UNC Sea Grant

September, 1983

COASTWATCH

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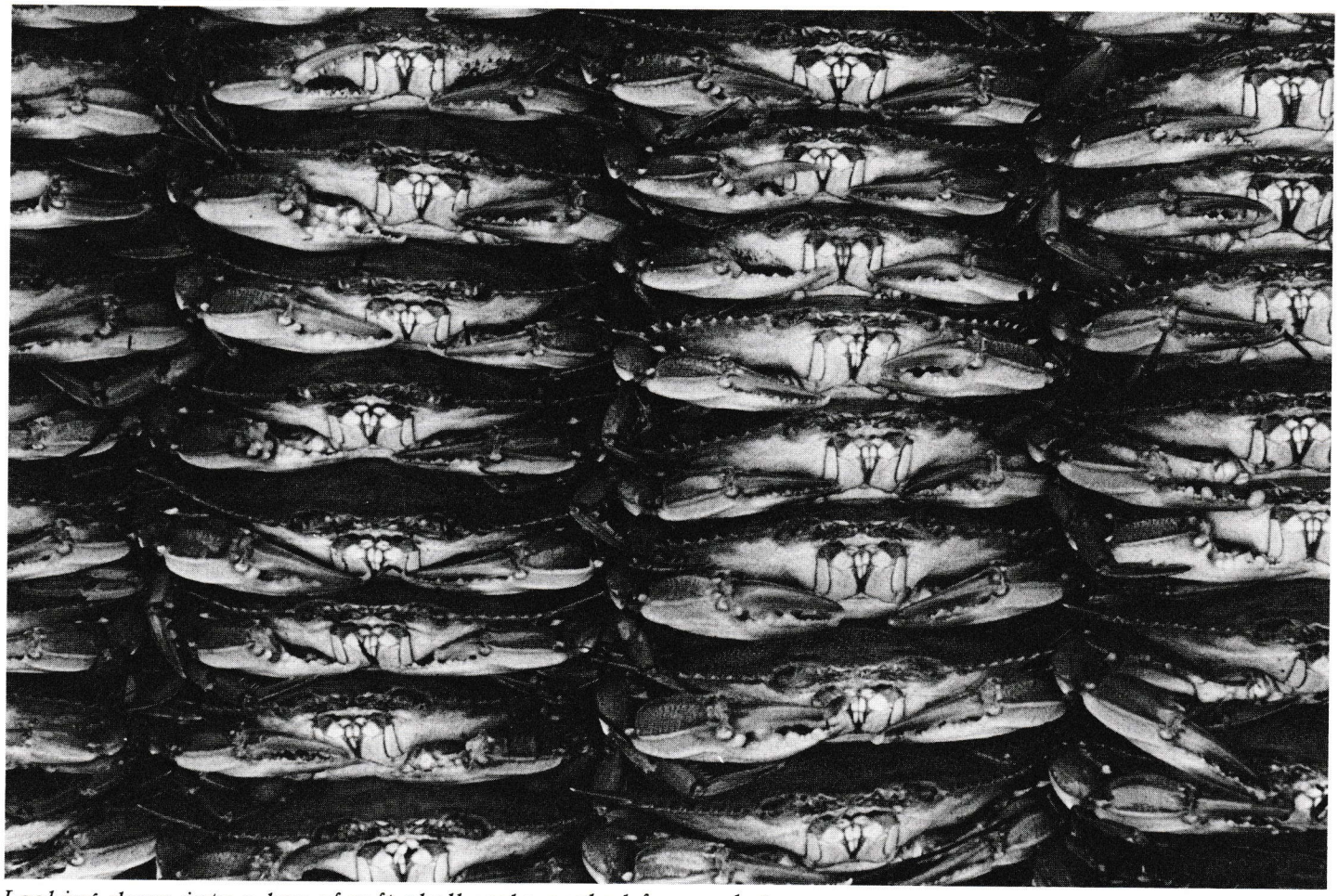


Looking down into a box of soft-shell crabs packed for market

The shell cracks,

splits, and opens. What emerges is a tender fistful of some of the sweetest eating anywhere: the soft-shell crab.

It's a transformation so fleeting and lovely, fishermen refuse to call it molting. Crabs, they insist, peel. Or shed.

Peelers, they say, are hard crabs on their way to going soft. Shedders are the fishermen who help them on their way. Now that you know the terms, read about the whys and hows.

Inside, the business of crab-shedding, and the delectable soft crab.

Crabbers turn soft-shells into hard cash

If you're going to make a living as a commercial fisherman, you've got to be willing to try a little bit of everything, says Milton Styron, a fisherman from Davis. "I'm a full-time, one hundred percent commercial fisherman," he says. And the emphasis is on 'commercial.'

For three generations, the Styrons have been working at the business of fishing. That meant going wherever there were shrimp, oysters, clams, scallops or crabs.

And through all those years, they've been producing soft-shell crabs in floating trays in Core Sound. Lately, their crab-shedding has paid off. Styron says he gets as much as $20 a dozen for his soft crabs at the opening of the season in spring.

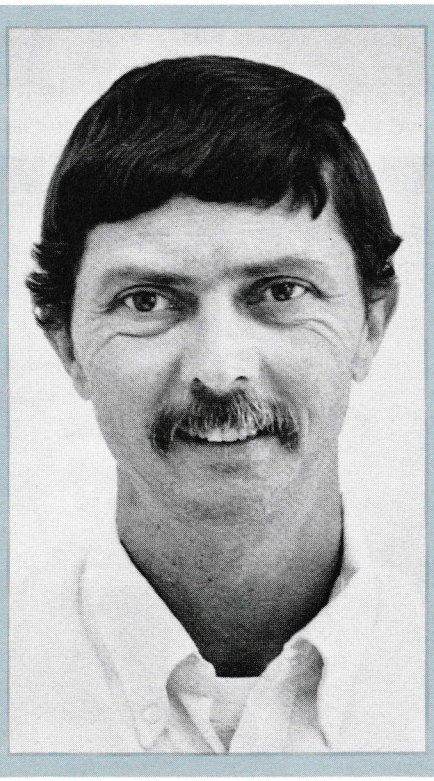
But he says the money hasn't always been that good. "I can remember back ten or twelve years ago when soft crabs were only bringing a dollar a dozen," says Styron.

That was before most people knew you could eat a soft crab, legs and all. Years ago, peeler operations were common in the state, but then fishermen decided shedding wasn't profitable enough, says Sam Thomas, Sea Grant's seafood specialist at the NCSU Seafood Laboratory in Morehead City.

Now soft-shell crabs are becoming known as a delicacy and command a high price, particularly from buyers in the North.

Fishermen can land extra profits if they're willing to cull out peelers and hold them until they shed, says Wayne Wescott, a Sea Grant marine advisory agent in Manteo. Since crabbers have access to peelers, the two enterprises naturally go hand-in-hand.

"Often a crabber either doesn't take the time to sort his catch or, in some cases, he might not know how to identify the peelers. With a little bit of effort, they can get a better price for their crabs," says Jim Murray, Sea Grant's advisory services director.



"Not only is the soft crab good to eat, but the quantity of edible meat exceeds that of the hard crab by ten to fifteen times."
—Wayne Wescott

Wescott says basic economics has encouraged crabbers to sell both hard and soft-shell crabs. "Not only is the soft crab good to eat," says Wescott, "but the quantity of edible meat in a soft crab exceeds that of the hard crab by ten to fifteen times. Because of this, the dollar value of soft crabs is much higher than that of hard crabs per individual crab."

At the start of the season in 1983, the highest recorded price for hard crabs was $1 per pound. At the same time, soft crabs were bringing as much as $2.33 each or $28 per dozen in New York. (Wescott estimates that two to three hard crabs weigh one pound.) While prices for both soft and hard shell crabs come down as the season progresses, soft crabs bring a higher unit price than hard crabs throughout the season, says Wescott.

If commercial fishermen catching hard crabs were to save their peelers for the crab-shedding trays, North Carolina's soft crab production could more than double, says Wescott. Maryland is the leading producer of soft crabs. Virginia is second. North Carolina and Louisiana compete for third.

But North Carolina soft-shell crab production is increasing. From 1981 to 1982 landings of soft-shell crabs almost doubled in North Carolina, says Terry Sholar, a marine biologist with the Division of Marine Fisheries. Sholar attributes that increase to the numbers of fishermen who have been giving soft-shell crabbing a try.

In March, Sea Grant sponsored a statewide workshop to bring fishermen up-to-date on crab shedding. Over 250 commercial fishermen attended and several hundred other fishermen have contacted marine advisory personnel for information on shedding crabs. In an informal survey of the workshop's participants, 47 percent said they added or changed a shedding operation af-

"I can remember back ten or twelve years ago when soft crabs were only bringing a dollar a dozen."

—Milton Styron

ter attending the workshop. As a result, those fishermen were able to shed an additional 570 dozen crabs. They reported making new investments averaging $1,229.

(During crab-shedding season, Sea Grant operates crab-shedding demonstration facilities at the Marine Resources Centers in Manteo and Bogue Banks and at the Aquaculture Research and Demonstration Project in Aurora.)

Mark Hooper, a commercial fisherman from Smyrna, has his crab-shedding trays set up onshore. He says he starts looking for peelers at the beginning of March. By April, he's shipping his first soft-shell crabs to the Fulton Market in New York. For him, it's not a full-time venture. "Down here, it just fills in nicely between seasons."

North Carolina crabbers have the advantage of getting their crabs on the market a couple of weeks before the Chesapeake fishermen. That means the biggest profits are made early in the season. Prices begin to go down as more crabs from Virginia and Maryland get on the market.

For that reason, most fishermen don't have large shedding operations. Like Mark Hooper, they find that soft-shell crabbing is a way to increase their profits in spring.

But for Murray Bridges, a Collington soft-shell crabber, it's a full-time business. Bridges buys peelers from local crabbers, sheds them, and ships them to New York and other northern states. In May and June of this year, he produced 12,000

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Photo by Steve Murray

Collington crabber Murray Bridges checks shedding trays for soft-shells

"I wouldn't be in it if it weren't profitable."
—Murray Bridges

dozen soft crabs. For those crabs, he got as much as $18 per dozen and as little as $9 per dozen.

Before you try to figure out how much money he made this year, Bridges says you'd better consider his operating costs. He has 80 shedding trays, which he set up at a cost of about $100 apiece. Add to that the cost of keeping his pumps running, his freezer cooling and his lights on. Then there are the costs of cartons for shipping and for freight to northern markets. In all, Bridges estimates his weekly operating costs are about $1000. Still, he says he's not discouraging other fishermen from soft crabbing. "I wouldn't be in it if it weren't profitable," he says.

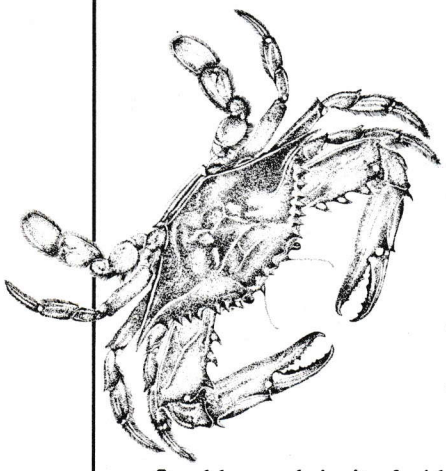
Not all crab-shedding operations are so large. Larry Holden, owner of Holden Seafood in Shallotte, started shedding crabs last year. He set up twelve tanks at a cost of about $100 each. He says his first season wasn't profitable because there just weren't many crabs to be had. He only shed 2,000 crabs—not enough to cover those initial costs.

Milton Styron agrees that mother nature didn't produce many peelers during the 1983 season. In 1981, a good year, he shed about 1,200 dozen crabs. So far this year, he has only produced about 170 dozen.

But when the season is good, there's no problem with marketing your crabs, say soft-shell crabbers. Terry Conway, owner of the John T. Handy Company in Crisfield, Maryland, agrees. The Handy Company is the largest distributor of soft-shell crabs in the country. Conway says, "You usually don't have to worry about a market for your soft crabs. Fortunately, demand usually exceeds supply."

Conway's advice to a fisherman just beginning to shed crabs is to focus on the quality of his crabs. "Soft-shell crabs are just like any other food commodity," he says. "The person with the highest quality gets the best price."

— Nancy Davis



Blue Crab Biology

A blue crab isn't afraid of coming out of its shell. In fact, the blue crab molts from 20 to 30 times during its three- to four-year lifetime (females shed slightly fewer times than males).

The blue crab must shed its exoskeleton to grow because its shell, made up largely of chitin, produces no growth cells. Small crabs increase in size 30 to 50 percent after each molt, while larger crabs increase 20 to 30 percent. Very small crabs shed every three to five days. As the crabs grow larger, they shed less frequently. Large crabs molt every 30 to 50 days.

With some exceptions, the female ceases to molt when she becomes sexually mature. An immature female or "she-crab" has a triangular abdominal apron, while one that has reached maturity, a sook, has a semi-circular apron. Only during the final molt can the female blue crab mate.

The courtship of the blue crab is marked by the gallantry of the males. After attracting a soon-to-be-mature female, the male cradles the female beneath him with his swimming legs until she molts, which may be as much as a week away. Crabbers refer to the pair as "doublers" or a "buck and rider." During the female's final molt, the male continues to protect his future mate by making a cage around her with his body. Once the female has molted, the pair mate and the male again cradles the female until her shell hardens.

Shedding requires all of the strength the crab can muster. Wiggling out of the old shell can take up to three hours and some crabs, especially older ones, may die in the process. Sapped of its strength and soft in body, the blue crab is especially vulnerable to attack from predators and even from its own hard-shell brothers.

For one to two hours after shedding, the crab absorbs water and completes the expansion of its new shell. After about four hours, the crab will begin to harden unless it is taken from the water. When the shell feels leathery to the touch, the crab has become a "papershell" or "buckram."

Between 24 and 48 hours after molting, the crab's shell reaches its premolt hardness.

'BUSTING' INTO THE BUSINESS OF

Soft-Shell Crabbing

It takes good water, skill and some time to shed blue crabs. It also takes live crabs, ready to molt. And North Carolina has an abundance of those.

Wayne Wescott says that thousands of North Carolina's coastal residents have access to the resources they need to begin producing soft crabs.

More and more people, Wescott says, are turning to crab-shedding as a hobby, an avocation, or a career. Every week he fields dozens of questions—How much time does it take? Is it costly to get started? How much money can I make? Wescott says the answers depend on what sort of crab-shedding you want to do. He recommends that people begin with some reading and thinking, before they invest their money. Here are some of the basics:

Finding 'peelers'

Peeler crabs, or those ready to molt and become soft crabs, are harvested most of the year (except in winter, when blue crabs are dormant) in the estuary. You can catch them one-by-one in small dip nets along the shoreline. This is a laborious method, but one that pays off in peeler crabs in good condition.

You can catch female peelers by "baiting" a wire trap—called a crab pot—with a large male crab. Virginia crabbers have been successful with a "peeler pound," a variety of pound net that directs crabs into a submerged trap. Louisiana crabbers have used a "bush line"—branches of wax myrtle tied to a floated line—which attracts peelers in search of cover.

Many crab-shedders simply use one of the traditional crab-fishing methods, such as pots, trawls, or trotlines, and sort peelers and soft crabs out of the hard-crab catch. Wescott says that some crab-shedding operations can acquire soft crabs and peelers by arranging to buy them from hard-crab fishermen.

Identifying peelers

However you get your crabs, the trick to successful shedding is recognizing the peeler. Experienced crabbers often look at the translucent edge of the crab's paddle fin, where subtle colorings betray the ready-to-molt crab. On the following page is a list of some of the telltale signs. The estimated number of days to molt are given for crabs measuring at least three and one-half inches, point to point. Smaller crabs molt more frequently.

• *White-line* peelers are in the earliest phase of premolting. They show a light, almost transparent line along the outer edge of the last two joints of the paddle fin. These peelers are usually at least five and sometimes 14 days away

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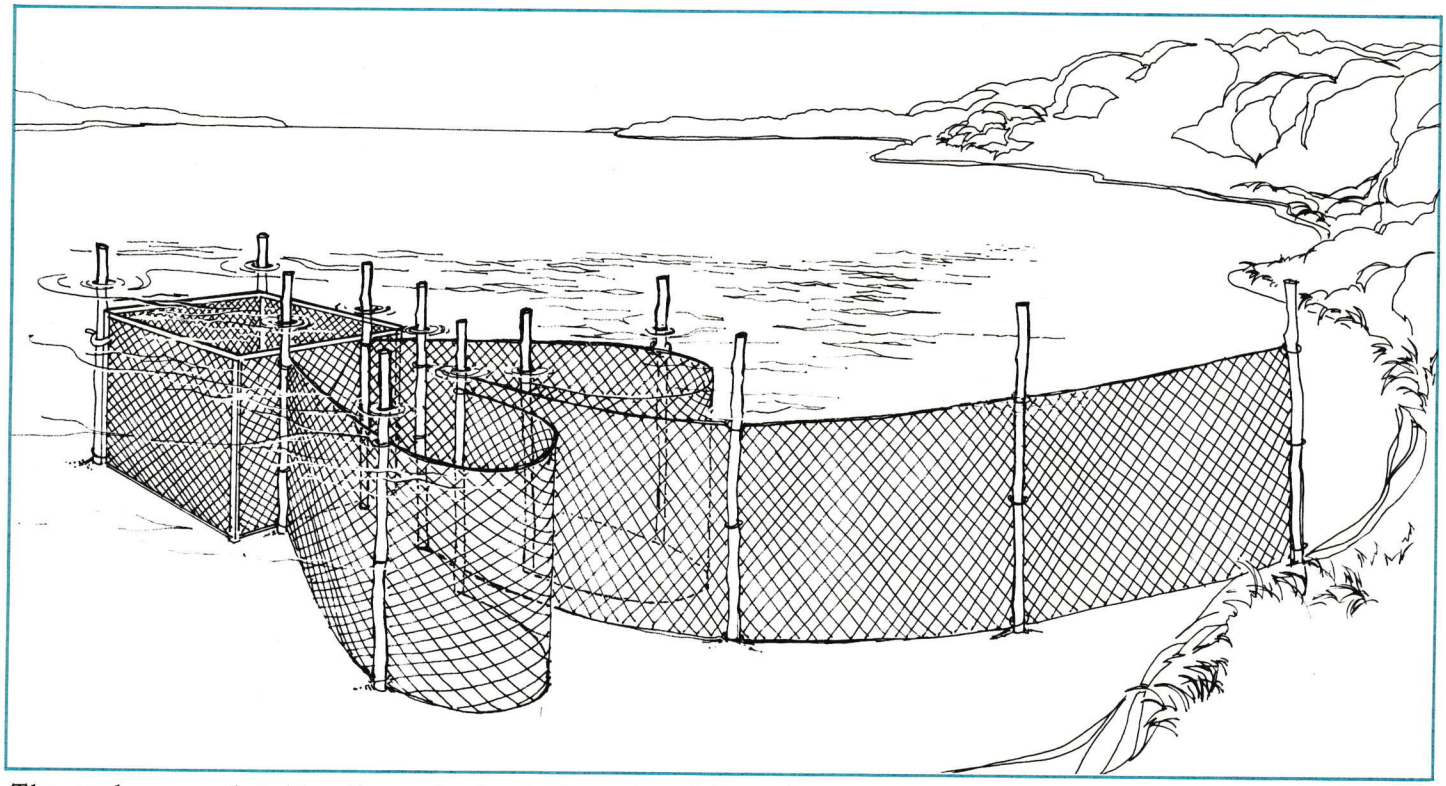
Illustration by Sue Sunday



The peeler pound guides the crab along the net and into the trap

from shedding, and some shedders have found that keeping peelers that long is unprofitable. Many white-line peelers die in the shedding trays.

• *Pink-line* peelers show a pinkish tint just inside the outer edge of the last two joints of the paddle fin. These peelers are usually two to six days away from molting and are, along with red-lines, "ripe" or "rank" for peeling.

• *Red-line* peelers show a deeper red in place of the pink. They are one to three days away from their molt.

• *Busters* are molting crabs whose shells are opening to let the soft crab "bust" out.

There are other signs and methods for guessing when a crab will molt. Some of these, such as nicking a claw to see the developing soft claw underneath, distress the crab and increase mortality.

Wescott says that although the color-line methods of identifying peelers require some practice, they produce the best result.

Handling peelers

After you've caught your soft crabs or peelers, handle them very carefully on the boat. Keep them away from hard crabs, which will eat soft crabs. Soft crabs are stored in a container of seawater until they can be iced or sold. Lay just-caught peelers on wet burlap in shallow baskets with covers. Shade them on their way to the shedding trays.

Busters, which are weak and helpless from the ordeal of molting, must be pampered. Keep them in a bucket of water and change the water every hour to introduce oxygen.

Wescott says you should keep all crabs away from chemicals and fuels. Never pile them on top of one another, or dump them into their containers.

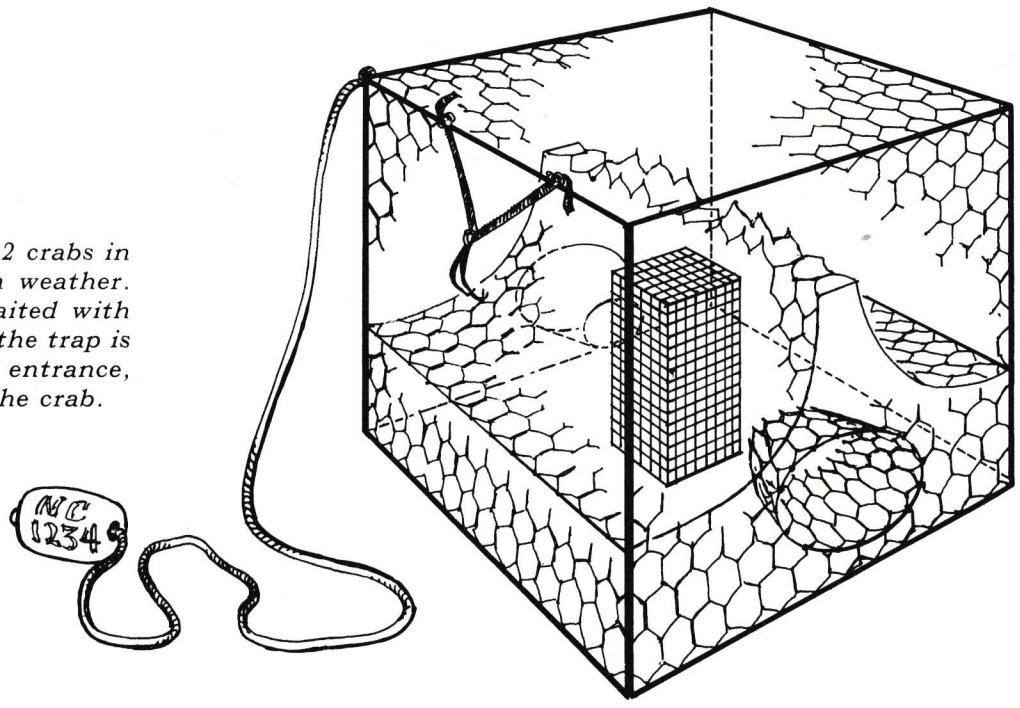
Shedding methods

North Carolina crabbers are using three different methods to shed crabs. There are variations for each method, but here are the basic systems:

• *Floating shedders* are the most economical shedding systems. Shallow trays, often four feet by eight feet by twelve inches deep, are anchored in a creek or sound. Water flows in and out of the tray through openings in its sides and bottom. Floats keep the shedder's bottom a few inches below the water's surface.

Floating shedders are a good choice if you have waterfront property and conditions suitable for shedding crabs—clean, brackish water with tidal or wave action sufficient to aerate the shedder. These systems can house as many as 500

Illustration by Sue Sunday



The crab pot

A crab pot can trap 10 to 12 crabs in several hours during warm weather. Built of wire mesh and baited with fish heads or fish remains, the trap is designed to allow an easy entrance, but a difficult escape, for the crab.

peelers when the water is around 70 degrees, early in the season.

The disadvantages? Shedding production drops off as the water warms beyond 72 degrees. And Wescott points out that fishing, checking and maintaining the shedders is inconvenient, often requiring the crabber to wade or use a boat each time he or she checks the trays.

• *Flow-through shedders*, placed along the shore, are more convenient and are popular among North Carolina crabbers. They are often very productive, and some house 500 or more peelers in each tray, when the water is cool.

The trays are similar in size to the floating shedders, but are mounted on legs. They are water-tight and are fitted with plumbing and pumps that circulate water from a brackish creek or sound through the shedders.

If the water you have is dirty or full of debris, you will need to filter it before it reaches the shedders.

These flow-through systems rely on electricity to keep them running, so energy costs are somewhat higher than with floating shedders. Also, Wescott warns that crabs will die if a power failure shuts down the pump, unless there is a backup power supply handy.

Wescott says that the convenience and simplicity of these flow-through shedders has made them very successful.

• *Closed-system shedders* are similar to the flow-through types except that the water is continually circulated within the system. You may need a closed shedding system if the water in your creek or sound is of very poor quality, or if your property is not on a waterfront.

Closed systems rely on filters and devices called protein skimmers to remove waste. Water for these systems is often pumped from a well and treated with chemicals to simulate natural conditions.

Because of the extra filtering, treating and re-circulating of the water, closed systems are more expensive to build and operate than the other types. But Wescott says they can nevertheless be operated profitably in many coastal areas, if they are carefully maintained.

Maintaining shedding systems

The floating shedders require the least maintenance of the three types of systems. Wescott advises you to haul out each floating shedder for a day at a time, every couple of weeks, temporarily distributing its crabs among other trays. He says a day or two of sunshine will kill growths and parasites that might otherwise reduce the life of the trays.

Flow-through and closed shedding systems require regular scrubbings and inspections. Valves and pipes must be cleaned, and pumps and wiring inspected each season. Filters need regular cleanings through the season.

All the systems must be checked for the proper salinity and temperature, and the trays protected from birds and other predators.

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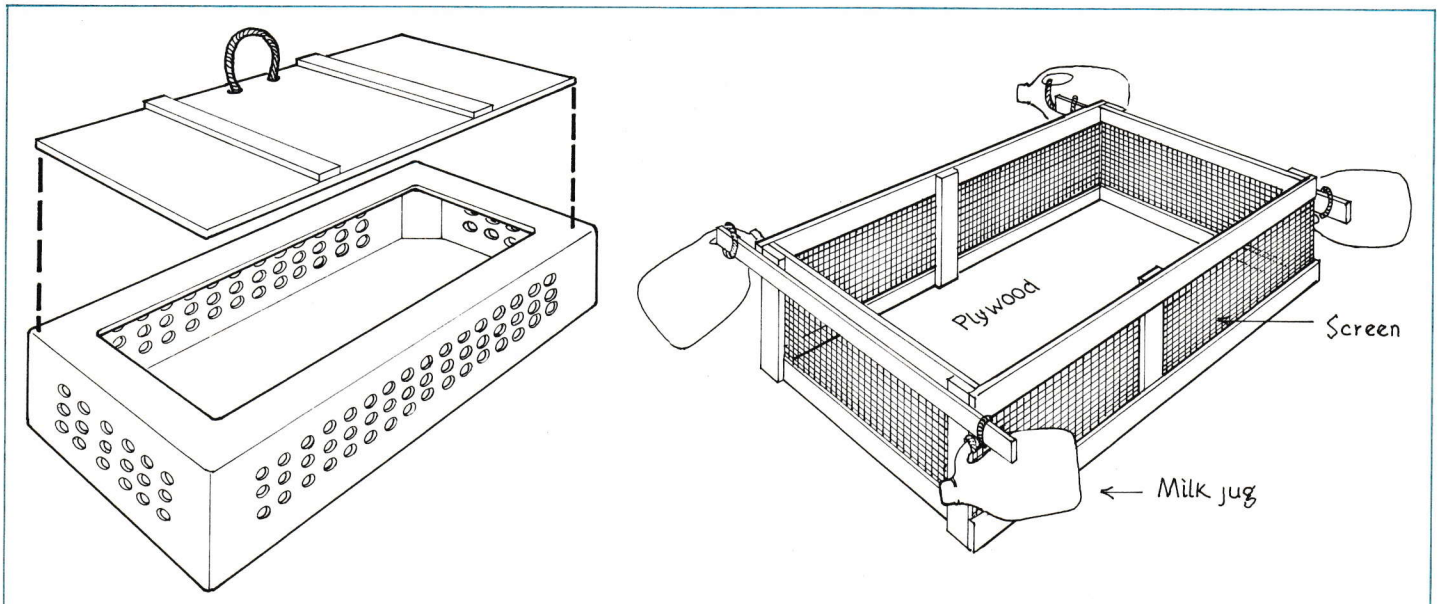
Illustrations by Sue Sunday



Floating trays like these may hold 300 to 500 peelers early in the season

Fishing and checking the system

There is one problem common to all crab-shedding operations: They take a lot of time. Even in small operations, crab-shedding demands attention seven days a week, around the clock.

You must catch or buy your peelers. You must cull out dead crabs and discarded shells, sort peelers by stages, and check the shedding trays at least every six hours for soft crabs.

Timing is important. Many large crab-shedding operations check for soft crabs every four hours, to prevent them from hardening to the "paper-shell" stage. Soft crabs must be given an hour or two to firm up, then they should be removed from the water and cooled to stop their shells from hardening any further.

Preparing soft crabs for market

North Carolina shedders who can reliably produce high-quality soft crabs never have trouble selling their product, Wescott says. But many buyers are very particular about the condition and packaging of the crabs they choose.

Restaurants, which buy many of the soft crabs shed in North Carolina, usually insist on nice-looking crabs with at least one claw each, and most want crabs packaged in uniform sizes, according to a prescribed method of boxing and wrapping. Most buyers prefer live soft crabs, chilled and dormant and packed one layer deep in shallow boxes. Many, however, will accept fresh-frozen soft-shell crabs, if they are properly cleaned, frozen and packaged. (See story beginning on page 9 for information about cleaning.)

Live soft crabs sold to distributors in North Carolina, Virginia, Maryland, New Jersey and New York must meet standard packaging and quality requirements.

"Stills," or crabs that die during or after shedding, are not shipped with live crabs. They are salable only if cleaned and frozen promptly. Stills with an odor should be discarded.

As with other seafoods, commercial freezing equipment, operating at −20 degrees Fahrenheit, produces the best product. But these freezers are also too expensive for most small shedding operations. Wescott says that some crab-shedders do use household freezers, which will hold crabs at around 0 degrees Fahrenheit.

Anyone can learn

Although these techniques take some time to master, Wescott says that most anyone can learn them. And a fisherman handy enough with tools to keep a boat in good repair can usually save some money by doing the carpentry, plumbing and electrical work himself.

Wescott adds that, while crab-shedding is no get-rich-quick scheme, a strong market, respectable profits and relatively low start-up costs have made the business attractive.

"There's room for a lot more crab-shedding operations before we reach the limits of the market," he says. "And a lot of people who fish for hard crabs could be sorting out the peelers they catch, and getting more for their effort."

[If you want to know more about setting up a crab-shedding operation, contact Wayne Wescott at the Sea Grant Marine Advisory Service office in the N. C. Marine Resources Center on Roanoke Island (P.O. Box 699, Manteo, N.C. 27954). His telephone is (919) 473-3937.

— Neil Caudle

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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__State government
__University professor/researcher
__Other _____

Soft-shell crabs come battered and fried

Ask a coastal cook how she or he prepares soft-shell crabs and the answer is almost always the same: fried. From posh restaurants in New Orleans to the down-home kitchens in Dare County, cooks batter and fry the soft-shell crab.

"Frying is the only way," says 77-year-old Helen Scarborough of Manteo. "And that's the way we've always fixed our soft crabs." Scarborough cleans her crabs, then salts and peppers them. She dips the crabs in a batter made of evaporated milk and flour (Occasionally an egg is added). Then Scarborough drops the crabs in hot, deep fat, frying them to a golden brown.

While it seems everybody prefers soft crabs fried, cooks do differ in their choice of batters. Emma Avery, a Carteret County cook, coats her crabs with an egg-and-flour batter. No milk. Collington shedder Murray Bridges says he dredges his soft crabs in flour only. "The flour holds in the moisture while frying," he says.

Sherry Creech, manager of The Charter Restaurant in Morehead City, says cooks there salt and pepper the soft-shells before thoroughly coating them with flour. "Flour is the best coating for soft-shells," she says. "Flour has a lighter texture than cornmeal and it retains less grease. And because flour provides a more even coating than cornmeal, it holds in more moisture.

"And we never fry soft-shell crabs in the same grease we fry any of our other seafoods. Soft-shell crabs will pick up the stronger flavors of other seafoods if they're cooked in the same grease."

Creech says The Charter does broil soft-shell crabs and occasionally grills them for customers who request it. For broiling, the crabs are rubbed with oil, sprinkled with minced garlic and topped with seasoned bread crumbs, Creech says. Broiling sometimes makes the top shell tough, Creech says, and the crab more chewy.

The demand for soft-shell crabs has increased in recent years, Creech says. "We now prepare about sixty dozen soft-shell crabs a week," she says.

Eating a soft crab means eating the whole thing except the eyes, mouth, apron and lungs, which are removed before cooking.

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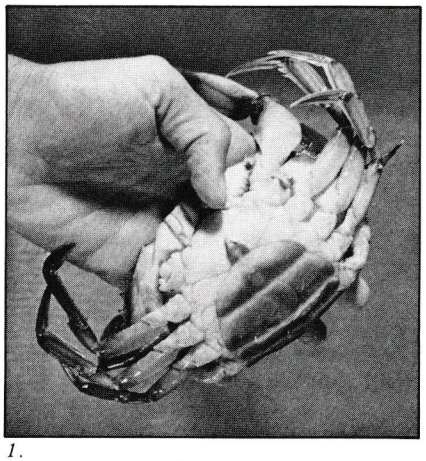
Photos by Steve Wilson



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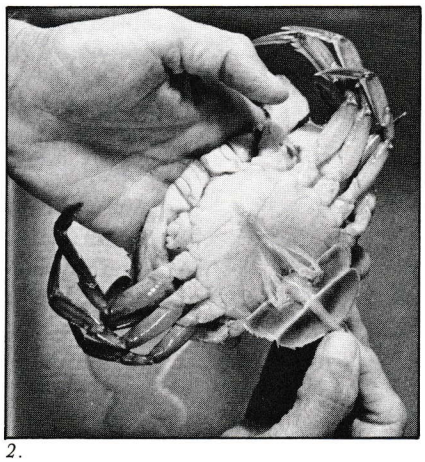

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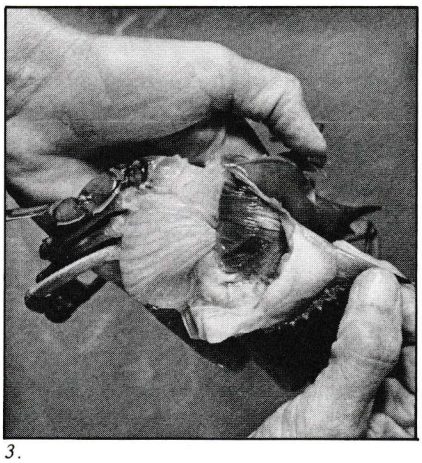

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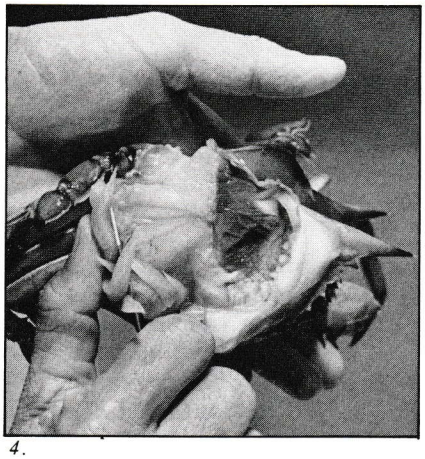

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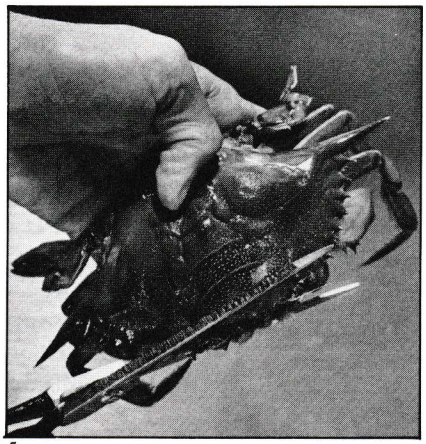

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Cleaning a soft-shell

1. Turn the crab on its back.
2. Lift and remove the apron.
3. Turn the crab over and lift the left lateral spine.
4. Scrape away the grayish-white feathery gills. (Remove gills from left side using the same procedure.)
5. Remove the eyes and mouth by making one cut behind the eyes with kitchen shears.

Though soft-shell crabs are considered a coastal delicacy by many, they are not always served with a flourish. Many coastal folks like them fried and sandwiched between two slices of bread spread with mayonnaise, says Joyce Taylor, Sea Grant's marine advisory agent at the NCSU Seafood Laboratory in Morehead City.

No one knows exactly when it was discovered that the crab in its softened state made such good eating. Avery, who is 81, says she has been eating soft-shell crabs since she was a little girl. "I remember when soft crabs could be bought for twenty-five cents a dozen," she says.

During late July, a dozen soft-shell crabs were selling for $10 to $12 at seafood markets and from local shedders in Carteret and Dare counties.

When buying soft-shell crabs, coastal cooks say to buy the crabs alive or frozen. Never buy a soft-shell crab that is dead unless it is frozen, says Janice Tillett of Manteo. Top-quality crabs should have all of their legs and at least one claw. Occasionally, shedders will sell damaged crabs, missing claws and legs, at reduced prices.

Buying soft-shell crabs alive means buying the crabs at coastal seafood markets or from shedders. Few, if any, inland seafood markets handle the soft-shell crabs alive. "We had problems keeping them alive until they are all sold," said a spokesman for one seafood market in Raleigh.

If you buy frozen soft-shell crabs, they should be checked to make sure they show no signs of freezerburn, Taylor says.

To clean a soft-shell crab, wash it thoroughly. Turn the crab on its back, lift and remove the apron. Turn the crab over. Lift the large lateral spines of the shell top, and scrape away the grayish-white, feathery gills. Remove the eyes and mouth by making one cut just behind the eyes with a knife or kitchen shears.

Some cooks advocate removing the top shell completely and scraping away the digestive sac. Tillett says the digestive sac will leave the soft-shell crab with a sour flavor unless it is removed. Creech says The Charter also removes the sac for the same reason.

— Kathy Hart

The skillet's good But so's the grill

While frying is the method most preferred for cooking soft-shell crabs, here are a few alternative ways to prepare soft-shell crabs:

Baked Soft-Shell Crabs

12 soft-shell crabs
¼ cup milk
¾ cup flour
2 eggs, beaten
2 teaspoons salt
¾ cup dry bread crumbs
½ teaspoon pepper
(garlic powder and cayenne pepper are optional spices that may be used)

Combine salt, pepper, eggs and milk. Combine flour and crumbs. Dip crabs in egg mixture and roll in flour/crumb mixture. Place crabs in a shallow, buttered baking pan. Put a pat of butter on each crab. Place pan in preheated 400° F oven for 8 to 12 minutes, or until browned.

Virginia Sea Grant Program

Grilled Soft-Shell Crabs with Seafood Marinade

1 cup salad oil
2 tablespoons white vinegar
1 teaspoon salt
¼ teaspoon tarragon
1 teaspoon lemon and pepper seasoning
⅛ teaspoon lemon zest or 1 teaspoon lemon juice
⅛ teaspoon garlic powder

Mix above ingredients together. Let stand several hours at room temperature to let flavors blend.

Liberally baste bottom side of 12 soft-shell crabs with marinade and carefully place, bottom-side down, on grill.

Grill over a slow fire, at least 12 inches from coals, for five minutes. Liberally baste top of crabs with marinade, turn carefully and grill five more minutes.

Makes six servings, two crabs each.

Grilled Soft-Shell Crabs

½ cup butter, melted
3 tablespoons lemon juice
2 tablespoons minced parsley
½ teaspoon grated lemon rind

Make a lemon butter from above ingredients. Brush soft-shell crabs with it. Grill over medium heat, four to six inches from heat for seven to eight minutes. Turn. Cook until lightly browned and done, about seven to eight more minutes. Baste often while cooking.

NCSU Seafood Laboratory

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).

North Carolina fishermen are reporting disappointing shrimp catches this year, particularly in western and northern Pamlico Sound, says Ed McCoy, of the Division of Marine Fisheries in Morehead City.

News reports blame the heavy rains that fell earlier this year and the resulting lower salinity levels in the estuary. But is it that simple?

Sea Grant researcher John Miller says probably not. Instead, he says it's more likely that heavy rainfalls indirectly affected the shrimp. "The same weather conditions that affect salinity also affect a lot of other things. And those may be the things causing reduced numbers of shrimp," says Miller.

He says it's important to remember that shrimp is an annual crop. "The number of shrimp in 1983 is a direct function of the number of shrimp produced in 1982," says Miller. So, it may be that fewer of the shrimp spawned last year actually survived.

Shrimp larvae rely on currents to move them from offshore where they're spawned to the estuarine nursery areas where they'll mature. Weather conditions may have resulted in a lack of currents for the shrimp to migrate toward the estuary.

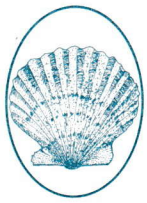
Once the shrimp reached the estuarine waters, it may be that abnormally low salinity levels stressed them, says Miller. The low salinity levels also may have stressed the food supply on which the shrimp feed.

In turn, the low-salinity environment may have been conducive to a disease organism or to an organism that competes with the shrimp for food, says Miller.

McCoy says the heavy rains came in March, April and May—the critical months for the brown shrimp. But there is hope for the shrimp fishery in North Carolina, McCoy says. The critical months for pink shrimp are June, July and August. The heavy rains probably won't affect that species, he says.

On Aug. 1 Congress approved the reauthorization of the National Sea Grant Program for 1984-85. The program was created by Congress under the National Sea Grant College Act and must periodically be reauthorized by Congress so it can continue to operate as a federal program.

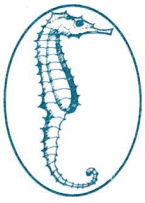
The Senate Committee on Appropriations has voted to increase the 1984 budget for Sea Grant by 10 percent. The UNC Sea Grant College Program is in the process of preparing and submitting its 1984 renewal budget request to the National Office of Sea Grant.



Spencer Rogers, Sea Grant's coastal engineer, has received a prestigious award for outstanding extension service from North Carolina State University (NCSU). Rogers was one of only ten university extension workers to receive the award this year, and is the first Sea Grant marine advisory agent or specialist to be so recognized.

Rogers, who was recently named Specialist of the Year in UNC Sea Grant's Marine Advisory Service, was recommended for the NCSU extension award because of his work helping to solve coastal engineering, construction and shoreline-erosion problems.

Bruce Poulton, NCSU chancellor, said that Rogers' "efforts and devotion to the application of knowledge for individual enrichment, community development, and public service exemplify the spirit and mission of our Land-Grant University."



Lise Knelson, a zoology graduate of the University of North Carolina in Chapel Hill, will be the first student to receive the North Carolina Marine Policy Fellowship. UNC Sea Grant Director B.J. Copeland provided project initiation funds for the program, which will be administered through the Institute for Coastal and Marine Resources at East Carolina University under the direction of Michael Orbach, a noted ocean policy researcher.

Knelson, who was elected to Phi Beta Kappa in 1981, concentrated her undergraduate work on the marine sciences.

Copeland says the fellowship program will train top students in marine policy, providing leaders that will help solve tomorrow's ocean-use problems.

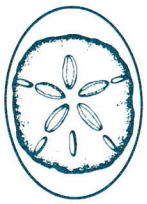
The Neuse River Foundation sponsored a symposium on water quality and other related issues on Sept. 15. The Fairfield Harbour Symposium featured discussion from scientists, regulatory agency officials, city and county planners, and industrial developers on three main topics: municipal and industrial development, groundwater hydrology and water quality.

UNC Sea Grant Director B.J. Copeland conducted the session on water quality and Sea Grant researchers Hans Paerl and Donald Stanley presented some of their findings on the blue-green algal blooms of the Neuse

Continued on next page

River. For more information about the blue-green algal blooms plaguing the Neuse, read the October issue of *Coastwatch*.

Paerl and Stanley also discussed the problems of the Neuse in a public forum at the Sept. 8 and 9 meeting of the N.C. Marine Science Council at Bogue Banks.



Soils, roads, waterways, buildings and populations — They're all going into computers these days, as data. And now, more and more of North Carolina's coastal planners and managers can use a computer to map the resources in their communities.

A state agency—the Land Resources Division of the N.C. Department of Natural Resources and Community Development—has introduced the Land Resources Information Service (LRIS). LRIS is a computerized system that draws on "digitized" data to draft maps, overlays and displays that can help with the job of planning and managing coastal resources.

If you would like more information on LRIS, call (919) 733-2090, or write LRIS, N. C. Division of Land Resources, P.O. Box 27687, Raleigh, N. C. 27611-7687.

It's been twenty-three years since a hurricane crossed the coast of North Carolina. But that statistic can be deceiving, says Joe Pelissier, deputy meteorogist in charge at the National Weather Service forecast office in Raleigh. "From a statistical point of view, North Carolina is very hurricane-prone. In fact, if we go back over a hundred years of record, it turns out that, along the Atlantic coast, the coast of North Carolina is the second most vulnerable place for hurricanes, surpassed only by South Florida."

Could this be the year when another hurricane strikes our coast? Pelissier says there's no way of knowing. But he's concerned that if a hurricane does strike our coast, residents there may not be prepared. More and more people, many who have never known the force of a hurricane, are moving into the hurricane-vulnerable areas, says Pelissier.

To help people prepare for a hurricane, Sea Grant, the N.C. Division of Emergency Management and the N.C. Office of Coastal Management published a brochure, "About Hurricanes, what to do and when to leave." In conjunction with Hurricane Awareness Week, WRAL-TV in Raleigh adopted and reprinted the publication for mass distribution in their viewing area.

Mini-grant funds have been awarded to Vito Blomo, an East Carolina University (ECU) economist, to study the impact of a proposed minimum mesh size for menhaden nets. John Maiolo and Michael Orbach, also of ECU, will assist Blomo on the project.

Overfishing is a growing problem in the menhaden fishery. As a possible solution, the Atlantic States Marine Fisheries Commission is considering a regulation requiring a minimum mesh size for net materials. Currently, there are no regulations on mesh size for menhaden nets in North Carolina.

Earlier, the researchers studied how a shortened season might affect the employment and revenues of the menhaden fishing industry and regional economics.

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