible for formulating fisheries policy.



Joyce Taylor, Sea Grant's seafood agent at the NCSU Seafood Lab in Morehead City, has completed a slide show and script on seafood care and handling. The project, sponsored by the Mid-Atlantic Fisheries Development Foundation, was designed for teachers and extension and advisory agents in the mid-Atlantic states. The slide show explains step-by-step methods for

selecting, preserving and dressing fresh finfish and shellfish.

If you'd like to borrow the slides and script, contact Taylor at the NCSU Seafood Laboratory, P.O. Drawer 1137, Morehead City, N.C. 28557, or call (919)726-7341.

The staff of *Coastwatch* wants to remind you we're purging our mailing list. We are required by North Carolina law to ask readers periodically if they would like to continue receiving our publication. If you did not mail us the card in last month's issue, you may still use it or send us your name, address, zip code and the number above your name on your mailing label. If we do not receive this information, *Coastwatch* will no longer be sent to you.

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