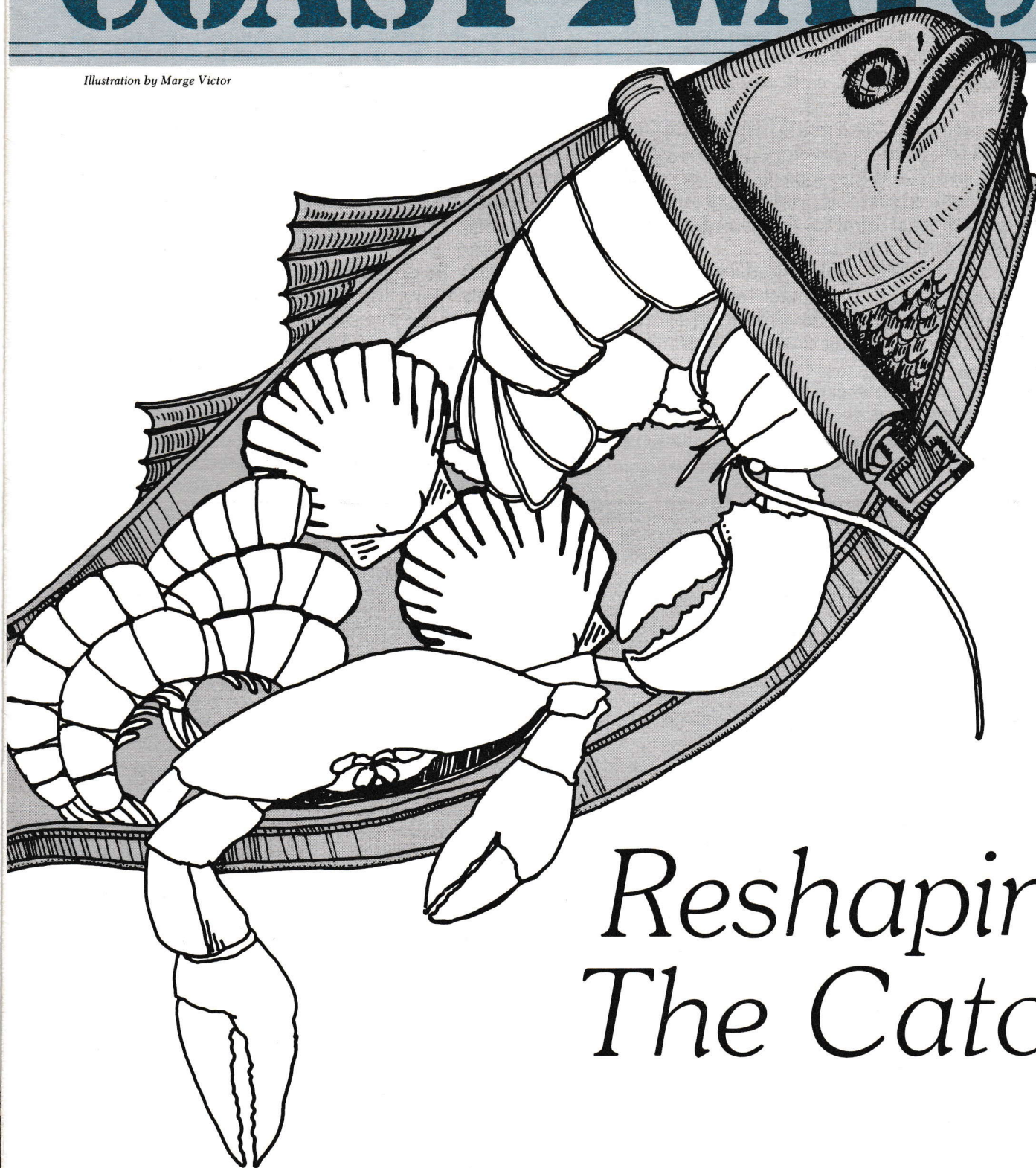


# COAST WATCH

Illustration by Marge Victor



*Reshaping  
The Catch*

# A YEN FOR IMITATION SEAFOOD

By Nancy Davis

The label on the box says "imitation crab meat." But inside, the product looks like crab meat, has the texture of crab meat, and it tastes, well, almost like crab meat.

Instead, it's a pseudoshellfish made from surimi (sur e' me), a minced fish product developed by the Japanese. The fish is processed into a paste that serves as the base for restructured seafood products, or analogs. Just add a little of the real thing for flavor and, voila—crab legs, scallops and lobster tails.

So far, it seems Americans don't mind a little Japanese ingenuity making it to the dinner table. In fact, consumer taste buds are giving the products positive reviews, and folks are gobbling down the imitations like the real thing.

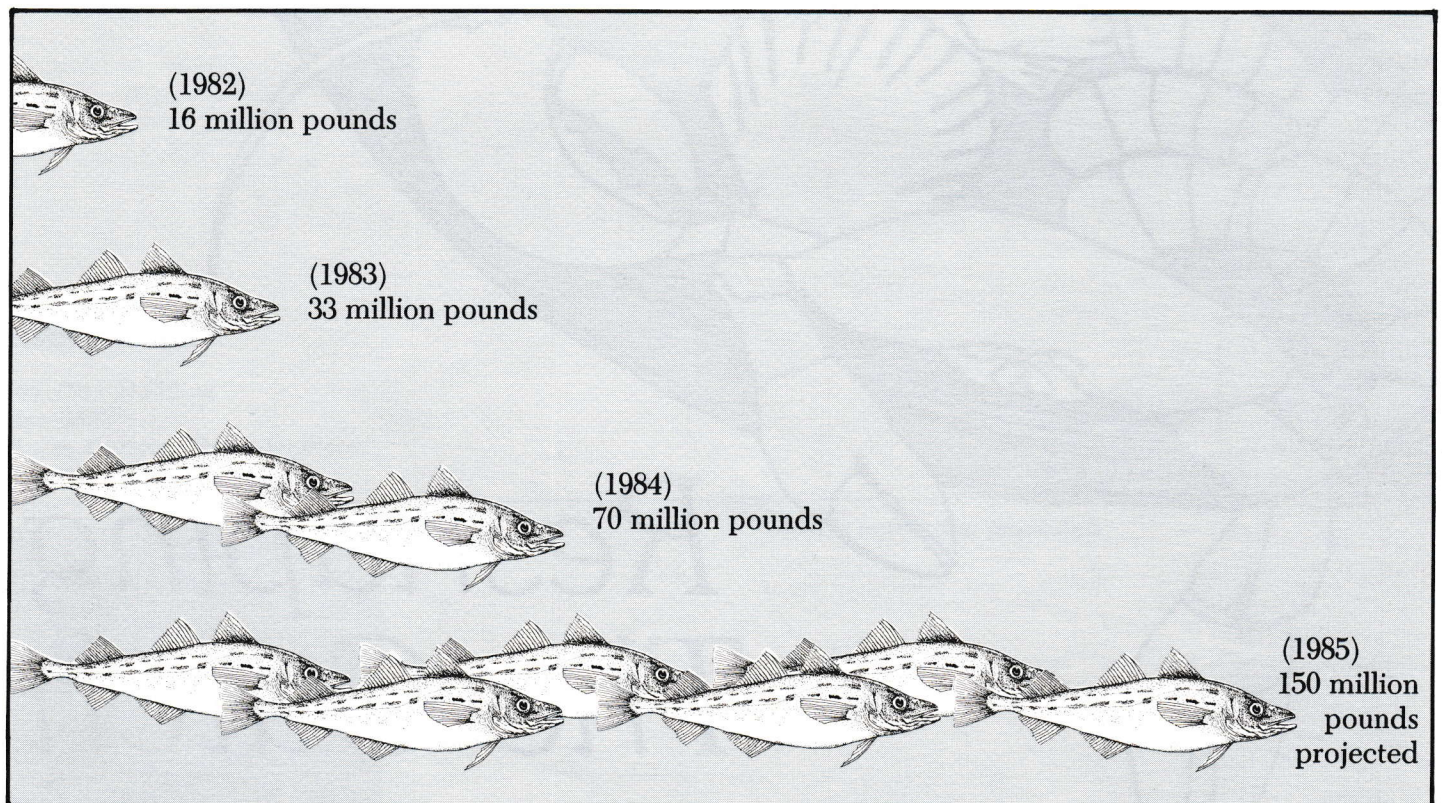
Admittedly, no substitute can entirely match the flavor of fresh seafood. But, the real thing isn't always available and, sometimes, the expense of Alaska king crab, scallops and lobster can be prohibitive.

In 1984, the Japanese-based Kibun Co. Ltd., the world's largest processor of surimi-based products, opened a plant in Raleigh. The company markets its products under the label "DelicaSeas."

Masayuki Fukuda, executive vice president of Kibun Corporation of North Carolina, doesn't describe his company's target market as a segment of the population. Instead, Fukuda grins and says the company wants its products to reach "every American."

Ambitious perhaps, but from all appearances, Fukuda may be on his way to achieving that goal. In the last four years, surimi-based products have been riding high on a wave of success. American sales for surimi-based products have risen from 3.3 million pounds in 1980 to 70 million pounds in 1984. And, experts project an analysis of 1985 numbers will indicate sales reached as high as 150 million pounds.

The process of making surimi began in 15th century Japan. The fish are skinned, eviscerated, deboned and



American sales of surimi-based products increased almost ten-fold in four years

washed, and sugar and sorbitol are added. The resulting product is surimi, a protein concentrate that is white, odorless and flavorless. Finally, the surimi is frozen in blocks for storage.

In this form, the surimi is without food value. It's what happens next that transforms the commodity into something consumers will buy and eat.

The surimi is chopped and natural shellfish flavorings are added. Then the mixture is extruded or molded into shapes, similar to the natural counterparts, and cooked.

Why are Americans so taken with an imitation product? It's possible that they see the same attributes that first captured food scientists' attention. The surimi is molded into products that are high in protein and low in fat, calories and cholesterol. And, the products offer consumers a consistent, high quality product.

Another big selling point is economics. Surimi-based products sell for a fraction of the cost of the real thing. Alaska king crab legs, for example, were retailing in Raleigh supermarkets in January for about \$10 per pound. But the simulated crab legs retail for about \$4.50 per pound.

Most surimi is made from Alaska pollock, a lean, white-fleshed fish that is abundant and inexpensive. Each year an estimated 3.7 billion pounds are caught by Japanese trawlers in Alaskan waters, shipped to Japan to be made into surimi, and the surimi or surimi products are shipped back to the United States.

Now, with the development of a surimi-based food product industry on the East Coast, researchers are investigating the possibility of using an Atlantic fish species as a resource for surimi production to lessen the costs of shipping surimi from Japan or Alaska. Already, Sea Grant researchers at N.C. State University have developed a surimi from menhaden, an abundant fish found off the North Carolina coast.

Menhaden processing companies along the mid-Atlantic are following the new technology as a possible alternate outlet for their catches. It may be possible to elevate the lowly menhaden from a source for livestock and chicken feed to a quality product for human consumption.

At Kibun, Fukuda says his company would consider buying American-produced surimi, providing there is an adequate supply and a consistent high quality.

If there is no surimi production here, why did Kibun locate in Raleigh? Speaking through an interpreter, Fukuda said the area was chosen because of its proximity to Sea Grant researchers at NCSU and its attractiveness as an East Coast distribution point. (Kibun's West Coast plant is in Seattle, Wash.)

The availability of labor and the attractiveness of the area as an industrial site were also drawing cards, says Frank Thomas, a Sea Grant seafood extension specialist with NCSU's Food Science Department. Thomas worked with Kibun and city and state officials to help the company locate in Raleigh. Initially,



Masayuki Fukuda

because such a venture was so new to this area, there was concern over the quality of effluent from the proposed plant. But Thomas supplied technical expertise about surimi plants, and city officials approved the facility.

Thomas estimates Kibun's initial investment was about \$4 million. Kibun began its Raleigh operations with one processing line. Now, three lines are in operation, and the company produces 7,000 pounds of its product each day. The company employs 52 workers at its Raleigh site.

Thomas says the Kibun plant operates with state of the art technology. Product quality is closely monitored. Each day, employees take samples, run bacterial analyses, and test the product for its appearance, texture, water content and flavor.

If surimi-based analogs are so popular, will they begin to cut into conventional shellfish markets? Fukuda doesn't think so. "Fresh seafood and blended seafood are completely separate categories. Fresh seafood is wonderful as it is. We have a completely different product to offer," he says. Fukuda adds that he thinks it's important for supermarkets to offer the product as a frozen seafood product rather than alongside fresh seafood.

Thomas agrees. "You can't equate one with the other. These seafood products are analogs of shellfish. They're a fully prepared item, a convenience item. We're essentially opening up a new market that probably won't compete with flounder, trout and other fresh seafoods."

# SELLING SCIENCE and MENHADEN

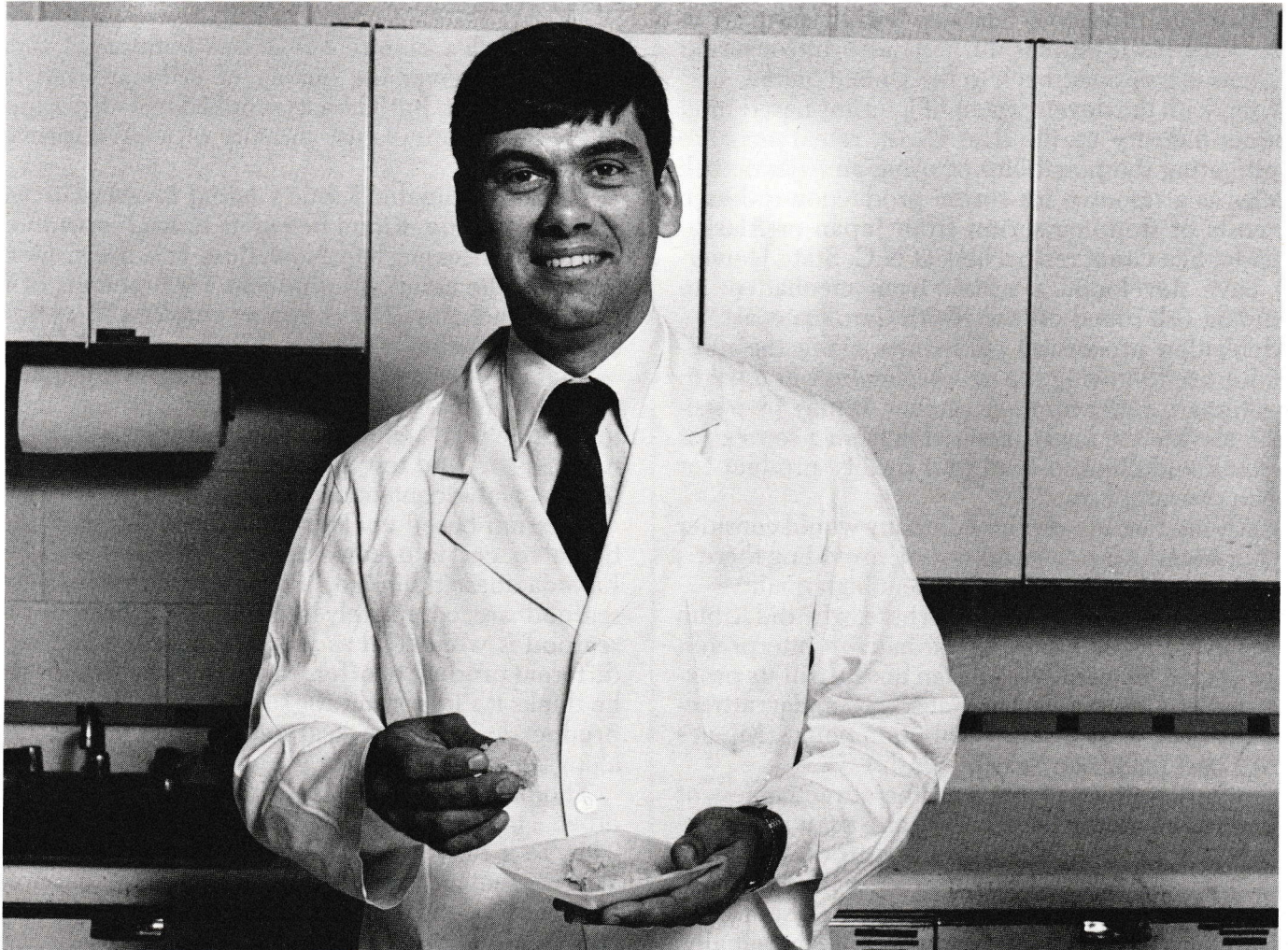
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*Sea Grant researcher Tyre Lanier is selling  
the seafood industry on menhaden surimi*

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By Kathy Hart

*Photo by Allen Weiss*



**T**yre Lanier is a scientist by trade, but a salesman at heart. He delivers a spiel that is fast, slick and convincing. He glibly describes how the lowly menhaden, a fish once used for fertilizer and animal feed, can be transformed into nutritious food additives. When he's finished, you're as sure as he is the menhaden is destined for the dining room.

But Lanier is not a double-talking huckster. His "soft sell" of menhaden is straightforward and honest. It's based on hard facts, good science and an earnest belief that menhaden derivatives can mean as much to the food industry as the soybean.

In fact, Lanier, a Sea Grant researcher and food scientist, introduces the menhaden as "the soybean of the sea"—a Madison Avenue marketing phrase he coined to sell menhaden companies and seafood processors on the fish's versatility and potential.

Food processors know the story of the soybean. But for those who don't, Lanier describes how years ago Henry Ford (of automobile fame) saw the contribution the soybean was making to nutrition in the Far East. Ford initiated research that resulted in edible oils and protein concentrates which today can be found in almost every manufactured food product in America. Lanier envisions a similar fate for the menhaden.

"The way the soybean evolved into the food industry is almost identical to the way we think the menhaden will evolve," Lanier says. "We want the food industry to see that analogy. We want them to see that something they now perceive as (animal) feed or worse can easily become a food ingredient. Soybeans permeate so many food products beyond where you would normally expect them to be. In other words, the first person to perceive putting soybeans in food would have probably said, 'Let's put it where the seed grains go or the legumes go.' They wouldn't have thought about putting them in bacon bits or milkshakes, strange places like that."

To follow the path of the soybean would elevate the menhaden from its present status as an industrial fish. Like the soybean at the turn of the century, menhaden oil is not approved for domestic food use, and the protein is used almost entirely for animal feed.

Such a lowly fate has lowered the

menhaden's value (5 cents per pound) as compared to other fish, although the fishery remains the nation's largest in terms of volume. In Lanier's eyes, it's the menhaden's low price and high volume that make it a likely candidate for the "soybean of the sea."

Now that Lanier has you convinced of the menhaden's potential, he's ready for the hard sell—menhaden surimi. He begins surprisingly by saying that today all surimi is made from the Alaska pollock, a white-fleshed fish that is low priced and abundant.

BUT, he emphasizes, rumblings from Alaskan fishery managers indicate that pollock stocks may not be as limitless as once believed. With a second punch, he raises the doubt that any one fishery can meet the growing demand for surimi. "If surimi expanded to food chains such as McDonald's or Hardee's," Lanier says, "the pollock fishery could not meet the demand for such large volumes."

Finally, he adds that food processors have perfected a method for filleting the pollock, making it a potential product for higher priced traditional seafood markets.

After casting a shadow on the pollock, Lanier opens the door for an alternative—the menhaden. For four years, Lanier and food scientist Frank Thomas have been working on various Sea Grant projects at NCSU to perfect the making of surimi from menhaden. They know that only science can transform the menhaden from a possibility into a reality. And rest assured, Lanier knows his science as well as his salesmanship.

Pausing from his sales pitch, Lanier admits that menhaden presented some unique problems. It contains a significant amount of dark muscle that could discolor the surimi product. The fish, especially the Gulf species, had a high fat content that could adversely affect the gelling quality, flavor, storage stability and fat content of the surimi. And the processing procedure required large volumes of water and produced large amounts of effluent.

Later the research team identified another problem: an enzyme present in the meat that could cause textural problems if heated to certain temperatures. But, Lanier stresses that this only poses a problem if the surimi is processed into traditional meat "sausage" products such as hot dogs, bologna or luncheon meats. It presents no road-

blocks for manufacturing pseudoshellfish products—menhaden surimi's most likely avenue of entrance into food processing.

Back to his peddling, Lanier smoothly counters each problem with scientific research. He reports that the light and dark muscle tissues have been successfully separated under laboratory conditions. If very fresh fish is used, the two meats can be separated in the straining step of the surimi process. And more rigorous washing has reduced the fat content to less than 1 percent in surimi made from Atlantic menhaden and less than 3 percent from Gulf menhaden.

Next, Lanier called in another Sea Grant researcher, NCSU civil engineer Allen Chao. Chao developed a method to reduce water needs and concentrate the effluent. The concentrated effluent can be funneled into existing menhaden reduction plants and recovered for feed or fertilizer.

The scientists are currently tackling the enzyme problem, Lanier says. They are looking for an additive that might inhibit the enzyme or a process that would remove it altogether. Even without a solution at hand, Lanier confidently says menhaden can be refined into "a surimi of a quality comparable in many ways to that prepared from Alaska pollock."

With many research results in hand and more on the way, Lanier is ready to accept his commission—application of the research on a commercial scale. In fact, Lanier probably developed his peddling pitch because of efforts to interest a menhaden industry bent on animal feed in food products.

But interest he did. To get started in this new line of production, the menhaden industry asked the federal government for some assistance. This year, the National Marine Fisheries Service awarded Zapata Haynie Corporation a fisheries development grant to build a pilot menhaden surimi plant in Reidsville, Va.

When the plant becomes operational this summer, a university advisory panel, including Lanier, will examine the quality of the plant's surimi production—the surimi's fat content, protein content and gelling ability.

What becomes of Sea Grant's top salesman after he collects his commission? He continues to upgrade his product and look for other ways to refine the menhaden into edible products.

# Serving Up Seafood Substitutes

Face it. When it comes to flavor, it's hard to beat the taste of fresh crabs, scallops, shrimp and lobster. But those catches aren't always available. And, even when they are, the price may turn more than one cook's head toward a surimi-based substitute.

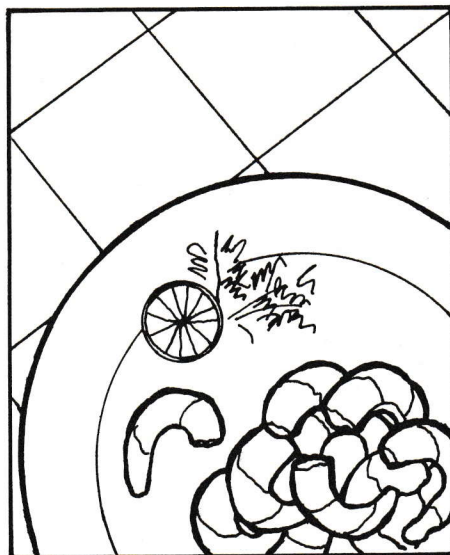
We're not advocating you give up on the real thing, because nothing could take its place. But the surimi-based substitutes have some positive points you should consider. For example, food scientists say the imitations often are more nutritious, containing higher protein and lower fat, calories and cholesterol than the natural counterparts. Some food scientists say surimi-based products will revolutionize the food industry, predicting such edibles as lunch meats, cheeses, snack chips and even a surimi milkshake. But for the moment, surimi's proven worth is in the shellfish analog business.

Joyce Taylor, Sea Grant's seafood education specialist, says the analogs can be substituted in most recipes calling for the real thing. The analogs are best, she says, when used with sauces or in recipes for dishes such as seafood salads, soups, casseroles or Newburgs.

Below are some suggestions for making the imitations taste less like imitations.

## CREAM OF CRAB OR SHRIMP SOUP

2 tablespoons butter or margarine  
1 small onion, minced  
½ cup minced celery  
1 tablespoon plain flour  
½ teaspoon salt  
½ teaspoon paprika  
dash white pepper  
1 teaspoon Worcestershire sauce  
¾ pound crab or shrimp analog, finely chopped  
2 cups milk  
2 cups light cream  
2 tablespoons sherry  
1 tablespoon minced parsley



Melt butter in double boiler. Stir in onion and celery and cook until tender, about 5 minutes. Blend in flour, salt, paprika, pepper and Worcestershire. Add crab or shrimp, milk and cream. Cook over boiling water, stirring constantly until slightly thickened. Stir in sherry just before serving and garnish with parsley. Serves 6 to 8.

## CRAB IMPERIAL

¼ cup low calorie mayonnaise  
1 egg  
½ teaspoon dry mustard  
⅛ teaspoon salt  
dash freshly ground black pepper  
hot pepper sauce to taste  
½ tablespoon minced green pepper  
½ tablespoon minced red onion  
1 pound crab meat analog, flaked

Combine mayonnaise, egg, mustard, salt, pepper and pepper sauce. Add green pepper and onion. Gently stir in crab meat. Place in individual baking shells and bake at 350 degrees for 15 minutes. Serves 4 to 6.

## SHRIMP CASSEROLE

2 tablespoons butter or margarine  
½ cup sliced fresh mushrooms  
1 tablespoon chopped green peppers  
2 tablespoons chopped onion  
1 can cream of mushroom soup  
½ cup grated mild cheddar cheese  
¼ teaspoon freshly ground black pepper  
1 pound shrimp analog  
¼ cup dry bread crumbs mixed with 1 tablespoon melted butter or margarine

Melt 2 tablespoons butter or margarine. Cook mushrooms, green pepper and onion until tender. Stir in soup, cheese and pepper. Heat, stirring constantly until cheese melts. Stir in shrimp. Pour into greased casserole. Spread bread crumb mixture over top. Bake in a 400-degree oven for 10 minutes or until heated and crumbs are brown. Serves 6.

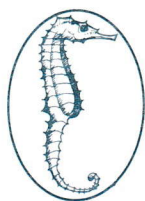
## SEA ENTREE SWISS-STYLE

¼ cup (4 tablespoons) butter, melted  
1 tablespoon lemon juice  
2 cloves garlic, pressed  
½ teaspoon tarragon, crushed  
2 tablespoons Parmesan cheese, grated  
1 package (8 ounces) lobster tail analog, thawed  
salt  
pepper  
½ cup Swiss cheese, grated

Blend together butter, lemon juice, garlic, tarragon and Parmesan cheese. Place analogs face down on foil-lined cookie sheet or broiler pan. Season with salt and pepper. Brush with half the butter mixture. Broil 5 minutes. Turn analogs over. Brush with remaining butter mixture and sprinkle with Swiss cheese. Broil 1 to 2 minutes. Serve with wild rice. Makes 4 lobster tails.

# 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 summer, 15 science teachers from North Carolina will see the state from a new perspective. August 10 to 17, they'll join 15 Puerto Rican teachers for the "Sea to the Mountains Environmental Education Workshop," organized by Lundie Spence and Juan Gonzalez, marine education specialists from the North Carolina and Puerto Rico Sea Grant programs respectively. Any North Carolina science teacher with a pair of tennis shoes, a sense of adventure and a love of nature is eligible.

In one week, the teachers will travel from the coast to the mountains, exploring the temperate ecosystems of North Carolina and learning teaching techniques for marine science classes. They'll trek down a nature trail at Greenfield Lake, examine salt marshes and ocean ecology, relive history with the Cherokees and raft down the Nantahala River. In addition, education materials and field guides will be identified and activities from national science curricula will be used.

The week will also give the North Carolina teachers the opportunity to compare the state's ecosystems with the tropical ones of Puerto Rico and to share ideas from different cultures.

The workshop is sponsored by UNC Sea Grant, Puerto Rico Sea Grant, the N.C. Math/Science centers at the University of North Carolina at Wilmington and Western Carolina University, the N.C. Marine Resources Center at Fort Fisher, Discovery Place, the Highlands Biological Station and the N.C. Wildlife Resources Commission.

Cost for the workshop is \$175. This includes housing, some meals and transportation costs. Deadline for registration is April 1. For more information, write Spence at UNC Sea Grant, Box 8605, N.C. State University, Raleigh, N.C. 27695-8605. Or call, 919/737-2454.

Sea Grant has a new seafood extension specialist at the NCSU Seafood Laboratory in Morehead City. David Green, a Ph.D. candidate in food science at NCSU, will work with North Carolina seafood handlers and processors.

While at NCSU, Green worked with Sea Grant researchers Tyre Lanier and Allen Chao on menhaden surimi processing and on wastewater reduction in surimi operations.

At the seafood lab, Green will introduce clients to new technology, emphasize fundamental seafood handling and processing sanitation practices, and recommend measures to reduce water consumption and waste generation during processing. Green will continue the lab's work on the smoking of mid-Atlantic seafoods.

If you have questions about seafood processing, contact Green at the lab at 919/726-7341.



If you're hooked on fresh North Carolina seafood, you'll want a copy of a brochure compiled by Joyce Taylor, Sea Grant's seafood education specialist. *Hooked on Fresh Fish and Shellfish* gives consumers tips for choosing seafood at the market.

You should know, for example, that a fresh fish will have bright, clear and protruding eyes. If its eyes are cloudy, pink and sunken, there's a good chance that fish has been out of the water too long. If a fish doesn't look fresh, it won't taste fresh either, says Taylor.

*Hooked on Fresh Fish and Shellfish* will provide you with tips for buying fresh fish, shrimp, clams, scallops, oysters, crabs and lobsters. Taylor explains the difference between the var-

ious market forms of fish, and she takes the guessing out of deciding how much to buy. A chart provides consumers with serving suggestions.

For a copy of the free brochure, write Sea Grant. Ask for UNC-SG-85-08.



Both fishermen and fishery managers would like to know the secret for the biggest catches and the most profits. With the help of three N.C. State University economists, the answer can be revealed.

Robert Kellogg, J.E. Easley Jr. and Thomas Johnson recently developed a bioeconomic model and optimal control theory and applied it to the North Carolina bay scallop fishery. For their study, biologic and economic data were fed into a computer model. By altering these economic and biologic variables, the effects of management decisions on the economic returns of the state's bay scallop fishery were examined. Their results are published in *A Bioeconomic Model for Determining the Optimal Timing of Harvest for the North Carolina Bay Scallop Fishery*, which is available from UNC Sea Grant. The information included in this publication should be a useful guide for development of management models for other fisheries.

If you would like a copy, send \$2.75 to UNC Sea Grant, Box 8605, N.C. State University, Raleigh, N.C. 27695-8605. Ask for publication number UNC-SG-85-25.

Seafood is the new kid on the block when it comes to restaurants and grocery stores. Consequently many seafood buyers don't know as much about fish and shellfish as they do about pork, beef and chicken.

To help those new to purchasing seafood, Sea Grant's seafood marketing specialist Gary Van Housen has written a booklet, *A Guide to Purchasing and Handling North Carolina Sea-*

*Continued on next page*

*food for Restaurant Operators and Retailers.*

The booklet will help those who buy bulk quantities of seafood determine freshness, check net weights and handle their purchases more carefully. Van Housen also provides descriptions of some of North Carolina's best seafood selections: bluefish, king mackerel, mullet, red snapper, shrimp, blue crabs and more.

For a copy of this publication, write Sea Grant. Ask for publication UNC-SG-86-01. The cost is \$1.

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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 8605, NCSU, Raleigh, N.C. 27695-8605.

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