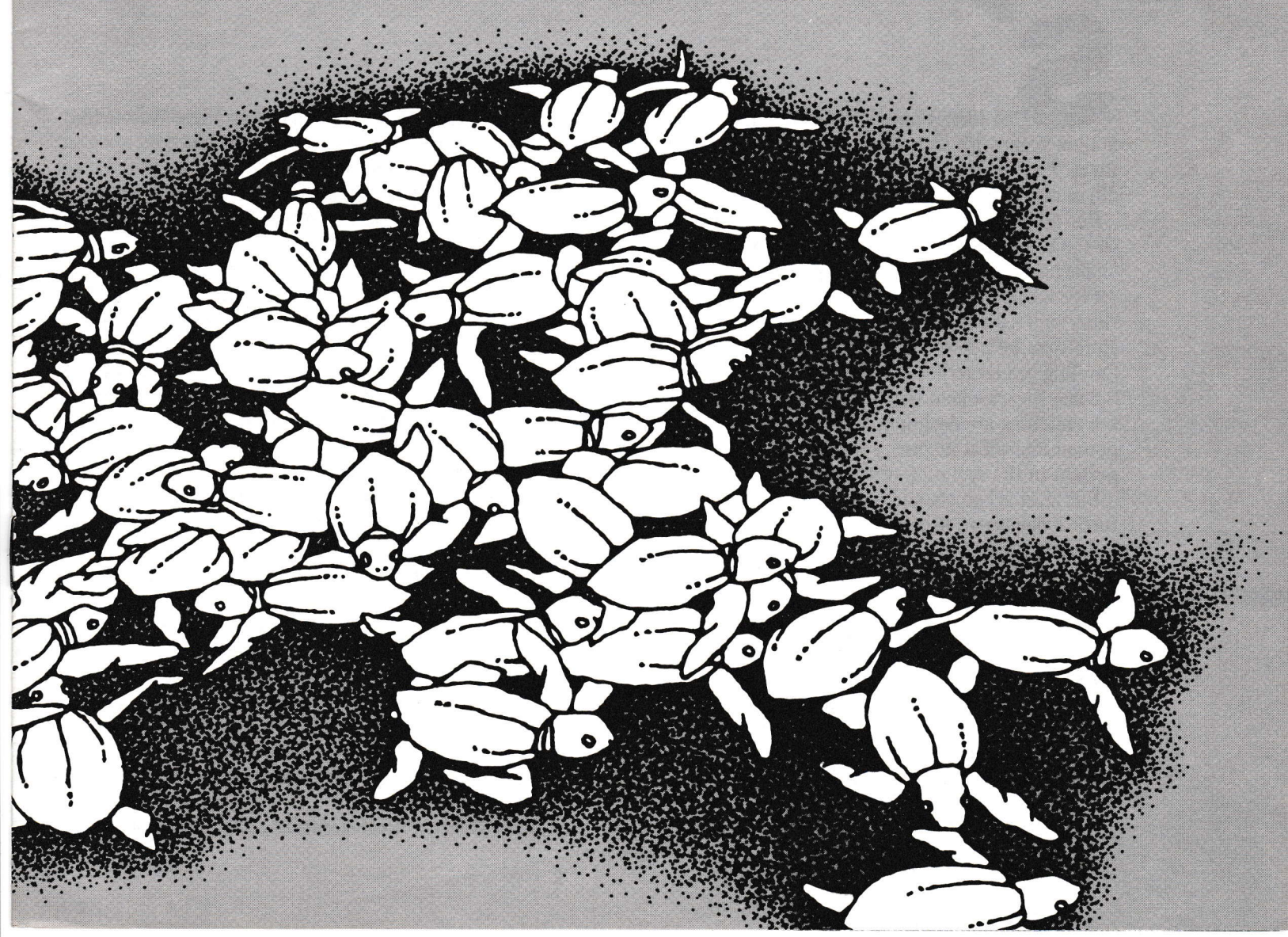




COAST WATCH

THE TROUBLE WITH TURTLES





Surviva

Sea turtles have survived for more than 150 million years with little more than their shells to shield them. They have swum the oceans since the time of dinosaurs, outliving their reptilian cousins by centuries.

But now, sea turtles seem headed for a similar fate. Of the seven species in the world, six are considered endangered or threatened with extinction.

Five species—loggerhead, leatherback, green, Kemp's ridley and hawksbill—can be found in the Southeast. More than 99 percent of the nesting turtles in North Carolina are loggerheads.

Some theories hold that the populations of these giant sea creatures are declining naturally. Extinction is a normal biological process, some researchers say. It's important in the evolution of new species.

But most scientists and environmentalists blame the turtle's demise on people.

And now, they say the responsibility to halt the decline and to aid in the turtles' recovery is ours, too.

"Sea turtles have been a great success through time, until about 100 years ago," says Bill Brooks, naturalist for the Bald Head Island Nature Conservancy.

Excessive exploitation began then. People around the world captured sea turtles and their eggs for food, fisheries and trade. By the 1960s, more than 75 percent of the population had been eliminated.

Conservationists retaliated and the government took action. A ban was placed on turtle fishing, and in 1973, the Endangered Species Act made it illegal to

take or disturb adult turtles and their eggs. Worldwide, treaties were passed for further protection.

Still, sea turtle populations decline.

Many countries ignore the international treaties that protect the turtles, says Marydele Donnelly, director of the Sea Turtle Rescue Fund of the Center for Environmental Education.

From 1970 to 1986, 2 million hawksbill sea turtles were killed for their shells and sold in the Japanese market.

Olive ridleys are captured for their leather. And green turtles are slaughtered for leather, meat, oil and shells. In some countries, young hawksbill and green turtles, stuffed and polished, make popular souvenirs.

"The problem with international trade," Donnelly says, "is that the easiest turtles to catch are the nesting females because they're coming into shore. And that's the worst thing of all."

Killing a female turtle robs present and future populations.

In the United States, Donnelly cites the incidental catch and subsequent drowning of sea turtles in fishing nets as the reptile's biggest threat. Scientists estimate over 11,000 drown in nets each year. (See story, page 5)

Plastics and entanglements play a negative role, too.

Sea turtles often consume plastic bags and other trash. Such refuse can clog their digestive system and cause them to die.

David Webster, a researcher studying loggerheads at

By Sarah Friday

al of the Fittest

Sea Turtles Survived the Age of the Dinosaur . . . Can They Survive the Age of Man?

the University of North Carolina at Wilmington, believes increased development at the coast also has caused declines in populations.

Pollution, toxic waste, agricultural runoff and other environmental hazards alter turtle foraging grounds. And beachfront development destroys nesting habitats.

Brooks says the turtles aren't used to people, lights and activity.

"Developed beaches are seeing fewer and fewer turtles coming to their area," he says. "And natural beaches like Bald Head are seeing more and more."

Donnelly believes the turtles' problems may have broader implications.

"What is happening to turtles may be happening to other species," she says. "To me, it's an indicator of the health of the ocean . . . or the nonhealth."

Without these ancient reptiles, Webster fears nature would lose a vital cog in the cycles of marine ecology. There would be repercussions throughout the food chain, he says.

But today, conservationists are doing their part to ensure that those repercussions are never felt.

The CEE pushed the National Marine Fisheries Service to adopt regulations that will require shrimpers to equip their boats with turtle excluder devices. They've battled oil companies to stop the dynamiting of abandoned oil rigs in the Gulf of Mexico, a prime turtle habitat.

Internationally, the CEE and other environmental

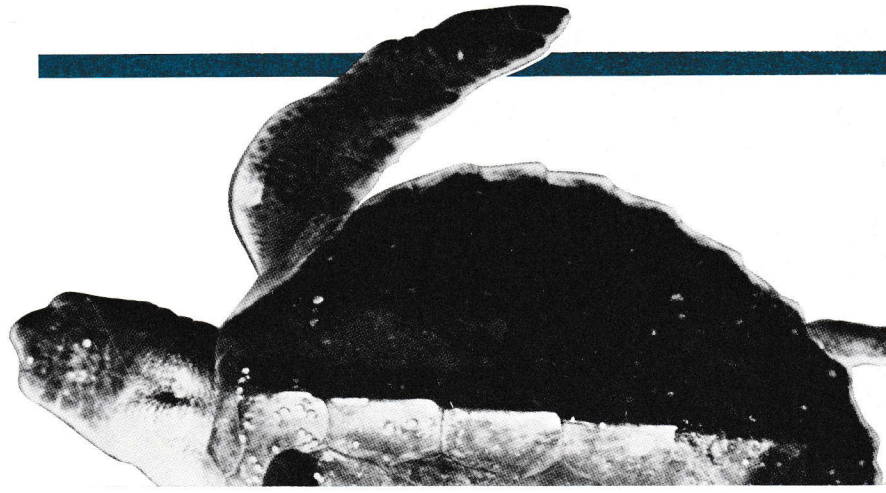
groups have worked feverishly to stop the trade in turtle products.

And the turtles have plenty of local support, too.

Florida plays host to 95 percent of the nation's nesting loggerheads and, now, to numerous organizations concerned about their survival.

Other states such as North Carolina, South Carolina and Georgia are helping also. Some of the most popular programs, like Bald Head's "Turtle Watch," monitor seasonal sea turtle nesting and hatching activities.

To Donnelly, this kind of local involvement is the solution to the sea turtles' plight.



By Sarah Friday

NIGHT WATCH

John Ward doesn't usually stay up until 4 a.m. But one Wednesday this July the Raleigh schoolteacher made an exception. The turtles were coming.

Ward was part of a small group of nature lovers that wanted to see the female loggerheads nesting on Bald Head Island. He had joined about 10 others for a four-day trip sponsored by the N.C. Museum of Natural History and the N.C. Nature Conservancy.

The first night of the watch, Ward was the only one awake when a mother sea turtle came to shore. By the second night, everyone wanted a chance.

But there were no guarantees.

Sighting a female loggerhead laying her eggs is rare.

Bill Brooks should know. Every night, the Bald Head naturalist and three summer interns patrolled the 12-mile beach looking for loggerheads. From 9:30 p.m. to daybreak, they rode three-wheeled vehicles up and down the beach like cowboys looking for a stray heifer.

Last season, there were 196 nests. This year the count was lower, running 65 behind the same time last year.

Some reassurance for the visitors came in discovering Bald Head is the state's largest nesting ground for loggerheads. Most sea turtles nest south of the island in more tropical environments, but loggerheads come to more temperate climates.

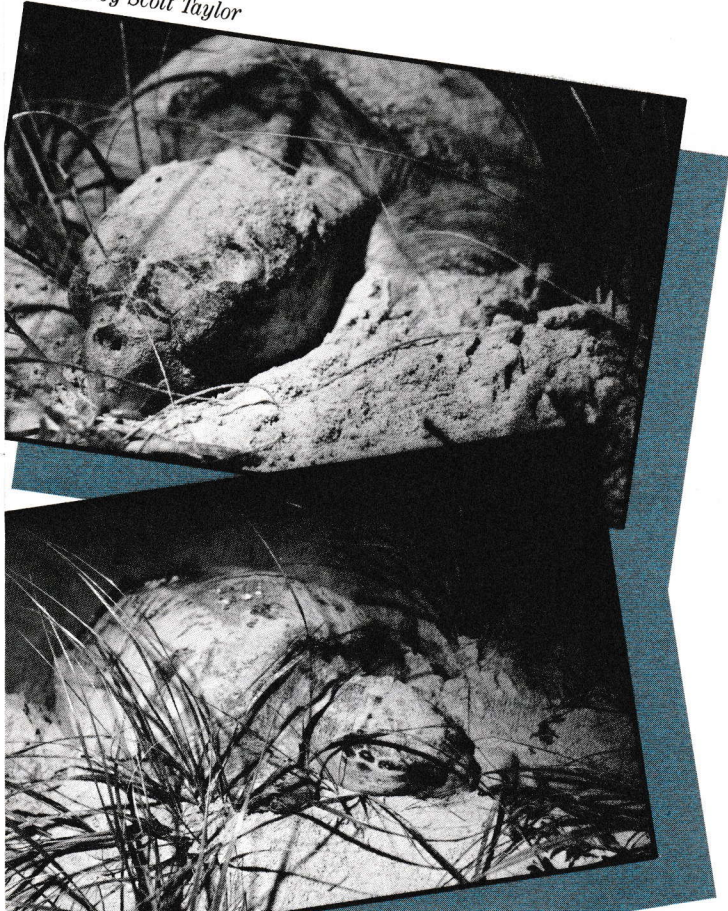
From mid-May to mid-August, they swim north, often running into the cape that juts from the island. Then they follow the shoals inland until they get to the beach.

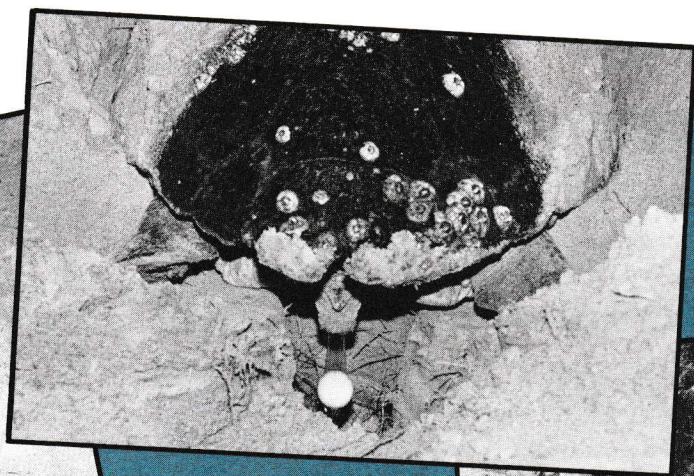
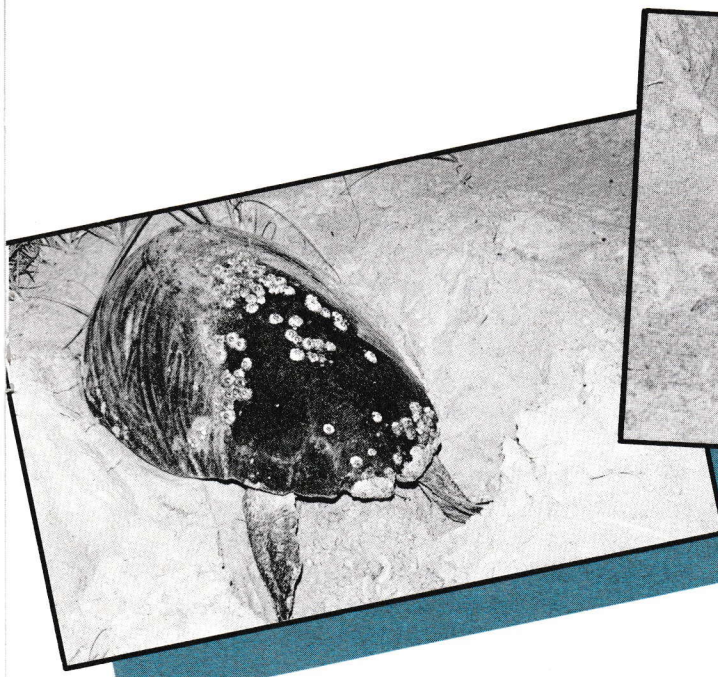
Bald Head remains relatively undeveloped and natural. A unique arrangement involving the developer, residents, the island's Nature Conservancy and government agencies has resulted in a major effort to protect the nesting loggerheads.

Brooks offers a nightly slide show and turtle walk to help educate visitors. And residents voluntarily turn off all outside lights so the loggerheads will not be distracted during nesting season. Nighttime beach walkers are asked to cover flashlights with red cellophane to reduce light interference.

Turtles are skittish creatures. Unusual sounds or lights will send

Photos by Scott Taylor





a mother turtle crawling back to the sea with no nest dug and no eggs laid.

Anticipation builds for the group as questions about the mysterious reptiles are asked and answered.

When night falls, the search begins.

About 9:45 p.m., Brooks takes one group to the darkest end of the island. Another heads in the opposite direction.

Both walk the beach for about an hour until it begins to rain, then head for the cottages.

About 11:45 p.m., somebody runs up from the beach with news.

They found a turtle about a half mile down on the right.

Some run; others walk.

Then, there—about 25 feet from the surf—they spot the female loggerhead laying her eggs.

She's about three feet long and probably weighs 300 pounds, one of the interns estimates. Her head is characteristically large, and her shell is gray and smooth except for some small barnacles.

Often these barnacles help Brooks and his staff identify the loggerheads when they nest on the beach again.

The mother turtle lies in a trance with her tail tilted downward. For now, she's oblivious to light, sound and people.

For more than 20 minutes she drops white, pingpong-ball-sized eggs into her nest. Sometimes three and four fall at a time.

Tears wet her eyes to protect them, and every now and then she sighs.

By the end, 150 eggs have filled the 1-by-2 foot hole.

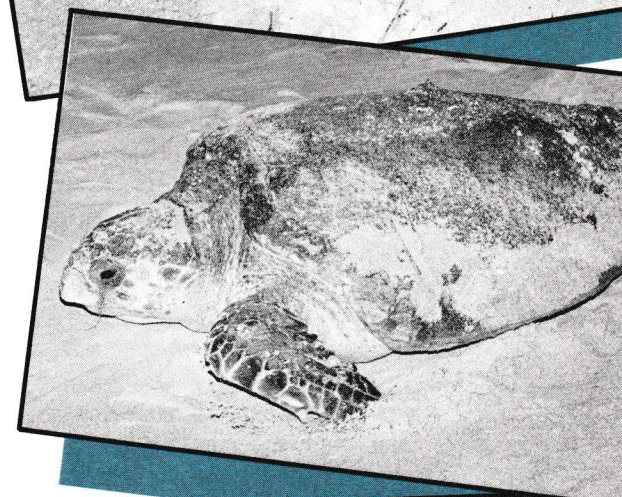
The turtle swishes sand into the cavity, then packs it down using her back flippers.

"Isn't she gracious," someone remarks as the loggerhead smooths over the nest with her "knees," or joints.

Then, to camouflage her nest from predators, she throws sand from the right and left for about 10 minutes. When she leaves her spot, even the interns cannot tell exactly where the nest was laid.

Slowly, the giant mother loggerhead pushes herself back through the sand to the ocean. She stops to rest, then waddles to the surf.

She waits for a wave to take her, then swims off into her dark home.

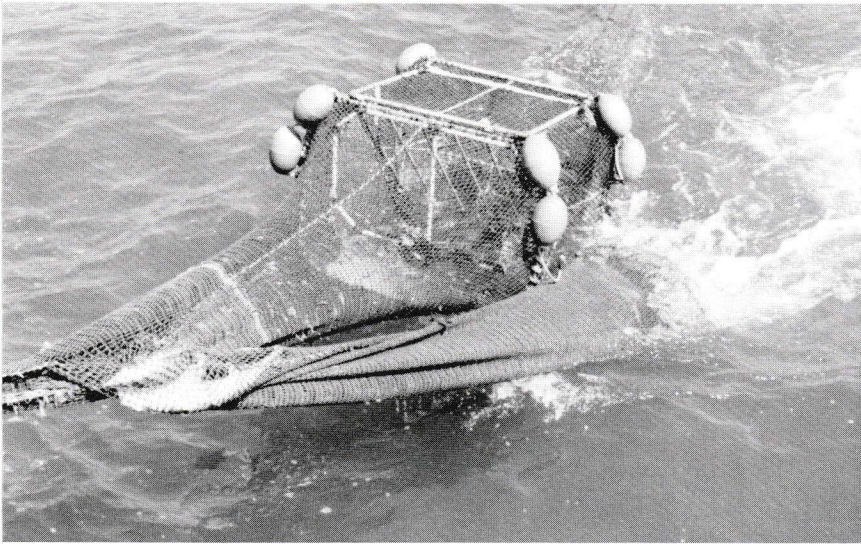


T · E · D

S P E L L S

C O N T R O V E R S Y

By Kathy Hart



From North Carolina to Texas, fishermen, environmentalists, and state and federal management agencies are butting heads over TEDs.

A TED is a turtle excluder device—an aluminum and web box that prevents endangered sea turtles from drowning in shrimp nets.

In a few months, many Southeast fishermen will be required to install TEDs in their nets. It's a requirement that has fishermen hopping mad and environmental groups cheering.

The devices, intended to protect turtles, have pitted fishermen against environmentalists. And each group has its own support cast—congressmen, federal agencies, state agencies and fisheries organizations—willing to enter the fray on its behalf.

The National Marine Fisheries Service spent nine years and over \$3.5 million developing a workable excluder device that could be sewn into fishermen's nets to eject turtles and small fish while catching shrimp.

For the last four years, NMFS gear experts asked shrimpers to install and use the TEDs on a voluntary basis. But more often than not, the requests were ignored.

Fishermen say the TEDs will reduce their catches of shrimp, the most sought-after and valuable species on the South Atlantic and Gulf coasts.

In 1986, Southeastern fishermen netted over 325 million pounds of shrimp valued at over \$600 million dollars.

With competition keen from foreign imports, fishermen say they can ill afford to lose a single pound of the tasty crustaceans.

When it comes to money, fishermen also point to the cost of installing TEDs. The NMFS TED costs about \$350. Most North Carolina shrimpers pull two nets; some, four. And they'll need a spare. The overall cost could be \$1,000 to \$2,000 per shrimper.

And the shrimpers worry that the 2½-by-4 foot excluder devices will injure crewmen as they swing on and off the deck. To a fishermen, injuries translate to added dollars for already escalating insurance costs.

Some fishermen and fishery organizations go so far as to say the TED could put them out of business.

But NMFS officials don't think so. They have tried to counter the fishermen's concerns.

They told them of data from thousands of hours of tests that showed TEDs did not detract from shrimp catches or cause injuries.

But the wary fishermen remained largely unconvinced.

To them, TEDs were another government intervention, another device for making a tough job even harder.

But NMFS had a job to do, too.

Along with the U.S. Fish and Wildlife Service, NMFS was bound by law to uphold the Endangered Species Act that prohibits the capture of turtles.

And turtles were being captured, though unintentionally, in shrimpers' trawl nets.

NMFS specialists estimate that more than 45,000 sea turtles are caught in shrimp trawls each year. Of those, more than 11,000 drown.

Environmentalists saw the statistics as a red flag.



They began to pressure NMFS, even threaten a lawsuit.

NMFS had developed a workable TED. Why weren't shrimpers being forced to use it, environmental groups asked.

And NMFS officials realized the futility of the volunteer TED program. Not enough shrimpers were using TEDs to reduce turtle mortality.

The time for mandatory use seemed at hand.

In early 1987, NMFS established proposed TED regulations and solicited public reaction. In late June, final TED rules were written.

Specifically, the regulations require shrimp trawlers 25 feet or longer to use TEDs in offshore waters from North Carolina to Texas. For vessels less than 25 feet long shrimping in offshore waters and for all inshore shrimp boats, the captains must limit their towing time to 90 minutes unless they pull a TED.

Restricting the tow times will limit the amount of time the net tows along the bottom to 60 to 75 minutes. And studies show that turtle mortalities are negligible at tow times up to 75 minutes.

Four types of TEDs were approved for use. They are the NMFS version, the more oval Cameron TED and two deflector grids, the Matagorda and Georgia TEDs. Other versions of the TED may receive approval if they are tested and prove to exclude 97 percent of the turtles captured.

The regulations become effective in Cape Canaveral in October. But North Carolina shrimpers have until May 1, 1988, to comply. The TED "season" will extend from May 1 to Aug. 31 in Tar Heel waters.

The U.S. Coast Guard, NMFS and the U.S. Fish and Wildlife Service will be responsible for enforcing the regulations. The N.C. Division of Marine Fisheries will provide no enforcement unless the rules are adopted by the N.C. Marine Fisheries Commission.

But the struggle to get TEDs on shrimping vessels didn't end with adoption of this federal regulation.

Fisheries agencies and organizations, and congressmen are lining up to take some of the wind out of the TED rules.

One of the first in line is North Carolina's Division of Marine Fisheries.

DMF opposes the regulations, especially the limitations on inshore shrimping. And the management agency is putting together a petition to sue NMFS, says DMF Director William Hogarth.

Hogarth maintains that the regulations are based on insufficient evidence.

He counters with his own data which show that 88 percent of the sea turtle strandings in North Carolina are reported on ocean beaches. But only 14 percent of the state's shrimp is harvested from the ocean.

In contrast, 8 percent of the strandings came from Bogue, Core and Pamlico sounds where 70 percent of the state's shrimp are harvested.

"We're not fighting the protection of sea turtles," Hogarth says. "We simply believe that shrimp fishermen were singled out without the data to back up the regulation."

Hogarth also believes that federal officials misled DMF. During talks about proposed TED regulations, NMFS indicated the rules would not include inshore waters or offshore waters north of Ocracoke, he says.

But the final ruling on the regulations did include these areas.

And U.S. Rep. Walter B. Jones is riled.

He is planning to introduce legislation in Congress that would amend the Endangered Species Act, says staff member and Sea Grant intern Danny Rasch.

The bill would place a one- to two-year moratorium on TED use in inshore waters in the Southeast and would require NMFS to conduct further TED tests.

Jones is likely to have plenty of support from his fellow Southeastern congressmen and senators. Like others, Jones believes that there is no data to substantiate the inshore regulations, Rasch says.

Chuck Oravetz, chief of NMFS's protected species management branch, admits that NMFS's inshore data is limited. But he says that's why NMFS restricted towing times and did not require TEDs.

"There are turtles there and they are captured by shrimp trawls," he says.

Oravetz also points out some of the feedback NMFS received from North Carolina during the public comment period for the proposed regulations (which did not include inshore waters) requested tougher regulations.

In particular, he cites a letter from the N.C. Wildlife Resources Commission. The commission manages and protects sea turtles during the terrestrial portion of their lives.

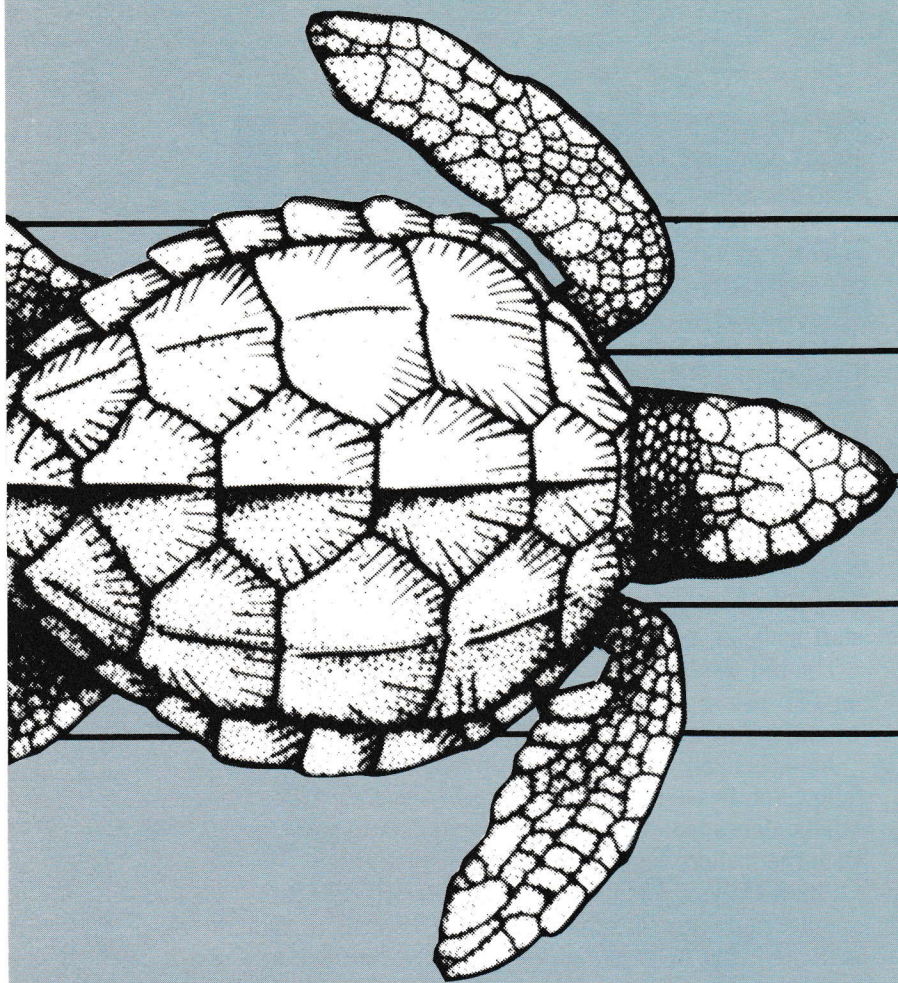
In an April letter, Charles Fulwood, executive director of the wildlife commission, supported the use of TEDs in offshore waters and recommended that the estuarine waters be included in the regulation.

"It was interesting," Oravetz says. "We were receiving opposing views from the same state agency." (DMF and the wildlife commission are both part of N.C. Department of Natural Resources and Community Development.)

But other states were sending mixed messages, too.

It was a matter of whether an agency or organization represented the fishermen's interests or the turtles' interest, Oravetz says.

Continued on page 9



A LESSON IN TEDs

By Kathy Hart

At the docks in New Hanover and Brunswick counties, Jim Bahen is teaching fishermen about an unpopular subject—TEDs.

For Bahen, a Sea Grant Marine Advisory Service fisheries agent, the classroom is the docks and his visual aid is an odd mixture of aluminum tubing and web.

Like other Sea Grant agents in the Southeast, Bahen is educating fishermen about the excluders.

He stops by fish houses on the days or afternoons when the “boys” are at the docks, pulls the collapsible TED from the back of his red truck and heads cautiously for the fish house door.

Sometimes he’s greeted warmly, and fishermen stop to listen.

Other times, he’s told to take his contraption and leave.

But gradually Bahen has coaxed one shrimper and then another to try the TEDs.

His main selling point is not the device’s ability to rid nets of turtles. North Carolina shrimpers claim they don’t catch many turtles and the ones they do catch, they revive.

Instead, Bahen gets fishermen to try TEDs based on the small fish, crabs and jellyballs they eliminate.

Shrimper William Varnum of Holden Beach has been pulling TEDs in his nets for three years.

“There’ll be a bunch of us out shrimping and we’ll come across an area where we’re catching a lot of fish,” Varnum says. “The other boats will have to leave and go to another area where the fish are not so bad. I keep right on going.

“I can put a few bugs (shrimp) in the hole like that,” he says.

Varnum says most fishermen do not want to pull the TEDs because they’re worried about losing shrimp and about injury to crewmen.

But Varnum says he catches the same amount of shrimp or more when the TEDs are in his nets.

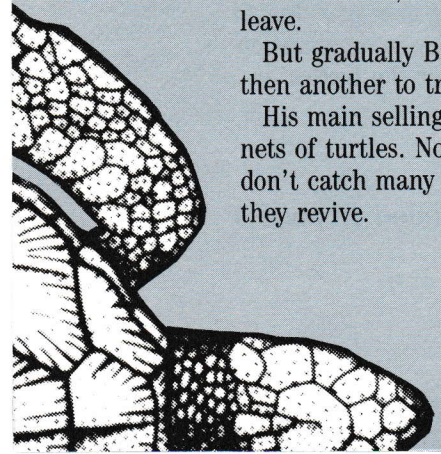
He’s convinced the TEDs save him time and money.

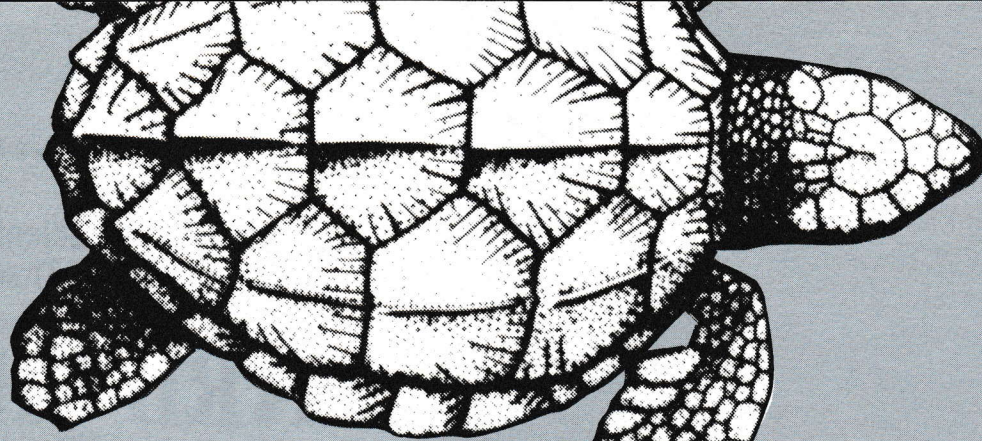
During July and early August, the fish bycatch was so heavy off Brunswick County beaches that fishermen split their nets to eliminate bycatch.

“Fishermen complain that they’re going to lose shrimp with TEDs,” Varnum says. “But you can’t tell me they don’t lose shrimp when they split their bags, too.”

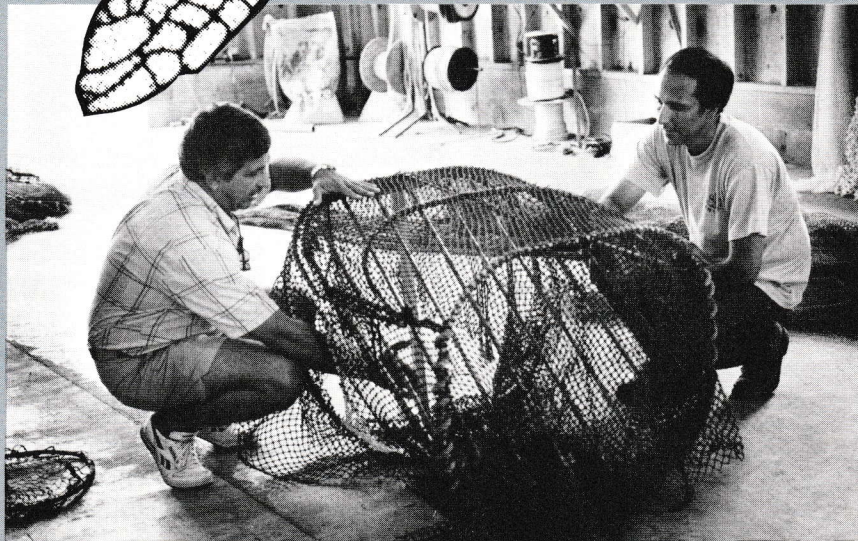
And Varnum says the devices are no more dangerous than other equipment on the boat’s deck.

“The only time the TED is anywhere near the men is when you whip the nets in,” Varnum says. “You have to watch when you drop it to see how the boat is rolling. But if your men have common sense, there should be no problem.”





Jim Bahen and Steve Parrish



Varnum is one of Bahen's best students. Others weren't as easily convinced. Even the promise of a free TED couldn't lure them to try the excluders. So Bahen tried another approach. He began working with Supply netmaker Steve Parrish to redesign the TED.

Parrish was a willing partner. He didn't want to produce the TED designed by the National Marine Fisheries Service.

'Fishermen think that netmakers like the TEDs because we can make a killing off it,' Parrish says. 'That's not the way we feel. It's a hindrance to us too.'

To build the NMFS TED, Parrish says he would have to hire extra personnel and buy new equipment.

He would like to find an excluder that is cheaper, easier and faster to build.

Bahen began telling Parrish about a 'soft' TED made from webbing. It had been developed in South Carolina.

The two put their heads together and came up with a TED made of 8-inch stretch mesh.

A piece of mesh is sewn in the net at an angle. When the turtle hits the mesh, it is propelled downward and out of a slit in the bottom.

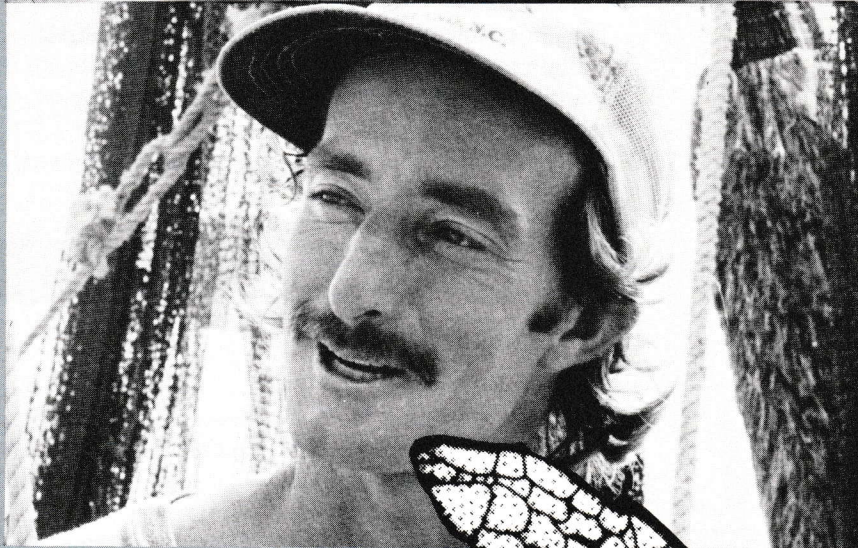
The slit is kept closed with an elastic bungee cord. It provides the flexibility to allow large objects such as turtles and jellyballs to escape but otherwise keeps the flap closed and the shrimp in.

Bahen and Parrish are testing their TED on Varnum's boat. If all goes well, the pair plan to ask NMFS to qualify their soft TED for use.

Even skeptics like shrimper Ronnie Galloway of Supply say the soft TED may offer the best solution for all sides in the TED controversy.

It reduces TED costs, eliminates safety concerns, rids the nets of turtles and, best of all, catches shrimp.

And if Bahen can convince Galloway to use a TED, he knows he has a good lesson plan.



William Varnum





A

Photo by Norman Martin

The sea turtle has been roaming the globe for centuries. But for a creature with such an ancient history, it remains an enigma.

For the most part, scientists know only about the terrestrial portion of the turtles' lives—a small fraction of their lifetime.

For males, this time is limited to development in the egg, hatching and a short trek across the beach to the ocean. But females return to land more frequently to lay their eggs.

When female sea turtles reach reproductive maturity (about 20 to 25 years), they nest onshore three or four times a season. Some theories suggest they always return to their beaches where they were born, using olfaction, sand temperatures or water composition to guide them.

They nest only at night and use the moon to direct them inland. When a female finds an appropriate site below the vegetation line or near a dune, she digs a hole, lays about 120 eggs, then swims back to sea.

In 90 days, hatchlings crawl from the nest and head

Sea Turtles Provide Scientists With More Questions Than Answers

HARD SHELL TO CRACK

instinctively for the water in which they'll spend the rest of their lives.

But the odds are against them. Only 1 percent of the hatchlings from each nest reach maturity.

Once the turtles are in the water, the mystery begins. Scientists find it nearly impossible to keep track of the large reptiles.

Most efforts to tag turtles have been unsuccessful. Small tags break or fall off. Tagging by satellite is costly.

In addition, research is hindered by the turtle's lengthy life span. Most sea turtles live to be 100 years old or older, making it impossible for one researcher to follow a full life cycle.

Studying an endangered species creates problems, too. Population numbers are low. Special restrictions for testing exist. And the work is expensive.

But scientists persist. They know a better understanding of this unique creature will help improve conservation strategies.

CONTROVERSY

Continued from page 6

Clearly on the side of the turtles is the Center for Environmental Education in Washington, D.C.

Mike Weber, vice president for programs for CEE, says his agency has worked nationally and internationally to save the ancient, but threatened sea turtle. Part of their involvement included the TED public hearings and negotiations.

Weber said he was surprised by DMF's opposition to the TED regulations.

"We believe that the Division of Marine Fisheries is twisting available information to suit conclusions they've already come to," Weber says. "I don't think their data will stand up to peer review."

And Weber is concerned about DMF's possible lawsuit.

"It's a bad situation," Weber laments. "I hope we can work it out. But if they pursue this lawsuit, we will

file a counter lawsuit. And in that suit we will ask that TEDs be required in all waters."

As representative organizations toss points and counterpoints back and forth about the TED, the time for its mandatory use approaches.

North Carolina shrimpers have eight months leeway. But faced with the inevitable, the fishermen are making phone calls and asking Sea Grant's marine advisory agents about the excluder devices.

In Brunswick County, Jim Bahen, a Sea Grant advisory agent, has distributed 42 free TEDs from NMFS.

The fishermen are installing the TEDs and getting accustomed to the way they pull in the water, Bahen says.

"Once they put the doggone thing on, they're going to find it's not as bad as they think it is," Oravetz says. "It's not going to put the shrimping industry out of business."

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.



This fall, why not combine a short beach vacation with education? Join Sea Grant, the N.C. Wildlife Federation and the N.C. Aquarium at Pine Knoll Shores Oct. 1 to 4 for a conservation retreat.

The weekend event will offer a chance to learn about the natural history of the state's barrier islands. Choose from classes such as barrier island folklore, seafood preparation and cooking, outdoor photography, marsh ecology, and seashell identification.

The retreat will be headquartered at the John Yancey Motor Inn on Pine Knoll Shores, and most classes will be held at the N.C. Aquarium. Participants will arrive on Thursday night, and classes will be held Friday and Saturday.

For more information, write the N.C. Wildlife Federation, Box 10626, Raleigh, N.C. 27605. Or call 919/833-1923.

As the first cool breezes of fall blow over coastal waters, schools of "blues," trout and mullet begin to migrate, or "run" as coastal folks say.

It's a perfect time to have a gill net set and waiting.

Sea Grant can help you prepare your net with its publication, *How to Hang a Gill Net*.

The booklet provides a step-by-step description for buying the supplies and hanging the net.

The versatile net can be used to catch a variety of fish—trout, hake and mackerel to name a few. And it can easily be staked, anchored, allowed to drift or pulled by a boat.

Aptly named, the gill net actually gills fish. The meshes are large enough to allow a fish's head, but not the rest of its body, to pass. When the fish tries to back out of the net, it gets caught behind the gill covers.

For a free copy of *How to Hang a Gill Net*, write Sea Grant. Ask for UNC-SG-79-03.



Sea Grant agent Bob Hines is getting the "hang" of putting offshore obstructions on computer. Hines is updating a list of inshore and offshore Atlantic hangs and obstructions.

He recently traveled to the Alabama Sea Grant Program to observe how agents there put a similar list on computer. The hang log includes the Loran coordinates of wrecks, vessels and other structures buried in the Gulf.

Gulf fishermen can request the entire list, or they can have agents print out a list of hangs for a specific area.

Hines wants to develop a similar system for Atlantic hangs. He knows a hang can cost a fisherman hundreds of dollars in torn or lost nets.

And the obstructions often make excellent sportfishing and diving locations.

If you have hangs you'd like to contribute to Hines, write him at P.O. Box 896, Atlantic Beach, N.C. 28512. Or call 919/247-4007.

Or if you'd like a copy of Sea Grant's *Hangs and Obstructions to Trawl Fishing Along the Atlantic Coast of the United States*, send \$2 to Sea Grant. Ask for publication number UNC-SG-83-01.

For more information on Alabama's hang log, call Sea Grant agent Tony Lowery at 205/661-5004. Or write him at Alabama Sea Grant Advisory Service, 3940 Government Boulevard, Suite 5, Mobile, Ala. 36609.

Celebrate the state's seafood heritage at the North Carolina Seafood Festival. From Oct. 1 to 4, the Morehead City waterfront will be transformed into a showcase for the catch of Carolina.

The four-day extravaganza will include sporting events, educational exhibits, musicians, dancers, fireworks, a boat parade and more. For seafood lovers looking for a real taste of the festivities, the highlight will be a seafood sampling tent.

Sea Grant will present a series of seminars on topics such as seafood and health.

The festival has been organized by a group of volunteer citizens and businessmen from Carteret County. It is designed to promote the state's seafood catch and educate people about the importance of the resource to the state's economy.

For more information about the first North Carolina Seafood Festival, contact Carolyn Barnett at 919/726-1212.



Wayne Wescott is trying to interest the blue crabs in Roanoke Sound in a new meal with an artificial flavor. Wescott, a Sea Grant marine advisory agent, is testing several formulas of an artificial crab bait developed by Du Pont.

The company has successfully developed an artificial bait for crawfish and is hoping to do the same for crabs. It is a mixture of polymers and fish meal.

The bait was formulated to attract the feisty scavengers and to last in the crab pot for up to one week. If it works, the 3-inch long, 2½-inch diameter bait logs could decrease the amount of labor and, perhaps some of the expense, required for crab potting.

So far, Wescott's test results have not been promising.

He's tried several different artificial bait formulas, but none have lasted a full week. And the catch ratios were down 50 percent compared to pots baited with fish.

But Wescott has several more formulas to try. He'll be testing those in September. Watch "The Back Page" for further results.

Continued on next page

The N.C. Natural Heritage Foundation has published a guide to many of the state's outstanding natural areas. *A Directory to North Carolina's Natural Areas* describes 108 locations from the mountains to the barrier islands that are accessible to visitors.

The 98-page booklet describes state parks, state wildlife gamelands, estuarine reserves, national parks and forests, as well as preserves owned by private conservation groups.

For a copy of the directory, write the N.C. Natural Heritage Foundation, P.O. Box 11105, Raleigh, N.C. 27604. The cost is \$5.



Sea Grant has a guide to some of the state's best offshore fishing spots, and strangely enough the guide is called *The Hardbottom Distribution Map*.

"Hardbottoms" is a geologic term for underwater mesas. These mesas and their jagged edges form natural reefs that attract some of the ocean's most delectable fare—

snapper, grouper and black bass.

The hardbottoms in Onslow Bay—an area between Cape Lookout and Cape Fear—are pinpointed on a map. Using the map's Loran grid, fishermen can locate the reefs.

Offshore fishermen say the maps will take much of the guesswork out of snapper and grouper fishing in Onslow Bay.

The flip side of the 39-by-27 inch poster features five attractive, four-color paintings of the underwater reefs and the flora and fauna they attract.

This side of the poster makes an excellent educational tool for teachers and students. The realistic paintings can provide endless classroom discussion of offshore geology, underwater habitats and species identification.

The poster costs \$5. For a copy, write Sea Grant. Ask for UNC-SG-86-25.

The 1987 Marine Expo will be held Sept. 27 to Oct. 4 in Wilmington, N.C. The weeklong event, held in conjunction with Wilmington's Riverfest, features a series of events focusing on marine

resources, educational opportunities, and the potential for future development.

This year underwater explorer Sylvia Earl will deliver the keynote address Tues., Sept. 29. And Emory Kristof, *National Geographic* underwater photographer, will present some of his work Oct. 1.

Staff from Sea Grant and other marine scientists will present some of the educational seminars for the expo.

For more information about Marine Expo '87, call 800/922-7117 in North Carolina or 800/222-4757 in the eastern United States.

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