Sea Grant
New York

COASTLINES

Spawning New Efforts to Culture Fish

Early spring is the spawning season for many of New York State's popular sport fish. High on the list is tasty walleye, but stocks of this premium fish are in short supply. Each year, the state fish hatchery on the shores of Oneida Lake collects over 200 million eggs to produce fry and fingerlings for stocking fresh water rivers and lakes as far east as Montauk. But during intensive culture of advanced fingerlings (5 to 6 inches), as many as 60 percent of the fish die. The culprit? *Columnaris* bacteria.

Enter Mike Timmons, professor at Cornell University's Department of Agriculture and Biological Engineering working with Sea Grant Scholar Ed Aneshansley and Richard Colesante of NYSDEC's Oneida Fish Hatchery. Their currently-funded NYSG project helps to minimize loss of walleye to bacterial disease. Using an innovative water reuse system coupled with optimal temperature control and food delivery systems, this project has already bolstered the survival rate of fingerlings and will help determine the feasibility of establishing a new industry—producing walleye ready for market.

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Director
Jack Mattice
Associate Director
Dale Baker
Assistant Director
Cornelia Schlenk

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Editor/Writer
Barbara A. Branca
bbranca@notes.cc.sunysb.edu

Contributing Writer
Paul C. Focazio
pfocazio@notes.cc.sunysb.edu
Design
L.C. Graphics
Layout
Sharon O'Donovan
Production Assistants
Sharon O'Donovan
Susan Hamill

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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

From the Director

Fisheries management in New York State involves a broad spectrum of challenges and requires just as broad a range of effective responses. New York Sea Grant, with its complementary program of research, extension, education and communications, is capable of responding in many ways to challenges of coastal and water resource management. These responses help to advance or convey the current state of the science so that decision-makers can make optimal choices about use and protection of coastal resources, often in the face of opposing stakeholder perspectives.

This issue of *Coastlines* provides examples of some of the ways in which NYSG activities can affect fisheries management without involving policy making *per se*. This separation is important in maintaining NYSG's role as a source and purveyor of objective, science-based information.

The articles on walleye and perch (see pages 1 and 6, respectively) focus on NYSG - sponsored research projects to develop effective strategies for culturing fish. Both strategies start with the collection of "wild" eggs and both involve rearing in hatchery tanks. But other protocols differ based on needs to deal with different system problems (mortalities due to pathogenic bacteria or fouling due to algal growth, for example), biological characteristics of fish species, and/or the final use of the cultured fish. Nevertheless, these strategies support stocking of walleye around NYS and reductions of the risk to Native Americans of eating a traditionally fish-heavy diet.

NYSG - sponsored meetings can also have quite different purposes depending on the topic. Attendees of the Hard Clam Workshop (see page 12) summarized existing information, little of it NYSG - generated, to suggest research that would effectively use money generated by Congressman Michael Forbes to determine why hard clam resources are at such a low level in Long Island's south shore estuary. The fisheries experts at the International Blueback Herring Workshop (see pages 10-11) concluded that the invasion of this species into Lake Ontario and its tributaries was unlikely to be severe. Presenters at the Bycatch Workshop (see page 12) highlighted some of the difficulties in determining the implications of bycatch for regulation of recreational and commercial fishing. Finally, preliminary results from studies to increase knowledge concerning brown tide were documented at the Brown Tide Research Initiative Informational Symposium (see page 14). At the Symposium, the factors and processes that stimulate and sustain brown tide were identified. Brown tide is an important factor in the health of local shellfisheries.

Other fisheries issues also yield to the flexible approach of NYSG. Sea Grant's CoastWatch project (see pages 8-9) generates thermal maps that charterboat fishermen and others can access to determine where fishing is likely to be most productive. Increases in the quality and quantity of catches can enhance community economics via expansions in tourism. A NYSG extension specialist has played a key liaison role in developing a consensus about the relationship between cormorant population increases and the smallmouth bass fishery in Lake Ontario (see pages 10-11). Some controls are to be instituted since cormorants have been identified as major predators of the fish.

Finally, concern about the wise development of fisheries and other coastal resources in Lake Champlain (see page 13) was the springboard for a new extension effort successfully proposed to the National Sea Grant College Program Office. NYSG, in concert with Plattsburgh SUNY and the University of Vermont, will be sponsoring two extension agents to determine what actions will foster the lake's optimum coastal resource use.

I hope that you are favorably impressed by these NYSG contributions to the management of the state's fishery resource.

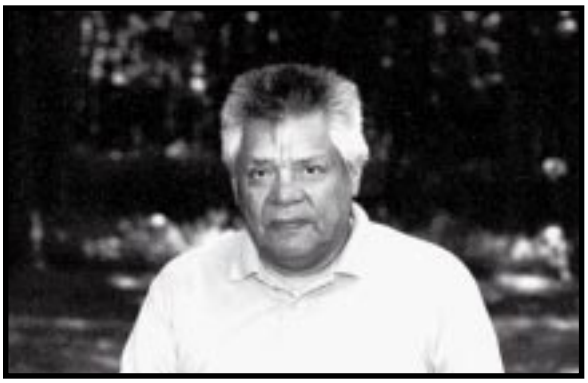
Linear Park, Rochester is one of several Lake Ontario fishing sites affected by NYSDEC's recent stocking plan, which, last year, also filled New York's waters with 5.1 million salmon and trout.

In this spring/summer Coastlines,

New York Sea Grant spotlights some recent efforts of its researchers and extension agents—admirable individuals alongside NOAA's chosen environmental hero, Skip Hartman.

In April, the National Oceanic and Atmospheric Administration (NOAA) honored **Sea Grant steward Walter "Skip" Hartman** for his "tireless efforts to preserve and protect the nation's environment." **Vice-President Al Gore** congratulated this year's heroes, including Hartman, for their "passionate commitment to the protection of our nation's environment."

"We are delighted and honored that NOAA is recognizing Sea Grant personnel in their efforts in extension and educational outreach," said **NOAA National Sea Grant College Program Director Ronald C. Baird.** Hartman, a member of the Seneca Native American nation, has actively participated in the care of the Great Lakes environment for over a decade. He has been commended for his advisory work with NYSG's sportfishery program as well as the Great Lakes Fisheries Commission and its Lake Ontario Committee. Hartman is also a former chair of the Niagara County Fisheries Department and has played an important role as a member of NYSG's program advisory network and the National Sea Grant Panel for a number of years.



Skip Hartman **Photo by Ronnie Malcom**

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Photo by Ian Stupakoff

"Skip Hartman's work in New York represents a strong commitment of Sea Grant to promoting responsible use of our fishery and coastal resources," said Baird. As a co-advisor to the Lake Ontario Sportfisheries Promotional Council, Hartman's efforts have allowed for the funding needed to launch the Lake Ontario thermal-mapping **CoastWatch program**, a Sea Grant initiative featured on pages 10-11. Most recently, Hartman has been instrumental in the development of a cage-aquaculture project for chinook salmon fingerlings—a cooperative effort between sportfishing stakeholders and fisheries managers. Sea Grant-related subject matter regarding **sportfishery issues** supplementary to CoastWatch as well as the New York program's recent associations with **aquaculture activities** are explored further in this issue.

Don't Let Dinner Get Cold

What is the optimal temperature for feeding walleye fry dry food? To find out, Sea Grant Scholar Ed Aneshansley set up different living conditions for walleye fry in experimental tanks at Oneida Fish Hatchery last spring. Both tanks in the photo below use a novel recirculation system which includes "good" bacteria to keep the water free of disease organisms. The system also uses "packed columns" that surround the water pipes (appearing as dark colored, plastic-shrouded objects below). The packed columns aid in the reaeration of water in the tanks. The object in the lower left corner is a chiller that keeps the left tank at a cool 60°F. The walleye fry in both tanks were fed dry pellet food. The result? The fish in the chilled tank didn't consume the food, leaving them emaciated and the water murky with uneaten food. The fish in the right tank at about 68°F ate the dry food, stayed healthy and kept the water clear.

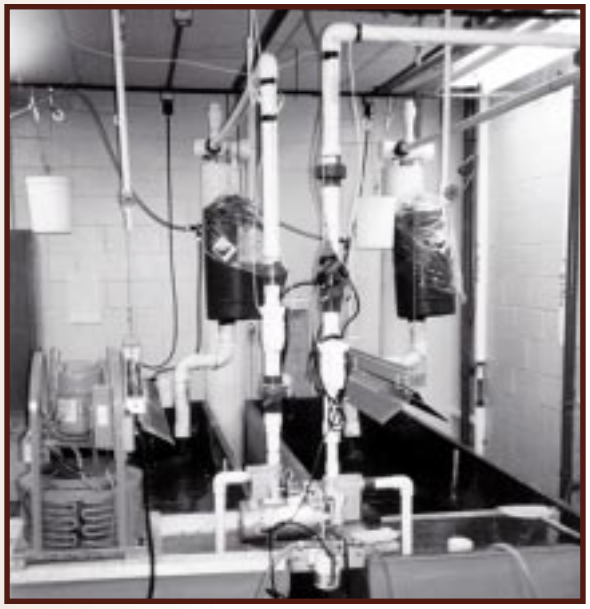

Photo by Ed Aneshansley

Spawning New Efforts

Continued from front cover

Using tanks in walleye fingerling culture is revolutionary. Historically, earthen ponds are filled with water in springtime and inoculated with tiny swimming zooplankton that will serve as dinner for walleye fry. Walleye larvae, stocked between April 20 and May 10, are monitored so that walleye "fingerlings" can be harvested by summer when they reach two inches. In New York State and in Ontario Province, implementing such walleye culture has been the result of cooperation among many agencies including Sea Grant, NYS DEC and several angler associations.

Workers at the Oneida Fish Hatchery check female walleyes in preparation for an "egg take." This photo and that on page 1 by NYS DEC

But according to Timmons, "It's a messy business when fry eat live food," referring to the ponds full of zooplankton. "Much effort is spent on the inoculation and monitoring of those populations." A walleye that has been trained to eat dry pellets can be fed and maintained longer, growing to a larger size for stocking or perhaps even all the way to marketable size. This project attempts to maximize feed-trained fingerlings by minimizing disease through use of a recirculating water system; the water in this system has been sterilized through a process of chlorination.

At Oneida Hatchery, Colesante had been producing walleye fingerlings for years, seeing many lost to disease. "We once lost 80 percent of the fish in three days," recounts Colesante. "That was several hundred thousand fry." Some kinds of disease can run rampant, especially if there is a condition that causes a compromise in the fish's protective mucus covering. Ultraviolet sterilization techniques do not appear to kill *columnaris*. Although Timmons' methods were unconventional, Colesante was enthusiastic over a method that might halt the spread of bacterial diseases. Like most fish, two or three days after hatching, a tiny walleye fry swims up to the surface to inflate its swim bladder. Now it's graduated to a "swim up" fry and starts to take on a fish-like appearance. But if there is any oil sheen on the water, walleye fry have trouble swimming up. This, coupled with their cannibalistic nature, makes them more of a challenge to culture than other species. According to Colesante, the fry and small fingerlings are fed a diet of brine shrimp for the first 50 days, then trained to eat dry pellet food as they approach fingerling size. The hatchery's tanks are producing what Colesante calls "advanced" walleye—that is, 5 or 6-inch fingerlings.

The rearing program for these fingerlings is novel and so is the water system in which they live. To the casual passerby, as summertime approaches the tanks look—well—dirty by some

to Culture Fish

people's standards. Comments Timmons, "You don't manage these fish living in close quarters by 'sight' – the more conventional means of measuring water quality." The experimental tanks use an innovative water reuse system in which a fluidized sand bed (FSB) is inoculated with helpful bacteria. According to Aneshansley, "These bacteria break down ammonia, the chief waste product of fish, into nitrite and then into nitrate, which is nontoxic to fish." With bacteria playing an important role in recycling the nitrogen in the system, the water is bound to look dirty. Aneshansley explains, "We hypothesized that although the recirculation systems were literally a 'bacteria soup,' the fish in them would have fewer pathogenic bacteria than the fish in the flow-through system." And indeed, after culturing bacteria taken from fish, experimental results have borne this out. Fish in the hatchery's conventional "raceways" with single pass water have more pathogenic bacteria than the fish in the more turbid water of the experimental tanks.

Now in the project's second year, the team is learning from last year's recipe for mixing the right temperature, light and feeding techniques into the bacterial soup. "We've added a fourth tank this year for settling excess particles of dry feed," says Colesante, "and we 'aged' the biofilters longer so that sand won't cloud the water." Water quality problems in some of last year's tanks kept the survival rate of fry to fingerling stage down. Without water quality problems, other tanks had close to 80 percent survival rates. The team anticipates no disease in the experimental tanks, just like last year.

How feasible will it be to grow walleye all the way to "food fish" size? According to Timmons "You have to know not only the growth rate—how fast the fish get to marketable size—but also when the growth rate starts slowing down." "You don't want to continue feeding them if the conversion is getting inefficient." Conversion refers to how many pounds of feed are being converted into pounds of flesh. You also have to determine how many fish can share the same space and still keep healthy. So, a fish fry of cultured walleye is still a long way off, but the team is getting there one fry at a time.

—Barbara A. Branca

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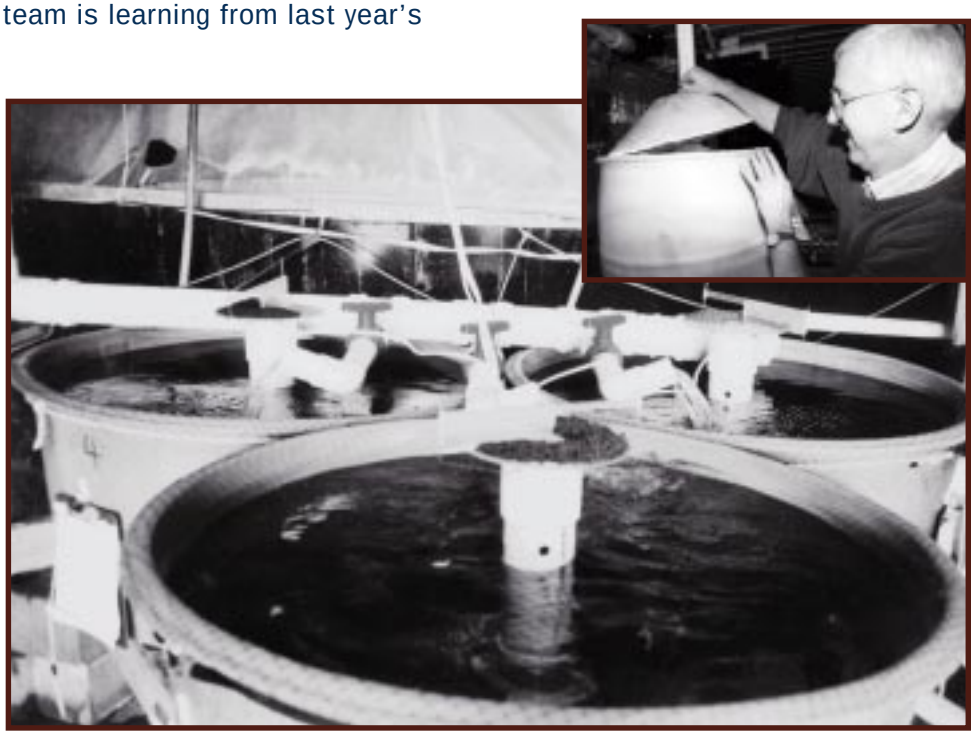
>
> *—Mike Timmons*



Inset:
Cornell professor Michael Timmons, experienced with numerous fish species, is an innovator in aquacultural methods.

Photo by Cornell University

The fish in these "grow-out" tanks at Cornell University are almost one year old. They went in at the age of 5 months. It's possible they could be reared in grow-out tanks from a much earlier age.

Photo by Ed Aneshansley

No Resting on This Perch

Dr. Joseph Buttner
Photo by Sharon Fleming

When Joseph Buttner, then a professor at SUNY College at Brockport, began developing aquaculture techniques for several species of freshwater fish—some as a result of research funded by New York Sea Grant—he knew that his work would be applied in the field by many groups of anglers and business owners. But he couldn't have predicted how far-reaching an impact those techniques would have on the lives of a group of people in northern New York.

In 1995, Joe Buttner mentioned to Lloyd Benedict, Director of Ekohawk, a community enterprise on the Akwesasne Mohawk Reserve along the New York/Canadian border, that yellow perch was a promising species for domestication. The yellow perch fishery, whose historic abundance in the St. Lawrence River had made it the staple of the Mohawk diet, had been in decline for decades. Perhaps aquaculture of this popular fish was a to solution providing both business opportunities and an improvement in diet to the residents of this somewhat remote expanse of 28,000 acres that straddles our national border. NYSG community issues specialist Dave Greene worked with Ekohawk to investigate various methods to "grow out" the perch to a marketable size in larger numbers making more fish available to the Akwesasne community.

To try out Buttner's net-pen techniques with perch, Benedict had two net-pens built in the bay adjacent to Cornwall Island within the St. Lawrence with the assistance of Arthur Mauger of the Quebec Ministry of Agriculture, Fisheries and Food. But it proved difficult to maintain a population of small yellow perch due to fouling of net-pens with a small mesh size. Although the pens are still functioning for larger perch, Benedict set his sights for the time being on Buttner's other suggested means of culturing the perch—in ponds and tanks. So, on Cornwall Island,

Armed with a shallow, pool-skimmer type net and a permit to collect fertilized perch eggs in the wild, Ekohawk's team heads for the warm shallows of the St. Lawrence River where early April conditions are right for perch to breed. Benedict will know when they come across the long gelatinous matrix of perch eggs. "Imagine a three-foot long white tube sock with a helix coil wrapped around it. Instead of DNA, it's got a coil of 50,000 eggs," describes Benedict. Sometimes the matrix is twice that size. Perhaps he'll hit a bonanza of 50 percent fertilized eggs of which 3 to 10 percent will hatch into nice, healthy fry—considerably less than yields achieved with controlled spawning of domesticated fish, an undertaking that Ekohawk is not yet able to do with its limited broodstock.

All perch culture photos courtesy of Ekohawk

Harvesting wild perch eggs

Benedict built six half-acre ponds holding a million and a half gallons each with diesel pumps to maintain water levels. The ponds would soon be home to not only perch fry but the tiny organisms called zooplankton that fry need for food until they reach about 1 to 2 inches in length.

"Joe taught us how to maintain our zooplankton populations," explains Benedict, who ferments horse feed pellets in 1500-gallon fermentation tanks to produce zooplankton culture. "The feed is cheap, breaks down quickly and forms a high-protein slurry which we

Stocking the pond with perch eggs

draw out of the tank and spray into the pond." The slurry feeds tiny algae and zooplankton, giving the pond a greenish-purple sheen. As the algae bloom, they provide oxygen and food for tiny whirling rotifers and water fleas. "It's a timing thing," says Benedict. "We might have several blooms and crashes of zooplankton before the fry are actually in the pond."

After collecting wild perch eggs from the river shallows, Benedict transports them to the hatchery where they'll be incubated and treated with dilute concentrations of formalin to keep in check any fungus which could be rotting the unfertilized eggs. Says Benedict, "We continually monitor the eggs and when you see hearts beating in the embryos, then it's time to move them into the pond." In a few hours or a day they will hatch out into hungry fry and if the timing is right, immediately feast on a pondful of water fleas and rotifers.

When the fry are 1 to 2 inches long, they're fingerlings and ready to come out of the pond and into the hatchery building. In the past, the crew used long seines to gather the fingerlings—a pretty awkward setup. But the redesigned ponds have a clay bottom with a small sump beneath the drain. The ponds are drained of water leaving a 30 by 10-foot sump into which all the fingerlings are forced, making them easy to "scoop up."

Inside the hatchery, Benedict has set up belt feeders to deliver cracker crumb-sized portions of ground trout food. As the fish grow larger, they are fed pellet food and move into culture tanks. If all goes according to plan, for the first time this year, fingerlings will be housed in a new culture building. The new facility has an inground water delivery system and industrial-strength wiring that will overcome some of the past problems of leaky ponds and finicky pumps. The fish will remain in twelve 2,400 gallon culture tanks until ready for market. Benedict predicts, "Inside of three years we'll have a marketable fish of about a half-pound in weight."

"Joe Buttner ignited a spark which made us go on to the next step," says Benedict. Ekohawk will still put effort into growing perch in the net-pens, but ponds and tanks may turn out to be the best technique for domesticating perch for market. Getting these fish to market is of great importance to this community. Not only is the fishery of what was once the mainstay of the diet here greatly diminished, but Benedict believes that the reserve's soaring diabetes rate may be linked in part to unfortunate dietary choices made during decades of dwindling fisheries. Providing a source of perch that is hand fed and free of contaminants to members of the Akwesasne community is the overarching goal of this Ekohawk project and is a fitting application of some important Sea Grant research.

—Barbara A. Branca

Extending Sea Grant Research to the Community

In accordance with the objectives of aquaculture to reduce and eliminate conditions that cause stress in fish, the new and future perch culturing facilities at the Akwesasne Reserve in northern New York include microfilters and ultraviolet sterilization techniques to improve water quality. Inspired by the NYSG pond culture research of Joseph Buttner, the new operation at Ekohawk will also include an improved filtering system and earthen grow-out ponds designed to shorten the time to bring perch to the already-waiting market.

Other benefits of perch aquaculture to the Akwesasne community are educational. With support from several governmental agencies, local development boards and school councils, Ekohawk's Director Benedict has planned a 23-week long accredited training course for the community on the college level. The long-term impact to the community will be to foster student interest in the practicality of scientific careers. On a reserve with relatively high unemployment, this affords a unique educational opportunity.

Harvesting fingerlings

Coast . . . on Lake Ontario

Sea Grant is one of over 40 active providers of information offered through NOAA's CoastWatch program, which was extended to include Lake Ontario and the other Great Lakes in 1990.
Photo by Pat Peterson

A few years ago, New York Sea Grant (NYSG) fisheries specialist Dave MacNeill turned his stakeholders on to a new approach to recreational fishing. He suggested that they plan their expeditions according to seasonal water temperature changes. "Fish have distinct temperature preferences," MacNeill explains. "In the spring, when the thermal structure of the lake is reconfiguring itself from its setup during the winter season, they are attracted to a migrating thermal feature. This feature, called the thermal bar, is literally a vertical wall of 37-degree water that serves as a corral, keeping fish such as rainbow trout and steelhead on the warmer, shoreline side of the bar."

So how, you may ask, can anglers and recreational boaters pattern their coastal practices after such technologically-dependant observations? By using information offered through CoastWatch, a National Oceanic Atmospheric Administration (NOAA) program comprised of eight regional nodes that supports environmental science and decision making by obtaining, developing and delivering environmental data and products for near real-time monitoring of U.S. coastal waters.

Above: **George Leshkevich, NOAA's Great Lakes CoastWatch Manager**

Below: **NYSG Great Lakes fisheries specialist Dave MacNeill points out the features of the newly redesigned website for the Great Lakes CoastWatch node, located in Ann Arbor, Michigan**

Photos by Barbara A. Branca

Initially formed by NOAA as a means of better anticipating and monitoring coastal environmental events such as North Carolina's late 1987 offshore red tide bloom, CoastWatch, which can be accessed on the World Wide Web at <*sgiot2.wwb.noaa.gov/COASTWATCH*>, has expanded to other U.S. coastal regions, including the Great Lakes.

CoastWatch's Great Lakes regional node, which was founded at NOAA's Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor, Michigan in 1990, receives a daily suite of over two dozen satellite images from the Command and Data Acquisition Station on Wallops Island, Virginia. This collection of images, which includes updates on lake surface temperatures and cloud cover, is then made available to local users via the Internet, at <*coastwatch.glerl.noaa. gov*>, or over dial-in telephone lines. According to George A. Leshkevich, a NOAA/GLERL physical scientist and manager of the Great Lakes CoastWatch program, "This data is being used in a variety of ways, including monitoring such things as algal blooms, plumes, ice cover, wave height, currents and water intake temperatures at fish hatcheries."

The first Great Lakes CoastWatch user site was established nine years ago at the Center for Great Lakes Studies at the University of Wisconsin at Milwaukee. Since then, regional application has grown to include over 40 active providers from federal, state and local government agencies as well as academic institutions and the public sector.

Watch

In 1994, Michigan Sea Grant (MSG) formed a cooperative project with NOAA's GLERL to test and evaluate the feasibility of digitally processing the surface temperature imagery available through the regional CoastWatch program into contour maps, a form that would prove to be useful and accessible to the fishing community.

Employing a process that includes using a Geographic Informational System (*see side bar*), a newly hired MSG computer programmer began posting Lake Michigan surface water temperature and cloud mask maps daily on the program's web site, <*www.coastwatch.msu.edu*>. Two years later, these efforts were expanded to encompass the other Great Lakes.

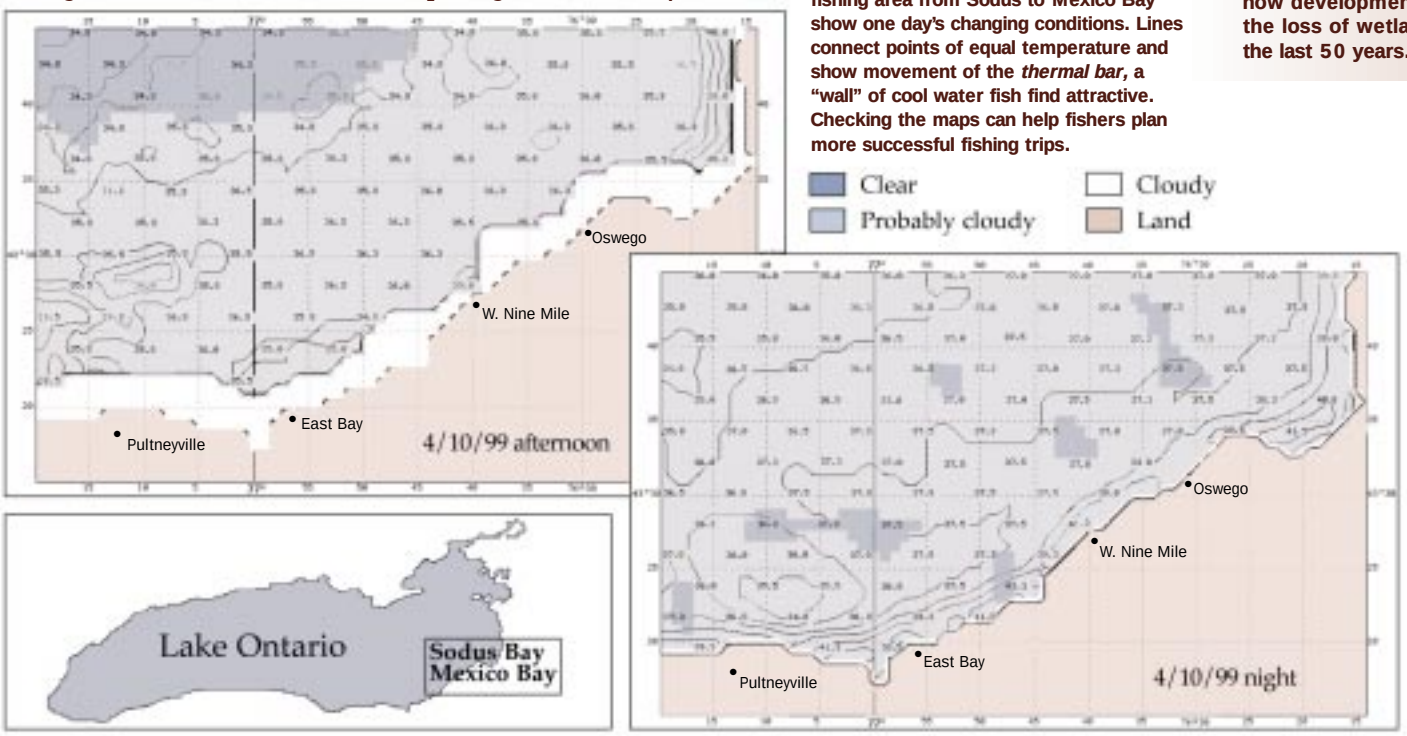
Through publishing a series of articles in his quarterly newsletter, *New York's Great Lakes Angler*, and by presenting the idea to sportfishing organizations, MacNeill says, "I was able to describe the Lake Michigan CoastWatch project to my stakeholders, educate them on its benefits and question them as to their level of their interest in developing such a thermal mapping system for Lake Ontario." Supplementary to being the main financial supporter for the undertaking, NYSG provided input on the design of the regional port maps for the lake, which were based according to the relative sport-fishering importance of its various locales.

MacNeill is also an advocate for the Great Lakes Forecasting System data— real-time surface water temperatures, water levels, integrated water currents and forecasts of vertical water temperature profiles on a whole-lake scale— available for Lake Ontario online at <*superior.eng.ohio-state.edu*>.

While both Leshkevich and MSG's Coast-Watch Extension Associate Mike Klepinger say efforts are being made to improve the on-line presentation of data, MacNeill is certain that his stakeholders are already using the information. "Based on the number of letters, phone calls and hits on the web sites, clearly this project has improved angler efficiency and allowed many to better target species of recreational interest."

—Paul C. Focazio

Using Sea Grant's CoastWatch maps to get a "line" on fish.



These two website maps of a popular fishing area from Sodus to Mexico Bay show one day's changing conditions. Lines connect points of equal temperature and show movement of the *thermal bar,* a "wall" of cool water fish find attractive. Checking the maps can help fishers plan more successful fishing trips.

Don't Guess— Use GIS

A geographic information system (GIS) is a computer-based tool for mapping and analysis that transforms statistics into an interactive visualization of an area's population, land use, vegetation or geological changes. GIS displays many layers of information more efficiently than paper maps, helping a wide range of users explain the past and plan the future.

NYSG coastal processes specialist Jay Tanski has developed GIS tools specific to Long Island's geography and population. With a rise in sea level being predicted, officials need to know how serious the threat may be to coastal communities. Tanski has prepared GIS maps to show the extent of coastal flooding due to sea level rise and coastal storm surges under different prediction scenarios. Three such maps were featured in *Newsday's* "Long Island, Our Future" series.

Supported by NYSG and the Hudson River National Estuarine Research Reserve, Fellow Daisy Tang developed a GIS land use database for the Sparkhill Creek watershed of the Hudson Valley. According to NYSG specialist Nordica Holochuck, Tang used hundreds of digitized aerial photographs to document how development caused the loss of wetlands over the last 50 years.

blueback herring

Angler Alert: Concerns and Issues of Lake Ontario

> *"Now is a great opportunity for Sea Grant to work with sportfishing promoters to better inform anglers. —Diane Kuehn"*

In its 28 years of "Bringing Science to the Shore," New York Sea Grant has served as a vital source of information for the state's angler communities. A recently released NYSG publication based on statewide and Great Lakes angler surveys finds, though, that there are over 193,000 potential anglers in the region who are interested in fishing but do not partake in the sport. This may be because, as NYSG coastal tourism specialist Diane Kuehn points out, "These individuals think that they need a boat or special skills to fish here."

Kuehn, like NYSG Great Lakes fisheries specialist Dave MacNeill, uses outreach efforts as a means to more effectively capture the interest of potential coastal users. For MacNeill, *New York's Great Lakes Angler,* a 23-year-standing Sea Grant newsletter originally underwritten by charterboat groups, is the ideal tool to educate NYSG's lakeshore constituency. "Several years ago," he says, "I began receiving comments from numerous recreational anglers who were not necessarily charterboat captains requesting Sea Grant to reach out to the unaffiliated average angler. This necessitated several publication format changes, including a more generalized manner in which issues pertaining to fisheries of the Great Lakes and other freshwater systems of interest were addressed."

The *Angler* addresses a variety of Great Lakes and general fisheries news items as well as the potential for impacts on the sportfishing industry by blueback herring and alewife as well as cormorants. The discovery of blueback herring in the Lake Ontario watershed and the potential invasive threat posed in Lake Champlain by its sibling species, the alewife, have raised some eyebrows in both the scientific and sportfishing communities. According to literature co-written by MacNeill, more than 9,000 blueback herring were collected in the Oswego River in 1994, followed by the capture of two juveniles in Lake Ontario during the fall of the next year. "This represents the first sighting of the species in the Great Lakes," MacNeill says, "and the furthest inland sighting in North America."

Because blueback herring are known to survive, reproduce and settle in land-locked settings, MacNeill adds, "Their presence raised some real concerns about the colonization potential in the region." Despite bluebacks being "somewhat of an oddity in the Great Lakes Basin," their potential for ecological impacts in the region is "a situation hauntingly analogous to that existing when zebra mussels were first discovered," MacNeill says. As cited in the March 1999 *Angler,* the discovery of bluebacks in Lake Ontario has raised some questions of the potential for food competition with the landlocked population on alewives, hardy competitors themselves.

Over the past decade, the alewife population has declined in Lake Ontario. Presumably a result of predator influence as well as food web nutrient-zooplankton disturbances, these population decreases suggest the possibility for bluebacks, which share a partial ecological overlap and considerable structural similarity with the alewife, to thrive. To remedy identification difficulties as this scenario plays out, MacNeill has created a Sea Grant brochure, *What is it: Alewife or Blueback Herring?,* to better educate both his coastal user and fisheries biologist constituencies on distinct key features of both species. Recently, NYSG Hudson River specialist Nordica Holochuck, with help from NYSDEC, updated this informative brochure to serve her own user group.

Sportfishers enjoying a day of leisure on the Salmon River, one of three rivers MacNeill will focus on in his fisheries workshops this summer and fall. MacNeill will educate anglers about population trends and regulation updates in the Salmon, as well as the St. Lawrence and Niagara Rivers.

Photo by Diane Kuehn

Double-crested cormorants, which began nesting on Lake Ontario around 1945, were affected for many years by the use of organochlorine pesticides. After DDT and other like pesticides were banned, the waterfowl began to rebound in the 1970s.
Photo by NYS DEC

In June '98, MacNeill held an international blueback herring workshop attended by top North American experts and members from the New York State fisheries management and research communities along the Hudson and Mohawk Rivers and Lakes Erie and Ontario. At the close of the event, attendees collectively generated several proposals to address concerns of an increasing overlap in alewife/blueback herring populations. "While there is obvious potential for bluebacks to colonize in Lake Ontario," MacNeil says, "the conclusion left by the select panel was that their ecological impacts on the region, while unknown, are unlikely to be severe and may even be inconsequential."

In *Angler,* MacNeill also addresses disruptions in Lake Ontario's eastern basin ecosystem due to an increasing cormorant population. Today, the DEC reports that there are approximately 12,000 cormorant breeding pairs throughout the state, of which 7,500 nest on Little Galloo Island in Lake Ontario's eastern basin. Last summer, the Island was the site of two major cormorant shootings that left around 1,000 of the federally protected long-necked black birds dead. In April, 10 men from sportfishing communities along the lake's eastern shore pleaded guilty to charges, agreeing to serve six months of monitored home confinement and pay fines and environmental conservation contributions totaling $7,500.

"This recent cormorant shooting is but a barometer of the escalating polarity between anglers, fish and wildlife managers, environmental interest groups and birding organizations," MacNeill says. The complex struggle stems from a somewhat paradoxical situation. On the one hand, a large number of cormorants thrive on a food source comprised primarily of smallmouth bass, yellow perch and three-spine sticklebacks, favorites of the sportfishing region's people. On the other hand, MacNeill says, "Despite this ongoing clash, increases in the cormorant population reflect the ecosystem's continually renewed state of health."

In 1994, MacNeill served as a technical advisor to the DEC's Cormorant taskforce, which was designed to develop a consensus management scheme for cormorants in Lake Ontario. "All parties were well represented," MacNeill says. "Even pro-birding interests agreed to support a cormorant control program if scientific data indicated that the birds were negatively impacting fish populations." With no such data available at the time, MacNeill adds, "The perception was that no action was being taken, so some anglers felt that civil disobedience was in order. Unfortunately, the shooting caused some environmental groups to take a position where in they are now unlikely to support a stringent control program."

—Paul C. Focazio

Cormorants—A DEC-isive Solution

In December 1998, DEC studies concluded double-crested cormorants annually consume an estimated total of 87.5 million three-spine sticklebacks, alewives, yellow perch and smallmouth bass in Lake Ontario's eastern basin. Based on these findings, the DEC has developed a five-year experimental management program to reduce the Little Galloo Island colony from 6,000 to 1,500 nesting pairs in five years, thereby improving the quality of smallmouth bass and other fisheries.

Under a federal wildlife permit, the DEC will send biologists to the Island to trap and kill 300 adult birds and dip their eggs in mineral oil before returning the eggs to the nests. MacNeill says, "While shooting cormorants creates openings for other birds to fill and smashing eggs will stimulate additional egg laying, oiling eggs smothers the embryo but does not inhibit the birds from breeding them anyway, thus limiting breeding periods."

Catching up to bycatch

At the Bycatch Workshop are (l. to r.): NYSG recreational fisheries specialist and workshop coordinator Mark Malchoff; Tom Hurst, legislative advisor to State Senator Owen Johnson; Bill Wise of the Marine Sciences Research Center (MSRC) at SUNY Stony Brook, chair of the Marine Resource Advisory Council and panel moderator; John Turner, legislative advisor to Assemblyman Thomas DiNapoli; and John Mason of NYSDEC, who presented updates on Mid-Atlantic Fisheries Management Council bycatch activities.

On March 19, 1999, Danford's Inn in Port Jefferson was the site of a workshop led by New York Sea Grant fisheries specialist Mark Malchoff to discuss the problem of bycatch in New York's waters . Bycatch is the inadvertent capture of non-target fish and other organisms during commercial fishing operations. The number of organisms caught in such a way is unknown, and the difficulties in getting accurate bycatch data was one of the issues the workshop was designed to address. Recreational hooking mortality—subsequent death of fish released alive by recreational anglers—was also on the workshop agenda. Although hooking mortality is excluded from the concept of bycatch in federal fisheries legislation, it was included on the agenda because it, too, produces an unknown amount of waste of fishery resources. Attendees, who included commercial and recreational fishermen, researchers and legislators and/or their advisors, also learned of developments in research leading to successful bycatch reduction strategies. Guest speakers included Dr. Joseph DeAlteris of Rhode Island Sea Grant and Henry Milliken of the National Marine Fisheries Service (NMFS) at Woods Hole. Dr. DeAlteris reviewed presentations given at the 1995 East Coast Bycatch Conference and Mr. Milliken presented an overview of trawl gear modifications that have successfully reduced bycatch of fish and mammals in several Northeast fisheries.

Bycatch reduction plans are mandated by federal law, and in New York State each session of the legislature sees the introduction of various bills proposing bycatch reduction strategies. The workshop was a joint effort between Sea Grant and the Bycatch Reduction Workgroup of the Marine Resource Advisory Council (MRAC). Assistance in planning the workshop was provided by Cornell Cooperative Extension of Suffolk County, Rhode Island Sea Grant, New York State Department of Environmental Conservation (NYSDEC) and MRAC.

. . . and working hard to restore clams

At Danford's on February 26, New York Sea Grant, the South Shore Estuary Reserve Council and the NYSDEC sponsored a *Workshop on Hard Clam Population Dynamics—Research Priorities for the South Shore of Long Island*. This session provided a forum where knowledgeable individuals could define and discuss what is known and what needs to be known about hard clam population dynamics as applicable to restoring and enhancing the dwindling hard clam resource and its fishery. With research goals in focus, New York Sea Grant will administer $450,000 in hard clam research funds from NOAA's National Marine Fisheries Service after a recent appropriation initiated by Congressman Michael Forbes.

Top photo:
SUNY at Stony Brook Marine Sciences Research Center (MSRC) biologist Bob Cerrato (left) with Bob Malouf, Director of Oregon Sea Grant, a former NYSG director and shellfisheries biologist at MSRC.

Bottom photo:
At the hard clam workshop, New York Sea Grant Director Jack Mattice (left) and workshop steering committee chair Jeffrey Kassner, Director, Division of Environmental Protection, Town of Brookhaven.

All photos by Barbara A. Branca

Reaching Out to Lake Champlain

Photo of research vessel on Lake Champlain courtesy of Lake Champlain Research Institute, Plattsburgh SUNY

With 587 miles of shoreline and over 70 islands, historic Lake Champlain is the largest freshwater lake in the United States outside of the Great Lakes. More than 650,000 people currently live in the drainage basin of this long lake which defines much of the border between New York and neighboring Vermont. Because of changes in the recent Sea Grant Reauthorization Act, there now exists an opportunity for Sea Grant to provide outreach to the population of the entire Lake Champlain region.

NYSG Director Jack Mattice and Associate Director and Extension Program Leader Dale Baker, backed by NYSG's 25-year history in implementing its own solid proactive outreach program, sought ways to adapt NYSG's infrastructure to provide leadership for a Lake Champlain effort. The pair worked closely with Malcolm Fairweather, Director for Earth and Environmental Science at the State University of New York at Plattsburgh (Plattsburgh SUNY) and Lawrence Forcier, Dean of the Division of Agriculture at the University of Vermont (UVM) on the program's details. Director Mattice, Horace Judson, President of Plattsburgh SUNY, and Judith Ramaley, President of UVM, sent a letter of endorsement of this collaborative effort to National Sea Grant Program Director Ronald Baird.

The proposal, drafted by Baker and NYSG's Great Lakes program coordinator Dave White, calls for two Sea Grant extension specialists—one at UVM and one at Plattsburgh SUNY, where that specialist will be associated with that school's Lake Champlain Research Institute. Collaborating with existing groups including the Lake Champlain Basin Program, the Sea Grant outreach specialists will work basin-wide on a series of coastal issues. These issues will be identified through the programmatic planning and review process of the newly-formed Lake Champlain Sea Grant Board, which was set up to oversee and advise this comprehensive outreach effort. In the initial discussions so far, priority issues that will likely be addressed include water quality, non-point source pollution, sustainable development in the coastal region, coastal economic development, recreational fisheries and aquatic exotic species.

The economy and ecosystem health of the Lake Champlain Basin are integrally linked. Traditionally, the basin had a rural resource-based economy. Farming, forestry, boat building, mining and guiding provided significant employment. Commercial fishing, logging and maple syrup production provided direct economic returns from the basin's diverse natural resources. In recent years, sportfishing, hunting, boating, hiking, and cross-country skiing—all made attractive by the area's excellent water quality and wildlife habitat—have bolstered tourism and local businesses moving the Lake Champlain Basin toward a service economy.

The efforts of this project will serve as a bridge between scientific research and user groups as well as all individuals concerned with Lake Champlain's coastal regions. One goal is that these efforts will result in coastal businesses and industries providing enhanced and more competitive goods and services to their clientele while increasing profitability. Another goal is to provide information so that the government and the public will be better informed on coastal problems and issues, resulting in wiser decision-making and greater stewardship of coastal resources. As the new effort gets underway, maintaining and improving the economic and environmental vitality of communities surrounding Lake Champlain will be fostered by a Sea Grant program designed to educate the watershed's inhabitants and visitors about actions needed to protect the quality of the Lake Champlain waters and its other natural and cultural resources.

—Barbara A. Branca

Brown Tide Activity 1998

The Peconic Bays of Long Island remained relatively free from brown tide for the third consecutive year in 1998, with neither Rhode Island nor New Jersey reporting any bloom activity. Delaware Sea Grant, though, reported brown tide algal cells for the first time in the state's inland bays. Also, brown tide bloomed in isolated embayments of Long Island's east end and south shore. A short, but relatively intense bloom occurred in West Neck Bay on Shelter Island that started in June and ended by late July. Sergio Sañudo-Wilhelmy, a BTRI principal investigator from SUNY at Stony Brook's Marine Sciences Research Center (MSRC), and Sea Grant Scholar Christopher Gobler have been finding out why. During the annual symposium, Gobler presented possible reasons for last year's bloom activity in West Neck Bay. According to his report, the bay has been a brown tide "hot spot" in previous years mainly because of increases in the area's enriched nitrate levels during the wet spring season.

Fitting Together Pieces of the Brown Tide Puzzle

Brown Tide investigators at the symposium are (l. to r.): José Giner, SUNY College of Environmental Science and Forestry in Syracuse, NY; Robert Andersen, Bigelow Laboratory for Ocean Sciences in Maine; David Caron, Woods Hole Oceanographic Institution; Maureen Keller, Bigelow Laboratory; and Darcy Lonsdale, SUNY at Stony Brook's MSRC.

On Saturday, April 10, New York Sea Grant hosted the third annual Brown Tide Research Initiative (BTRI) Informational Symposium in Westhampton Beach. The symposium featured talks by scientists who charted their research progress on the microscopic alga *Aureococcus anophagefferens* which has intermittently plagued areas of Long Island's coastal waters since 1985, severely impacting eel grass populations and devastating the once-thriving Peconic estuary bay scallop industry.

Early on in their joint efforts, BTRI investigators David Caron and Darcy Lonsdale hypothesized that one of the factors that triggers brown tide is the inability of certain small animal plankton grazers to control the abundance of brown tide by feeding on it. They cite that if these grazers do not eat the brown tide organism, the algae population may increase, possibly leading to a bloom. Caron presented an analysis of last summer's data indicating how certain experimental conditions could artificially induce a bloom.

In their latest work, BTRI investigators Patricia Glibert and Todd Kana from Horn Point Environmental Laboratory in Maryland have been analyzing how and what kinds of nutrient supplements brown tide uses to foster growth. According to Glibert, growth is intimately tied to the light-dark cycle such that at night *Aureococcus* fits into a pattern of reduced negative growth when certain organic compounds are present. Although *Aureococcus* may function best under conditions of higher light intensity, the alga may have a mechanism to function in low light situations, possibly giving it a competitive advantage over phytoplankton.

A joint effort of NYSG and the National Oceanic and Atmospheric Administration's Coastal Ocean Program, BTRI was launched in 1996 as a means to coordinate efforts in brown tide research and awareness. Scientific findings and results resulting from the multi-year program are documented in a series of reports. See page 15 for brown tide publications and web sites. Additional funding for the six-hour public symposium was provided by SUNY at Stony Brook's Living Marine Resources Institute (LMRI), the Department of Environmental Conservation, and the Peconic Estuary Program.

A *Newsday* reporter (far right) discusses BTRI initiatives with (clockwise) NYSG's Assistant Director Cornelia Schlenk, Brown Tide Outreach Specialist Patrick Dooley and Susan Banahan, project manager from NOAA's Coastal Ocean Program and member of the BTRI steering committee. Banahan emphasized the importance of BTRI's existence, saying, "For many locations across the country, the issue of harmful algal blooms has become a growing problem, one that hasn't received a great deal of monitoring."

Photos by Barbara A. Branca

LastWave

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
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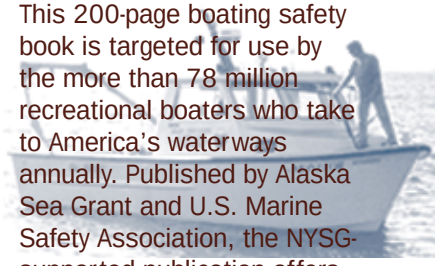
Water Wise: Safety for the Recreational Boater



This 200-page boating safety book is targeted for use by the more than 78 million recreational boaters who take to America's waterways annually. Published by Alaska Sea Grant and U.S. Marine Safety Association, the NYSG-supported publication offers sea-faring individuals survival tips as well as information on overboard rescues, first aid and fire fighting. Boating safety trainers Susan Clark Jensen and the Alaska Marine Safety Education Association's Director, Jerry Dzugan, pen the work. *Call for ordering details.*

Have you checked out NYSG's web site lately?

Along with our new World Wide Web URL, www.seagrant.sunysb.edu, some of the major changes include:

Text and PDF versions of Sea Grant publications, including *Coastlines* and *Brown Tide Reports*

A recent list of research and outreach publications (1997-99)

New web pages on Fiscal Opportunities and Processes, Brown Tide Research Initiative and NYSG Program Summary Great Lakes and Marine District Research and Extension Efforts

An updated Staff Directory, which now includes links to web sites of our extension specialists, where applicable

Journal Reprints — Aquaculture

Angler associations as partners in walleye management. Joseph K. Buttner, David B. MacNeill, David M. Green and Richard T. Colesante. 1991. *Fisheries* 16(4):12-17. $1.00

Concentration of selected priority organic contaminants in fish maintained on formulated diets in Lake Ontario waters. Joseph K. Buttner, Joseph C. Makarewicz and Theodore W. Lewis. 1995. *The Progressive Fish-Culturist* 57:141-146. $1.00

Cooperative walleye culture programs: the New York State and Province of Ontario experiences. Joseph K. Buttner. 1996. *In:* R. C. Summerfelt, editor. Walleye culture manual. *NCRAC Culture Series 101* $1.00

Culture of fingerling walleye in earthen ponds. Joseph K. Buttner. 1989. Reprinted from Aquaculture Magazine, March/April 1989. Pages 37-46. $1.00

Efficacy of enrofloxacin for the treatment of salmonids with bacterial kidney disease, caused by *Renibacterium salmoninarum*. Hui-Min Hsu, Gregory A. Wooster and Paul R. Bowser. 1994. *Journal of Aquatic Animal Health* 6:220-223. $1.00

Genetic comparison of naturally spawned and artificially propagated Lake Ontario lake trout fry: evaluation of a stocking strategy for species rehabilitation. J. Ellen Marsden, Charles C. Krueger and Peter M. Grewe. North American Journal of Fisheries Management 13:304-317. $1.00

Uptake and retention of mirex by fish maintained on formulated and natural diets in Lake Ontario Waters. Joseph C. Makarewicz, Joseph K. Buttner and Theodore W. Lewis. 1993. *Progressive Fish-Culturist* 55:163-168. $1.00

New York Sea Grant Publications

Brown Tide Research Initiative Report #3. 1998 Brown Tide. Patrick Dooley. 1999.

Angler activity in New York's Great Lakes Counties: 1988-1996. Nancy A. Connelly, Diane Kuehn, Tommy L. Brown and Barbara A. Knuth. 1999. Fact Sheet. $1.00

New York's Great Lakes Angler Markets. Nancy Connelly, Diane Kuehn, Tommy Brown and Barbara Knuth. 1999. Fact Sheet. $1.00

1996 Angler Effort and Expenditures on New York's Great Lakes Waters. Nancy A. Connelly, Diane Kuehn, Tommy L. Brown and Barbara A. Knuth. 1999. Fact Sheet. $1.00

This series of three publications discusses the results of the 1996 New York Great Lakes and statewide angler surveys conducted by Cornell University researchers and funded by NYSG and the NYSDEC. Angler effort and expenditures and angler market groups are discussed for NY's Great Lakes Region. The publications can also be ordered from New York Sea Grant, 101 Rich Hall, State University of New York, Oswego, NY 13126 or accessed through our web site at <http://www.cce.cornell.edu/seagrant/tourism.html>.

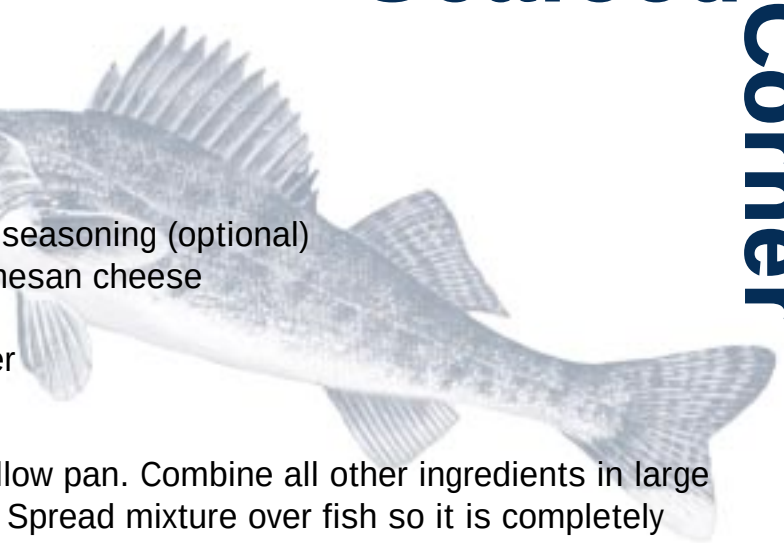
Walleye

Historically, walleye was an important recreational fishery. But by the early 1960s, it was nearly overfished and its population hurt by invading exotic species and poor water quality. However, improved water quality and the economic successes of salmonid stocking led to an interest in walleye culture. According to Joseph K. Buttner, currently at Salem State College in Massachusetts and formerly a Sea Grant researcher at the State University of New York College at Brockport, walleye is an important recreational fish that has substantial aquaculture potential. Demand for fingerling walleye used in stocking farm ponds and other waters exceeds the available supply. Walleye are perhaps the most popular food fish in the north central United States and Canada. To provide walleye at the numbers of sizes desired, it is essential to develop effective and economical culture practices.

—Barbara A. Branca

Walleye Parmesan

Seafood Corner



Ingredients

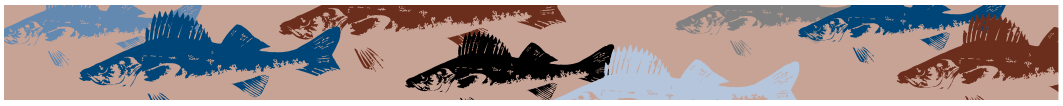
3 lbs. walleye
1 cup sour cream
1/4 cup butter
1/4 teaspoon cajun seasoning (optional)
1/2 cup grated Parmesan cheese
1/2 teaspoon salt
1/4 teaspoon pepper

Method

Place walleye in shallow pan. Combine all other ingredients in large bowl and blend well. Spread mixture over fish so it is completely covered. Bake in a 350 degree oven for 30 minutes or until brown. Serves 6 to 8

Lori Dickerson of the Southtowns Walleye Association of Western New York, Inc. modified an old cookbook recipe by adding a little cajun snap saying that friends enjoy this recipe as an alternative to basic walleye “fish fry.”

Anglers who catch their own walleye should be aware that the general health advisory in NY for sportfish is to eat no more than one meal (one-half pound) per week of fish from the state’s freshwaters. More restrictive advisories may exist for some freshwater lakes or rivers. The NYS Dept. of Health (DOH) updates advisories annually. The advisory is available from DOH on the internet at <http://www.health.state.ny.us>.



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