UNC Sea Grant

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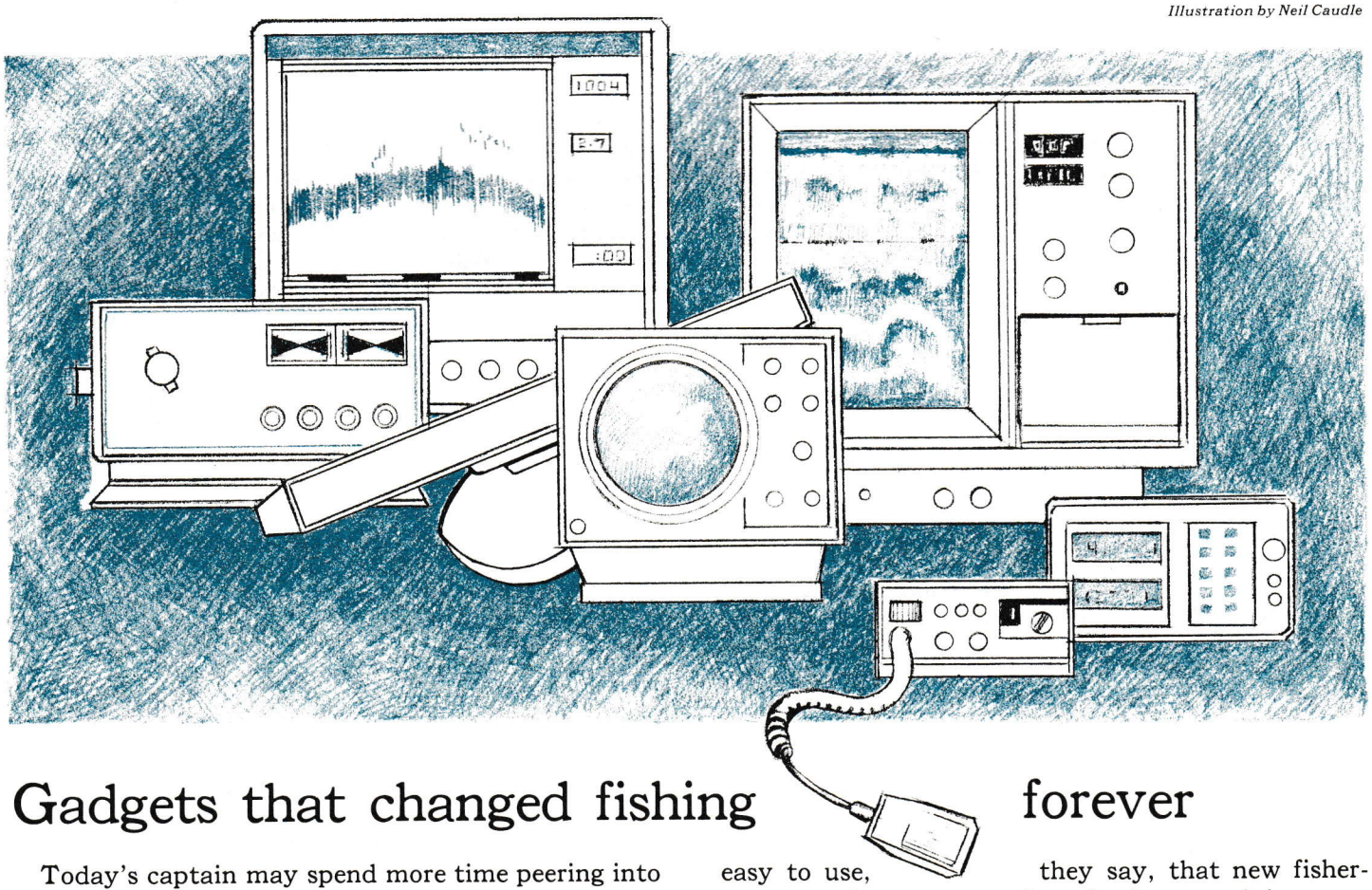
COASTWATCH

Illustration by Neil Caudle



Gadgets that changed fishing forever

Today's captain may spend more time peering into video screens and printouts than he does peering into water.

Fishermen today won't leave the dock without their solid-state circuits, their transducers, their computer chips. They listen for fish with electronic ears. They sail to sea and home again on the pulse of a radio wave.

The value of North Carolina's seafood catch has doubled in the past five years, to a single-year record of $60 million for the dockside value. Many fishermen will tell you they would never have landed that much seafood without the new generation of electronics.

Others will argue that new gear has made our fleet so efficient, so adept at raking in the catch, that we're fishing ourselves out of business. The new gear is so easy to use, they say, that new fishermen can jump into business and be competitive more quickly than ever before.

"It (electronic gear) probably does have some effect, because it increases efficiency," says Mike Street, of the N. C. Division of Marine Fisheries. "Whether that is a significant factor in putting pressure on stocks, I don't know."

And, it's not only the commercial fleet that's laying out hard cash at the electronics store. Sportsfishermen by the thousands are wiring their boats and comparing wattages.

This month, *Coastwatch* looks at marine electronics—who needs them, how they work, and what we did before we had them.

Electronics: what you'll plank down to plug in

To the uninitiated, a first visit to the marine electronics store is like walking into the nest of some newly hatched species of gizmo. The things are so animated, you can almost imagine one perched on the shoulder of an old skipper, blinking its digital eyes and chattering away in the latest "user-friendly" computer-speak.

But for all their gadgetry, these critters are not toys or pets. They are tools—the working tools of the serious fisherman.

Jim Bahen, Sea Grant's marine advisory agent at Fort Fisher, says that in the last ten years, electronics have revolutionized the fishing industry. It's part of Bahen's job to help fishermen choose and use gear that improves their performance. He spends much of his time helping fishermen put together the right combinations of boats, rigs and electronics.

"These days, there are more and more boats going after fewer and fewer fish," Bahen says. "It's practically impossible to compete in the offshore fisheries without electronics. This gear is so important to the commercial fishermen that many of them have gone so far as to buy back-up units, just in case something breaks down."

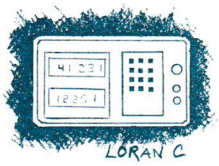
The shopping list for a commercial fisherman is often a bit longer than that of a recreational fisherman, but Bahen says the basic types of equipment are very much the same. The inset below gives a brief rundown of the most popular, and most useful, instruments.

But these are by no means the only electronic instruments in the cockpit. Side-scan sonar functions something like a depth recorder aimed forward and to either side, instead of downward. Transducers are mounted so that they pick up schools of fish in the surrounding waters.

"Side-scan is good for, say, a mid-water trawler looking for mackerel," Bahen says.

Fishermen sailing far offshore, around the continent or around the world, often add some other high-priced items

The best sellers

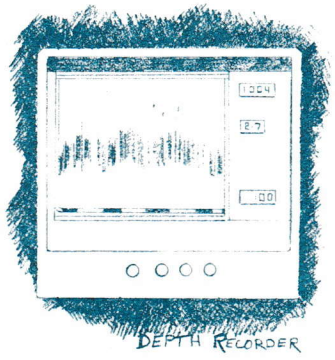


Loran receivers pick up radio waves broadcast from towers onshore and, by comparing the signals, "plot" the position of the boat at sea. Loran A, a navigation system developed by the U. S. during World War II, gave way a few years ago to loran C, a more precise system that can help a fisherman pinpoint a fishing spot at sea and then return to within a few hundred feet of the same spot, sometimes as close as 50 feet to a favored reef or wreck. The most sophisticated machines have computers that can remember the exact route a boat travels and, coupled with the automatic pilot, steer it along the same path next trip.

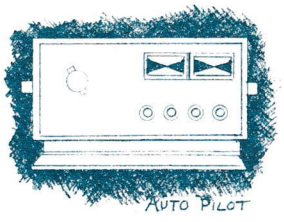
"Now, a captain can plug a course into his loran, go below and relax, and his boat will steer a straight course to the site," Bahen says. Price range: $800 to $4000.

VHF radio gives the captain radio communication with other boats, bases on shore, and with the Coast Guard, which monitors channel 16 for distress calls. NOAA weather radio broadcasts bulletins at 162.55.

"VHF has just about replaced the CB," Bahen says. "It has a much longer range, and a greater number of channels. Most of the boats now have VHF radios." Price range: $129 to $1000.



Depth finders use an electronic transducer mounted on the boat's hull to broadcast sonic waves and then record and display the depth of the bottom and other objects under the boat. Depth "indicators" (price range: $100 to $500) report the depth of the bottom in numbers or display the reflected image of fish and bottom contours on a screen. Depth "recorders" (price range: $300 and up) print these images out on paper. Some units, priced from about $1500, combine the two systems in one. The better instruments filter out noise from shafts and other gear for a "cleaner" picture. The most expensive types display the sonic picture in color, with different densities showing up as different colors. (See story on page 5.)



Autopilot frees the fisherman to do what he does best: fish. Autopilots are useful on big fishing boats and yachts. The modern autopilot electronically reads a course mapped in its computer, accommodates sea conditions, then turns the wheel. Alarms wired

Photo by Neil Caudle

Weather relay

Jim Bahen, a Sea Grant marine advisory agent at Fort Fisher, uses VHF radio to receive weather information from fishing boats offshore. Bahen relays word of conditions to the National Weather Service, which uses the information to update its advisories, broadcast at 162.55 MHz

to their list. A single-side-band radio gives tremendous range and keeps the captain in touch with stations thousands of miles away. "Weather facsimile" machines print out data and maps broadcast from the National Weather Service. Captains knowledgeable enough about meteorology can use the printouts to avoid bad weather and to find the water conditions fish favor.

"If you wanted to look at a satellite photo of the Gulf Stream, you could turn the weather facsimile machine on at a certain time of day and get the print-out," Bahen says. "But you have to be able to read the map."

Captains who travel beyond the reach of loran transmitters need a second navigation system. Some subscribe to the Omega service, a privately owned network similar to loran but with transmitting towers around the world. Others pay thousands of dollars for machines that navigate their boats by signals beamed from satellites.

"There are more and more satellites up there, and satellite navigation is the thing of the future," Bahen says. "But right now, it's just too expensive for most fishermen." Some of the bigger boats have on-board microcomputers that monitor all their machines and gauges, record travel times and speeds, report fuel efficiency, and help the captain choose the best routes.

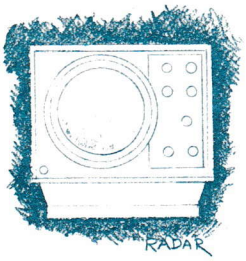
But it is not only the commercial fisherman who wants electronics. Bahen says that he has noticed a strong trend toward more electronics on smaller recreational boats.

"The sportsfisherman can get by with just a compass, and that should be the first thing he buys," Bahen says. "But if he's a serious fisherman and he loves to fish, he's going to have a good rod and reel, and he's going to want some good electronic equipment. Remember, he's competing too."

How much electronic equipment does a sportsfisherman need? And how much should it cost him? Bahen cites a typical case: the fisherman with a 23-ft. boat capable of going 25 miles offshore. He might have $8000 to $10,000 invested in boat, motor and tackle. Bahen says his first purchase, assuming he already has a compass, might be a medium-priced VHF radio. The next item would be a depth finder, either an inexpensive one with a digital indicator that will help the fisherman run unmarked inlets or, for the more serious competitor, a depth recorder. Then, if the boat has space for another antenna, the next piece might be a good loran unit for what Bahen calls "repeatability"—the ability to easily find the way back to

Continued on next page

to sonar and radar equipment warn the captain of traffic or hangs. Before electronics, autopilots, or "iron mikes," were mechanical contrivances of pullies and gears connected to a gyrocompass. The new machines are compact, reliable and expensive: over $1000, and typically at least $3000.



Radar units sweep the surface around a boat with radio waves beamed from transmitters mounted high on the boat. A receiver translates the reflected waves into bleeps on a screen. On fishing boats, radar is most useful as a safety device that warns the skipper of traffic, finds buoys and allows a trawler captain to keep an eye on neighboring boats, even in fog.

The two most important considerations in buying radar are power and discrimination. Powerful sets cost more, but power improves not only the range of the unit, but also its ability to define small targets at intermediate distances. Good discrimination in a unit allows it to separate objects close together—for example, boats fishing side-by-side. In general, the smaller the pulse length (the length of time taken for each burst of signals), the better discrimination.

It is best to mount a radar antenna as high as possible on a boat. However, doubling the height of the antenna will not double the unit's range. It will only increase the possible range by about one-third. Price: $3000 and up.

a rock or wreck that gave good results last time. The shopping list might look something like this:

VHF radio/antenna	$300 to $400
Depth recorder/transducer	$600 to $700
Loran receiver/antenna	$600 to $700

So, while the typical big-boat setup for a commercial fishing operation might require $9000 worth of electronics, the small-boat, recreational fisherman might only invest $1500.

Bahen offers some more pointers to the sportsfisherman who is interested in marine electronics: Choose a reputable dealer. Buy equipment that can be serviced locally. Ask the advice of experienced fishermen. And only buy what you can use.

"The guy who only goes out in his boat to do a little sightseeing once in a while doesn't need loran and depth recorders," Bahen says.

Bahen adds that, for now, it might even pay some fishermen to wait and shop around, before investing in marine electronics.

"The gear is changing all the time," he says, "and some of it is actually getting less expensive."

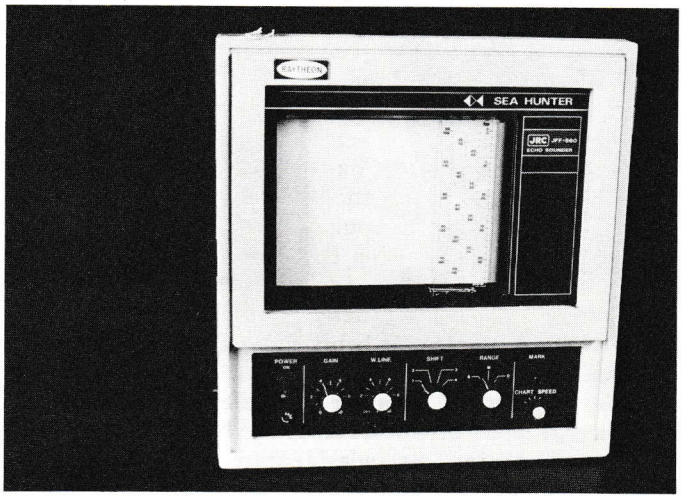
Mike Renn, who works in a marine-electronics shop in Wilmington, says that electronic gear is following the example of the pocket calculator.

"They're coming down in price and down in weight," Renn says. He says that a few years ago a typical loran receiver sold for around $3400 and was very bulky. A similar receiver now runs $800, will do the same job, and may be half the size of its predecessor.

"Just because a piece is big and expensive doesn't mean it is better," Renn says. "You have to shop around and compare features to get the best value."

—Neil Caudle

Photo by Nancy Davis



One version of the depth recorder

Photo by Neil Caudle

High-tech headboat

The pilothouse of a large North Carolina headboat sports an array of marine electronics, including autopilot and three different depth indicators. The depth machine mounted upper right was manufactured on Harkers Island

Scoping the catch as it swims

With the flip of a switch, one piece of electronic wizardry—a depth recorder—listens to the sea beneath a fishing boat and shows the captain graphically what it hears: fish. He sees his catch before he ever lowers a net.

The depth recorder works like this: a transducer, mounted on the boat's hull, transfers electrical impulses into mechanical sound vibrations that are broadcast at millisecond intervals down into the water in a conical beam. When the vibrations strike objects in the water, such as fish, the pulses are reflected back toward the surface. The transducer receives the pulses and converts them back into electrical signals which are fed into the depth recorder.

By calculating the time it takes for sound pulses to reflect back from objects or the ocean floor, the recorder can produce a display on paper or on a color video screen that shows the fisherman a sketchy image of what is beneath him.

Depth recorders can determine water depths, record a graphic profile of the ocean floor, indicate the composition of the bottom and locate fish beneath the boat. Today's commercial and recreational fishermen consider this piece of electronics almost as valuable as their first mate.

"You're wasting your time if you fish without a depth recorder."

—Ken Kramer

"You're wasting your time if you fish without a depth recorder," says Ken Kramer, a Morehead City commercial fisherman. "If you don't have one, you're putting yourself at a disadvantage by not being competitive." Kramer has had his boat equipped with a recorder for ten years. Kramer bottom fishes. He uses his recorder to locate schools of fish and determine the composition of the ocean floor. He looks for areas with a hard bottom made of shell, rock or coral—one that attracts the baitfish on which larger, more valuable fishes feed.

Depth recorders are also called echosounders or fish finders. But Kramer says the term "fish finder" is an advertising term. "A depth recorder, or fish finder if you want to call it that, doesn't find anything you don't run the boat over," he says.

To use a depth recorder fishermen have to do a little detective work to determine what kind of fish are being displayed. Recorders only provide clues fishermen can use along with their own knowledge of fish characteristics to make an accurate "guess" about the fish's identity. For example, fish with a swim bladder or air sac return stronger soundings than fish without the sacs.

Three types of depth machines are on the market—flashers, paper recorders and color scopes or "chromascopes." The flasher, the least sophisticated and least expensive, flashes the water depth on a digital readout as the boat moves along. There is no recorder, other than the fisherman's own memory. But the fisherman can tell if he is over a wreck, trough or reef, areas where fish might congregate. Duncan Amos, a gear and electronics expert with the Rhode Island Sea Grant Marine Advisory Services and a columnist for *National Fisherman*, says fishermen have to watch the flasher very closely if they're going to be useful. A good flasher will cost about $500, Amos says.

The paper recorder, the middle-range in expense and sophistication, graphically records a continuous profile of the area between the boat's hull and the sea floor on a strip of paper. Jim Bahen, Sea Grant's marine advisory services agent for the Wilmington area, recommends the paper recorder over the flasher if the fishermen can afford it. Bahen says the paper recorder offers the advantage of having a record of the area covered. "The fisherman can take the paper out of the machine, write the loran coordinates for that area and return there if the fishing is good," Bahen says. Paper recorders range from $300 to $16,000.

The state-of-the-art in fish finders is the color scope. On a small, computer-like video screen the fisherman can tell what is between his boat and the bottom by differentiating between colors. Denser objects are displayed in bright red; less dense objects are shown in yellow, green, purple and blue. Blue is the background color that represents water.

A color scope will cost fishermen between $2,000 and $18,000. But like other expensive electronics, as more manufacturers produce color scopes, prices will begin to fall, Bahen says. Color scopes are luxury items that only a few North Carolina fishermen can afford now.

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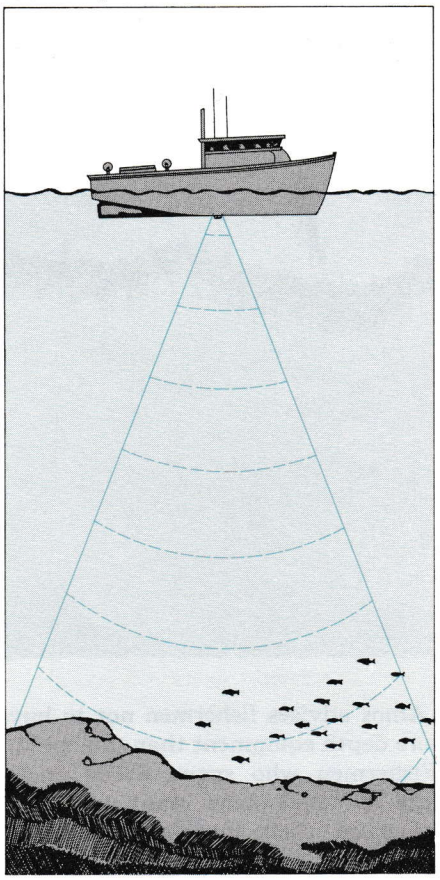
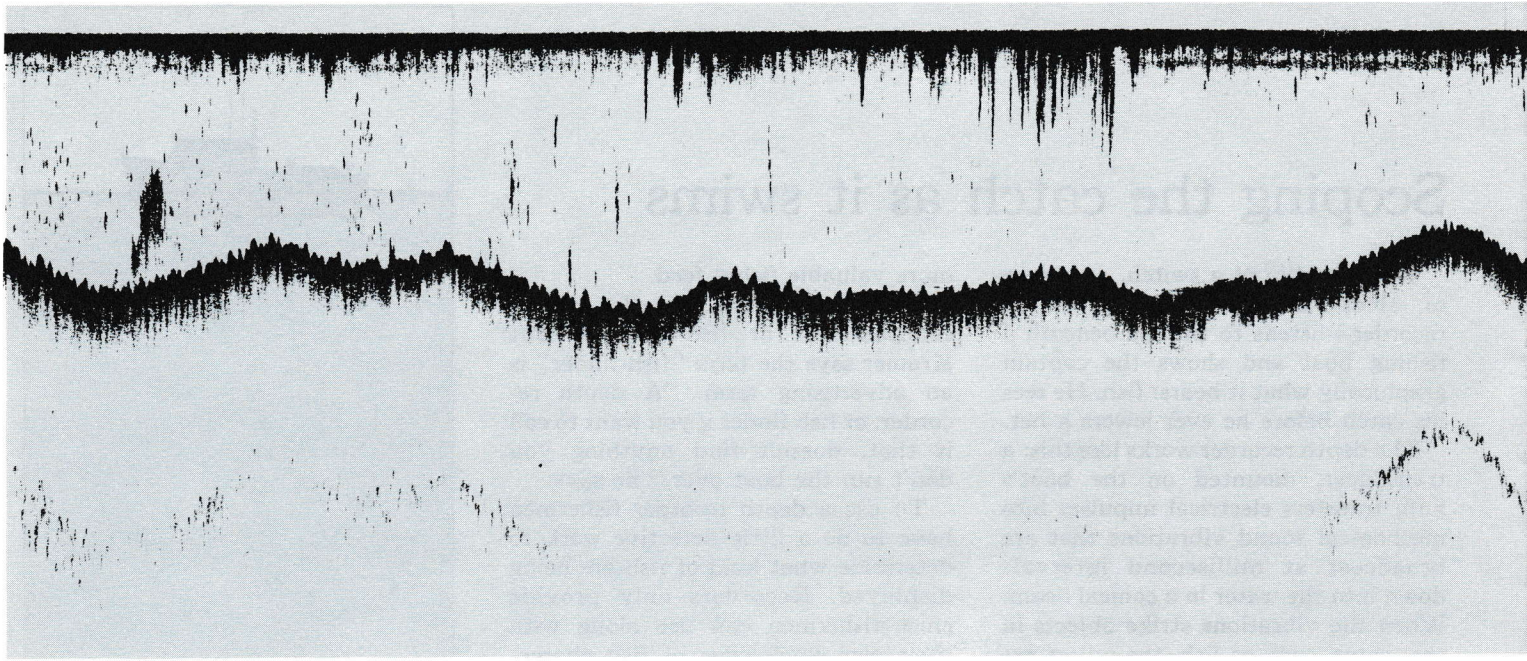
Illustration by Neil Caudle



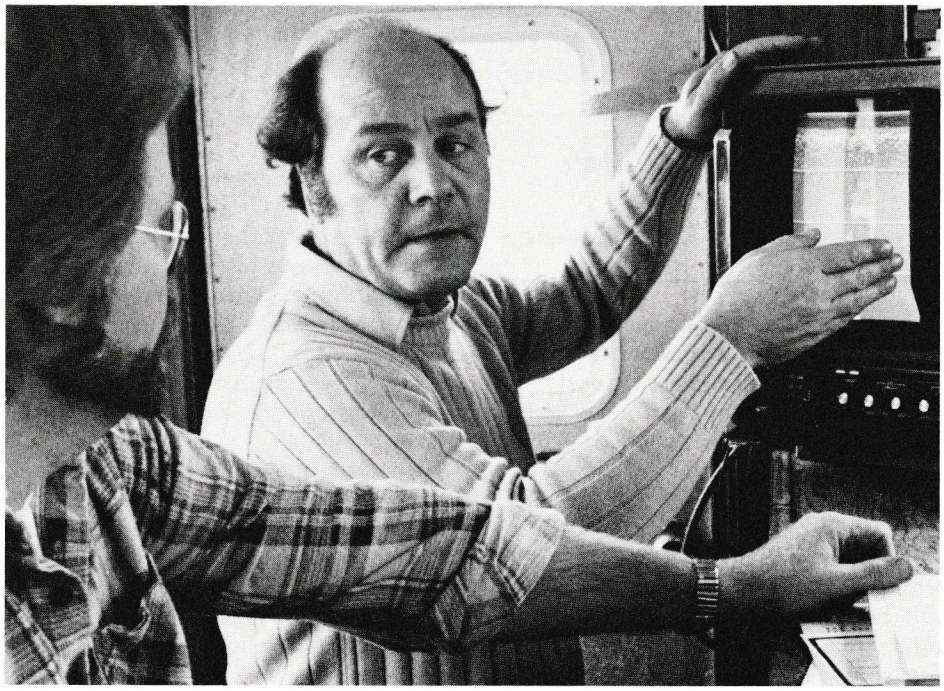
Transducers on boat's hull pulse sonic waves, recording the "echoes" of fish



Amos advises fishermen not to buy more depth equipment than they need. "Fishermen who spend $5000 on a piece of equipment want a $5000 return on their investment," Amos says. "That's why it is important for fishermen to get as much information as they can about the equipment before they buy."

Fishermen should consider these factors before choosing a recorder: the water depths at which fishing will take place, the fish being caught and the place on the boat where the transducer will be mounted. Amos has written a 68-page booklet, published by the University of Rhode Island Sea Grant Program, that will help fishermen choose a depth recorder based on their particular needs. The booklet, *A Fisherman's Guide to Echo Sounding and Sonar Equipment: Acoustic Fish Detection Instruments*, is available for $2 from the University of Rhode Island Marine Advisory Service, Publications Unit, Bay Campus, Narragansett, RI 02882.

Fishermen should also consider several features when selecting a depth machine. Amos says the most important features are frequency, transducer beam angle and pulse length. The right combination of these features can mean a more accurate picture of the area beneath the boat and a better chance of finding fish.

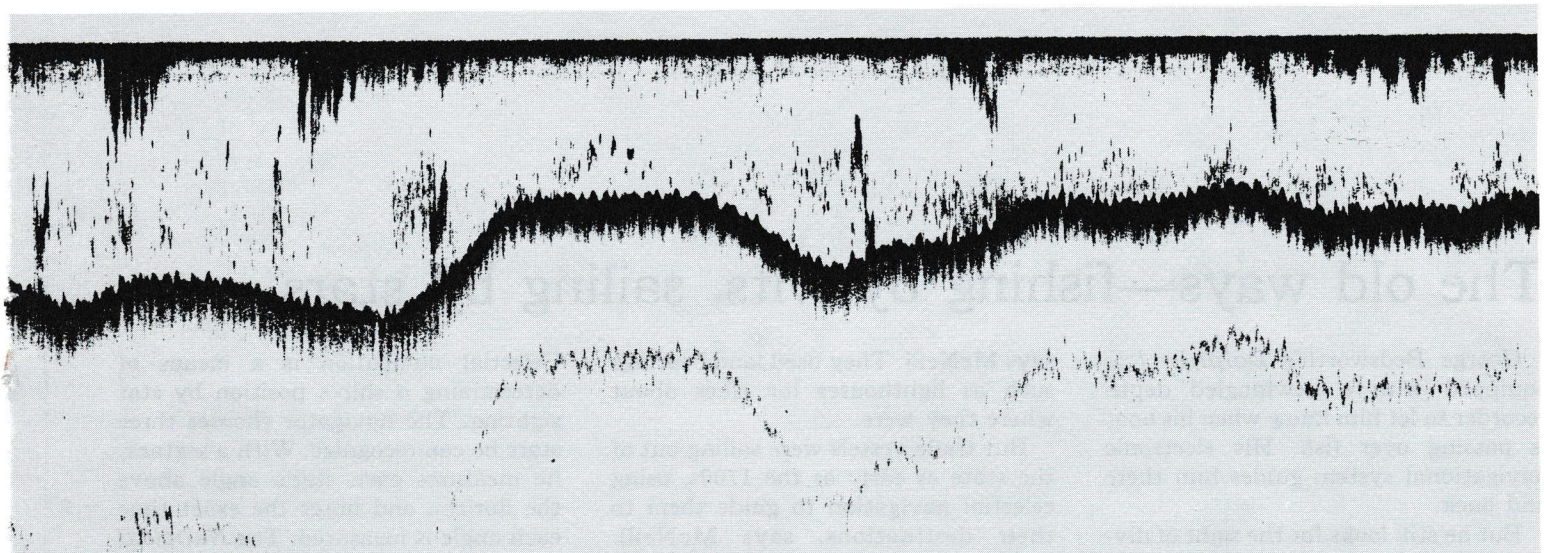


Duncan Amos demonstrating a color scope

For fishermen fishing shallow waters (less than 50 fathoms), a high-frequency depth recorder can be considered. But lower frequency recorders should be used for fishing in deeper waters and when fishermen need to determine the composition of the bottom. Many machines are now fitted with both a low and a high frequency, an ideal choice for the multi-purpose fisherman.

The beam angle of the transducer is one feature many fishermen overlook when selecting a depth recorder. Beam angles can range from 9° to 25° and affect the shape of the fish echoes on the recorder, the ability of the recorder to determine seabed composition and the ability to locate smaller fish at greater depths. Amos suggests selecting a wide beam angle for shallow fishing and a narrow beam angle for deep-water fishing. A wide angle for deep waters will show many more fish targets than a trawl could catch during a single tow; a narrow angle at shallow depths would limit the fish displayed.

Pulse length, the thickness of the sound wave transmitted by the transducer, can help a fisherman determine the size of the fish or schools of



Part of a depth recorder's printout: heavy line near center is the bottom; clustered specks at left turned out to be a school of Spanish mackerel; those at right were king mackerel

fish located, if the device is used correctly. The wrong pulse length can make a small fish look like a large fish or schools of fish look denser than they really are. Amos says a shorter pulse length distinguishes smaller objects better and provides a more accurate representation of the fish's size. But the shorter pulse length can not be used continuously in deep waters without sacrificing the seabed profile.

For deeper waters, fishermen need a recorder with a variable pulse length or a phase-ranging feature. The variable pulse length allows the fisherman to temporarily shorten the pulse length to look inside a school of fish. Using phase ranging, the fisherman can focus on a particular section of the water column.

For fishermen buying a paper recorder, Amos suggests equipment that uses paper no smaller than four inches wide. The recorder compresses hundreds of feet of sea information into a few inches of recorder paper. For the most detail possible, fishermen should buy a recorder that uses wider paper.

Correct installation of the transducer can make a decided difference in how well the depth recorder works. The transducer should be mounted on the boat's hull in an area with minimum noise interference from the boat's machinery or from movement through the water. Amos suggests mounting the transducer one-third to one-half of the vessel's length from the stem post, preferably beneath the fish-storage area.

And, like a musical instrument, a depth recorder may need a little fine-tuning after installation. A fisherman should make sure he is very familiar with the recorder's variable controls before adjustments are made.

The gain control, probably the most important variable control, requires careful adjustment for the recorder to operate at peak efficiency. The gain control works like the volume control on a stereo, picking up more sound and from farther away as it is turned up. If the gain control is turned up too much it will register extraneous noises, such as vibration from the boat's engines, as schools of fish.

For fishermen wanting more detailed information about the seabed or midwater regions, add-on functions are available for some depth recorders. The most common "extra" is the seabed locked-scale expansion unit. With this feature, a fisherman can magnify the display of any area he chooses over a seabed. The expansion unit allows accurate measurement of the fish echoes and their exact depth above the seabed. Another expansion unit, the midwater expansion, magnifies an area of the water column, but the data is not locked to the seabed. Another add-on feature is the net sounder or net monitor, used to provide data on the performance of the trawl nets.

Depth recorders were developed prior to World War II for navigational purposes, says Amos. But during the war, depth recorders were refined and used to look for enemy submarines and mines. After the war, an industry developed around these new electronics as manufacturers recognized their value to commercial fishing. By the late 1950s, most offshore commercial fishermen had installed depth recorders abroad their boats. Now every commercial and many recreational fishermen have at least one depth recorder and sometimes as many as four recorders, Amos says.

In the future more automation and computerization is likely for the commercial fishing industry, says Dave White, a manufacturing representative for Epsco Marine Systems of Seattle. "Instead of having six thousand boxes hanging from the ceiling giving loran, depth recorder and other information, it's all going to be in a . . . video computer console." he says.

White says he already knows about 20 West Coast fishermen who are using computers. "There is a fisherman in Seattle who put a computer on his boat and everybody laughed. What he did was enter all the information gathered while fishing into the computer," White says. "After two to three years of entering data, he was able to punch the computer, and, based on the day's conditions, determine the best places to fish. His fish catch actually increased 25 percent."

—Kathy Hart

The old ways—fishing by wits, sailing by stars

George Bedsworth's *Dolphin I* is equipped with a newfangled depth recorder to let him know when his boat is passing over fish. His electronic navigational system guides him there and back.

But he still looks for the sight of diving gulls, still smells the air for the odor of fish, still watches for an oil slick that will tell of a school of fish. And, he can still navigate without fancy electronic equipment.

For nearly 50 years, Bedsworth has taken charters out of Morehead City. And for nearly as long, he's relied on his own senses to find fish and to find his way around the water.

It's only been in this generation that we've learned to rely on electronics for fishing and navigating. Bedsworth, just one fisherman who's been around long enough to learn the old and the new methods, says it's not time to throw away tradition yet. What electronics has done to fishing, he says, is to make it more convenient. Depth recorders will let you know if there are fish under the boat, but you've got to know where to find them first.

It takes time to recognize the signs of fish, says Bedsworth. A trained eye can spot the darkened blob of a school of fish. For example, menhaden swim in a tight bunch and appear black against the water.

A trained nose can sniff the smell of a school of fish. Bedsworth says he also watches for the oily film on the water's surface —the sign of a large school. And, the old standby of watching for birds feeding on fish still works, he adds.

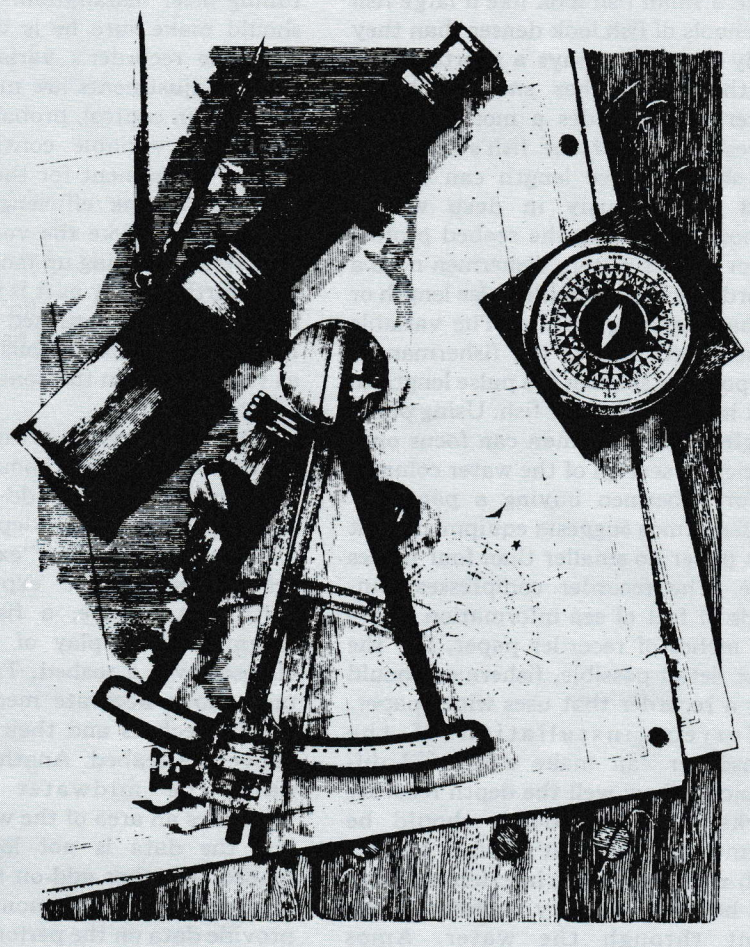
It's not time to give up on the old ways of navigation, either, says Charles McNeill, director of the Hampton Mariner's Museum in Beaufort. He says he's amazed at how little navigating experience some of the younger fishermen and sailors have these days.

Traditionally, North Carolina fishermen have stayed close to shore, says McNeill. They used land bearings such as lighthouses for clues about where they were.

But trade vessels were sailing out of the state as early as the 1700s, using celestial navigation to guide them to their destinations, says McNeill. Celestial navigation is a means of determining a ship's position by star sighting. The navigator chooses three stars he can recognize. With a sextant, he measures each star's angle above the horizon and notes the exact time each angle is measured. The *Nautical*

"Electronics are subject to failure . . . But the stars will always be there."

—Joe Snare



Old-time tools of navigation: dividers, spyglass, sextant and compass

"The new equipment won't do anything the old wouldn't do. It's just easier now."

—Charles McNeill

Almanac tells the navigator where each star is in relation to the earth's surface and he is able to determine his ship's position.

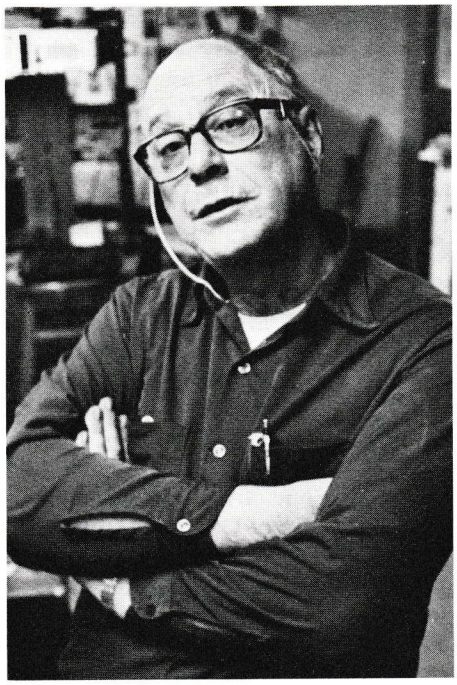
With celestial navigation, a boater can determine his position within one-eighth of a mile—without the use of electronics. "The new equipment won't do anything the old wouldn't do," says McNeill. "It's just easier now."

At the Morehead Planetarium in Chapel Hill, Joe Snare teaches recreational boaters the ancient art of celestial navigation. Many of his students' vessels are equipped with loran, but Snare says his students prefer to put their faith in the stars.

"Electronics are subject to failure, and when you're miles from nowhere, there's nobody to call to fix it," says Snare. "But the stars will always be there."

The view of the new electronics is the same from somebody who makes the gear. Jerry Barton, a Harkers Island electronics manufacturer, likes to talk about the gear's evolution. He points out that the first sonar of the sea belonged to the dolphin, which transmitted a sound and received the echo with its forehead. And the patent on celestial navigation belongs to migratory birds, which have been found to use the stars to navigate on their journeys.

While sonars were around during World War I, they weren't used commercially until after World War II, says Barton. He boasts of being the only U.S. manufacturer of fish scopes. Unlike most depth indicators on the market today, Barton's fish scopes use multiple transducers, allowing fishermen to tell if fish are to the left or right of the boat as well as directly underneath. The scope is also equipped with a bell that pings as it detects fish so that fishermen don't have to continually watch a screen.



Jerry Barton

Now, Barton is even working on a electronic sextant to help boat owners navigate by the stars, without having to do any computations. So, why do we need a sextant if we've got loran to navigate for us? Barton says that if the United States were involved in a war, navigational systems such as loran might be squelched.

When Barton began manufacturing his scopes, commercial fishermen in North Carolina were still using primitive gear and techniques, he says. It's improved since then, but Barton thinks there's still room for advances.

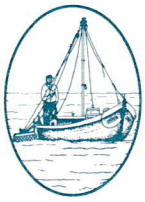
He expects fishermen of the future to be equipped with the most advanced fish scopes, deep water thermometers and salinometers to gauge the levels of salt in the water.

But even after his thirty years of working with electronic gadgetry, Barton concedes that his fish scope won't do much good unless fishermen know where to look for fish.

—Nancy Davis

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).



The Albemarle shad boat may have seen some better days, but Mike Alford, curator of historical maritime research at the Hampton Mariner's Museum in Beaufort, is trying to change that for one old vessel.

He and a boat builder from Beaufort are restoring a shad boat to its original 1915 state. But what took a month to accomplish then will take Alford at least six months, including time for researching the boat's construction.

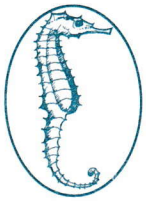
Alford says, "The first shad boat was apparently built in the 1870s on the east end of Roanoke Island by George Washington Creef. And where he got his ideas from we don't exactly know, but the boat is unique and very successful and was rapidly adopted by fishermen on the Outer Banks and Roanoke Island."

Originally sail-powered, most of the shad boats were converted in the early 1900s to use automobile engines for power. These days, there are only about a dozen in use.

In its day the boat was a favorite of fishermen because of its distinctive round bottom and its unique style of construction.

"The boats are real seaworthy," says Alford. "Fishermen like them. They're safe and comfortable to work in rough water."

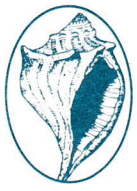
An international conference on sail-assisted commercial fishing vessels will be held May 15-16 at the Tarpon Springs Yacht Club in Tarpon Springs, Florida. The conference will be sponsored in part by Sea Grant programs in Florida and Virginia. Registration is $30 for commercial fishermen and $60 for others. Register in advance by contacting John W. Shortall, University of South Florida College of Engineering, Tampa, Fla. 33620.



It's not unusual for Sea Grant agent Larry Giardina to advise a fisherman about taxes or Bob Hines to tell an angler how to maintain his gear. But what is unusual is that Giardina and Hines are doing their advising via the television set.

Giardina and Hines, the Sea Grant marine advisory agents at Bogue Banks, appear on Vision Cable channel 12 every other Wednesday evening at 7 p.m. in Carteret County. Their 30-minute show, called "The Sea Grant Program," focuses on topics of interest to the marine community—boat and gear maintenance, marine electronics, smoking fish and more. Other UNC Sea Grant agents and specialists will make guest appearances on the program, produced by Vision Cable.

On the weeks Giardina and Hines aren't on the air, the time slot is filled by a program from the N.C. Marine Resources Center at Bogue Banks. Center staff tell audiences about the state's coastal creatures and habitats.



Lundie Spence's "Oceans" course, taught as an interdisciplinary course at North Carolina State University, has been evaluated as one of the best courses in the Department of University Studies. Spence, UNC Sea Grant's marine education specialist, has been teaching the course during fall semester to about 30 college students since 1979. Spence teaches students about many aspects of the ocean environment—coastal geology, estuarine ecology, marine biology, coastal history—often drawing on Sea Grant staff and researchers for their expertise.

While Spence was collecting kudos from the university, John Sanders, Sea Grant's marine weather awareness specialist, was collecting an award from the National Weather Service. In a March 23 luncheon, Sanders was given a Special Service Award from Richard Augulis, director of the National Weather Service Eastern Region, for increasing the public awareness about coastal storms, particularly hurricanes, through emphasis on preparedness and storm education.

"We feel John has heightened coastal awareness of hurricanes," says Joe Pelissier, deputy meteorologist-in-charge of the National Weather Service office in Raleigh. "We feel the next time a devastating storm like Hazel comes along, people on the coast will better understand the threat, know what things like storm surge mean and take the precautionary measures necessary." Sanders completed his two-year project in March.

Since 1978 a colony of endangered brown pelicans has nested on two dredge-spoil islands in the lower Cape Fear River. But for the last two years, erosion has threatened the homes of some 800 feathery residents of the islands.

"The south island is eroding much more rapidly than the northern island and is down to a level that I would estimate there would be probably no more than about a foot above mean high tide," says Jim Parnell, a biologist at the University of North Carolina at Wilmington.

Parnell, whose Sea Grant research has shown the value of dredge-spoil islands as nesting grounds for waterbirds, recently advised the Army Corps of Engineers on an effort to save the birds' homes. The Corps dumped

more dredge material on the island to raise it to a safer elevation. Without the extra dumping, "one good storm during the nesting season could wash out a hundred pelican nests very easily," says Parnell.

But Parnell adds the action by the corps wasn't strictly for the birds: a lot of wildlife lovers will benefit, too.

Sea Grant's newsletter, *Coastwatch*, has for the second consecutive year won top honors in international competition sponsored by the Society for Technical Communication (STC). The newsletter received the award of "Distinguished Technical Communications," first place in its category. *Coastwatch* is edited by Neil Caudle; Kathy Hart and Nancy Davis are staff writers.

Another UNC Sea Grant publication, *A Homeowner's Guide to Estuarine Bulkheads*, placed third in its category and received the society's "achievement" award. The booklet, which advises coastal property owners on ways of mitigating the effects of estuarine shoreline erosion, was written by Spencer Rogers, UNC Sea Grant's coastal engineering specialist and illustrated by Deborah Ford, a member of the Sea Grant staff at Ft. Fisher.

These two publications, along with three others from UNC Sea Grant, also won awards in regional competition sponsored by the STC's Carolinas Chapter.

To help fishermen avoid costly hangs, Sea Grant has just updated its book, *Hangs and Obstructions to Trawl Fishing*. The book was compiled from the records of trawler captains, who were willing to share their hang logs with others. It lists hangs by loran headings and covers waters off the Atlantic Coast from Cape Cod to Florida.

If you would like a copy of the hang log book, send $2 to Sea Grant, Box 5001, Raleigh, N. C. 27650-5001. Ask for UNC-SG-83-01.

Sea Grant's waterproof fishing maps have been revised and reprinted in time for spring fishing. The first chart shows fishing locations near Masonboro Inlet on one side, and has locations off Beaufort Inlet on the other. The second chart covers the waters around Roanoke Island and those off Oregon Inlet.

Both charts include loran headings and are designed as a navigational aid. They are place-mat size. For your copy, send $1 for each chart (or $2 for the set of two) to Sea Grant, Box 5001, Raleigh, N. C. 27650-5001. Be sure and specify which chart you're ordering.

Aquaculturists—if you're interested in raising mountain trout, or curious about how it's done, a new publication from the N.C. Agricultural Extension Service might interest you. The booklet is called *North Carolina Mountain Trout Production: Investment and Operating Cost Estimates for a Trout Production Enterprise*. It was written by Jim Easley, an NCSU extension economist and Sea Grant researcher. Copies of the booklet may be obtained by writing Easley at the Department of Economics and Business, North Carolina State University, Raleigh, N.C. 27650-5576.

North Carolina State University Chancellor Bruce R. Poulton provided written testimony to the U.S. House of Representative's subcommittee on Oceanography in April. Poulton wrote on behalf of the reauthorization of the National Sea Grant College Program (House Bill 1643), pending before the House Committee on Merchant Marine and Fisheries, chaired by Representative Walter Jones, D-N.C. The Sea Grant Program was created by an act of Congress and must periodically be reauthorized by Congress so it can continue to operate as a federal program.

Fishermen are always looking for ways to increase their catch. That's why Wayne Wescott, Sea Grant's marine advisory agent on Roanoke Island, and Murray Bridges, a Collington crab shedder, are testing a peeler pound, a net used by Chesapeake fishermen to catch hard crabs and peeler crabs. Chesapeake fishermen report the net catches more hard crabs and peeler crabs than crab pots or peeler pots. Wescott and Murray want to find out if that information holds true for

Continued on next page

Coastwatch is a free newsletter. If you'd like to be added to the mailing list, fill out this form and send it to Sea Grant, Box 5001, Raleigh, N.C. 27650.

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To help us specialize our services, please answer these questions.

I am in the following line of work:

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

Coastal property owner __yes __no Boat owner __yes __no

North Carolina waters. They will begin testing the net this spring. The team will also be weighing the costs of the using the nets against the costs of using pots. And they'll be trying to find out where the nets work best.

For a crab processor, cooking a crab for eight minutes and cooking it for 15 minutes could mean the difference between making it or breaking it in the business.

Bob Pittman, a partner in Osprey Seafoods in Chocowinity, likens cooking crabs to cooking hot dogs. "You take a hot dog and put it in the microwave for one minute and everything is just right. But you put it in there for ten minutes and it'll come out all shriveled up."

That's what was happening to crabs at the seafood plant when Pittman and his partner bought the company in September. "We were just overcooking the crabs and driving all the moisture from the meat," says Pittman.

So Pittman called on Sam Thomas, a Sea Grant seafood specialist at the North Carolina State University Seafood Laboratory in Morehead City, to evaluate the cooking process at the plant.

Thomas set up thermometers inside the cookers to monitor the temperatures while the crabs were cooking. He found that the entire cooker was overheating, improperly ventilating and causing excessive pressures.

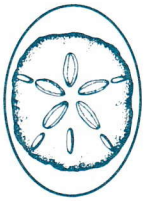
Most cookers operate under 12 to 15 pounds of pressure per square inch. "When you contain that inside a vessel like a crab cooker, the pressure buildup inside on the walls and doors is tremendous," says Thomas. In this case, pressures were higher than they should have been and could have been dangerous.

The solution? Thomas estimated the optimum temperature and pressure over an eight-minute period and recommended venting the cooker and adding bleeders or small openings to allow steam to escape.

Those recommendations made the system safer and more efficient, says Pittman. Now, instead of yielding nine pounds of crab meat for 100 pounds of crab, Pittman says he gets 10 pounds of meat for the same 100 pounds of crab.

That may not sound like much, but consider that it's not unusual for Pittman's company to process 10,000 pounds of crab in one summer day.

If crabmeat were $6 a pound, that one extra pound of crabmeat he gains is a savings of $6 per 100 pounds or $600 in one day.



Sea Grant has just published a series of working papers and technical reports. *Modeling Estuarine Migration and Abundance of the Brown Shrimp (Penaeus Aztecus) of Pamlico Sound, North Carolina,* by Marc-david Cohen and George S. Fishman of the Curriculum in Operations Research and Systems Analysis at the University of North Carolina at Chapel Hill, develops a series of models that examines the in-migration of brown shrimp to the estuarine nurseries and the out-migration of shrimp from the nursery to fishable areas. The models are part of a larger study designed to develop methodologies for evaluating fishery management policies. For a copy of this working paper, write UNC Sea Grant, Box 5001, Raleigh, N.C. 27650-5001. Ask for publication UNC-SG-WP-83-1. The cost is $2.75.

An Evaluation of Five Types of Binders to Improve the Artificial Diet of Young American Eels, by James F. Salevan of the North Carolina State University Department of Zoology, examines and evaluates five types of binders used in the preparation of feeds for American eels under culture. For a copy of this publication, write UNC Sea Grant. Ask for publication UNC-SG-WP-83-3. The cost is $1.25.

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