

COAST WATCH

Why smoked fish in North Carolina?

Centuries ago, the coastal Indians began smoking fish over glowing embers as a means of preservation. By using this method, the catch from a good fall fishing trip could be enjoyed throughout the lean winter months. However, as time passed and refrigerators came into being, preservation was no longer the primary reason people were still smoking fish.

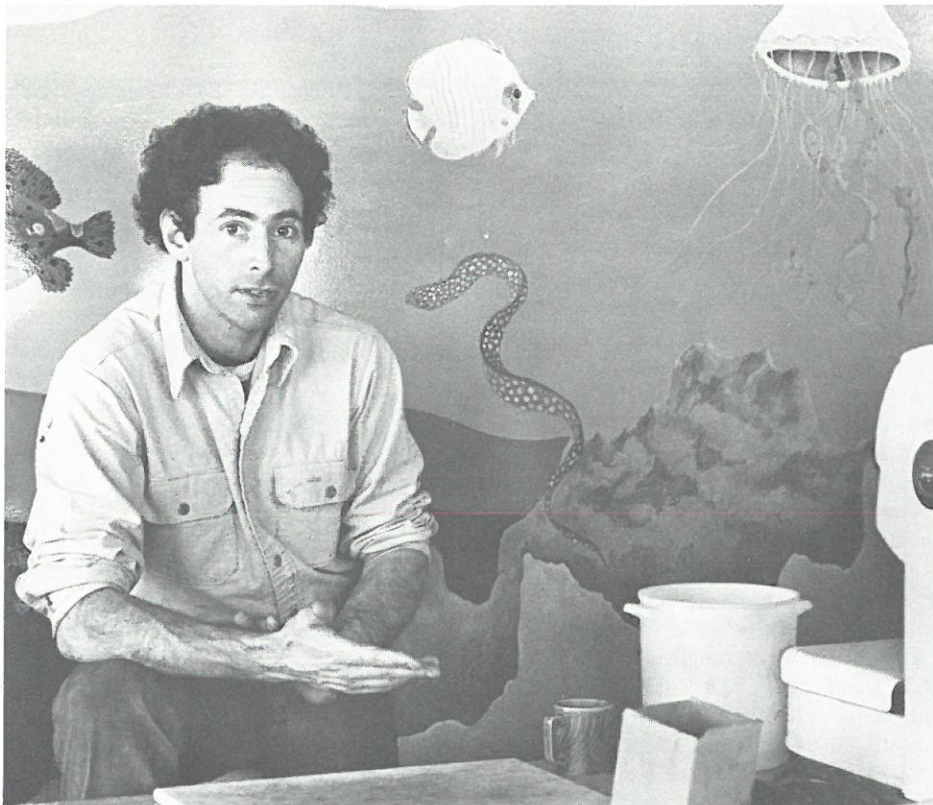
The rich, distinctive flavor produced by smoking kept the fires burning and the product in demand.

In North Carolina, the smoking tradition is still maintained in many backyard home smokers and in two commercial businesses. The state's waters are rich in resources, and smoking provides a good market for some species, such as bluefish and mullet,

which do not keep well in frozen storage.

And, for the latest in research and general information, the Sea Grant staff at the NCSU Seafood Lab is ready to answer questions from smoking techniques to which seafoods smoke best and why. With resources and research, potential for seafood smoking is great in North Carolina.

Photo by Cassie Griffin



Andrew Michaels, owner of the Chapel Hill Smoked Fish Company

A delicacy in demand

Three years ago, a young man in North Carolina decided to turn a hobby into a business. Now, on quiet Friday afternoons in his shop outside Chapel Hill, customers stream in to buy his product. By Saturday noon, it's standing room only. And, by Monday, a 500-pound order has been packed and shipped to a supermarket outside Washington, D.C.

The product that many faithful customers and wholesalers buy week after week is smoked bluefish from North Carolina waters. And, business is truly booming for Andrew Michaels, owner of the Chapel Hill Smoked Fish Company. He attributes the success of his retail business to the large cosmopolitan population in the Triangle area, "a consumer sophistication," Michaels says.

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A native of New York City, Michaels moved to this state to attend the University of North Carolina at Chapel Hill. While fishing commercially off Harkers Island, he started smoking fish as a hobby.

"I grew up with smoked fish," Michaels says, "and I have a fondness for all the different kinds. I built my first smoker out of an old refrigerator, and it suited my needs just fine. Later, when I had a restaurant in Chapel Hill, I put smoked fish on the menu, and it was real popular."

At the time Michaels opened his business, it was the only commercial smokery in the state. (Last fall, another smoked fish business opened in Swansboro.) "I have developed a market for smoked bluefish that we fillet and use our own special process here," he explains. "Regularly, we smoke fresh rainbow trout from the mountains of North Carolina and also white salmon from British Columbia. And, when we can get it, sturgeon."

Although blues from the Pamlico Sound account for 80 percent of the total sales, the Chapel Hill Smoked Fish Company does a good business with its other smoked products and specialty seafoods. In the refrigerated case, frozen conch and squid are displayed alongside smoked eel and turkey. Other products include Florida

red snapper, king mackerel, king salmon and swordfish, in addition to local seafoods.

Europeans and northerners who grew up with smoked fish as a staple in their diets make up his regular clientele, although southerners are increasingly among his customers. "All of my during-the-week customers," he

CAROLINA
WATERS
SMOKED BLUEFISH



Chapel Hill
NC
27514

says, "are steady, once-a-week customers. As readily as they go shopping for butter, milk and eggs, they come and get smoked fish."

"It did real well right away," Michaels says, "and paid the bills from the very day it opened." Seeking markets elsewhere, he says, "I tried my back door," and now sells regularly to a dozen local restaurants.

"I'm just starting to branch out now," he explains, "and I'm doing a really nice wholesale business in Washington, D.C., Greensboro, Charleston, South Carolina, and I just started with Wilmington a few weeks ago." Although wholesale sales account for only 20 percent of his business, Michaels expects that to approach 50 percent in the near future. "Right now," he says, "I'm operating at about 20 percent capacity."

But, what do you say to the consumer who thinks \$5 a pound is too much to pay for smoked fish? Michaels has an answer.

"Number one," he explains, "you're talking about a fillet of a product, so you don't have any waste. Number two, you're also talking about a product that's already cooked and ready to be eaten, so you don't have any energy and time involved in cooking it. You also don't have any shrinkage. Furthermore, the smoking enriches the product in such a way that you consume very small quantities. It's not ordinary; this is a gourmet, premium product."

"So, when you put all of these factors together," he says, "it's not that expensive. I haven't raised my price in three years, since I've been in business. All they gotta do is taste my product, they like it, and they buy it."

Adding technology to an art

For centuries North Carolinians have been smoking fish as a means of preservation. The techniques used by the coastal Indians years ago are still in practice today. And, according to Sam Thomas of the North Carolina State University Seafood Laboratory in Morehead City, "Smoking is still basically an art here in the United States that's been acquired through experience." But, that's changing now.

Jointly operated by Sea Grant and the North Carolina Agricultural Extension Service, the Seafood Lab is involved in research to improve the quality and to promote the use of North Carolina seafood products. Research efforts are then extended to seafood processors and consumers. The Seafood Lab has just recently started looking into smoking seafood. Thomas says smoking is especially good for

some species that do not keep well in frozen storage, such as mullet and bluefish. "These species have never brought a good price to fishermen," he says, "and they're very abundant."

A year and a half ago, the lab acquired a smoke box which has since been in operation 16 times. "The first five or six times, we were just getting a feel for the box," Thomas says, "then we started doing some different species like eel, bluefish, shark, trout, ray, octopus, mullet and scallops. We had really good results on everything."

Two of the best species for smoking, according to Thomas, are the American eel and bluefish. "High fat content is of primary importance to the final product," says Thomas, "and the oil in the eel carries the flavor beautifully. Mackerel and mullet are also good."

Photo by Cassie Griffin



Susan Lovelace in the lab

Recently, the Seafood Lab smoked 40 pounds of fresh bluefish fillets, using both the brining and dry salt techniques. A portion of the fish was brined in a mixture of six percent salt for 16 hours, rinsed, drained, and placed in the smoke box skin side down. The remaining fish were skinned, divided in half and rolled in and rubbed lightly with a dry salt cure and a dry salt and sugar cure. The dry salt cure consisted of one pound of salt mixed with one-half ounce of black pepper, and the salt and sugar cure had one pound of sugar added to this mixture. These fish were allowed to sit in the cures for 30 minutes, then rinsed, drained, and placed in the smoke box. Smoke time was approximately six and a half hours, and hickory sawdust was used for the smoke. When the larger pieces of fish reached an internal temperature of 160°F, everything was taken out of the box to cool.

"The Food and Drug Administration," Thomas says, "recommends that the final salt content in a smoked product be two and a half to three and a half percent. We have found the latter to be a little too much salt. So, we are studying different brining procedures."

Susan Lovelace, a technician at the Seafood Lab, is analyzing samples of the last products for several studies in smoking. Results from a chlorine analysis will determine the amount of salt in the bluefish which was brined, dry salt cured, and dry salt and sugar cured. Lovelace says, "We will be studying different salt concentrations to get a more palatable fish."

"We are trying to get a good relationship between smoke time and temperature, too," Lovelace explains. "We will be working with several different species, such as bluefish, mackerel, mullet, and white and blue marlin, and their seasonal variations. There are fat differences at various seasons, and we will be working to compensate for that and still come up with a quality, uniform product."

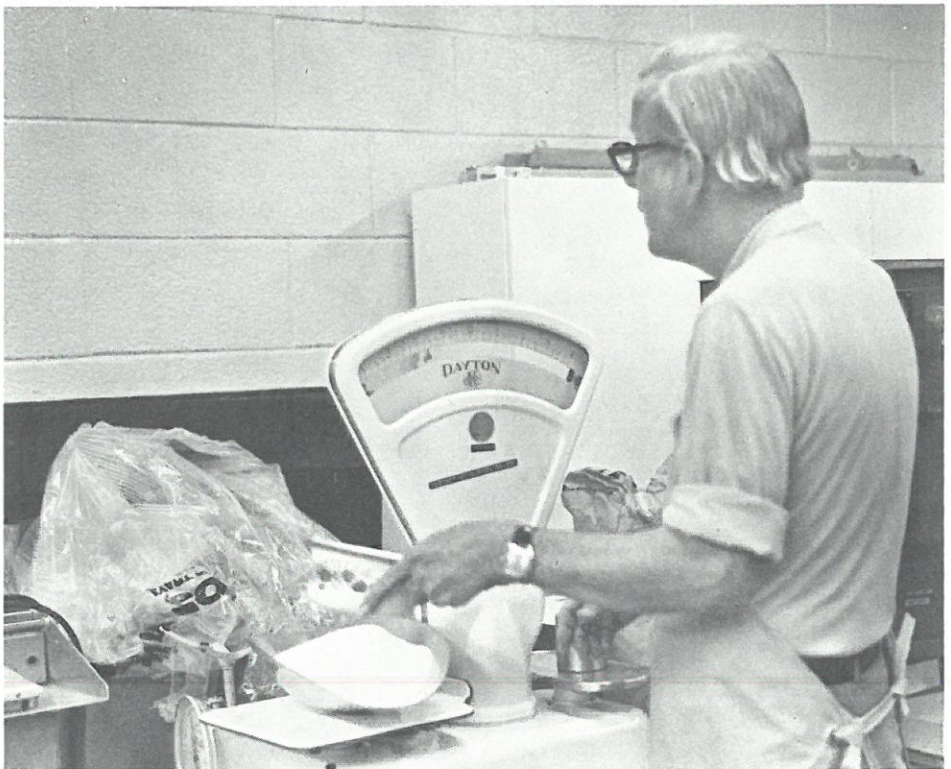
In addition to these studies, Lovelace and lab personnel will be running tests on smoked fish for rancidity, shelf-life storage and nutrition. Previous research from other Sea Grant programs and agencies hasn't included specific information on species native to North Carolina, such as the bluefish. At present, there are only two commercial operations smok-

Photo by Cassie Griffin



Sam Thomas prepares a bluefish for brining

Photo by Cassie Griffin



Salt for brining and curing is measured out by Dave Hill

ing bluefish outside of the Seafood Lab research—Reef Lite Fish Company in Swansboro and the Chapel Hill Smoked Fish Company.

When Dick Barlow and Bruce Paulson of Reef Lite decided to open their smokery, they came to the lab for

assistance. The lab helped them meet their Food and Drug regulations in addition to informing them of the necessary permits needed to start their business. Seafood agent Dave Hill,

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who works with seafood processors in designing their plants, also helped them turn a small concrete building into an approved smoked fish processing plant.

"Basically, I worked with them on the building they had," Hill explains, "and developed some plans which included expansion. In any of these processing plants, you try to set up a good work flow so you're not

backtracking. At Reef Lite, there is a cool room to keep the raw product chilled, a filleting room where the fish are headed, gutted and brined, the smoke box, and a second cool room where the finished product is air-cooled and packaged. They also have a small retail counter and display case," he says.

Although there are only two commercial businesses in the field now,

smoking in North Carolina has the potential to offer some competition to the European and other United States markets, according to Thomas. "Many of the smoke houses in the foreign countries are using very sophisticated, computerized machinery, probably more like we see in the ham smoking operations here. And, we have smoking operations scattered in this country—herring in Canada and the North Atlantic states, smoked salmon in California, mullet and other species in Florida, and a lot of smoking in Chicago, the Great Lakes area and New York."

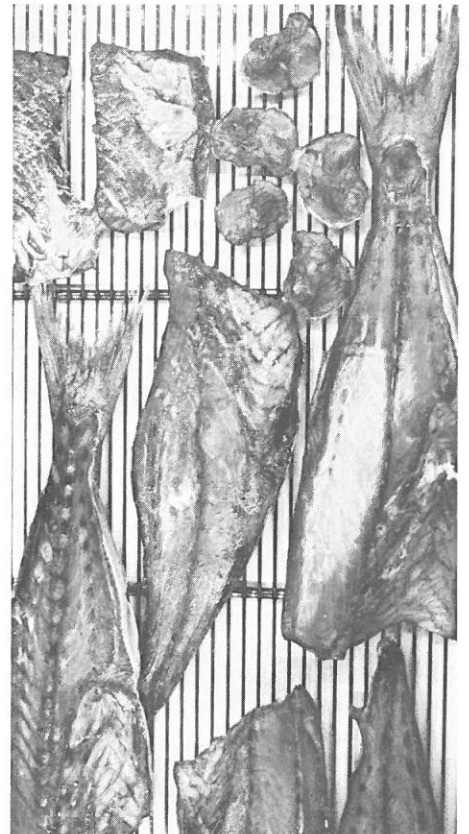
Thomas admits that it is going to be a while before the average consumer in North Carolina is ready to spend \$5 a pound for smoked fish. And, he thinks that a large population with a diversified, cosmopolitan background is essential to successfully marketing specialty food items. "But, I think there is quite a bit of backyard smoking going on," he says, "because we get a substantial number of requests for information. A lot of people are interested in it, and they like the flavor smoking gives to food. Everybody loves to do something with food. Besides, it tastes good."

Photo by Cassie Griffin



Sam Thomas takes out a tray of smoked bluefish

Photo by Cassie Griffin



The finished product

Marketing a premium product

About a year ago, Bob Hines, Sea Grant marine advisory services agent at Bogue Banks, got a call about some eels. He agreed to meet the caller at the NCSU Eel Culture Project in Aurora, but little did he realize the future importance of that call. The caller was Alex Catenis of the Alpha Export Import Company, a firm which specifically exports fish products to Europe. And, Catenis had picked the right man to contact that day.

As part of his daily work, Hines deals with commercial fishermen and seafood processors in North Carolina's central coastal area. A major responsibility is finding markets for the fishermen's catch. And, the Sea Grant-Alpha meeting produced another market for eels.

Catenis says, "Basically, my function is to keep our manufacturing plants in Germany and surrounding areas running full time with eels. We have highly sophisticated computerized smokers, and we are anticipating buying a minimum of 40,000 pounds of North Carolina eel in 1981 for smoking."

According to Catenis, Europeans eat fish products at 70 percent of their meals. "It's so readily available, very nutritious and low in cost. In Europe, fish markets with smoked, fresh and frozen fish products are what the butcher shops were to the United States twenty-five years ago."

Photo by Neil Caudle



Bob Hines

In addition to eels, Catenis is also hoping to experiment with other North Carolina species, such as bluefish and mullet. "I hope the bluefish will go,"

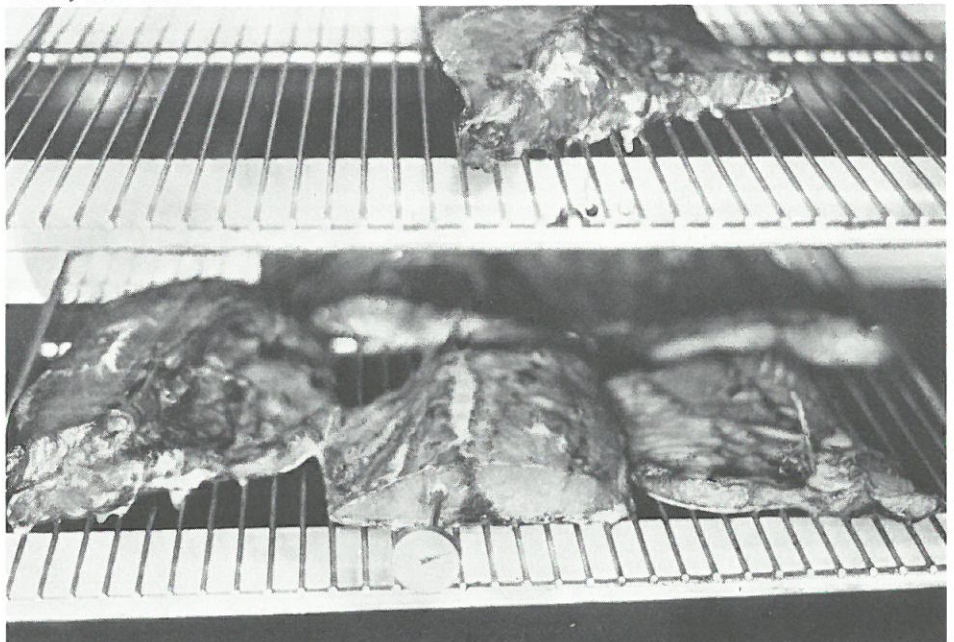
he says, "and if they do, we will open up a good market for fishermen on the coast. I have high hopes for the bluefish." Samples of bluefish and mullet are now being sent to the German plants for tests.

To meet his company's immediate needs for eels, Catenis has worked up a long-range plan that will eventually establish new business in North Carolina. Presently, he wants to obtain more North Carolina eels and

reach more eel fishermen that will fish for his company and meet his specifications. In Canada, he has an organization of eel fishermen working for Alpha, and he would like to duplicate that here. Catenis and Bob Hines are also working on constructing an eel grader similar to one used now in Canada. Eventually, with a good eel fishery established, an eel processing plant and a smoking business could be constructed on the coast.

Smoking your catch

Photo by Cassie Griffin



For home smoking, a short stem metal meat thermometer is necessary for measuring flesh temperature

For excellent fish and seafood to smoke at home, North Carolinians need go no further than the nearest stream or ocean waters for an abundance in resources. Joyce Taylor of the Seafood Lab recommends fish high in fat content, such as bluefish, mullet, trout, mackerel, herring, eel, catfish and amberjack. Fresh clams, oysters, scallops and shrimp can also be smoked successfully.

For the home smoker, a simple smoke oven can either be purchased ready-made or constructed from an old refrigerator, stove, barrel or even with a foil tent over an hibachi. Non-resinous hardwoods, such as hickory, oak, apple, maple or birch, impart the best flavors.

The procedure described below for home smoking is recommended by the University of Wisconsin Sea Grant Program. For more information on smoking techniques and home smokers, write the NCSU Seafood Laboratory, P.O. Drawer 1137, Morehead City, N.C. 28557 or call (919) 726-7341.

1. Use freshly caught dressed fish, whole or filleted. Larger whole fish can be split lengthwise to, but not through, the back skin so they will lie flat. Very large fish can be steaked. Wash the fish thoroughly.

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2. Fish for smoking must be brined. Use either of the following methods. One gallon of brine is enough for 4 pounds of fish.

A. As the fish are dressed, place them in a glass or heavy plastic container in a brine consisting of 1½ cups of salt to 1 gallon cold water. Keep the fish in the brine for at least 12 hours at refrigerator temperatures (40°F).

B. For a short brine method, use a brine of 4 cups salt to 1 gallon cold water. Soak for 15 minutes.

3. Remove the fish from brine and drain. Rinse to remove salting mixture. Place fish skin side down on a wire mesh screen or suspend on hooks or wooden dowels. A method which holds the fish flat provides for more uniform smoking.

4. A short stem metal meat ther-

mometer should be inserted centrally in the thickest portion of the flesh of the largest fish to measure flesh temperature. It may be necessary to tie the thermometer so it will register correctly.

5. An old iron skillet on an electric hot plate can be used as a heat source for the smoker. Place sawdust or wood chips in the skillet and allow them to smolder. An alternate heat source is charcoal briquets which have been burned to a light gray color. Sprinkle wet wood chips or wet sawdust on the briquets to produce smoke.

6. Oak, hickory, maple, alder, beech, apple, white birch or ash wood chips or sawdust produce a good smoke. Do not use wood containing pitch, such as pine. Wood can be chipped or cut in pieces about 8 inches long and 1 inch in diameter. Sawdust burns slowly and produces good smoke. Too heavy smoke overemphasizes the smoke flavor.

7. Kindle fire and get a good bed of coals going before placing barrel over fire. Have a smoldering fire with no flames. Stoke the fire every half-hour or as needed.

8. Place the fish in the smoker when the air temperature is about 100°F. A regular meat thermometer can be hung on a rack in the center of the smoker or inserted through a hole in the smoker cover to guide you on temperature. During smoking, the internal temperature in the smoker should rise to 225°F. At this air temperature, the fish flesh will be approximately 180°F. Holding the fish at this temperature for 30 minutes is essential to cook the fish and inhibit bacterial action. Total smoking time will be about 4 hours.

9. As soon as the smoking is completed, wrap the fish in waxed paper and place in the refrigerator. The fish must be stored at temperatures not over 45°F and used within a month.

Recipes

Dillicious Dip*

1 cup smoked fish, flaked	½ teaspoon dried dill weed
8 oz. cream cheese, softened	½ teaspoon Worcestershire sauce
¼ cup half and half cream	¼ teaspoon garlic salt
1 tablespoon finely chopped onion	¼ teaspoon salt
2 teaspoons lemon juice	⅛ teaspoon pepper

Combine fish, cream cheese, onion, lemon juice, dill weed, Worcestershire sauce, garlic salt, salt and pepper. Mix well. Chill. Serve with favorite snack crackers. Makes about 2 cups.

Smoked Fish Salad*

1 lb. smoked fish, flaked	½ cup mayonnaise
2 cups diced cooked potatoes	1 tablespoon prepared mustard
1 cup celery, thinly sliced	1 teaspoon lemon or lime juice
½ cup sliced peeled cucumber	1 teaspoon vinegar
½ cup ripe sliced olives	Salt to taste
¼ cup grated carrot	¼ teaspoon celery seeds
¼ cup minced onion	Dash of black pepper
2 tablespoons chopped parsley	

Combine vegetables and fish in large bowl. Mix mayonnaise, mustard, lemon or lime juice, vinegar and seasonings, blending thoroughly. Add to fish and potato mixture and toss lightly. Chill well. Serve on a bed of greens. Serves 6.

Smoked Bluefish and Gruyere Quiche**

2 8" baked pie crusts (frozen)	½ teaspoon salt
1 13 oz. can evaporated milk	¼ teaspoon paprika
8 oz. gruyere (or Swiss) cheese	dash cayenne
8 oz. smoked bluefish pieces	3 tablespoons grated onion
4 eggs	

To heated milk, add cheese and spices. Remove from heat slowly and add fish and gently fold in beaten eggs. Fill crusts and bake at 325° for about 45 minutes. Serve hot or cold. Serves 12.

Smoked Bluefish Omelet**

2 oz. smoked bluefish, flaked
2 eggs
1½ oz. cream cheese
scallions
butter

Over medium heat melt butter. Pour in eggs and wait 30 seconds. Then add cream cheese cut thinly, bluefish and scallions. Cook over very low flame. When eggs are almost done, fold omelet in half. Then flip and cook 30 seconds more.

* NCSU Seafood Laboratory

** Chapel Hill Smoked Fish Company

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 (919/737-2354).



If you own property at the beach, give a thought to your dunes. Are they well-covered with a healthy stand of sea oats or beach grass?

According to Spencer Rogers, Sea Grant's coastal engineering specialist, grasses hold dunes in place and help them resist erosion.

If your dunes are balding and lack vegetation, this is the time of year to try some transplants. Rogers says that successful transplanting begins with the right fertilizer. Choose a granular variety containing nitrogen—"8-8-8" or "10-10-10" will do—and broadcast it onto the bare dunes or pathways. You can find American beach grass plants in nurseries along the coast, or you can select young plants from a good stand on your own property. Remember, it's illegal to take dune grasses from public land.

Dig the grasses up carefully. Set single plants about 18" apart, and make sure to get them at least a foot deep, so that the roots don't dry out. As the plants establish themselves, they send out rhizomes and fill out the stand.

Rogers says it's best to keep people and traffic off the dune grasses. Only a few trappings can kill the plants. He recommends elevated walkways for areas where people cross dunes to reach the beach.

If your lot borders a sound or estuary, and erosion is a problem, grasses might also help protect your property. Sea Grant researchers Ernie Seneca, Steve Broome and W. W. Woodhouse have found that in some areas, marsh-

grass plantings can help slow shoreline erosion. If you want to know more, contact Spencer Rogers, Marine Advisory Service, N.C. Marine Resources Center/Ft. Fisher, Kure Beach, N.C. 28449.



Sea Grant Publications is an updated brochure that lists all of UNC Sea Grant's general-interest publications. The brochure provides a brief description of each publication and lists its price, if there is a change. The brochure also provides an order form that can be filled out and sent to the Sea Grant office in Raleigh for quick processing. For your free publications list, write UNC Sea Grant, Box 5001, Raleigh, N.C. 27650.

Seacoast Life: an ecological guide to natural seashore communities in North Carolina, by Judith M. Spitsbergen of the Hampton Mariners Museum in Beaufort, describes the dunes, tidal flats, marshes, plants, organisms and critters that make up coastal North Carolina. An ideal field guide for teachers and students, the illustrated book focuses on coastal ecology rather than on the identification of individual plants or animals. Funding for the book was provided by UNC Sea Grant and the North Carolina State Museum of Natural History. For a copy of the guide, make a check payable to NCDA Museum Extension Fund for \$6.95 (\$5.95 plus \$1 for postage and handling). Send the check to Museum Publications, P.O. Box 27647, Raleigh, N.C. 27611. Or you can buy a copy by dropping by the Natural History Museum in Raleigh or the Hampton Mariners Museum in Beaufort.

Shellfish Relay: A Preliminary Review of Potential Gains from Alternative Property Rights in Southeastern North Carolina, by J.E. Easley and James D. Seabolt of

the NCSU Department of Economics and Business, discusses the alternatives for and economics of relaying or transferring contaminated shellfish from polluted water to clean water. For a copy, write UNC Sea Grant and ask for UNC-SG-WP-81-1. The working paper is free to North Carolina residents, but out-of-state residents must pay \$1.

Fishery Facts 9: design and materials used in construction of a 16-foot shrimp trawl, a reprint of a National Marine Fisheries publication, is now available from UNC Sea Grant. The publication is free. Ask for Fishery Facts 9.



As President Reagan sliced away at federal spending in February and March, his team outlined the shut-down of the federal Sea Grant program during fiscal year 1982. In the proposed budget he submitted to Congress, Reagan allowed only \$1.8 million for Sea Grant in 1982, to be used for "an orderly phase-out of the program."

The National Sea Grant office immediately issued a "call for information" to all the state programs, including North Carolina, to document Sea Grant's contribution to the nation's coastal economies. Economic information was forwarded to Secretary of Commerce Baldrige, as well as many members of Congress who support the Sea Grant cause. As the facts poured in from across the country, the national office was able to document that the economic benefits derived from the Sea Grant programs in one year came close to matching the total federal investment in Sea Grant for all its 13 years of operation.

North Carolina Sea Grant Director B. J. Copeland will be traveling to Washington, D.C. in late March to defend Sea Grant before the House Sub-

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committee on Oceanography. He will be telling Congressmen how research projects, advisory services and publications like *Coastwatch* aid coastal communities. Only with sound data about Sea Grant's benefits and the backing of concerned citizens will Sea Grant survive the budget cuts.



In the Philippines, many of the best crops are under water. But the farmers like it that way. Their harvest of milkfish, catfish, talapia, shellfish, shrimp and prawns represents a major industry and a primary source of food.

The 7,100 islands of the Philippines are rich in the resources that make aquaculture work: temperate climate, plenty of clean water, and an abundance of edible species well-suited to farming.

John Foster, who works with Sea Grant's aquaculture demonstration project in Aurora, believes North Carolina can learn from the success of fish-farming in the Philippines. In February, Foster spent several weeks touring the islands, stopping at fish farms, research sites and markets. He also studied some of the nation's culture, staying with Philippine families in their homes, and saw firsthand the central role seafood plays there.

Foster believes he can apply much of what he learned on the trip to his Sea Grant work with aquaculture. He

believes the Philippine techniques for raising fish in pens would work well in North Carolina's freshwater ponds and reservoirs, as well as in brackish bays and estuaries.

In exchange for their help, Foster gave his Philippine counterparts information on new technology and research, and pointed out ways they could make better use of their resources.

Foster and the five other North Carolinians who made the trip were selected to participate in an exchange program that also brought Philippine citizens to this state for study. The Rotary International Foundation, which sponsored the exchange, has asked Foster to report his observations of Philippine life to the state's Rotarians.



This summer, Sea Grant is again offering three workshops designed to help school teachers enrich their students' studies of the coast. Lundie Mauldin,

Sea Grant's marine education specialist, has designed the workshops in conjunction with the three N.C. Marine Resources Centers and the N.C. Department of Public Instruction. Each workshop offers course credit through the NCSU Division of Continuing Education.

The first workshop, scheduled for July 12-25 at Bogue Banks, is open to middle-school and secondary-school

science teachers, junior high pre-vocational teachers, vocational home economics teachers and marine occupation teachers. It will cover coastal habitats, organisms and occupational skills. Tuition is \$120.

Another workshop, to be held July 29-31 at Roanoke Island, is designed for middle-school teachers from "gifted-and-talented" programs, but is open to other teachers as well. It will cover salt marshes, whales, marine survival skills and literature about the sea. Tuition is \$30.

The third workshop, to be held August 12-14 at Fort Fisher, is open to life science and biology teachers. The workshop will cover collecting, maintaining and investigating marine organisms. Tuition is \$20.

For an application to enroll in any of the workshops, write: Lundie Mauldin, UNC Sea Grant, P.O. Box 5001, Raleigh, N.C. 27650. Enrollment is limited, so write soon.

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