

COAST WATCH

Photo by Mark Joyner



Up close and personal with a loggerhead turtle

Vagabond sea turtles leave scientists mystified

Sea wanderers. From the time they heave themselves from their sandy nests and flap their way to the surf, sea turtles belong to the ocean. They sometimes swim thousands of miles a year.

Much of the sea turtle's life remains a mystery, even to those who have spent years studying the marine reptiles. The sea turtle's life, which can last 100 years, often surpasses that of

its human researchers.

And, the sea turtle is a hard creature to track. Once the newly hatched male leaves his nest on the beach he will never again set a flipper on land. The female will visit land after she reaches sexual maturity to lay her eggs.

Tagging the reptiles to follow their movement has presented special problems for scientists. Tracing a loggerhead's movements by satellite

was successful in one study, but such techniques are too expensive to apply extensively. Placing metal tags in the female's leathery flippers as they nest is one method of tagging that has proved only fair at best. The turtles often lose the tags. Also, scientists can only tag the females. But using this method, researchers have found that

Continued on next page

many female turtles will return to the same beaches repeatedly to lay their eggs. Some scientists believe the mother is even returning to her own beach of birth. But Debbie Crouse, coordinator of the N.C. Wildlife Resources Commission's project for sea turtles in North Carolina, says evidence to support that belief is not conclusive. Until scientists can find a tag that will expand or remain attached to the turtle from the time it hatches until adulthood, she says, no firm conclusions can be made.

Frank Schwartz, a biologist at the UNC Institute of Marine Sciences who has been studying turtles for 25 years, says he has developed a tiny square metal tag, containing information about where and when the turtle hatched. The tag can be inserted under the skin of the turtle's flipper. It should remain with the turtle throughout its life, Schwartz says.

But other researchers say the drawback to this method is the bulky X-ray equipment needed to detect the tags.

But some method must be developed that will fill the gaps in our knowledge of the sea turtle's life. Crouse says once the hatchlings leave the beach, researchers totally "lose track of the turtles" until they become large enough to get caught in fishermen's trawl nets. Schwartz says he believes the loggerheads spend the first year of their life floating and feeding off sargassum weed. "But after that we just don't know what they do," he says.

Once sea turtles grow to adult size they have few natural predators. Their hard shell provides the protection needed to fend off most assailants. But scientists believe that sea turtles must rely largely on instinct to survive. With a brain the size of a grape, a turtle has little room to think.

Most turtle researchers think the turtles reach sexual maturity between the ages of 13 and 20. The loggerhead, the only sea turtle that consistently nests in North Carolina, mates $\frac{1}{2}$ to $\frac{1}{4}$ mile offshore. The male rides the female for several hours as they mate, fertilizing the eggs she will lay that summer. About two weeks after mating, the female loggerhead will come ashore to lay her first batch of eggs. The mother turtle may lay two to three more nests during the same summer. An average nest contains about 120 leathery white eggs.

In recent incubation studies, Schwartz and other researchers have learned that the sand temperature in which the turtle nests affects the hatchling's sex. Cooler sand temperatures yield males, while warm temperatures hatch more females. Schwartz says more males are hatched in the cooler nests of early and late summer, but females dominate in the warm mid-summer nests.

The loggerhead turtles will hatch in about 60 days. They use an egg tooth attached to their snout to chisel their way out of the shell. Most of the eggs hatch about the same time because the turtles must work together to escape their nest. "The turtles work as a unit," says Charles Peterson, wildlife management supervisor at the U.S. Marine Corps base at Camp Lejeune. "The hatchlings at the top of the nest scrape and shift the sand downward while the ones on the bottom pack the sand, building a rising platform."

The baby turtles usually emerge at night or early morning. Then they begin their scramble to the sea. But the soft, vulnerable hatchlings make easy pickings for ghost crabs and sea gulls. Only a few hatchlings make it to

the surf, and then they must evade large predators like sharks and bluefish.

What are the turtle's chances for survival? Schwartz cites this example: "There were 63 nests last year at Camp Lejeune. About 70 percent of the eggs from each nest will hatch. About one hatchling per nest will make it across the beach to the surf. That's 63 altogether to the ocean, and of that number only half, or 32, will make it past the sharks and bluefish. So, out of 7,000 eggs, you may get 30 adult turtles."

Schwartz and other scientists are working on incubation methods and head-start programs that may increase the survival rate of the endangered sea turtles. But more must be known about these reptiles before scientists can say any program will help.

"I'd rather not know everything there is to know about sea turtles. I like some of the mystery about the creatures," says Riley Hoggard, a park technician at the Cape Lookout National Seashore. "But if there is a chance they will become extinct, I want to know everything I can to help them."

A ritual in the night

The wee hours of a June morning find a mother loggerhead emerging from the surf to perform a ritual. At least it seems like a ritual, because so many loggerheads have performed it before in almost exactly the same way. The mother loggerhead has come ashore to deposit her first cache of eggs.

Those who have watched the loggerhead perform her egg-bearing duties say the performance is a grand one, and well worth sacrificing sleep to catch the opening curtain.

"It is indeed impressive," says Debbie Crouse. "It's very late at night on a beach in the middle of nowhere and you suddenly see this four hundred-pound creature hauling out of the water. You see her expending all this energy just to pull herself forward. It's like watching something prehistoric."

And the sea turtle indeed has prehistoric ties. Dating back about 150 million years, the sea turtle may be linked to a giant land turtle that

roamed with dinosaurs. Scientists speculate that when the turtle took to the sea, its feet gradually changed to flippers, the body became more streamlined and the bony shell covering its underside became smaller. After the initial changes, scientists say sea turtles changed very little. Today's sea turtle may look very much like its ancestors thousands of years ago.

"What struck me the first time I watched one lay her eggs," says Sally Hopkins, a biologist with the South Carolina Wildlife and Marine Resources Department, "was you saw this form in the darkness, then as she pulled herself further out of the water you saw these twinkling lights all over her shell from the phosphorescence and organisms growing on the turtle's back. It was so magical."

As the mother turtle lumbers from the surf, dragging her tremendous body toward the dunes, she stops here and there along the way—some say to rest. But others say that if you watch

the loggerhead closely she will prod the sand with her nose as if to test it. Recent research suggests that may be exactly what she's doing. Scientists believe the turtle is testing the sand's moisture content, grain size and temperature to find just the right spot for her eggs.

The turtles are skittish creatures. Unusual sounds and lights will turn the mother turtle back to the sea, leaving behind only her tracks, called a "false crawl." But she will usually emerge from the ocean again.

Once a mother turtle has begun digging her nest and laying her eggs she can not be deterred from her task by any amount of noise or light. After choosing the right place, the turtle backs up to her spot and digs her nest with her flippers.

"She swishes the sand back and forth with her back flippers," says Hopkins. "You can hear her flippers working. As she begins to dig deeper she scoops the sand with first her right and then her left flipper as she digs out her hole. She's very dexterous with those flippers. They're like hands."

The loggerhead will dig a nest about 18 inches deep into the base of the dunes, just above the high tide mark. She forms the nest in the shape of a flask. "As the turtle completes her digging, she urinates on the sides of the cavity," Crouse says. "The moisture allows the turtle to pack the sand and shape it the way she likes."

Crouse says researchers are unsure about the significance of the shape of the nest. Some scientists believe the shape may aid the hatchlings in climbing out of the nest. Or, it may keep the nest from becoming too packed. Until some answers are found, Crouse believes only nests in danger of destruction should be moved.

When the digging and the shaping are complete, the turtle plunks the eggs into the nest two and three at a time until about 120 fill the cavity.

Once her task is complete, the turtle begins sweeping sand in the hole, Hopkins says. "Then she rouses up and plunks her body down on top of the nest like she is packing down the eggs. Finally she crosses her back flippers and gives the nest a little 'umph'. She moves away, throwing sand with her front flippers over her back to cover the site."

The mother turtle then labors back to the sea.



A mother turtle dutifully lays her eggs

Turtles' survival threatened

Can a creature who survived the age of dinosaurs to live 150 million years survive the age of man? The question has provoked scientists and management officials to try and save the dwindling populations of endangered and threatened sea turtles.

Off the North Carolina coast, five types of sea turtles can be found in varying numbers—the green turtle, the loggerhead, the leatherback, the hawksbill and the Atlantic ridley. The green and loggerhead turtles are listed as threatened under the U.S. Endangered Species Act while the leatherbacks, hawksbills and Atlantic ridleys are listed as endangered. Those species listed as endangered are the ones scientists believe will probably become extinct unless changes are made. Threatened species are in less trouble, but they could easily become endangered if their populations are not revived. Many experts believe the

Atlantic ridley is just a step away from extinction.

Many factors have led to the demise of sea turtles, but probably the most critical problem has been the overdevelopment of beaches. Areas where the turtles once nested in solitude are now clustered with motels, condominiums, amusement parks and people—not exactly choice spots for a cache of 120 sea turtle eggs.

Not only is overdevelopment robbing the adult sea turtle of its nesting grounds, but it also is causing serious problems for hatchling turtles. After pecking their way out of their shells and unearthing themselves from their nests, usually at night, they head for the ocean—perhaps drawn to the gleam on the water. But Frank Schwartz says the tiny turtles can easily be lured off track by other light

Continued on next page

sources—street lights, motel and house lights and car lights. Wandering baby turtles become the victims of ghost crabs, sea gulls and the heat of the sun.

Besides being easily drawn astray by lights, hatchlings have another obstacle between the nest and sea—off-road vehicle (ORV) tracks. To a baby turtle the size of a half-dollar, climbing out of an ORV track can be like scaling a 10-foot wall for you and me. Riley Hoggard says the problem is particularly acute along the park service beaches where ORV driving is allowed. "They get caught in the tracks and they can't get out," he says. "They end up following the vehicle's path parallel to the beach and that just gives them more time to be prey for the ghost crabs and the sea gulls."

Paul Hosier, a biologist at UNC-Wilmington who has been doing Sea Grant research on ORVs, confirmed that ORVs are indeed a threat to the small hatchlings. In a study at Ft. Fisher, Hosier marked off three beach areas—one area undisturbed, one area marred by a three-wheeled ORV, and a final area heavily trampled by people. He then released 40 hatchlings. Of the 16 that passed through the undisturbed area, all made it to the surf. In the ORV area, 11 of 13 hatchlings trudged their way to the sea, while in the area trampled by people only six of 11 finished crossing the beach.

Of those hatchlings that did not make it to the surf, over half became inverted and could not right themselves, becoming easy targets of prey, Hosier says. Also, he notes that those hatchlings that crossed the undisturbed area moved at a much faster pace than the hatchlings that had to crawl in and out of the valleys left by vehicles and people. The faster the movement to the surf, the lower the predation rate, he says. (Note: No turtles died in this experiment. All turtles that became inverted or lost their way among the tracks were picked up after an allotted time and transferred to surf.)

But sea turtles are sometimes in trouble only seconds after they leave their mother's body as eggs. Raccoons and foxes often hover in the shadows as a female loggerhead nests, waiting for a midnight snack of eggs. Raccoons are particularly voracious, as they can gobble down an entire nest of eggs in just minutes. Schwartz says many of the raccoon's own natural predators

have been eliminated with development, causing their populations to boom. And raccoons along Onslow Beach and Bald Head Island are creating havoc with the loggerhead nests.

Charles Peterson says the nests at Camp Lejeune are being protected from predation by wire baskets. Peterson's assistants patrol the beach at night during nesting season, watching for the turtles to nest. As the females complete their tasks, the assistants cover the nests with the baskets. Peterson says the baskets are built of wide-mesh wire that allows the hatchlings to crawl away.

Peterson and the marines at Camp Lejeune aren't the only ones in North Carolina tracking and aiding sea turtles. Programs are also going on at the Pea Island National Wildlife Refuge, the Cape Lookout National Seashore and Hammocks Beach State Park.

Debbie Crouse, who is on loan from the N.C. Heritage Program to the state Wildlife Resources Commission, is coordinating a statewide sea turtle nesting survey. The Wildlife Commission is paying to have the state's coastline overflowed regularly to detect turtle crawls. Crouse takes this infor-

mation and coordinates it with the ground surveys being done by the other agencies. With the results, Crouse hopes to determine key nesting beaches and, eventually, put together a cooperative state program for the turtle's protection.

On a national level, the National Marine Fisheries Service has appointed a Sea Turtle Recovery Team. Otto Florschutz, a U.S. Fish and Wildlife biologist in Washington, N.C., is part of that team. He says the team is trying to draw up a management plan that will restore the sea turtle populations so they will no longer need to be protected.

But while programs in the U.S. fight to save sea turtles, many other countries continue to exploit the marine reptile. Many turtles, especially the green turtles, are still killed for food in parts of the Caribbean, Mexico and Central and South American. The hawksbill is slaughtered for its shell, which is used to make tortoiseshell combs, jewelry, brush handles and eye glasses. And, experts say, until other countries take a stand for conservation of the sea turtles, the age-old reptile will remain in trouble.

Photo by U.S. Marine Corps



Baby green turtles at Camp Lejeune waddle from their nest

Turtle-proofing Fishing Gear

One warm afternoon, a foul stench drifts in the wind along an Onslow County beach. A couple of hundred yards up the beach lies a 200-pound, decaying loggerhead turtle, bloated and matted with flies.

Last summer 102 sea turtles, mainly loggerheads, were found dead along North Carolina beaches. The numbers were even higher for other southeastern states where turtles are more numerous—693 in South Carolina, 656 in Georgia and 217 along the east coast of Florida.

No one is sure why most of these turtles died. But the deaths made a significant cut in already dwindling populations. Some speculate many of the turtles died after drowning in fishermen's trawl nets and gill nets.

Richard Seely, a commercial fisherman from Marshallberg, says he averages catching three or four turtles in his nets during the shrimping season every year. "That may not sound like a lot," he says. "But when I can count as many as 85 boats trawling in the same area and you start multiplying those numbers, well, that can be a lot of turtles."

Seely says most of the turtles he pulls up in his nets can be revived and returned to the water. But occasionally, he says, he finds one that is dead.

"They just get caught in my net as I'm towing," he says regretfully. "I can't tell when they get in there. It's not my fault and it's not the turtle's fault."

Chuck Oravetz of the National Marine Fisheries Service (NMFS) agrees that fishermen should not be blamed for all the sea turtle deaths. "It's a gross error to think that all stranded turtles are a result of fishing activities," he says.

To help fishermen bar the reptiles from their nets, NMFS has been developing a sea turtle excluder device to be used in their trawls. After careful testing, NMFS came up with a design that is low-cost (\$200 or less) and easy to attach to existing trawl nets. Oravetz says the excluder device eliminates 90 percent of the turtles usually caught and also eliminates sponges, logs and "cannonball" or "cabbage head" jellyfish.

Photo by Kathy Hart



Chuck Oravetz demonstrates miniature excluder device

Shaped like a wide funnel, the excluder has diagonal back and side bars that are three to six inches apart. The device is sewn inside the trawl at the intersection of the trawl body and the tail bag. As a turtle or any other large object enters the bag, it strikes the diagonal bars and is forced downward toward a trap door that is set to release heavy objects. The trap door closes after the turtle is released. Shrimp and other small objects will pass through the bars and into the tail bag.

The excluder will have several advantages that should sell the fishermen on its use, Oravetz says. "It will save turtles, eliminate heavy byproducts, reduce sorting time, cut down on crushed shrimp and allow longer towing times," he says.

Oravetz says some fishermen voluntarily used the excluder devices during last year's shrimping season and more are expected to give it a try this summer. He and other NMFS officials are traveling the southeastern coast this spring to demonstrate the device

through video tapes and models. (They demonstrated the excluder in North Carolina for Sea Grant agents in early April. You can contact your nearest agent for further information about the device.)

In another effort to save sea turtles last year, the NMFS enacted 240-day emergency regulations for reviving comatose sea turtles that are in shock and may appear dead. Under the emergency regulations, fishermen are asked to place a comatose sea turtle on its breastplate and elevate its hindquarters. Oravetz says this is a better method of resuscitation than the older method of placing the turtle on its back and pumping its breastplate.

All turtles, dead or alive, must be returned to the water. Fishermen who take turtles can be fined \$20,000 by NMFS.

To help sea turtles in North Carolina, the state Marine Fisheries Commission designated a sea turtle

Continued on next page

sanctuary that extends from Bogue Inlet to New River Inlet, the only sanctuary like it in the nation. The waters in this area are closed to shrimping from June 1 to September 1, beginning this year. The sanctuary extends ¾ mile seaward, except along Bear Island and northern Onslow Beach, where it only extends 1000 feet offshore. Fishermen expressed little opposition to the plan after the com-

Turtles, tears And tall tales

For the ancient Hindu philosophers, the world began with a gigantic sea turtle, swimming in an endless ocean with four colossal elephants on its back. Upon the elephants' backs rested the earth.

With a legacy of about 150 million years, sea turtles have had plenty of time to kindle the imaginations of man in folklore and fantasy.

Even Alice in her trek through Wonderland met a part-turtle, part-calf creature calling himself Mock Turtle. Mock Turtle sobbed constantly, but, in nature, it's the female turtle that sobs. All mother turtles cry as they lay their eggs—not from pain or distress, but only to wash the salt from their eyes. But, legend has it that the sea turtles were once land creatures banished to the sea because of some misdeed. Now, the story goes, as the females return to the land to lay their eggs, they cry because they, and eventually their young, must return to the sea.

Another tale frequently told about loggerhead turtles is that they nest on the full moon. The turtles will actually nest under any phase of the moon, according to those who have spent time watching for the reptiles. More likely, it's the people who are more active on the full moon.

Speculation has always abounded about why the sea turtles nest when they do. In Costa Rica, on the beaches of Tortuguero where green turtles nest in large numbers, Jack Rudloe turned up a legend among the Costa Ricans about a turtle rock. In his book, *Time of the Turtle*, Rudloe tells the story about a rock, shaped like a turtle with a head and flippers, buried in the cave of a mountain. For most of the year

mission reduced the closed area just off Bear Island, a prime shrimping ground.

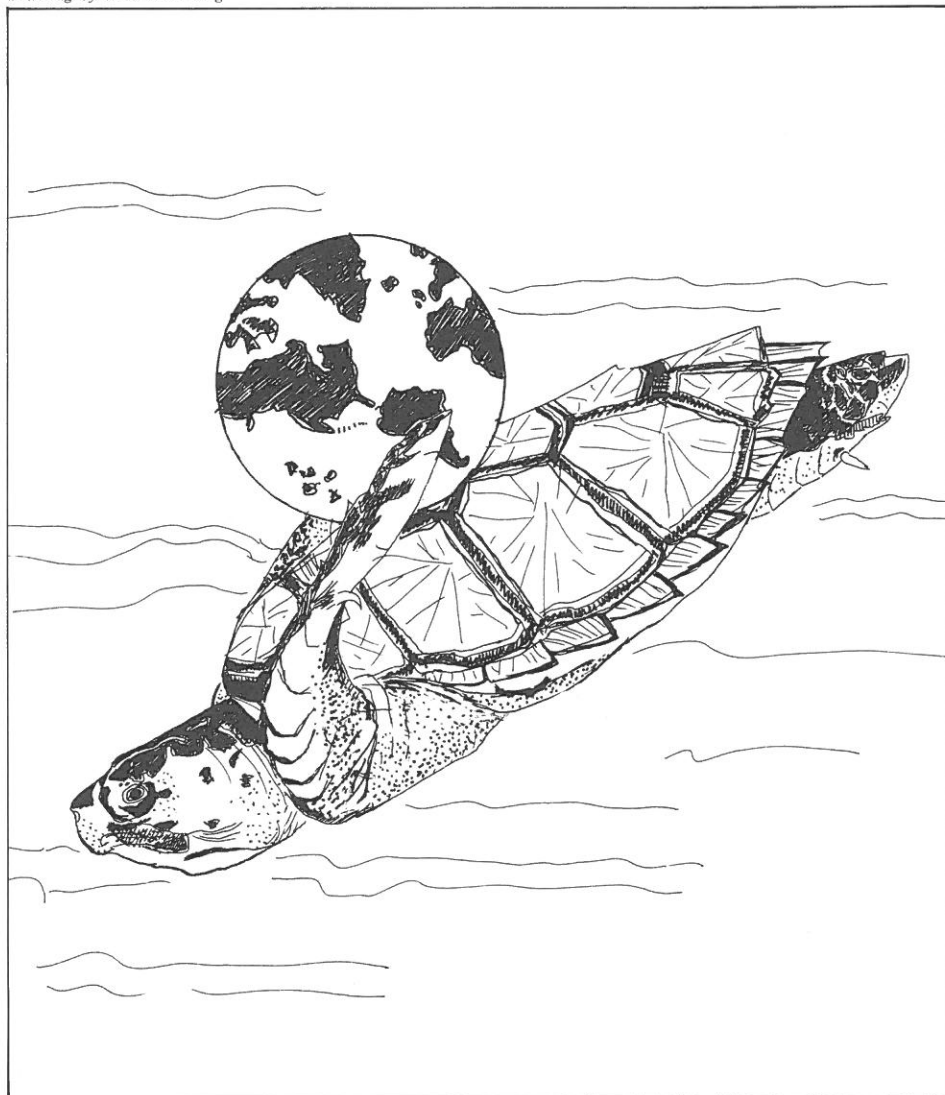
Frank Schwartz, who requested the sanctuary's designation, says that closing the areas to shrimpers means more turtles are likely to make it to the prime nesting beaches the sanctuary protects.

If a dead turtle does wash up on the beach, federal officials want to know

about it. You can report the stranding by calling a toll-free number (1-800-327-6545).

More and more steps are being taken to protect sea turtles as more people realize their plight. State and federal fisheries officials are hoping their efforts to aid the sea turtles will help to cast away some of the gloom surrounding their future.

Drawing by Tina Bromberg



Carrying the world on its back, this fictional sea turtle swims forever.

the turtle rock faces the ocean. But during June the rock turns and faces the land as a signal for the turtles that it is time to nest. In September the rock revolves again—nesting is over. Some of the natives claim to have seen the rock, while others say the turtle rock is just a myth passed down from earlier generations.

Another yarn that has been more widely broadcast is that of the sea tur-

tle egg being an aphrodisiac. A market once thrived on selling the eggs to stimulate sexual appetites. But the legend has no truth and probably originated because turtles lay so many eggs.

So many questions linger about sea turtles that it is sometimes hard to sieve the fact from the fiction. If the sea turtle does carry a world on its back, it is a world of mystery.

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).



Sea Grant's advisory agents will be taking advantage of warm weather and good fishing conditions during the summer to teach some folks to fish.

Dennis Regan, recreational advisory agent on Roanoke Island, will be conducting pier fishing classes every Wednesday from June 24 until the end of August. The classes will be held from 9 to 11 a.m. each week and will alternate between Jeannette's and Nags Head piers, beginning with Jeannette's Pier June 24. Those interested must preregister by calling (919) 473-3937. Equipment will be supplied, but participants must buy their bait.

After casting from the piers of the Outer Banks during the morning, you can learn how to cast in the surf during the afternoon. Regan also has set up surf fishing classes for 2 to 3 p.m. every Wednesday from June 24 to the end of August. James Hasty, a bait and tackle owner, will teach the classes, which will be held outside his shop in Nags Head. Bring your own gear if you want to ask questions about it or try some of your new knowledge after the class.

Bob Hines, Sea Grant's marine advisory agent at Bogue Banks, also will hold a surf fishing class this summer. To be held June 23 at the Bogue Banks Marine Resources Center, the class begins at 11 a.m. and will be followed by a surf fishing field trip to a nearby beach. The class is free, but those going on the field trip should bring their own gear.

At the Ft. Fisher Marine Resources

Center, Debbie Ford of the Sea Grant staff will be offering surf fishing classes for youngsters, ages 9 to 12. Ford will show the youngsters basic knot tying, casting, baiting and surf fishing. All materials for the class are supplied, but the children are required to wear shoes. Ford will be holding the classes June 16 and 26, July 10 and 28 and August 11 and 25 from 10 a.m. to noon at the Ft. Fisher Marine Resources Center. Parents must preregister their children by calling (919) 458-8257.



Bad weather is his business. John Sanders, UNC Sea Grant's new coastal weather awareness specialist, will be working with North Carolina coastal communities to plan ways to protect lives and property against severe storms like hurricanes and northeasters.

In his work, Sanders will help state and local agencies develop and improve their weather disaster plans. He will also present workshops designed to help people better understand the hazards of severe weather, and how they can protect their property.

Sanders will be applying some of the knowledge he learned while gathering information for his master's thesis at the University of South Carolina. For his thesis, Sanders assessed the hurricane preparedness of Myrtle Beach, S.C.

If you would like to contact Sanders, write UNC Sea Grant, Box 5001, Raleigh, N.C. 27650 or call (919) 737-2314.

Are you a wave watcher? You can learn the dynamics of beaches and waves by becoming a "wave watcher" with Spencer Rogers, UNC Sea Grant's coastal engineering specialist. Rogers will give three talks on wave dynamics this summer at the Ft. Fisher Marine Resources Center outside Wilmington. The talks are

scheduled for 1 p.m., June 18, July 16 and August 6. Rogers will begin his discussion by showing participants how waves work in an indoor wave tank. Then the group will move to the beach to observe the real thing.



Outer Banks residents and visitors can become a little richer in their knowledge of the coast this summer by attending a series of talks about the Outer Banks.

Dennis Regan, the Sea Grant recreational advisory agent on Roanoke Island, has organized the discussions, drawing on local and field experts to talk about everything from peat mining to beach safety.

The talks will be held at the N.C. Marine Resources Center/Roanoke Island at 8 p.m. each Thursday from June 25 until the end of August. Area residents and visitors are invited to attend the free talks.

Discussion leaders and topics are:

- June 25—John Sanders, Sea Grant's coastal weather awareness specialist, on hurricane hazards;
- July 2 —Dennis Regan on beach safety;
- July 9 —Bonnie Woodall, outdoor recreation coordinator for the Pea Island National Wildlife Refuge, on summer wildlife in the refuge;
- July 16—Henrietta List of the N.C. Nature Conservancy on flora and fauna of Nags Head Woods (followed by a field trip July 17. To pre-register call 473-3937);
- July 23—Spencer Rogers, Sea Grant's coastal engineering specialist, on hurricane-resistant construction;
- July 30—Herb Crase, U.S. Forest Service, on native Indian culture explored through artifacts;

Continued on next page

- Aug. 6—Jim Smith, N.C. Department of Natural Resources and Community Development, on peat mining in coastal North Carolina;
- Aug. 13—Joe Malat, local fishing guide, on surf fishing techniques;
- Aug. 20—Arthur Hurme, ecologist, on shoreline erosion control using marsh plants;
- Aug. 27—Bill Birkeneier, civil engineer for the U.S. Army Corps of Engineer's Coastal Research Center, on activities at the coastal engineering research pier at Duck.



UNC Sea Grant has two new "Blueprints" about eels and eel farming to add to its growing stock of eel publications. The first publication, *Eel Farming—Are*

You Prepared? by W.L. Rickards, J.E. Foster and W.R. Jones, provides a list of questions about things prospective eel farmers should consider before launching into aquaculture. To receive this free publication, write UNC Sea Grant, Box 5001, Raleigh, N.C. 27650. Ask for UNC-SG-BP-81-2.

The second publication, *Onshore Holding Tanks for Eels*, by W.L. Rickards, describes the major factors you should consider when building a holding tank for eels. The Blueprint also provides a diagram of an eel holding tank, showing essential features needed to keep the eels alive and healthy. For this free publication,

write UNC Sea Grant. Ask for UNC-SG-BP-81-3.

Other eel publications available are: *The Case of the Slippery Eel* (UNC-SG-75-20), a guide to harvesting, handling and marketing wild eels; *To Eel or Not to Eel* (UNC-SG-77-02), an economic analysis of a part-time eel fishing enterprise; *How to use Eels as Bait* (UNC-SG-80-01); *A Feeding Tray for Use in Eel Farming* (UNC-SG-78-04); *A Diagnostic Manual of Eel Diseases Occurring under Culture Conditions in Japan* (UNC-SG-78-06—\$9 for all requests); and *Techniques of Eel Culture in Greenhouses* (UNC-SG-WP-80-1—\$2 for all requests). To request any of these publications use the publication number. Include the fee as noted.

Eel fishing demands its own special gear and techniques. If you're interested in eel fishing, plan to attend a UNC Sea Grant workshop in May. Designed for fishermen new to eel fishing, the workshop will be held May 20, at 7 p.m. at the Jarvis Restaurant in Swanquarter. Sea Grant advisory agents and seasoned eel fishermen will acquaint fishermen with different types of eel pots, eel bait, pot handling gear, fishing techniques, holding and handling methods, markets and the economics of the eel fishery. For further information about the workshop contact: Hughes Tillett at the Marine Resources in Manteo (919) 473-3937, John Foster at the NCSU Aquaculture Demonstration Project in Aurora (919) 322-4054 or Bob Hines at the Marine Resources Center at Bogue

Banks (919) 726-0125.

Sea Grant advisory agents are planning another eel fishing workshop for the Wilmington area later this summer.



To get the latest word on marine research a group of North Carolina educators met in Greenville recently. The seminar, called "Bridging the Gap: Marine Information Update," was attended by marine education coordinators and educators, public and private school science coordinators and the information staff of the state Division of Marine Fisheries.

According to Lundie Mauldin, Sea Grant's marine education specialist, the purpose of the seminar was to translate marine research information for use by the general public. Educators and information staff, she says, often don't have the time to keep up with the latest developments in coastal research.

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. Vol. 8, No. 5, May, 1981. Dr. B.J. Copeland, director. Written and edited by Neil Caudle, Kathy Hart, and Cassie Griffin. Second-class postage paid at Raleigh, NC 27611.

COASTWATCH

105 1911 Building
North Carolina State University
Raleigh, NC 27650

Second-class postage paid
at Raleigh, NC 27611
(ISSN 0161-8369)

