Sea Grant
New York

COASTLINES

Restoring Coastal Ecosystems

A new field of applied science—restoring damaged coastal ecosystems—has become a priority for New York Sea Grant in both its research and outreach programs. Restoration attempts to bring an ecosystem back to some healthier state of functioning. Sometimes restoration is done because of some catastrophic event such as an oil spill. Other times, restoration is attempted to reverse the gradual, long term loss or destruction of coastal habitat.

Many programs have made restoration of coastal ecosystems a priority. For example, the Long Island Sound Study Habitat Restoration Initiative has three broad goals. The first is to restore the ecological functions of degraded and lost habitats. Secondly, the Initiative seeks to restore 2000 acres and 100 miles of natural habitats over the next 10 years. Thirdly, the Initiative will use partnerships to accomplish the restoration objectives and to

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From the Director

Director
Jack Mattice
Associate Director
Dale Baker
Assistant Director
Cornelia Schlenk

COASTLINES
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Writer/Editor
Barbara A. Branca
bbranca@notes.cc.sunysb.edu
Design
L.C. Graphics
Layout
Sharon O'Donovan
Production Assistants
Sharon O'Donovan
Susan Hamill

New York Sea Grant Institute
121 Discovery Hall, SUNY at Stony Brook
Stony Brook, NY 11794-5001
(516) 632-6905

New York Sea Grant Extension Offices:
74 John Street, Kingston, NY 12401-3824
(914) 340-3990

Cornell University Laboratory
3059 Sound Avenue
Riverhead, NY 11901-1098
(516) 727-3910

146 Suffolk Hall, SUNY at Stony Brook
Stony Brook, NY 11794-5002
(516) 632-8730

Morgan II, SUNY College at Brockport
Brockport, NY 14420-2928
(716) 395-2638

204 Jarvis Hall, SUNY at Buffalo
Buffalo, NY 14260-4400
(716) 645-3610

348 Roberts Hall, Cornell University
Ithaca, NY 14853-4203
(607) 255-2832

101 Rich Hall,
SUNY College at Oswego
Oswego, NY 13126-3599
(315) 341-3042

Habitat has become a critical national and state issue. National Sea Grant College Program Director Ron Baird has equated the potential impact of the 1996 Sustainable Fisheries Act (SFA) to the landmark 1972 Clean Water Act (see page 3). One part of SFA focuses on *essential fish habitat* (EFH). On January 13, 1999, President Clinton announced a $1 billion *Lands Legacy Initiative* that, despite its name, includes $25 million for acquiring and protecting critical coastal habitats. Hard as it may be to believe, over 85 percent of New York's population lives along marine or Great Lakes shores. The urbanization of New York's coasts has placed human uses in competition with each other as well as with maintenance of our wetland habitats. Thus, the habitat orientation of this *Coastlines* reflects the realities of sustainable coastal development in New York and the nation.

EFH is defined by NOAA as "those waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity." Managing fisheries by maintaining EFH understandably raises many of the same questions that are critical for decisions about habitat restoration. Such questions include: What are the ecological roles of each habitat? What are the physical, chemical, and biological parameters of the habitat that affect that role and how can they be optimized? How do fisheries respond to lots of marginal habitat as compared to a little optimum habitat? How does spawning habitat translate to fish productivity? Only by addressing these complex questions can we base our decisions on reliable predictions rather than trial and error or assumptions.

Research, extension and education can speed acceptable solutions for both fisheries sustainability and habitat restoration. The National Marine Fisheries Service (NMFS) has been revising Fisheries Management Plans to include EFH. All existing sources need to be mined for habitat data for use in these plans. Fishermen and the public need to be educated about the science of EFH and its use in decision making. And a research program needs to be implemented to generate the data required as a basis for wise application of the EFH concept. Similar protocols need to be applied to support state and federal partners who are wrestling with how best to restore habitats that are clearly degraded. Decisions are likely to be controversial until the methods are recognized as thoroughly based in science.

Sea Grant's integrated focus on research, extension and education can play a very important role in providing the scientific information needed for both EFH management and habitat restoration. In fact, Sea Grant programs from the northeast, mid-Atlantic and Great Lakes regions (including NYSG) will meet with the NMFS on April 7-9 to increase that role. In the mean time, I hope this issue of *Coastlines* gives you a better idea of NYSG's progress and plans with respect to both EFH and habitat restoration.

During his November visit, National Sea Grant Director Ronald C. Baird met with New York Sea Grant staff, Board of Governors members, as well as presidents of supporting universities. This photo shows from left to right Jack Mattice, NYSG Director, Shirley Strum Kenny, President of the State University of New York at Stony Brook, Ronald Baird, National Director, and Dale Baker, NYSG Associate Director. More about Baird's visit on page 13.

In this winter Coastlines,

Coastal Habitat Restoration and Essential Fish Habitat

are featured, two leading coastal issues of our day.

1998 was the International Year of the Ocean. However, a press release by the White House on January 11, 1999, reads: "Today's announcement that 1998 was the warmest year on record is yet more evidence that global warming is real." According to Vice-President Al Gore, "We owe our children and grandchildren a healthy planet that will support strong, sustainable economic growth. Today's announcement makes the task all the more urgent." With New York's 3400 miles of coastline, some of which is the most populated in the country, restoring coastal ecosystems to a healthy state is a priority. We urge our readers to consider Robert Kent's feature article entitled **"Restoring Coastal Ecosystems."**

Photo by Barbara Branca

"We owe our children and grandchildren a healthy planet that will support strong, sustainable economic growth. Today's announcement makes the task all the more urgent."

—Vice-President Al Gore

Essential Fish Habitat

"This is the most significant piece of environmental legislation since the Clean Water Act of 1972."

—National Sea Grant Director Ronald C. Baird

is a concept that sprang from the Sustainable Fisheries Act of 1996. Referring to this law, Ronald Baird, Director of NOAA's National Sea Grant College Program says, "This is the most significant piece of environmental legislation since the Clean Water Act of 1972." Continues Baird, "The law now mandates not only the management of the harvest of commercial species, but the environment necessary for the reproduction, feeding and growth of those species as well. The full implications of essential fish habitat are not widely appreciated by the public. They will be shortly." With Mark Malchoff's featured article entitled **"Essential Fish Habitat: Why all the fuss,"** *Coastlines* aims to familiarize our readers about this essential concept.

Photo and wooden fish sculpture by James Cook

Restoring Coastal

Continued from front cover

leverage the limited state, local, and federal funds. The use of partnerships will be key to successful restoration efforts. The expertise needed to conduct restoration lies in many different places, and so does the funding. Often, local governments own the habitat that is being restored, while the funding and expertise may come from other places. Private landowners are also getting involved in restoration efforts, as are community and environmental groups.

Many types of ecosystems are candidates for restoration. Tidal wetlands are a major focus of many restoration projects. These wetlands perform many important functions as they remove nutrients and contaminants from surface runoff and ground water and provide habitat for a wide variety of coastal and migratory species.

Other habitats being considered for restoration include rivers, dunes, coastal forest communities, intertidal flats, estuarine embayments, and coastal grasslands. On Long Island's east end, the Peconic Estuary Program seeks to restore a variety of ecosystem types including submerged aquatic vegetation (SAV) beds. SAV consists of rooted plants, primarily eelgrass *(Zostera marina)*. SAV beds provide essential habitat for the bay scallop, as well as nursery and feeding grounds for juvenile stages of many finfish species. They are also very important food for some waterfowl, especially the Atlantic brant.

The Hudson River Habitat Restoration project is a partnership between the U.S. Army Corps of Engineers, the New York State Department of Environmental Conservation, and the New York State

Success in Urban Restoration

What does it take to restore a little over two acres along a highly-developed urban coast? Eleven acres of maritime shrubland/grassland habitat fringed with intertidal wetlands located at the Norton Basin in Far Rockaway, Queens was purchased by the New York State Department of Environmental Conservation in 1995. Although the parcel was under significant developmental pressure, it had a high restoration potential and was identified as a high priority site through the Jamaica Bay Damages Account Restoration project. This effort, the Norton Basin Natural Resource Area at the terminus of Healy Avenue in Far Rockaway, consisted of restoring 1.25 acres of wetland and 1 acre of upland shrub grassland.

The wetland portion was created through excavation of historic fill to appropriate elevations to support wetland vegetation. The wetland plantings consist of a combination of intertidal salt-tolerant plants such as smooth cordgrass, salt hay and spike grass.

Step 1

Photo by Dawn McReynolds

Excavating the site.

Step 2

Photo by Tammy Greco

Planting the wetlands.

Department of State. A joint study identified opportunities for habitat restoration and recommended feasibility studies to determine their likelihood of success and to estimate restoration costs.

Because so many areas need restoration and because resources to get the job done are so limited, a process of establishing priorities is typically put into place. Community groups, scientists, local governments, and resource managers are asked to nominate potential sites for restoration. Criteria used to establish priorities include whether endangered species use the area, how severe the degradation is, the costs involved, how much community support there is for the project, and the likelihood of success.

Committees of experts and concerned citizens steer and implement restoration projects. New York Sea Grant is quite actively involved with the committees serving several estuary programs. Getting the best scientific information to groups that will actually do the restoration work is another goal of New York Sea Grant. Recently, Oregon, Louisiana, and New York Sea Grant, with funding from the National Sea Grant Office, teamed up to begin the Coastal Ecosystem Restoration Pilot Project. The objectives of the pilot program are to: 1) increase the capacity and skills of local restoration groups to incorporate the best available science into landscape-level plans and into the individual restoration and enhancement projects they design, construct, and monitor; 2) increase the capacity and skills of local restoration groups to make difficult decisions, set priorities, resolve

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Step 3

Photo by Tammy Greco

Restoring the dunes.

Restoring Rose-Covered Dunes

After screening out concrete debris from the excavated fill used to create the wetland at the Healy Avenue site in Queens, the fill was placed in the upland of the site to create a low, rolling dune habitat. The new dune was planted with shrubs such as pitch pine, Virginia rose, groundsel bush, bayberry, shad bush, and beach plum. Grasses such as switch grass, little bluestem, seaside goldenrod, sand dropseed broom sedge, purple lovegrass, side-oats gramma, and crowfoot cyperus were also planted to maintain the dune. The existing dune was regraded and planted with beach grass.

Norton Basin Natural Resource Area Restoration was completed in June 1998 and is slated to be monitored with both qualitative methods such as general on-site observations of fish and wildlife usage and quantitative methods such as plant densities, soil organic matter, above and below ground biomass and sedimentation rates.

—Information supplied by NYSDEC

Restoring Coastal

Continued from page 5

disputes, and operate effectively over the long term to achieve their goals; 3) share what was learned in the pilot project with the National Network of Sea Grant programs. Because it began in February of 1998, the Coastal Ecosystem Restoration Pilot Project is just getting started. In its first year a habitat restoration manual is being developed and in its second year the manual will be introduced in training programs in the three states involved. The principal audiences for the materials will be local government and agency staff, non-governmental organizations, and the workforce that carries out restoration and enhancement projects.

Restoring our coastal environment to a healthier level of functioning is a major undertaking. It will require the best science and the commitment of a wide variety of agencies and people. Restoration projects are expected to remain a major priority in both the marine and the Great Lakes districts in New York as well as regionally and nationally.

Sea Grant Along the Hudson

Currently funded by New York Sea Grant, Stuart Findlay, scientist at the Institute of Ecosystem Studies in Millbrook, New York, is working closely with the Habitat Restoration Project and in particular with the Hudson River National Estuarine Research Reserve. In Tivoli Bay North, one of four nationally designated estuarine reserves along the Hudson, Findlay is comparing the dynamics of decomposition for both invasive reeds *(Phragmites)* and the native cattails *(Typha).* Reeds stay standing long after they die compared to cattails which fall over soon after they die. Thus the rates at which the plant matter decays differ as do the nutrient loads added to the water and the dynamics of populations of bacteria and fungi that decay the plants. Findlay's documentation will be important in determining the benefit of restoration efforts made in many coastal areas which focus on removing invasive reeds. According to Findlay "Reed invasion and potential reed removal are central issues on the Hudson and our documentation of important marsh functions related to specific plant communities will contribute to overall tidal wetland management."

—Barbara Branca

Norton Basin before restoration

Photo by Dawn McReynolds

Illustration by James Cook

In many wetlands, invasive *Phragmites* (right) flourish at the expense of native cattails (left).

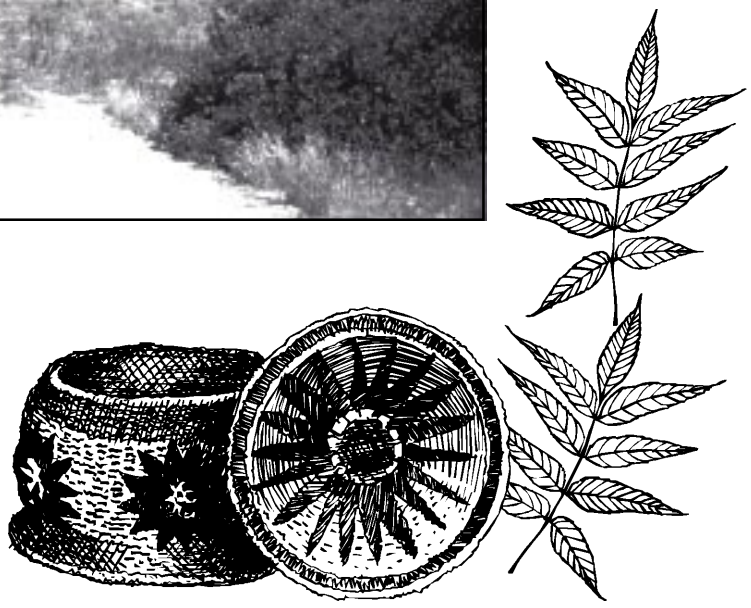
Ecosystems

Recently, New York Sea Grant was contacted about establishing a fund focused on habitat restoration by the family of Allan Overton of Quogue, NY. The result is the Allan Overton Memorial Coastal Habitat Restoration and Education Fund. The goals of the fund are to raise dollars that can be used to restore ecosystems, with a special emphasis on involving youth in the projects. Mr. Overton's mission in life was helping young people, including those whose lives had run into trouble, get back on the path of constructive living. Often this involved sharing his love of nature with young people. An information brochure about the fund can be obtained by contacting Robert Kent, Marine Program Coordinator, New York Sea Grant, 3059 Sound Avenue, Riverhead, New York 11901, telephone 516-727-3910. Anyone wanting to make a contribution to the fund may do so by sending a check made payable to Cornell University to Mr. Kent.

—Robert Kent
Robert Kent is NYSG's Marine Program Coordinator.

...and after.

Photo by Jodi McDonald



Splints of black ash (leaves pictured) and sweetgrass can be used to make traditional Mohawk baskets like the one shown.

Illustration by James Cook

… And in the St. Lawrence

Along the St. Lawrence river valley, far to the north of the Hudson's headwaters, strides are being made to restore the native black ash *(Fraxinus nigra),* a once abundant species made scarce by the development of the St. Lawrence Seaway. At the Akwesasne Mohawk reserve, NYSG community issues specialist Dave Greene and Cornell Extension state forester Peter Smallidge are collaborating with the Mohawk people and the Akwesasne Environmental Task Force to address the issue of restoring black ash which is used in traditional basket making and thus important culturally and economically.

Of his recent award of two grants to promote the restoration and use of this native species, Greene says, "Some of the landowners who will be participating in the black ash demonstration plots will be using the Wetlands Reserve Program (WRP) to support their efforts." Explains Smallidge,"Black ash seedlings will be planted in areas most likely to support the trees as well as in experimental sites to assess the ecological and financial efficacy of 'tree shelters' that offer protection against competing vegetation and browsing deer." One potential site at the Akwesasne Freedom School will also support sugar maple and sweetgrass. Greene's second grant from the Rural Development Council (RDC) enables basketmakers to initiate a project that will lead to a video demonstrating the crafting of black ash baskets.

—Barbara Branca

SUNY ESF student Patty Thompson getting water samples at Fairhaven Beach State Park on Irondequoit Bay, Lake Ontario.

Coast

A Fisheye View on Lake Ontario

If you're reeling in a record breaking Great Lakes salmon, it's likely to be a stocked fish, having been spawned in a fish hatchery and then released. But for plenty of fish species, life in Lake Ontario starts from eggs laid in quiet shallows. Just how productive are the nearshore habitats on Lake Ontario? New York Sea Grant has been funding a project to find out. Neil Ringler, Professor at the State University of New York College of Environmental Science and Forestry in Syracuse and Sea Grant Scholar Darran Crabtree have looked at the productivity of several areas of Irondequoit Bay, a wide scoop carved into the southern coastline of Lake Ontario just north of Rochester. Feeding into the bay are several streams and draining wetlands. How these wetlands serve as a nursery for lake fish is the subject of their recent project.

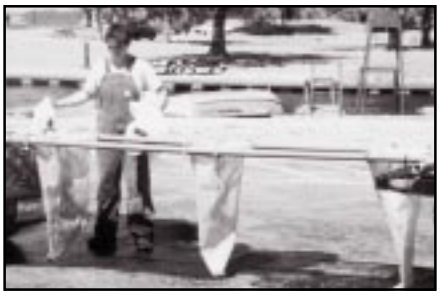
Work on this research project evolved when Ringler was asked to complete an impact statement for the installation of a flow-control device, a mechanism used to slow the water in the wetland, helping to retain nutrients there, while keeping the bay cleaner. He and Crabtree started studying the southern end of Irondequoit Bay in order to find out how flow-control devices affect the fish community. Evaluating the device was helpful, but more importantly, it opened up the question: does this qualify the bay as an estuary? These wetlands share several similarities with estuaries in that they serve as nurseries for young aquatic life and show some estuarine-like physical features. Although wetlands ringing freshwater lakes have small tidal cycles compared to marine estuaries, they do exhibit extreme reversals in water flow. These are not gravity-controlled fluctuations. They are apparently controlled by periodic seiches, the rhythmic movement of water driven by the wind.

Above: **Darran Crabtree using a pushnet.**

Below: **SUNY ESF student Patty Thompson cleaning sampling nets at Fairhaven Beach State Park on Irondequoit Bay, Lake Ontario.**

Page 9: **SUNY ESF student David Park (top left) and Darran Crabtree (right and in bottom photo) do some night sampling on Irondequoit Bay.**

All photos courtesy of Darran Crabtree.



In another wetland, Fairhaven Beach State Park, they witnessed a full flow cycle occurring within 15 minutes. That is, water was first flowing out of the wetland and within 15 minutes reversed direction to flow back into the wetland. During this time fish larvae, still too tiny to swim, go swishing back and forth. Ringler and Crabtree are attempting to determine the significance of this phenomenon to young fishes.

Crabtree, a systems ecologist, is most interested in seeing how energy flows in and between habitats and ecosystems. His work deals with describing the regulation of energy flow at ecotones— the gray area between two ecosystems. The two ecosytems in this case are wetland/embayments and the lake. Just how important are these habitats to young fish?

First he had to establish which fish were breeding in the wetland. He found that resident and nonresident species had an even split totaling to about 35 species. Then he moved on to the question of whether young fish have greater production in wetlands, bays or in the adjacent lake.

Watch

Then he was interested in the rates at which this energy moved from nearshore to offshore environments. To quantify this, Crabtree used drift sampling nets to see how many larvae and embryos make the perilous journey from the wetlands to the embayments. During the critical transition from embryo to juvenile fish, the mortality can be as high as 99 percent.

Together in this project, Ringler and Crabtree are looking at three locations and documenting the variation in fish production over space and time. What they are finding is that small organisms passively drift from one area to another. Once they make it to a juvenile stage, fish actively swim. With some help from Lars Rudstam, researcher at Cornell's Biological Field Station, Crabtree is using acoustic methods to determine the amount of juvenile fish movement from nearshore to offshore.

Another factor that affects fish production is predation—the "eat and run"—or rather *swim* kind. Offshore predators may come into a quiet embayment, eat the young and then swim back out into the larger body of water. This kind of predation exists, however, it is too difficult to ascertain with numbers.

Another way of determining production is by simulating it based on relationships with environmental factors that influence it. For example, there are definite relationships between young fishes and the submerged macrophytes (plants) which provide a source of physical structure for them. Generally, the shoreline along Lake Ontario has limited physical structure. However, in embayments and wetlands, there are more plants in the littoral zone, more ways in which fish are protected, and of course, more forage for fish. According to Crabtree, "Young-of-the-year or YOY 'like' structure. It's where the plants are that you probably find fish, too." Crabtree uses "a model based on light and fetch (exposure to wind and waves) relationships for determining where macrophytes can grow across landscapes. The output is displayed using a GIS, (geographical information system.)"

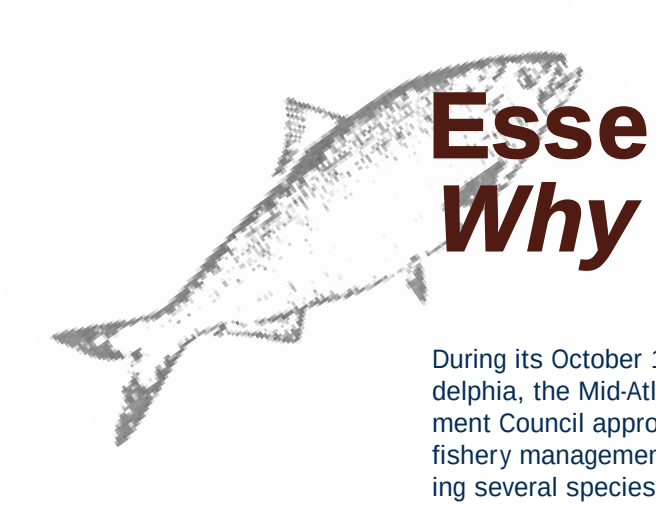
The distribution of submerged macrophytes may be useful as a surrogate predictor for young fish habitat. Generally, sheltered sites offer greater protection than exposed sites. But some areas that look like they would be sheltered are affected by the prevailing wind making it harder for fish to live. Currently Ringler and Crabtree's model is based on Irondequoit Bay conditions. During the 1999 season, the model will be applied to other embayments as part of a validation step.

Crabtree presented his results to date at the International Association for Great Lakes Research conference in May. He'll continue sampling drifting fishes through the winter. In this way, he can document the temporal dynamics of young fish production throughout the year.

—Barbara Branca
Barbara Branca is NYSG's Communicator

The Making of a Sea Grant Scholar

As a student at Rockland Community College who spent his youth on the Hudson River estuary, Darran Crabtree learned from his environmental activism days working on Earth Day celebrations that he preferred biology in the field to policy making. When a mentor recommended ESF, he earned his B.S. degree there meeting Dr. Neil Ringler, well-known fish behaviorist and veteran Sea Grant researcher. Darran worked on the EPA-sponsored Environment Monitoring Assessment Program or EMAP after graduation, taking samples for the Northeast Lakes program. Then his funded graduate assistantship led him to work on aquatic benthic invertebrates and later with the Fish and Wildlife Service. When Crabtree had an opportunity to work with Ringler in proposing a research project, combining Ringler's fish expertise with Crabtree's interest in estuarine conditions led to research in the nearshore habitat of Lake Ontario. To keep apprised of his research, try Crabtree's website at: www.esf.edu/resorg/aquaticeco/darran.



Essential Fish Habitat: *Why all the fuss?*

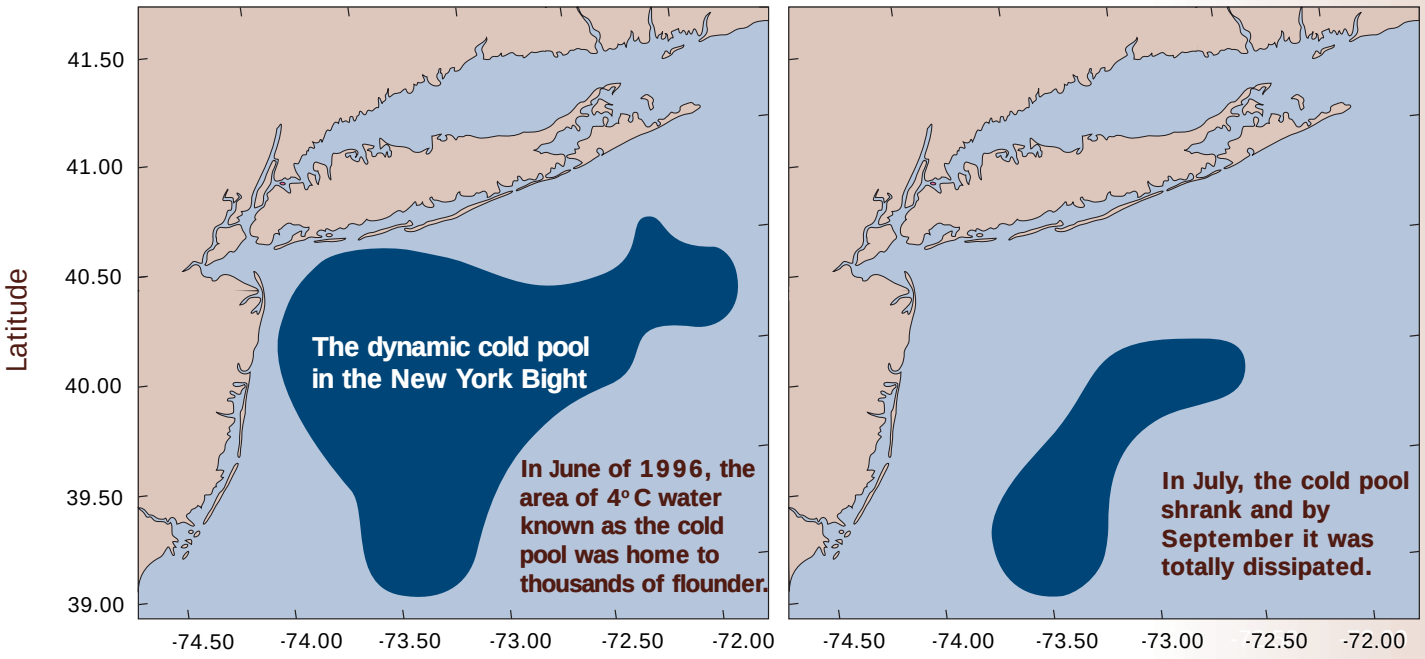
During its October 1998 meeting in Philadelphia, the Mid-Atlantic Fisheries Management Council approved amendments to fishery management plans (FMPs) governing several species of importance to New York coastal residents. Four FMPs governing the management of surfclams, ocean quahogs, squid, mackerel, butterfish, summer flounder, scup, black sea bass, and bluefish, were modified in accordance with the requirements of the reauthorized Magnuson-Stevens Act, better known as the Sustainable Fisheries Act (SFA) of 1996. Among the requirements of the SFA are sections within the plans that address the thorny problems of overfishing, bycatch minimization, and identification of essential fish habitat (EFH). Prior to the passage of the SFA, critics of the federal fisheries management process successfully argued that the tools traditionally available to fisheries managers such as mortality reduction by harvest restrictions, were insufficient to deal with many of the challenges facing coastal fisheries. From Alaska to Maine to the Gulf of Mexico, many fish population declines have been attributed to lost wetlands and seagrass beds, dammed rivers, contaminated sediments, polluted coastal bays, and other habitat loss or degradation. The essential fish habitat provisions of the SFA were developed to meet the ecological and economic imperative to address the nation's habitat problems before the treasured finfish and shellfish that depend on them disappear.

Aboard the *F/V Illusion,* graduate student Brian Steves collects conductivity, temperature and depth data using a CTD instrument. Biological sampling was conducted using 6-foot beam trawls. Photo by Mark Malchoff

Under the SFA, essential fish habitats must be identified for all life stages of species managed under fishery management council plans. Activities that damage that habitat, including fishing, must also be identified, as well as conservation and enhancement measures. In addition, the SFA requires that federal agencies consult with the Secretary of Commerce through the National Marine Fisheries Service on any activity that may adversely affect EFH.

All of this sounds great, but the task is much more involved than the legislative language would lead one to believe. Imagine trying to describe the habitat requirements for all the life stages (egg, larvae, juvenile, and adult) for the dozens of species managed by NMFS and the regional council. How, for example, does temperature or salinity or dissolved oxygen or light influence the survival or distribution of summer flounder during each life stage? Also, how do anthropogenic factors influence the biological and physical environments frequented by any of these life stages? An amendment to the Summer Flounder, Scup, and Black Sea Bass FMP drafted last summer by the Management Council utilized 114 pages of text to accomplish this task. Fortunately for those authors, these three species are fairly well studied. Oftentimes this information is simply not available for all of the stages of all of the 600 plus fish stocks covered by the management plans.

The depth of the problem may partially explain why a coalition of U.S. environmental groups



issued statements of concern after learning that several regional fishery management councils had missed the October 11, 1998 deadline to revise FMPs to better address overfishing, bycatch minimization, and habitat protection. Fortunately, efforts by government agencies, non-government agencies such as the American Fisheries Society, Sea Grant, resource users and others are starting to plug some of the data gaps which need filling if the EFH provisions of SFA are to be met.

In 1995, well before the passage of the SFA, a NY Sea Grant specialist, a university faculty member, and a commercial dragger worked together to complete a project designed to increase our understanding of how juvenile groundfish (especially yellowtail flounder) distribute themselves in the Mid-Atlantic Bight. This research, funded through the Saltonstall-Kennedy Fisheries Development Program, was aimed at filling in some of our knowledge gaps about the habitat requirements of recently settled groundfish.

Dr. Robert Cowen, formerly of the State University of New York at Stony Brook (currently with the Rosenstiel School of Marine Science at the University of Miami), and Sea Grant Specialist Mark Malchoff proposed a 12-18 month sampling regime during 1996 and 1997. Graduate student Brian Steves conducted most of the fieldwork and analyses with several objectives in mind. Steves sought to identify habitat requirements of young-of-year (YOY) continental shelf groundfish throughout the year. Commonly, most groundfish start out life as floating eggs. The larvae produced from these eggs are free swimming and are usually found well up in the water column. These larvae metamorphose after several weeks. In about 45 days, after hatching, yellowtail flounder take on more adult-like behavior and appearances as they begin side swimming, and their eyes migrate to the upper side. At the same time, these fish settle out of the water column onto the ocean floor within a period of a few days or possibly hours for some species. Larvae making this transition to the juvenile stage may encounter a variety of substrates. They may also encounter different water masses (shelf water, slope water), with varying temperatures and salinities. In many cases we do not yet know what mix of habitat characteristics constitutes "the right stuff" enabling the survival and growth of a particular species.

Project scientists also analyzed the information to see how fish were distributed and how such distributions changed over time, or from one location to the next. By studying these "spatial and temporal distributions," Steves and Cowen hoped to explain some of the year to year recruitment variability seen in groundfish.

Eight sampling cruises were conducted aboard the *F/V Illusion,* a commercial dragger owned by Mark and Mary Bess Phillips based in Greenport, New York,

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The Cold Pool

First studied by oceanographers several decades ago, a cold pool forms when surface water temperatures off NY's Atlantic Coast begin warming in the spring. As water temperature increases, its density decreases and by mid-summer, a layer of warm, low salinity water floats above the colder, saltier bottom waters. The two layers stay separated by a zone known as a thermocline across which no mixing occurs. This annual cold pool stretches from Cape Cod to Cape Hatteras, NC and to the edge of the continental shelf and most pronounced in the New York Bight. It is bounded offshore by warmer, higher saline "slope water," and inshore by shallow coastal water masses which have been heated by the sun and mixed by the tides. Fish who prefer the temperature of the cold pool are effectively prevented from leaving it during the summer months. Come fall, the water column "destratifies," as the warm surface waters cool and begin sinking, at which point even light winds can cause mixing between the two layers.

In 1996, the turnover was abrupt, early and "hot" relative to average years as two strong late summer hurricanes put out enough wave energy to disrupt the seasonal thermocline, and dissipate the cold pool. Unlike a normal turnover in which cool waters gradually sink, these storms suddenly forced warm water into zones that would normally remain cool well into fall.

"Rating" Fish Habitat

If EFH is to become the tool envisioned by Congress, "habitat ratings" may be key. Habitat restoration, protection and enhancement all involve socio-economic trade-offs, and it's likely that only the "best" habitat will receive maximum protection under the EFH provisions.

Several presenters at a recent EFH Symposium spoke to the fact that habitat quality is difficult to define and measure, especially in the Mid-Atlantic where migratory species often dominate the fisheries community. Several scientists related their experience in trying to better define the habitats of killifish, winter flounder, summer flounder, tautog, spotted seatrout, and spiny lobsters from New Hampshire to Florida. These experts concurred that research including multiple-year data sets and habitat modeling in concert with geographic information systems may greatly facilitate the tough decision making process that lies ahead.

and two aboard the State University of New York at Stony Brook's *R/V Onrust.* During each of the ten cruises, sampling tows were made during daylight hours at depths of 65 to 300 feet on three transects in the New York Bight. After ten cruises, the research confirmed that 49 species utilize these environments. Ten of them were flatfish such as deepwater flounder, plaice, yellowtail founder, fourspot flounder, and windowpane flounder. Yellowtails headed the list with about 20,000 specimens recovered.

Fish density data confirmed that juvenile yellowtail habitat, like that of the adults, seems to include the coldest bottom waters found on the shelf during the summer. The highest juvenile yellowtail abundances recorded during the study were in the summer months, coinciding with distribution of cold (less than 46°F) bottom water known as the cold pool (see p. 11 sidebar). This pattern changed dramatically by late September when the cold pool had dissipated and juvenile yellowtail numbers had plummeted. Steves and Cowen hypothesize that most of the yellowtails died either directly or indirectly from the temperature increase after the turnover. A sharp increase in bottom temperature, more than 18°F at mid-shelf, caused by a passing hurricane was likely a large source of metabolic stress. Aside from any direct temperature induced mortality, such stress undoubtedly increased rates of predation upon the yellowtail juvenile population.

The project successfully added to our knowledge of the early life history of several economically and/or ecologically important species. "Up to now, our knowledge of the habitat requirements of a whole suite of important fish has been limited. Now we're getting that knowledge," said Cowen. He went on to offer the following analogy: "Saying that the continental shelf in the New York Bight is essential fish habitat, is like saying humans live along the coast. It doesn't tell us if the humans are using wetlands, or beaches or cliffs." Such generalized information doesn't offer much in the way of predictive power, but the detailed, species-specific habitat requirements identified in this project will aid in our understanding recruitment processes of these species. Predicting whether a population is increasing or decreasing remains a long-term effort for fisheries scientists.

Other data from the cruises and related projects in Cowen's lab should continue to add to what we know about juvenile groundfish habitat interactions. Yet to be analyzed are growth rate data. With the ability of scientists to measure juvenile fish growth on a daily basis, it may be possible to compare growth rates within the study area, and see if some areas produce faster growth than others. Such differences may provide another tool that biologists can use to rate habitat.

—Mark Malchoff

Mark Malchoff is New York Sea Grant's recreational fisheries specialist.

Photo by Mark Malchoff

Newly hatched yellowtail flounder, the most abundant denizens of the deep waters of the cold pool.

National Director Visits

National Sea Grant director Ron Baird (left) met with Cornell President Hunter Rawlings on his recent visit with New York Sea Grant.

Early November marked the first-ever visit of National Sea Grant Director Ronald Baird to New York Sea Grant's program. From Long Island's balmy barrier beaches to the windy shores of Lake Ontario, NYSG Director Jack Mattice and Associate Director Dale Baker accompanied Baird on a whirlwind tour of administrative offices as well as the beaches, marinas and other coastal facilities that Sea Grant extension staff call home. Starting at New York Sea Grant's administrative office in Stony Brook, Baird met NYSG staff as well as SUNY at Stony Brook's President Shirley Strum Kenny and two members of NYSG's Board of Governors: Marvin Geller, Dean and Director of the Marine Sciences Research Center at SUNY Stony Brook, and Gordon Colvin, Director of Marine Resources at New York State Department of Environmental Conservation. Unique tours led by NYSG extension specialists to several Long Island beaches as well as to a smoked fish processing plant gave Baird an opportunity to meet with members of agencies, municipalities, coastal industries, environmental groups and other stakeholders to whom Sea Grant specialists extend their expertise on coastal issues.

At the SUNY College of Environmental Science and Forestry campus in Syracuse, Baird met NYSG Board of Governors members Bill Tully, Vice President for Academic Affairs and Bob Crowder of the New York State Department of Economic Development. Great Lakes extension staff led the national director to some of the coastal highlights of eastern Lake Ontario including lakeshore dunes, marinas and the Department of Environmental Conservation Salmon River Fish Hatchery. At Cornell University, Baird discussed issues with Cornell President Hunter Rawlings as well as Daryl Lund, Dean of the College of Agriculture and Life Science and Chair of NYSG's Board of Governors, and board members Ted Hullar, Director of the Center for the Environment and Jim Lassoie, Professor of Natural Resources.

From a fish hatchery along the Salmon River to Acme Fish Corporation in Brooklyn, National Director Baird got a real New York sampler of not only the varied coasts, but of the varied coastal industries, agencies, and stakeholders with whom NYSG staffers interact everyday. Come back again soon.

Great Lakes extension staff welcome the national director with a tour of the Department of Environmental Conservation Salmon River Fish Hatchery. From left to right are Chuck O'Neill, Diane Kuehn, Dave MacNeil, Fran Verdoliva, coordinator of the facility, Ron Baird, Dale Baker and Dave White.

Biennial Report

New York Sea Grant Institute Funding 1996-1997

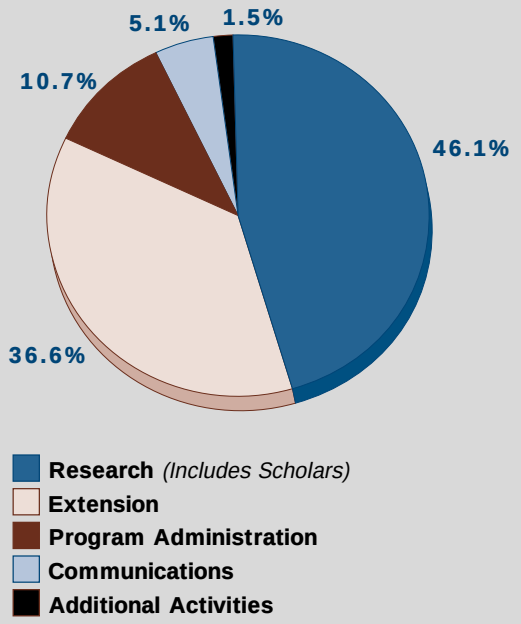
(State, Federal, and other Funds Allocated in Calendar Years 1996 and 1997)

	1996	1997
Program Administration	$347,419	$435,900
Communications	$208,603	$169,178
Extension	$1,366,937	$1,327,763
Research and Scholars		
Technology and Product Development	$267,684	$272,537
Fisheries — Great Lakes	$278,779	$166,904
Fisheries — Marine	$177,302	$130,552
Coastal Studies — Contaminants & Environmental Quality	$175,813	$245,653
Coastal Studies — Environmental Processes	$100,988	$74,802
Initiatives and National Investments		
Non-Indigenous Species	$83,593	$112,052
Brown Tide (BTRI)	$497,283	$502,193
Marine Biotechnology	$300,000	$0
Percent of Above Research Funds Allocated to Scholars	12.8%	14.9%
Total Research and Scholars	$1,881,442	$1,504,693
Additional Activities		
Fellowships	$46,847	$48,900
Conferences/Workshops/Special Projects	$3,703	$4,128
Regional Activites	$0	$8,000
Total Additional Activities	$50,550	$61,028
Total Funds Allocated	**$3,854,951**	**$3,498,562**
Unallocated Carryover Funds*	$71,261	$540,420
Additional Non-Federal Cost-Sharing or In-Kind Support	$1,116,827	$764,405
Combined Total Effort	$5,043,039	$4,803,387

**Includes funds committed to continuation of specific projects/activities*

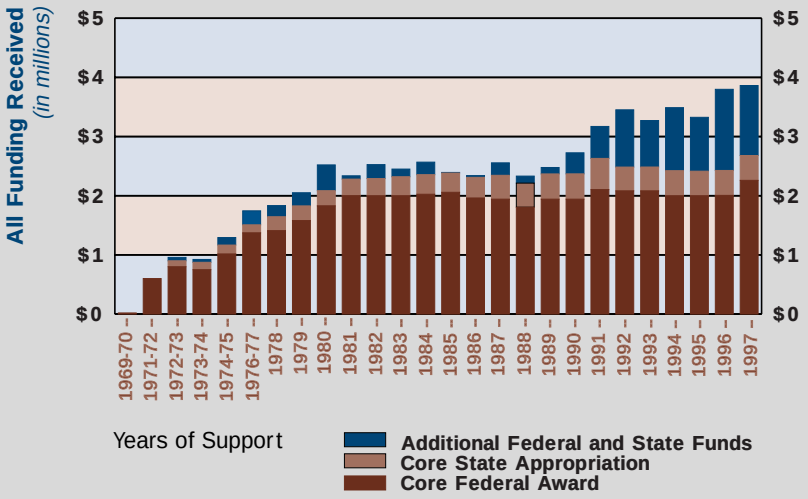
Distribution of Funding Among Program Elements

(Years Combined)



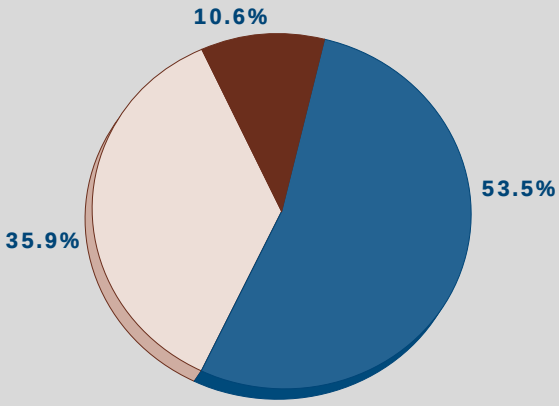
New York Sea Grant Funding

(Since Inception)



Funding Source

(Years Combined)



Note: "Other" includes additional state, federal, Cornell, SUNY and private funds received by NYSG program.

—Stefanie Massucci

Stefanie Massucci is New York Sea Grant's Fiscal Officer

LastWave

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To receive further information on topics covered in this issue of *Coastlines*, the following **newsletters and periodicals** are available upon request from our New York Sea Grant extension specialists - offices listed on page 2.

David Greene, Communities Issues Specialist, Buffalo
Coastal Educators News

Helen Domske, Coastal Education Specialist, Buffalo
Great Lakes Research Review
Perspectives: Great Lakes Program

Dave White, Program Coordinator, Oswego
Marine Facilities Notes

Charles R. O'Neill, Coastal Resources Specialist, Brockport
New York Great Lakes Water Levels Update

Diane Kuehn, Coastal Tourism Specialist, Oswego
Tourism News
Tips and Tactics for Sportfishing on Lake Ontario
http://www.cce.cornell.edu/seagrant/tourism.html "Newsletters"

New York's Great Lakes Angler
This newsletter provides readers with periodic updates of pertinent sportfishing issues in the Great Lakes such as fisheries management and policy, fish contaminants, socioeconomic impacts and new research initiatives. It is compiled, written and edited by Dave MacNeill, Fisheries Specialist. *$4.00 per annum for individual subscriptions or $2.50 per annum for charter boat association members. Order from New York Sea Grant, Morgan II, SUNY College at Brockport, Brockport, N.Y. 14420-2928.*

Ordering Publications

Please send requests for the following recent publications along with a self-addressed label and check payable to:

New York Sea Grant Institute
Communications
121 Discovery Hall
SUNY at Stony Brook
Stony Brook, NY 11794-5001
(516) 632-9124

New York Sea Grant Publications

Methods to Evaluate Constructed and Restored Wetlands as Finfish Nursery Habitats.
Mark Malchoff. 1996. $1.00

Lake Ontario Angler Satisfaction.
Nancy A. Connelly, Diane Kuehn, and Tommy L. Brown. 1997. $1.00

Directory of Educational Facilities, Programs and Resources of the South Shore Estuary Reserve.
New York Sea Grant, in cooperation with the New York State Department of State and Citizens Advisory Committee of the South Shore Estuary Reserve. 1998. Free from the Estuary Reserve, 225 Main Street, Suite 2, Farmingdale, NY 11735.

Video

Fish Nursery Habitat in the New York Bight: Beyond the Estuary.
Mark Malchoff. 1998. 16 min. $10.00

Journal Reprints

Sportfish Consumption Patterns of Lake Ontario Anglers and the Relationship to Health Advisories.
Nancy A. Connelly, Barbara A. Knuth, and Tommy L. Brown. 1996. *North American Journal of Fisheries Management.* 16:90-101. $1.00

Short-Term Hooking Mortality of Weakfish Caught on Single-Barb Hooks.
Mark H. Malchoff and Stephen W. Heins. 1997. *North American Journal of Fisheries Management.* 17:477-481. $1.00

Movements, feeding periods, and daily ration of piscivorous young-of-the-year bluefish, *Pomatomus saltatrix,* in the Hudson River estuary.
Jeffrey A. Buckel and David O. Conover. 1997. *Fishery Bulletin.* 95:665-679. $1.00

Variation in Larval Growth Rate among Striped Bass Stocks from Different Latitudes.
J. Jed Brown, Amir Ethisham, and David O. Conover. 1998. *Transactions of the American Fisheries Society.* 127:598-610. $1.00

Status and Restoration Options for Atlantic Sturgeon in North America.
John R. Waldman and Isaac I. Wirgin. 1998. *Conservation Biology.* 12(3): 631-638. $1.00

Hake 'n "Rake"

New York commercial fishermen harvest more red hake and silver hake (whiting) than any other kind of fish. These two smaller cousins of the well-known cod are abundant from late fall through spring, and offer good value and great taste. You can prepare these lean white-meat fish using cooking methods appropriate for cod or flounder like baking, broiling, and frying.

Historically, the dockside value of hard clams landed in New York has exceeded that of any other fish or shellfish species landed in the state. The hard clam is one of several different species or types of clam found in New York's marine waters. While many consumers may not be familiar with the term "hard clam," they readily recogize the market names for the various sizes of hard clams: chowders (the largest size), cherries or cherrystones (medium size), and littlenecks or necks which are the smallest (and most valuable) clams which are traditionally consumed cooked or raw on the half shell.

—Ken Gall
NYSG's Seafood Specialist

Winter Warmth

Pan-seared hake over Manhattan chowder style vegetables and clams

Seafood Corner

Ingredients

4 tablespoons olive oil

16 littleneck clams

1/4 cup white wine

1 medium potato peeled, washed, diced 1/4 inch blanched

1 medium carrot, peeled, washed and diced 1/4 inch

2 stalks celery, washed and diced 1/4 inch

1 teaspoon thyme

4 oz. canned stewed tomatoes

8 oz. clam juice

2 tablespoons parsley

1 tablespoon butter

4 hake fillets (6 oz. portions)

salt and pepper to taste

Adapted from recipes by Ralph Feraco, Nassau Country Club, Glen Cove, NY and the New York Seafood Council

Method

Heat medium-sized sauce pan. Add 2 tablespoons olive oil and clams. Sauté for 3 minutes. Add white wine and cover. Simmer until most clams open (3-5 minutes). Remove cover. Simmer 3-5 minutes more to reduce liquid by half. Add potatoes, carrots and celery. Sauté 3 more minutes. Add thyme, stewed tomatoes and clam juice and simmer until all clams open and vegetables are tender (about 3-5 minutes). Add butter, mix well, and sprinkle with parsley.

While vegetables are cooling, heat 2 tablespoons olive oil in a nonstick pan. Season hake with salt and pepper to taste. Sauté 3-4 minutes on each side or until golden brown. Remove from pan and keep warm. Place equal amounts of vegetables and clams in each of 4 serving bowls. Place one hake portion on top and serve immediately.

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New York Sea Grant
121 Discovery Hall
SUNY Stony Brook
Stony Brook, New York
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