



COAST WATCH

Photo by Steve Murray



At the eel farm, hundreds of baby eels squirm toward a meal specially concocted to make them grow fat and healthy

Mapping floods, Weighing waves

The North Carolina coast is a complex creature, but one worthy of understanding. From the barrier islands to the estuaries, from the seafood industry to the marina business, questions constantly crop up about our coast. Some of the answers are simple, but others require years of research.

In an attempt to mesh the need for greater use of coastal resources with a respect for environmental needs, Sea Grant has funded 26 research, education and advisory services projects by researchers at seven universities. Twelve projects are new to the program while 14 are continuing.

Of all the forces nature brings to bear in coastal North Carolina, none is more dramatic than a hurricane. But not since Hazel in 1954 has our coast felt the brutal winds and surging floodwaters of a major storm. The threat of a hurricane makes communities and officials apprehensive: When a hurricane does strike, what will it destroy?

A new Sea Grant study beginning this year is to pinpoint areas in coastal North Carolina that are especially vulnerable during storms. T. C. Gopalakrishnan, an associate professor of marine science at North Carolina State University (NCSU), has already begun studying data from Hazel. He will use the data to project the extent and impact of floodwaters under

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Dense coastal development, like this stretch in Long Beach, poses a host of problems for planners

various conditions. Beach communities and other populated coastal areas would be "mapped." The goal is to develop a numerical model that would predict, given the position and characteristics of an approaching hurricane, what coastal areas would likely be submerged.

The information will have several direct applications. Communities will be able to use it to plan evacuation routes for their citizens. It will help state and local officials strengthen building codes and land-use management plans. And it will be useful in the application of federal flood insurance regulations.

The research will fit nicely into Sea Grant's effort to create an awareness of weather hazards in coastal areas. This year, a coastal weather awareness specialist will join the ranks of Sea Grant's Marine Advisory Service. Working with the National Weather Service, the specialist will focus research results and help communities plan ways to protect the lives and property of their residents.

Less dramatic but perhaps just as

serious as hurricane flooding is the problem of septic tanks in sandy coastal soils. On the Outer Banks, where the water table is high and the soils are porous, it is difficult to find a site on which a conventional septic system works. Too often, such systems fail, allowing effluent to spoil groundwater or to seep into sounds and estuaries, where it contaminates fishing grounds.

Because ocean outfalls and sewage treatment plants are usually too expensive for small communities, preventing the use of a septic tank has meant preventing the development of a property in many areas.

This year and next, a Sea Grant research team with a record of success on other difficult soils will study the problems and, perhaps, prescribe some solutions.

The study will follow up on work done by Bobby Carlile of the NCSU soil science department. With Sea Grant support, Carlile has developed two modified septic systems—one built into a mound and the other employing a low-pressure pump—that

work effectively in many areas where conventional systems have failed because of poor soils. Carlile's associate, Craig Cogger of NCSU, will set up a demonstration site on the southern North Carolina coast and test both modified systems to see how each performs in the coarse sands of barrier islands. Cogger will get help from Mark Sobsey of the University of North Carolina at Chapel Hill (UNC-CH), who has been conducting a Sea Grant project on enteric viruses in shellfish.

Coastal management officials are waiting for the study to help them make sound judgments about development on the islands. And, if good alternatives are found, some failing systems might be replaced, protecting coastal waters from at least some of the pollution from island communities.

Dealing with any complex coastal issue—including such things as hurricane preparedness and sewage treatment—usually involves at least one legal or public-policy angle.

Finding expertise in coastal law and planning is a problem, not only for the

state's Office of Coastal Management, but also for many coastal communities. There is simply more legal and planning work than there are people trained to do it. Much of this work is research, and that's an area in which Sea Grant can offer help.

Sea Grant is funding a new two-year project that will provide both research and training. Graduate students from two state campuses, the University of North Carolina at Chapel Hill (UNC-CH) and North Carolina Central University (NCCU), will be recruited to work on coastal issues. Their efforts will be directed by David Brower, of the Center for Urban and Regional Studies at UNC-CH, and Tom Earnhardt associate professor of law at NCCU.

The idea of involving students in such work is not new. The first Sea Grant project in coastal law and planning was begun in 1971. Students from that program, and from the other programs that followed, have gone on to become coastal policy-makers active in a number of state offices.

This year's project has several goals: to provide some of the research and scholarship coastal management officials need to set effective policy; to interest and train talented law and public-policy students in the growing field of coastal and marine planning and law; and to help leaders keep up-to-date on the issues they face.

As their colleagues probe the soils, contours and issues of coastal North Carolina, two teams of researchers from NCSU will continue a pair of projects aimed at measuring and predicting the movement of its waters.

Ernie Knowles and Bob Weisberg are continuing a search begun in 1979 for ways of predicting how the Gulf Stream affects wave energy at the coast. Much of their effort so far has been invested in improving and testing the sophisticated gear required to measure wave size, shape and energy. This year and next, the team plans to use the equipment to pull together the data they need to tailor standard wave-prediction models to North Carolina. Such information could be applied to a host of coastal problems, from the design of coastal structures to the control of beach erosion.

The sea's energy runs deeper than surface waves. Currents carry sand, nutrients, pollution, marine life and energy in the nearshore waters. Measuring and understanding those currents is critical to the management

of many coastal resources.

In 1979 and 1980, Tom Curtin and Yates Sorrell developed the tools to measure and describe those currents. Current meters have been available for some time, but they were designed for deep water and were so expensive that scientists could not use enough of them to adequately measure nearshore processes. Curtin and Sorrell's gear has

the advantage of being relatively inexpensive, and yet accurate. This year, the team plans to moor several of the new meters and begin collecting data.

If the team is successful, it will be possible for scientists to trace nutrients, pollution, and sediments, and define the physical environment of the marine life.

An epidemic of marine education

Beaches, marshes, islands, estuaries and the sea—there is no more stimulating setting or subject for learning than coastal North Carolina. Just ask a child whose teacher has led a field trip there.

For some time, Sea Grant's marine education specialist, Lundie Mauldin, has worked to infuse marine studies into the curricula of the state's public schools. This year, Sea Grant will support five innovative projects that will reaffirm North Carolina's national leadership in marine education.

—By 1985, about 80,000 young people in the state's 4-H programs will have had exposure to marine and coastal science, thanks to a new Sea Grant program organized by Donald Stormer and Dalton Proctor of the N.C. Agricultural Extension Service that will train 4-H extension leaders and volunteers, and develop study materials for youth.

Because of the project, coastal resources will be stressed in 4-H curricula, volunteer-training workshops and 4-H camps. The entire effort is aimed at instilling in some of the state's future leaders a working knowledge of coastal resources.

—This year Sea Grant will be bringing more of the coast to the classroom. With a video system to be shared between the Marine Resources Centers, Sea Grant and center staff can tape workshops and programs for later use in the classroom. Neal Conoley, project coordinator and education specialist with the N.C. Office of Marine Affairs, says the video system can also be used to share programs between the centers.

—Three interns have successfully completed a program begun last year to train leaders in marine education. The project, directed by Carolyn

Hampton of ECU, schools future educators in the issues and the natural environment of coastal North Carolina. This year, several more students working towards advanced degrees in education will use internships in institutions like the N. C. Marine Resources Centers to develop new educational materials and teaching strategies.

—In its fellowship program this year, Sea Grant will offer support to five undergraduate students, from primarily black or American Indian colleges, who will participate in marine studies. Also, three doctoral candidates working in marine science will use Sea Grant fellowships to further their studies.

—Beyond the classroom, the need for education is especially keen. A program of continuing education for commercial fishermen, led by Jim McGee of ECU, last year reached hundreds of fishermen with information about new gear, safety practices and navigation. This year, more workshops, classes and presentations will cover such areas as financial management, new technology and practical meteorology.

—While these projects try to fill the immediate need for marine education, another Sea Grant research team is trying to anticipate the future need for skills and education in another area—the seafood industry. Nozar Hashemzadeh and Michael Simmons, both of North Carolina A&T State University, spent last year learning about the industry's needs for manpower. They have found that seafood plants, as they modernize, are hampered by a shortage of skilled labor. The team is compiling a profile of the state's seafood industry, including an analysis of its labor requirements.

Tracing the secrets of shells, fish and sportsmen

Among the natural resources concentrated in North Carolina's estuaries, recreational fishing ranks as one of the most important. This year, a Sea Grant research team will study the resource by going straight to the people who enjoy it—the people who spend their leisure hours fishing the state's sounds.

Following up last year's study of offshore fishing and tournament fishing, Peter Fricke, an ECU sociologist, Leon Abbas, Sea Grant's recreational and economic specialist, and James Sabella, a University of North Carolina at Wilmington anthropologist, will be conducting a similar socio-economic study of sound fishing.

They will be surveying fishermen to find out who fishes in the sounds, where they are from, how much they spend in local businesses while they're fishing and what type of fish they are hoping to reel in. The researchers feel this type of information can be used by local and regional planners to provide for things like boat ramps and fishing access areas as well as for more complicated things like zoning for economic activity.

In another part of the study, Fricke, Abbas and Sabella will be paying particular attention to the recreational and commercial striped bass fishery. There has been growing national concern over the decline of striped bass in eastern United States sounds. This study, along with others in Maryland and Virginia, will attempt to answer some questions needed for better management and revitalization of the fishery.

Striped bass aren't the only fish on the decline in North Carolina sounds. Commercial catches of river herring are also on the downswing. Past declines were attributed to intense offshore fishing of river herring by foreign vessels. But controls implemented by the 200-mile limit in 1975 lessened offshore fishing pressure. The river herring catches, however, did not respond and landings remain low. Scientists now suspect the reason for fewer river herring may lie elsewhere.

Bob Sniffen, an ECU researcher, will be examining larval and juvenile river herring in the Albemarle Sound

system, the state's primary nursery for these fishes. He will be studying the habitat needs of the tiny river herring soon after they are spawned along the edges of streams and rivers. He wants to determine what link exists between habitat conditions during the larval and juvenile stages and river herring adult abundance later.

In particular, Sniffen will be looking at river herring in the Chowan River system, where nutrient pollution has caused massive blue-green algae blooms and reduced oxygen levels in the river. Over 50 percent of the state's river herring landings come from the Chowan River. Sniffen will be examining the effects of the nutrient pollution on the young river herring.

Sniffen will be coordinating his Sea Grant work with an Environmental Protection Agency grant he received last year. With that grant he is studying the role of flood plains. Sniffen says his work will be used by Marine Fisheries to develop a management scheme for river herring later this decade.

With five major research facilities in Carteret County, there is a wealth of research on the nearby Newport River estuarine system. But the trouble comes in finding the results of that research. It is scattered among the files and libraries of numerous research organizations.

John Costlow and William Kirby-Smith, two scientists at the Duke Marine Laboratory at Beaufort, are going to put together an annotated bibliography of past, current and proposed research that is specifically related to the Newport River estuarine system. The bibliography will be particularly helpful to researchers planning new research in the Newport system and in similar systems along the East Coast. Coastal managers and planners can use the bibliography as a guide for seeking information needed to make management decisions.

As a second part of their project, Costlow and Kirby-Smith will characterize the Newport River system, describing its hydrology, geology, fisheries, biology and ecology. Scien-

Photo by John Rotter



Livelihoods rise and fall with the health of estuaries

tists can use this characterization as a base in developing plans for managing the state's estuaries and to compare the Newport system to other estuarine systems in this state and along the East Coast.

While Costlow and Kirby-Smith are digging through files and libraries, Mark Sobsey, a UNC-CH researcher, will be digging for clams and oysters. Sobsey will be continuing his Sea Grant work, begun last year, to study virally contaminated oysters and clams. He has already found that oysters relayed from polluted waters to clean waters flush harmful viruses from their bodies rapidly during winter, spring and late fall. But the oysters do not purge the viruses very well during summer and early fall.

This year Sobsey will be trying to find out why the oysters do not cleanse themselves as readily during warm weather. To find out this information, Sobsey will be examining where the viruses settle in the oyster's body. Sobsey will also continue to gather information on the distribution and survival rate of viruses and bacteria in shellfish, water and sediment contaminated by wastewater. Sobsey's project will be useful in evaluating current bacteriological standards for shellfish contamination and perhaps provide better ways of determining shellfish contamination in the future.

Shellfish also figure in a Sea Grant study being conducted by Charles Peterson, of the UNC-CH Institute of Marine Sciences, and Peter Fricke, who will continue their work with hard clams. Last year, Peterson learned that North Carolina hard clams, like trees, add a growth line in their shells every year. With this information, Peterson will know how long it takes a clam to reach a harvestable size. Peterson will also be continuing his harvesting tests. In these experiments, he will be comparing the biological effects of clam kicking to the more traditional means of harvesting, like clam raking.

Fricke will be conducting the sociological part of the clam study. He will be surveying and interviewing fishermen so that he can compare the economic benefits and costs of clam kicking to those of clam raking. He also will be seeking to learn why some groups of fishermen adopted clam kicking while others did not. And, more generally, he will be trying to determine fishermen's attitudes toward management policies.

Another continuing project concerned with fishermen's attitudes and beliefs about the fishery and its management is John Maiolo and John Bort's project about the shrimp fishery. Maiolo and Bort, two ECU sociologists, have been gathering historical information on the shrimp

fishery to give managers a better insight into a fishery steeped in tradition. Maiolo and Bort also have been conducting interviews with shrimp fishermen and marketers to see how traditions, community ties and occupational options of the fishermen affect the fishery.

Better eating for the edible eel

Since the original funding of Sea Grant in 1970, money has been allocated for aquaculture studies. One of Sea Grant's new projects this year proposes to encourage development of an aquaculture industry in North Carolina through research and demonstration at the Aquaculture Demonstration Project in Aurora.

William L. Rickards, associate director of UNC Sea Grant, says the project will provide aquaculture information on the American eel, coho salmon and rainbow trout. In response to one request, project personnel will be working in cooperation with Texasgulf in Aurora to develop fish farming techniques for salmon and trout during the summer months. Requests have also generated the need to establish a blue crab shedding demonstration at the facility. There are currently only a few crab shedders in North Carolina, but a high demand for softshell crabs indicates the time is right for this new seafood business.

The last part of this project will include aquaculture advisory services to meet the many requests and bring the research to the people. A reference library, demonstrations and cooperation with other agencies and active aquaculturists are some of the means this project will use to encourage development of new aquaculture businesses in the state.

To successfully raise any species in a culture system, a nutritional diet is one of the primary requirements. But, this one factor has been the major drawback in American eel culture operations in the United States. In Europe and Japan, where there is a strong market for eels, a nutritional diet for the European eel and Japanese eel has been established through research. One new Sea Grant project intends to do the same this year for the American eel.

In Europe and Japan, eels are widely used as a food source and that demand has increased annually. North Carolina has been harvesting and shipping its wild eels to these markets since 1972, but the long-term demand can't depend on just wild eel sources. The establishment of an eel industry can meet these demands if a low-cost, nutritional feed can be developed. At present, there is no inexpensive commercial feed being produced for the American eel.

Margie Lee Gallagher, assistant professor of home economics at ECU, is researching the nutritional requirements of the American eel. By studying the eel's body composition, she will develop the proper protein, fat, carbohydrate and energy levels necessary for an artificial diet and good growth under culture conditions.

When setting opening dates for shellfishing in the state, the Division of Marine Fisheries (DMF) often runs into conflicts. It may be the right time to open clam season, but what effect will certain harvesting techniques, such as clam kicking, have on young scallops developing in the same area. Holding the opening of shrimp season is sometimes good for shrimpers because larger shrimp bring higher prices. But, often this delay means more shrimp are migrating out of the estuary. What effect does crab trawling have on oyster beds that are being built up? What works for one species is often bad for another. So, where do you get the information to make these decisions?

Jim Easley, Thomas Johnson and Frank Benford at NCSU will be compiling the necessary information and developing a set of models to help DMF decide on the timing in such

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management questions. In this project, basic biological information will be collected on bay scallops, clams, New River shrimp and crabs in the Pamlico Sound bays. This information will be combined with economic data including weekly prices, market demands and past seasonal patterns in harvesting. With both the biological and economical aspects considered, a system will be developed to answer these questions with relation to each individual species and in overlapping situations, such as clams and scallops.

In 1981, this team of researchers will be setting up a model for each species mentioned and working with DMF to determine fishery management problems and conflicts. Once in operation in 1982, updated information can be added.

Seafood harvest and processing is a healthy industry in coastal North Carolina. In 1979, total landings amounted to \$60 million. To keep up with technological advances and improve economic yield, Sea Grant researchers will be continuing research on four projects.

Don Hamann, Tyre Lanier and T. S. Lin of the food science department at NCSU will be experimenting with new minced fish products this year. Underutilized species, such as spot, croaker and mullet, are washed and minced to produce a fish meat called surimi. When combined and processed with shellfish, like shrimp or crabmeat, the end product is not only delicious, but lower in cost. And, with ever increasing seafood prices, an inexpensive alternative is welcomed by people who can't afford, but still want, seafood on their tables.

During 1980, the researchers received very high marks from several taste panels which sampled surimi shrimp fried, in salads, casseroles and creole. Seafood processors are also interested in the highly nutritional seafood product for fabricated prepared seafoods. New work in this project will include refining processing techniques, developing new food products, and experimenting with new fish species for surimi.

In related research, Lanier, H. M. Hassan and Frank Thomas have been experimenting with ways to get fresh fish to inland markets. To achieve this goal, the researchers have been perfecting a method of freezing fresh fish. A frozen product that can withstand both shipping and market storage

also depends upon durable and appealing packaging, a second phase of the project.

Market surveys conducted during 1980 in area supermarkets indicated customers are eager to put fresh frozen fish in their shopping carts. But, by testing a variety of packaging techniques, it was determined that appearance is the selling factor in determining whether the consumer picks up the fish or not. Continuing research will include more experimentation in freezing and packaging, including more market tests, to produce a product with a longer shelf life and appeal.

Waste created in seafood processing plants is and always will be a major problem. Treatment is expensive and often ignored by small seafood businesses along the coast. But, Allen Chao and Jason Shih of NCSU have

found a way to take waste and create a valuable product from it.

Using techniques developed for poultry waste treatment, they devised an ultrafiltration process in 1980 which traps valuable nutrients. Water and small molecules which pass through the filter are cleaned, and the water can be re-used. The trapped nutrients also have potential for use as supplements in animal feed.

Aquaculture is also represented in a continuing project. Researchers Howard Kerby and Mel Huish of NCSU have developed a successful culture for raising hybrids from striped bass X white bass and striped bass X white perch. Begun in 1979, this project has demonstrated that larval bass can be produced in large numbers in tanks and ponds similar to those used at the Aquaculture Demonstration Project.

Photo by J. Foster Scott



From the ocean to the table, seafood is vital to the coastal economy.

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 office in Raleigh (919/737-2454).



Cold weather isn't enough to keep some fishermen in on a blustery day, but frozen sounds are. Days of record low temperatures in January froze sounds three to four feet thick along the Outer Banks, keeping all boats docked for several days and fishermen in for a winter break.

John McClain of the National Weather Service in Raleigh said this winter has been cold, "but not that cold. The winter of '76 and '77," he explained "was the coldest in North Carolina since we started keeping records." According to Jay Hull of the Cape Hatteras National Weather Service, "During that chilly winter, there were long strings of days below freezing with ice, blown up on the beach by wind, eight to ten feet high. Still, January has been a cold month with below normal temperatures."

Salinity is a prime factor in sounds freezing. Bob Hines, Sea Grant marine advisory agent at Bogue Banks, says the sounds are not as salty as the ocean and will freeze first. "As salinity goes up," he says, "the freezing point goes down. Average sound temperatures during this cold period were 34°F (1°C). The freezing point for ocean water is approximately 28°F (-2°C)."

When the water gets colder, fish move to warmer areas. But, thousands of young croaker in Pamlico Sound got caught in the sound and died in the freezing water. According to Bob Pittman of the Division of Marine

Fisheries, "This was not a tremendous loss in relation to the annual harvest, but still a significant loss. Fishermen were scooping up one-tenth of one percent of the dead fish, but they are not a marketable size."

Pittman is concerned that more of the extreme cold could affect the pink shrimp population which is overwintering now. Pink shrimp account for only 10 to 20 percent of North Carolina's total shrimp harvest, but Carteret and Onslow counties are very dependent on this species. "It's possible," Pittman explains, "that we could have a high mortality rate if these cold temperatures continue." The pink shrimp and oyster populations were in danger the winter of 1976-77.

The recent cold spell has the Coast Guard worried, too. Many aids-to-navigation, especially between Oregon Inlet and Roanoke Sound, were ripped out by the ice. QMT Richard Brady of the Cape Hatteras Coast Guard Station says, "A lot of aids are missing, destroyed or off location, and boaters should exercise extreme caution. A broadcast notice to mariners will be aired continuously until the aids are replaced."

Brady says replacing the aids will take some time. There is an ice-breaking vessel, the Chokeberry, assigned to the Hatteras area. But, it is now working in the Chesapeake Bay where there has been even more severe winter weather.



Since so many of our readers have expressed an interest in our Harkers Island issues, *Coastwatch* thought you might like to know about a program being aired on UNC-TV this month. "The Peggy Rose," a 30-minute program on the Rose Brothers Boat Works, will be broadcast on all UNC-TV stations February 9 at 10:30 p.m. and February 15 at 3:30 p.m.

Produced and directed by Woody Woodward, the documentary follows James and Earl Rose building a 55-

foot sportfishing boat from 1977-78. Completed last October, "The Peggy Rose" was a massive editing project of over 25 hours of videotape shot at the Harkers Island boat works. Woodward's production was the result of an artist-in-residence grant at UNC-TV funded by the Corporation for Public Broadcasting and the National Endowment of the Arts.



Over a thousand students entered a recent poster contest celebrating 1980 Year of the Coast. Sponsored by Sea Grant, the North Carolina Marine Resources

Centers and the Department of Public Instruction, the statewide contest entries were judged in four age categories by the three centers and the Sea Grant office.

Entries included seascapes, lighthouses and coastal animals in crayon, pastels, pen and ink, acrylics and mixed media. Winners were awarded a specially designed certificate and a marine education program, called "Sea Day," for their classes or schools.

Winners in grades K-3 were: Stephanie Krolick (first place), Kitty Hawk Elementary, Kill Devil Hills; Justin Cooper (runner-up), Forest Hills Elementary, Wilmington; and Rockridge 2nd Grade School (class poster runner-up), Cleo Taylor, teacher, Wilson. Winners in grades 4-6 were: Tommy Southern (first place), Summer Middle School, Greensboro; Cathy Scarborough (runner-up), Ocracoke School, Ocracoke; and Leslie Ashfield (runner-up), Welcome School, Welcome.

Winners in grades 7-9 were: Wylie Whitehurst (first place), Ocracoke School, Ocracoke; Denise Lavertz (runner-up), Wiley School, Winston-Salem; and David Cagle (runner-up), East Lee Junior High School, Sanford. Winners in grades 10-12 were: Robert Stephens (first place), Weaver

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Educational Center, Greensboro; Steve Warner (runner-up), Washington High School, Washington; and Karen Forehand, J.H. Rose High School, Greenville.



Fishermen and hunters ply coastal waters even during the winter. But rough seas can cause a boat to capsize and winter's cold water can be a killer.

When a person is thrown into cold water, nearby tissues begin to cool very fast. These tissues cool the blood flowing through arms and legs which in turn begins to cool the blood in the inner body. It takes 10 to 15 minutes in water below 70°F before the temperature of the heart and brain begin to drop. When the body temperature falls below 98.6°F, a condition called hypothermia exists.

First you shiver, then you lose manual dexterity and muscle rigidity. As cooler and cooler blood circulates to the brain, mental confusion occurs. When the core body temperature falls below 90°F, the victim becomes unconscious. At a core temperature of 85°F, heart failure occurs.

Your chance of survival in cold water depends on many factors. Conserve body heat as much as possible. Do not swim. A person will cool 35 percent faster by swimming. Keep your head out of the water and adopt the heat escape lessening posture (HELP).

To assume this posture, ball up in a fetal position. This is possible, however, only if you are wearing a personal flotation device. If there is more than one person in the water huddle together. Most boats will float even when capsized. Try to get in or on the boat to get out of the water.

If you rescue a hypothermia victim, rewarm him or her carefully. Do not warm the arms and legs. This can cause cold stagnant blood to rush to the core of the body, dropping the body temperature below a level that will sustain life.

Move the victim to shelter and warmth as soon as possible. Remove all the wet clothing. Apply heat to the head, neck, sides and groin with warm, moist towels, hot water bottles or heated blankets. It is best to lay the victim on a hard flat surface, should cardiopulmonary resuscitation be needed.

Another way to warm a hypothermia victim is for rescuers to remove their own clothing, using their body warmth to warm the victim's unclothed body. A blanket or sleeping bag should cover the victim and rescuer to conserve heat.

In cases of mild hypothermia, dry clothing and shelter may be all that is needed. But all hypothermia victims should be seen by a doctor.

Even if a victim appears drowned, administer heart massage and mouth-to-mouth resuscitation. Cold water drowning victims have a good chance of revival.



As inflation takes more out of your pocket-book and puts less in your grocery bag, economical meals become a necessity. One aid to good menu-planning is Sea Grant's flyer, *Fish Flakes: seafood stretchers*.

High in protein, fish flakes can be used as a low-fat extender, flavor enhancer or meat substitute in a variety of dishes. Any fish, including less popular, inexpensive kinds, can be flaked in the six simple steps explained in the flyer. And, the final product is good in casseroles, salads, chowders or sauces. Recipes are given for seafood pizza sauce, stuffed clams, stuffed scallops and crab imperial.

To obtain a free copy, write Sea Grant, Box 5001, Raleigh, North Carolina 27650. Ask for UNC-SG-79-01.

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