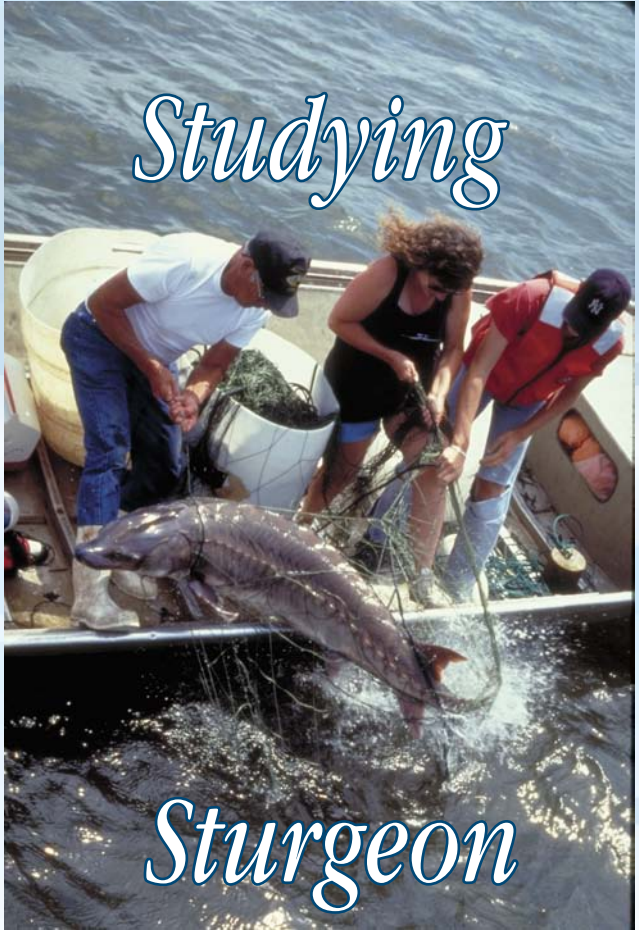
Studying Sturgeon



Long-time (and now deceased) Hudson River commercial fisherman Everett Nack (left) and a grad student crew bring in an Atlantic sturgeon. Photo by John Waldman

What is it about sturgeon that has fascinated people for centuries? Maybe it's the diamond pattern of bony scutes that set this behemoth apart from all other fish in North American waters. Maybe it's the unique snout and barbels that help it feed along the river bottom. But the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), once abundant along the eastern seaboard and in major river systems from Labrador to Northern Florida is no longer so. Human activities such as damming rivers, pollution and extensive harvesting have dwindled populations of the Atlantic Sturgeon as they have for the Gulf Sturgeon (*Acipenser oxyrinchus desotoi*), and the shortnose sturgeon (*Acipenser brevirostrum*). The smaller shortnose sturgeon, found in coastal rivers of the Atlantic seaboard including the Hudson, is federally listed as endangered.

Continued on page 3

Studying Sturgeon *page 1*
by Lane Smith and Barbara A. Branca

Estrogenic Compounds in Urban Waterways: An Interview With Anne McElroy
by Patrick Dooley and Barbara A. Branca *page 6*

CoastWatch: Youth on the "Line" *page 8*
by Paul C. Focazio

North America's New Form of Biological Pollution: Invasive Species
by Chuck O'Neill *page 10*

Currents
Hudson River Dredging: Problems and Solutions
by Nordica Holochuck *page 12*

NYSG Fellow is Recognized with Prestigious Award
by Barbara A. Branca *page 13*

Sea Grant New York

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

COASTLINES

Director
Jack Mattice
Associate Director
Dale Baker
Assistant Director
Cornelia Schlenk
COASTLINES
Vol. 35, No. 2, Spring/Summer 2006
Editor
Barbara A. Branca
Barbara.Branca@stonybrook.edu
Contributing Writers
Patrick Dooley
Nordica Holochuck
Chuck O'Neill
Lane Smith
Paul C. Focazio
Paul.Focazio@stonybrook.edu
Design
L.C. Graphics
Layout
Sharon O'Donovan
Production Assistant
Susan Hamill

Coastlines is a product of NYSG's project C/PC-7 funded under award NA16RG1645 granted to SUNY's Research Fdn. on behalf of NYSG from the National Sea Grant College Program of the US Dept. of Commerce's NOAA. NYSG is a joint program of SUNY and Cornell. Sea Grant is a national network of 32 university-based programs working with coastal communities. Its research and outreach programs promote better understanding, conservation and use of America's coastal resources.

New York Sea Grant Institute
121 Discovery Hall, Stony Brook University
Stony Brook, NY 11794-5001
631.632.6905

New York Sea Grant Extension Offices:
Administration Office
112 Rice Hall
Cornell University
Ithaca, NY 14853-5601
607.255.2832

Great Lakes District Central Office
New York Sea Grant
Morgan II, Second Floor
SUNY College at Brockport
Brockport, NY 14420-2928
585.395.2638

Marine District Central Office
New York Sea Grant
Cornell University Research and Extension Center
3059 Sound Avenue
Riverhead, NY 11901-1098
631.727.3910

From the Director

New York Sea Grant's management and staff are knee-deep in responses to the Pew and Ocean Policy Commissions and the draft Great Lakes Restoration legislation. Now that NYSG has successfully navigated through the September 2005 week-long Program Assessment Team review and the even more complimentary National Sea Grant College Program (NSGCP) February 2006 evaluation, these efforts have expanded.

On the state level, NYSG is working to respond to Great Lakes Restoration legislation and Governor Pataki's Ocean and Great Lakes initiative. A leaders' group, involving the Department of Environmental Conservation, the Department of State, Great Lakes Research Consortium, Seaway Trail, Finger Lakes - Lake Ontario Watershed Protection Alliance, and NYSG, is working together to plan an action agenda by next spring that the Great Lakes Basin Advisory Commission and/or the Coalition of NYS Great Lakes Legislators can help implement. NYSG also participated in the NYS Governor's Ocean and Great Lakes symposium and is negotiating a role for NYSG in the state agency development of ecosystem-based management for New York State.

NYSG's regional activities have been multi-faceted. NYSG developed the outreach section of a Marine Sciences Research Center proposal to conduct monitoring of the New York Bight for the Mid-Atlantic Coastal Ocean Observation Regional Association, part of the Integrated Ocean Observation System recommended by the Commission on Ocean Policy. NYSG also helped prepare proposals from the Great Lakes and Northeast Sea Grant Networks to the NSGCP. Both of these efforts involve coordination and collaboration among academics, agencies, and user stakeholders to develop priority research, education and outreach needs for ecosystem-based management.

Finally, NYSG has participated in several different activities at the national level. NYSG staff, via an Intergovernmental Personnel Act (IPA) with NOAA's NSGCP, as well as the Climate Program Office, is setting up a National Climate Outreach Extension effort for Sea Grant Extension to be completed later this summer. NYSG also is preparing comments on the Ocean Research Priorities Plan, a direct outgrowth of the Commission on Ocean Policy report. Its goal is to "identify and prioritize oceanographic objectives that address pressing national and global issues" for domestic and economic policy and homeland and national security.

Now all we have to hope for is that federal and state monies will be allocated to follow up on at least some of these activities.

Great Lakes diving guide author Cris Kohl's face lit up with excitement when he told a crowd of scuba divers and shipwreck enthusiasts about the *George A. Marsh,* which sank enroute to Kingston, Ontario from Oswego in 1917. Kohl was one of several speakers at the Tenth Annual Great Lakes Underwater event in Oswego organized by NYSG and the Oswego Maritime Foundation. Photo by Sean Treacy, *The Palladium-Times*, Oswego.

New York Sea Grant....

Bringing science ***expertise*** *to the shore....*

Below: National Marine Fisheries Service/Sea Grant Population Dynamics Fellow Kathy Mills onboard the NOAA research vessel, *R/V Albatross IV*. Participating as a volunteer, she is sorting mostly Acadian redfish (*Sebastes fasciatus*) caught during the Northeast Fisheries Science Center's autumn 2005 bottom trawl survey in the Gulf of Maine. Photo courtesy of Northeast Fisheries Center

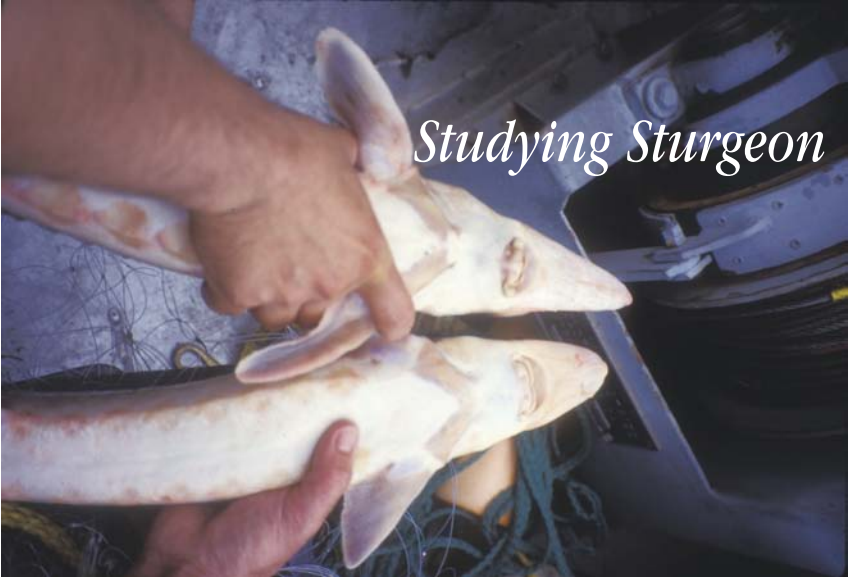
—from the field

John Waldman (top) then at the Hudson River Foundation, and Doug Peterson (formerly of Cornell) with an Atlantic sturgeon from the Hudson. Photo courtesy of John Waldman

to the public forum.

Above: Jay Tanski, NYSG's Coastal Processes and Facilities Specialist, informs Earthstock 2006 participants at Stony Brook University about Long Island's south shore barrier islands. Photo by Susan Hamill

From left to right, Christopher Gobler, Darcy Lonsdale, Gregory Boyer, Jeffery Fullmer, Karen Chytalo, Rick Balla and Carl LoBue comprise the panel of experts and organization representatives at the recent Brown Tide Research Initiative Public Symposium. Photo by Paul C. Focazio



Studying Sturgeon

How can you tell a shortnose from an Atlantic? By the shape of their snouts. The shortnose (on the bottom) doesn't have the elongated snout of the Atlantic.
Photo by John Waldman

continued from page 1

Due to the threatened and endangered status of sturgeon species, state and federal fisheries agencies are concerned about preserving and restoring them. But to do this, they must first identify the distinct population segments of each species. Then managers can take into account any unique regional populations and preserve as much as possible natural genetic structure of each species in management and/or restoration plans.

The key to this management strategy is genetic detective work, much of it done by a research team that got its start with two NYSG-funded projects over a decade ago. As presented in a 2005 article published in *Estuaries*, the NYSG-funded research team provided data that identifies the genetic characteristics of the 19 distinct population segments of the endangered shortnose sturgeon population. The researchers found that there are strong genetic differences among most shortnose sturgeon population segments along the Atlantic coast, usually differing by estuary of origin.

"Before we did genetic analysis on sturgeon, there was no way of knowing whether or not they showed 'homing fidelity' – and sturgeon do go home to their natal rivers," says **Isaac Wirgin**, the project's lead investigator from his lab at New York University School of Medicine. His lab is capable of identifying whether a shortnose has come from the Hudson, the Chesapeake or the Savannah –all from a tiny clip from the fish's fin. Sturgeon, like salmon and other anadromous fish, can live in salt water but swim into the rivers and tributaries of their birth to spawn. Wirgin's long-time collaborator, **John Waldman** of Queens College (formerly of Hudson River Foundation), has spent years studying and helping to conserve sturgeon in the Hudson, North America and internationally. Waldman has always had a fascination for anadromous fish and, like Wirgin, began fishing at a tender age.

Using DNA markers to identify distinct populations of sturgeon began with an earlier NYSG funded project in the mid to late 1990s when Wirgin and Waldman first examined the DNA of Atlantic and Gulf Sturgeon populations to determine their stock structure. The National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (FWS) jointly listed the Gulf sturgeon as a threatened species in 1991, and share jurisdiction for this species under the Endangered Species Act. This research reinforced the designation of the Gulf sturgeon as a threatened, distinct subspecies. As such, the Gulf States Marine Fisheries Commission (GSMFC) along with FWS developed a Gulf sturgeon management and recovery plan that came out in 1995.

From Fin Clip to DNA Snip

Identifying which estuary a fish is from can't be done by eye. It's done by genetic markers on a sturgeon's DNA, specifically mitochondrial DNA.

Research technician Lorraine Maceda receives a sturgeon fin clip in ethanol. She extracts the DNA, adds DNA polymerase enzyme (1) to replicate a selected portion of its mitochondrial DNA with the polymerase chain reaction (PCR) in a DNA replicator called a thermocycler (2). She then sequences the selected portion of mitochondrial DNA and reveals the DNA sequence on slab gels (3) as well as on the automated DNA sequencing system (4).

Within two days of receiving a fin clip, Maceda can send a 600-700 base DNA sequence back to the hatcheries or agencies where management decisions can be made. The managers can then decide if they have viable broodstocks that could be mated to repopulate that distinct population segment.

Photo sequence by Barbara A. Branca

According to **Frank Parauka** of FWS, Wirgin's research helped inform the development of that plan. And **Ron Lukens** of GSMFC noted that the research helped delineate Gulf sturgeon populations by drainage allowing managers to de-list recovered populations while others remain listed. The genetics work from this project on this subspecies has been used by FWS, GSMFC, and the state of Florida for management and stock enhancement, and to help avoid mixing unique stocks.

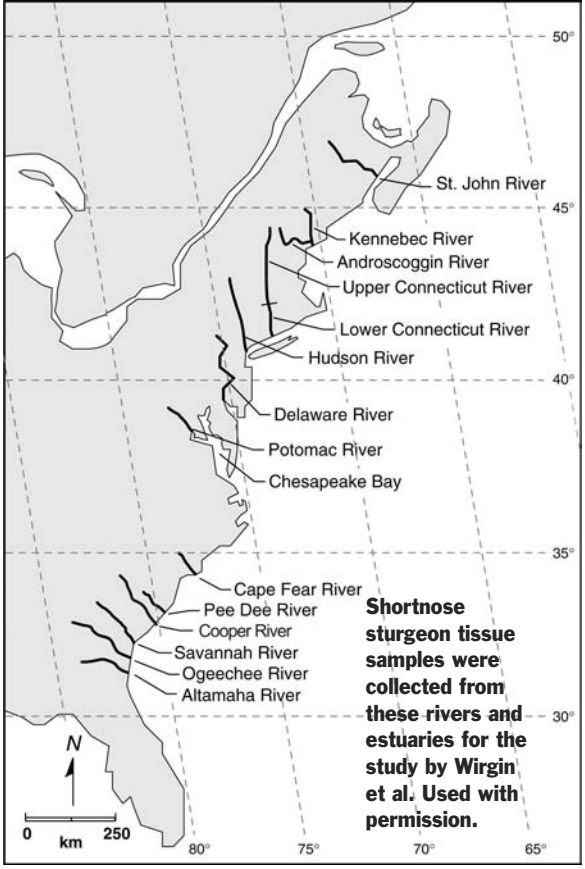
As part of this research, genetic markers were developed for use in hatchery programs to maintain the genetic diversity in native stocks. The study also determined that the Hudson River Atlantic sturgeon, which seem to be quite robust, contributed the overwhelming majority of fish to the New York Bight intercept fishery. It was also determined that younger fish in the Delaware River were likely a mixture of fish from the Hudson River and southeastern stocks.

The results of this research increased knowledge of the biology of these species by determining genetic stock structure of populations. Says Waldman, "Our data results have been heavily used by the Atlantic States Marine Fisheries Commission (AMSFC), especially in their stocking and culture protocol for the Atlantic sturgeon." Because populations of the Atlantic sturgeon were so low, the Atlantic States Marine Fisheries Commission adopted a 40-year fishing moratorium in 1998. The research results were an aid for the status review of the species prior to implementing the moratorium. With the moratorium in place, the Atlantic sturgeon was considered a "species of concern" and not listed as endangered under the Endangered Species Act.

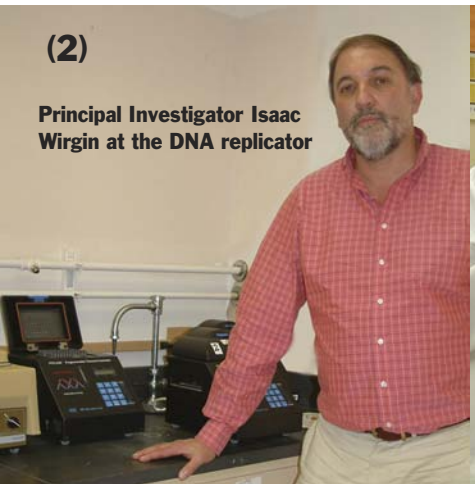
Shortnose sturgeon were first listed under the Endangered Species Preservation Act in 1967. As with the Atlantic sturgeon, a management and recovery plan was developed in 1998. The genetics research from NYSG-funded projects has helped inform development of those plans and enables review of endangered status by condition of local populations. Populations doing well enough could be reclassified while others remain classified as endangered.

Currently, a status review team is assessing the status of the Atlantic sturgeon to determine if listing the species as threatened or endangered is warranted. Wirgin's research is playing a role. According to **Kimberly Damon-Randall**, Proactive Conservation Program Coordinator in the Protected Resources Division of NMFS, the ongoing status review was initiated because NMFS has concerns over the current status of the Atlantic sturgeon throughout its range. Says Damon-Randall, "The genetic work that Wirgin is currently conducting and his past work are being used to assist us in determining if distinct population segments exist for Atlantic sturgeon and, if so, what the appropriate management parameters are for these distinct population segments."

— Lane Smith and Barbara A. Branca



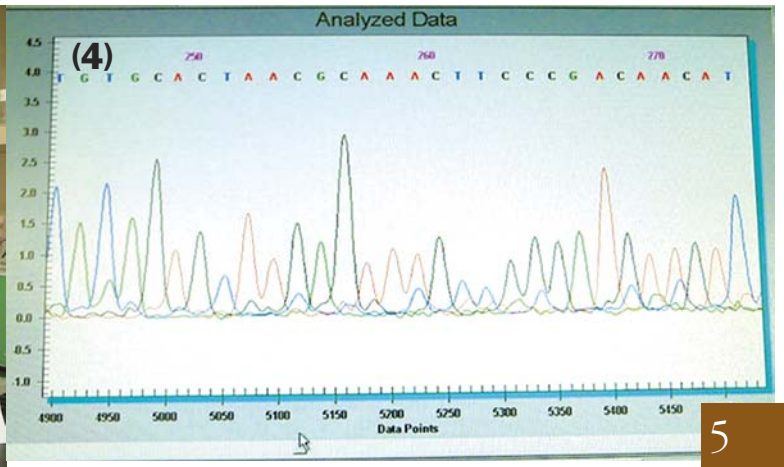
Shortnose sturgeon tissue samples were collected from these rivers and estuaries for the study by Wirgin et al. Used with permission.



(2)

Principal Investigator Isaac Wirgin at the DNA replicator

(3)



Researcher Anne McElroy (right) and doctoral student Lourdes Mena in New York Harbor aboard the *Seawolf*, the research vessel of the Marine Sciences Research Center, Stony Brook University.
Photo by Mark Wiggins.

Estrogenic Compounds in Urban Waterways:

An Interview with Anne McElroy

Dr. Anne McElroy, Associate Professor at Marine Sciences Research Center, Stony Brook University, and a former New York Sea Grant director, sat down with Coastlines editor Barbara Branca for a Q & A about some of her work on winter flounder. She and her research team have used fish as a model animal to examine the potential effects of toxic chemicals in New York City's waterways.

You've done a lot of research in various areas of toxicology. Two of your most recent NY Sea Grant projects related to a specific group of pollutants in urban waterways. You and your team looked at pollutants that mimic the female hormone estrogen. What exactly is an estrogen mimic and why look at these compounds?
Many everyday compounds–from pharmaceuticals, plastics and personal care products to industrial strength paints, detergents and pesticides–contain compounds that can act as hormone mimics. We've been looking at a group of compounds called nonylphenol ethoxylates or NPEOs. These are surfactants, chemicals that have both water soluble and non-water soluble parts that make them good cleaning agents among other things. Some NPEOs can mimic the hormone estrogen, which is important for female reproduction. We want to look for any effects these chemicals may have on animal populations—and set out to see if their presence causes males to exhibit female characteristics.

What got you so interested in this research area and why is it so important to study?
Toxicologists are looking closely at hormone mimics in many urban waterways, particularly in Europe. It has become a global concern.

In one NYSG-funded study, you sampled at New York City municipal sewage treatment plants. What were you looking for?
Our team assessed the estrogenic potential of sewage effluent from three plants in Brooklyn, NY: Newtown Creek, Red Hook, and 26th Ward. We looked for the egg-yolk precursor protein vitellogenin (Vtg) in three live stages of sunshine bass—newly hatched larvae, and two- and five-month old juveniles. We chose Vtg because estrogen turns on its production. Female fish need Vtg to make egg yolk protein. But all fish, including males, have the genes to make Vtg, it's just a question of whether or not the gene gets turned on. Estrogen mimics in the environment can cause immature and male fish to make Vtg. That's why Vtg makes a good biomarker for exposure to these chemicals. We also measured levels of NPEOs and natural estrogens in the plant effluents, and expression of the estrogen receptor or ER in larval fish.

And were the results in keeping with your hypothesis?
Yes. All three plants elicited some kind of estrogenic response in larval bass. However, juveniles only responded to effluent from the largest plant that also provided the least level of treatment, Newtown Creek. There, both Vtg and ER were elevated by a factor of 3-5 in larvae that were exposed to sewage effluent. Older fish exposed to effluent from Newtown Creek showed 20 to 200 fold elevations in Vtg expression, with the older fish showing the largest response. Levels of NPEOs were also much higher at Newtown Creek than at the other plants studied (more than 500 ug/L or parts per billion). Based on laboratory studies conducted on other species, the levels of NPEOs found in Newtown Creek sewage effluent are likely to be

high enough to be responsible for the estrogenic effects observed. At the time of the sampling, the Newtown Creek plant did not provide full secondary treatment. Even though it has been recently upgraded, it is my understanding that it still does not provide full secondary treatment.

Those numbers sound off the charts. Did you tell people about it?
Yes. The results were presented at numerous scientific meetings including the *11th Symposium on Pollutant Response in Marine Organisms* in Plymouth, England, annual meetings of the *Society of Environmental Toxicology* and I was invited to talk in a special session on endocrine disruptors to the *Society of Environmental Journalists*. Our colleagues on this project, **Bruce Brownawell** at Marine Sciences and his former student **Lee Fergusson**, now a faculty member at the University of South Carolina, also presented the data on developing methods to detect ultra trace levels of NPEOs and hormones at meetings of the Society of Mass Spectroscopy. The American Society for Testing Materials has expressed interest about developing their approach into a standard method of analysis.

Your work over the years has also gained you some national, as well as some very local, notoriety. You were interviewed, along with your husband and collaborator, Bruce Brownawell, by the local newspaper, *The Three Village Times*, about the Environmental Leadership award you both received from Southampton College.
It was very nice to be recognized for our environmental work, but my real interest is in answering applied science questions. It's an opportunity to address questions that really matter to people and our world, but it's very messy at times.

Who were your collaborators on this project?
This project was a collaborative effort between many people and places, including two departments at Stony Brook University (Marine Sciences and Pharmacology with **Dr. Charles Iden**), and scientists at other universities, including **Adria Elskus** who used to work with me at Stony Brook, but moved on to the University of Kentucky, **Daniel Schlenk** who used to be at Ole Miss but is now at the University of California at Riverside, and **Nancy Denslow** at the University of Florida. **Phil Heckler** of the NY State Department of Environmental Protection generously gave us permission to sample effluent. Part of this work was supported by related projects funded by the Hudson River Foundation to Schlenk and Brownawell.

In another NYSG-funded project you collaborated with **Martin Schreibman** and **Lucia Magliulo-Cepriano** from City University of New York's Brooklyn campus to assess whether or not winter flounder in Jamaica Bay are showing evidence of endocrine disruption.
We chose this economically-important species as a model because it lives in sediments where these compounds accumulate and if endocrine disruption is a problem for local fish, we would expect to see effects in Jamaica Bay animals. We believe this study will provide information for the protection of ecosystem health and be of use to managers of toxic substances, wastewater treatment, and fisheries resources.

This project got off to a slow start because we had trouble finding male fish in Jamaica Bay during our first sampling season. So we decided to return to the field the next spring to collect additional adult fish from Jamaica Bay and our reference site, Shinnecock Bay on Long Island's east end. Because of problems we encountered

Continued on page 14

**Lourdes Mena dissecting a winter flounder.
Photo courtesy of Anne McElroy**

Spotlight on Lourdes Mena

Lourdes Mena, a graduate of the University of Puerto Rico, has been working on the winter flounder project since 2002, first as a NY Sea Grant Scholar and later as a Turner Minority Fellow. She completed her MS thesis in 2004 and immediately entered the Ph.D. program at Marine Sciences Research Center where she is continuing on with this project.

Mena presented the results of this Jamaica Bay project at the Association for Limnology and Oceanography (ASLO) Annual Meeting in Salt Lake City, at the 12th Symposium on Pollutant Responses in Marine Organisms in Tampa Bay, and at the Annual meeting of the Society of Environmental Toxicology and Chemistry in Austin TX.

"For my PhD project, I am looking at the assessment of endocrine disruption in wild populations of winter flounder (*Pseudopleuronectes americanus*) by use of molecular biomarkers (Vitellogenin, E2, 11-ketotestosterone), enzyme activities and histopathology. I expected to find fish with high levels of the protein vitellogenin (egg-yolk precursor protein) in male fish and use this as a biomarker of endocrine disruption as it has been used before in many studies. However, our findings have surprised me and I am now looking at more complicated aspects. I am looking at enzyme activities, protein expression, steroid metabolism and histopathology to try to find what is really happening to the fish population in Jamaica Bay. We know there is endocrine disruption in female fish and young fish, but the pattern is less clear in adult male fish. What is driving the changes we are seeing? Is one of the pathways in the endocrine system being interrupted? Are the fish functioning well reproductively?"

Coast

Youth on the "Line"

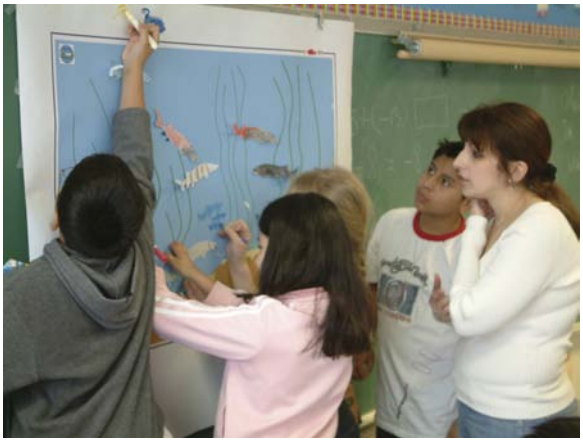
I FISH NY programs are offered free to 3rd graders and up in any borough of New York City. Here, 5th graders at PS 78 in Long Island City form an interconnected food web with help from NYSG's Nim Lee, as she builds on an earlier lesson in fish biology. Photos this page by Paul C. Focazio

"My students and I learned a great deal from the fishing program and especially Nim's knowledge of the local fishing community,"

. . . says PS 78 science teacher Victoria Mulligan (far right) as she helps her 5th graders diagram a marine ecosystem. "Nim motivated the children and sparked their interest in fishing, especially for those who had never fished before." Adds Nim, "There are a lot of great teachers in the NY public school system. And Victoria is just one of the teachers who pursues opportunities like I FISH NY to augment her science curriculum."

It's an overcast, brisk Monday morning in early April in Long Island City. Inside the doors of PS 78, though, **Victoria Mulligan**'s science classes are filled with the engaging minds and waving arms of eager 5th graders. Today is the second in a series of three sessions the students will have with educators from I FISH NY, an educational outreach partnership between New York Sea Grant and the New York State Department of Environmental Conservation (NYSDEC). Targeting New York City and Long Island residents, I FISH NY is designed to broaden knowledge of the local fresh and saltwater resources via school visits, fishing clinics and festivals.

But don't try and pass on those specifics to the kids at PS 78. After being taught Fish Anatomy 101 a month ago, these 5th graders are more intent on identifying the laminated fish or animal pictures strung around their necks. They're playing an interactive marine food web game. And most of them are right on the mark. "I'm a phytoplankton," one child says, hesitating as she tries to sound out the syllables.



Nim Lee, a NYSG Recreational Fisheries Specialist in New York City, is overseeing the exercise. She's accompanied by **Sarah Bruner**, a NYSDEC Urban Aquatic Educator. Afterwards Lee compares notes with **Malynda Nichol**, her I FISH NY counterpart in Long Island's Nassau and Suffolk Counties, who offers similar classes in her region.

After Lee asked the students "who" or "what" they are – a striped bass, bluefish, a school of silversides, or even an angler – Lee sits them in a circle to begin making connections between the various plants and animals using long pieces of colored yarn.

Kids are then grouped together by trophic level – top predators like the angler; predators like the striped bass and bluefish; prey like the silversides; and producers like algae and phytoplankton. "Food source" cards are passed along through the pyramid as each level "consumes" the one before it. Some of these cards are marked with an "X," later explained to the kids as pollutants. So, while predators prey on those lower on the food chain, they are also consuming pollution. At this most basic level, Victoria Mulligan's students learn about the interconnections of the food web. They'll apply what they know on a class fishing trip in June with Nim and other I FISH NY-ers at Gantry Plaza, which is across the street from the school and overlooks New York's East River.

Watch

I ♥ NY℠
New York State Department of Environmental Conservation

Nearly 2,400 people, including members of the Smith family from North Babylon (pictured), took part in the annual Belmont Lake State Park Spring Fishing Festival. NYSDEC and I FISH NY, in conjunction with NYS's Office of Parks, Recreation and Historic Preservation, hold such festivals each spring, summer, and fall. Rods, bait and tackle are provided. No fishing license is required. Similar events will be held at Lake Ronkonkoma County Park in June and Hempstead Lake State Park in October. Photo by Larry Cowdon

"People love animals," says Lee. "I know this from having worked at the American Museum of Natural History and, well, just from observing." Citing New York's urban dwellers as "unknowing environmentalists," she continues, "New Yorkers utilize fewer resources because of the way the city is organized – smaller apartments, public transportation, and high population density. The flipside of that is that there is not much space for natural areas. So, I think the I FISH NY program gives traditional classroom students and other user groups in New York access to something they might not even know they're missing."

Those in the I FISH NY program realize that interest in fishing starts at a young age. "Since I was young, my father and I shared a special bond through fishing," says Nichol. "It left such a tremendous impression upon me as a child. Now it's great to be able to provide a similar opportunity for others to enjoy the sport of fishing."

NYSG's Malynda Nichol helps a student from PS 48 in the Bronx reel in a fish he caught at Crotona Park last spring. I FISH NY's Nim Lee plans to fish with PS 48 classes for six days in mid-May. Photo courtesy of Student Conservation Association/Americorps

Nichol and Lee are not alone in their beliefs. A new Cornell University study in *Children, Youth and Education* suggests that if you want your children to grow up to actively care about the environment, give them plenty of time to play in the "wild" by going hiking, camping and fishing before they're 11 years old. "When children become truly engaged with the natural world at a young age," says principal investigator **Nancy Wells**, "the experience is likely to stay with them in a powerful way – shaping their subsequent environmental path."

Helene Dillard, Director of Cornell Cooperative Extension and member of NYSG's Board of Governors, concurs. "My parents enjoyed fishing, and I loved it too," she says. Despite the demands of her job, in good weather, Dillard, her husband and 14-year old son Jamar can be found fishing in streams in the Finger Lakes region and the Adirondacks.

And, much like the I FISH NY educators, she's passing down her passion to the next generation of potential anglers and sport fishermen. "I'm really pleased Jamar has developed a passion for fishing," she says.

"We have been taking him fishing since he was a toddler – he's now nearly six feet tall. He will fish in any kind of weather – I'm a little more weather-selective."

— Paul C. Focazio

I FISH NY began in January 2002, when the NYSDEC was awarded a grant from the U.S. Fish and Wildlife Service. Three years later, the DEC partnered with Sea Grant to further expand the program. Malynda Nichol and Nim Lee were hired as NYSG Recreational Fisheries Specialists to provide outreach via classroom visits, fishing trips and clinics.

"This partnership utilizes Sea Grant's outreach expertise to help the DEC inform people about local fishing opportunities and the value of the local aquatic resources," says Chart Guthrie, DEC Region 1 Bureau of Fisheries Manager. "Fishing is one way to connect residents with the past, as well as the outdoors in general," adds Steve Heins from DEC's Bureau of Marine Resources. "Urban dwellers especially don't get to make that connection without leaving the city. With I FISH NY, they can discover what's here is often just a short walk away."

Expanding on the symbiotic relationship between Sea Grant and the DEC, NYSG's Director Jack Mattice says, "As access and water quality improve in urban estuaries, fishing becomes a more desirable recreational outlet for relieving daily stresses. I FISH NY recognizes this and provides a valuable forum for teaching urban youth the joys and skills of fishing."

James Gilmore, a DEC Regional Natural Resources Supervisor based in Long Island City, applauds I FISH NY's recent efforts. "We've increased the number of schools and other institutions we visit, reaching a greater number of urban residents, especially children," he says. Melissa Cohen, a DEC Biologist also in Long Island City, says, "Our lesson plans have not only increased in number, but also, existing lessons have improved by being more effective at getting our message across and, thus, our mission accomplished."

For more on I FISH NY go to www.ifishnewyork.org or check out the "Web Extras" for this issue of *Coastlines* at www.nyseagrant.org.

NY Sea Grant Specialist Nordica Holochuck contemplates an infestation of invasive water chestnut (*Trapa natans*) on the Hudson River. Photos this page courtesy of Chuck O'Neill, NYSG

North America's New Form of Biological Pollution: Invasive Species

> *"Invasive species is defined as "…an alien [non-native] species whose introduction does or is likely to cause economic or environmental harm or harm to human health."*
>
> ***— Executive Order 13112***

An extraordinary form of pollution is impacting the waters of North America but has, for the most part, been taking place mostly "under the radar" of the general public. This pollution has nothing to do with industrial plants spewing wastes into the air or the water, nor with hazardous waste dumps, power plants, sewage discharges, nor any of the other "culprits" usually associated with pollution. This pollution is in the form of non-native organisms introduced to our waters, and the lands around them, by either natural or human-mediated mechanisms. These species run the gamut from plants (purple loosestrife, *Phragmites* and Japanese knotweed) to familiar animals (common carp, zebra mussels, green crabs, and Asian longhorned beetles) to pathogens (West Nile virus) which affect native and non-native organisms alike.

These non-native species are causing dramatic changes to North America's aquatic (and terrestrial) ecosystems. At the time of writing, about 5,000 non-native species have established free-living populations in the U.S., 162 of which live in the Great Lakes. Approximately 15 percent of these non-native species have caused severe harm to agriculture, industry, human health, and the environment. **David Wilcove**, of the Environmental Defense Fund, estimates that almost half of all federally listed endangered species have been negatively impacted by invasive species. Cornell University researcher **David Pimentelle**, pegs the cost of damages from and control of invasives at more than one billion dollars per year in the U.S.

These introduced species are referred to by many names: exotic species, non-native or nonindigenous species, aquatic nuisance species, and invasive species. In reality, these terms are not interchangeable and their misuse can confuse discussions of what to do about their introduction and management. Generally, the terms "nonindigenous" and "non-native" can be used synonymously, meaning "those [species] that have been transported by human activities – intentionally or unintentionally – into a region in which they did not occur in historical time and are now reproducing in the wild" (**Dr. James Carlton**, Williams College). Many non-native species support human livelihoods or

Invasive mute swans (*Cygnus olor*) in a patch of invasive water chestnut (*Trapa natans*) in the Hudson River.

improve our quality of life (an abundance of agricultural crops and domestic pets fit into this category). Non-native is not, however, synonymous with "invasive." The key defining point in determining whether an organism is invasive or simply non-native is a connotation of harm in the case of invasives.

The invasive species debate today is clouded and confused because of differing perceptions by differing audiences of the relative harm caused or benefit gained by particular non-native organisms: one person's weed is another

A stand of invasive Japanese knotweed, *Polygonum cuspidatum* (a.k.a. *Fallopia japonica),* crowds out all native plant growth beneath it on New York's Long Island. Photo courtesy of Chuck O'Neill, NYSG

person's wildflower or another person's herbal dietary supplement. Perceptions of relative benefit and harm may also change over time as new knowledge about the organism is acquired, or as human values or management goals evolve.

For a non-native organism to be considered an invasive species in the federal (and most state) policy context, the negative effects caused (or likely to be caused) by that organism must clearly outweigh any beneficial effects. The introduction of many non-native species, such as livestock and food crops, provides benefits to society which greatly exceed any negative effects. However, in some cases positive effects are substantially exceeded by negative effects. Take, for example the popularity of the non-native water hyacinth in outdoor water gardens in the Northeast. While this plant is undoubtedly pretty in such a setting, once the water hyacinth escapes backyard cultivation into natural areas, its populations can "explode," completely overwhelming native species in lakes and rivers and having severe negative effects on the native plant and animal life originally living in those water bodies.

While truly invasive organisms make up only a small portion of all non-native species that have been (and might be) introduced into North America, their introduction and unchecked spread can be devastating to natural ecosystems, the economies those ecosystems support, and/or our public health. It is these truly "bad players" that are the target of policy makers and resource managers.

For more information on invasive species, surf on over to the National Aquatic Nuisance Species Clearinghouse's Web site at www.aquaticinvaders.org for information on high profile freshwater and marine invaders or to the National Invasive Species Council's site at www.invasivespecies.gov for information on what is being done at the federal policy and management level.

— Chuck O'Neill

Chuck O'Neill is a Sr. Extension Associate with New York Sea Grant, specializing in aquatic invasive species. He serves on the Invasive Species Advisory Committee which advises the National Invasive Species Council, as well as on the National Aquatic Nuisance Species Task Force's Northeast and Mid-Atlantic Panels on Aquatic Nuisance Species and the New York State Invasive Species Task Force.

Purple loosestrife has been steadily replacing native species throughout North American wetlands. Artwork by Maxie Buchanan

Invasives Have Much in Common

These organisms share some or all of a number of biological characteristics:

- **high abundance in their native range (where they are "picked up" for transit to ecosystems where they are not already present);**
- **high fecundity rates, allowing them to produce more offspring that survive than die once introduced to a new environment;**
- **a short generation time, with offspring maturing to a reproduction-capable age very quickly (again, providing a large number of offspring in the receiving habitat);**
- **polyphagous feeding habits (they can utilize more than one food, allowing them to out-compete native species which might rely on a single food source);**
- **an ability to occupy diverse habitats (as opposed to many native species which have evolved to occupy only a narrowly defined habitat which, if degraded, can negatively impact native populations);**
- **high genetic variability (allowing for "plasticity" in adapting to new environments or changes in existing environments); and,**
- **proximity to a transmittal vector (which can move the organism to its new habitat in North America).**

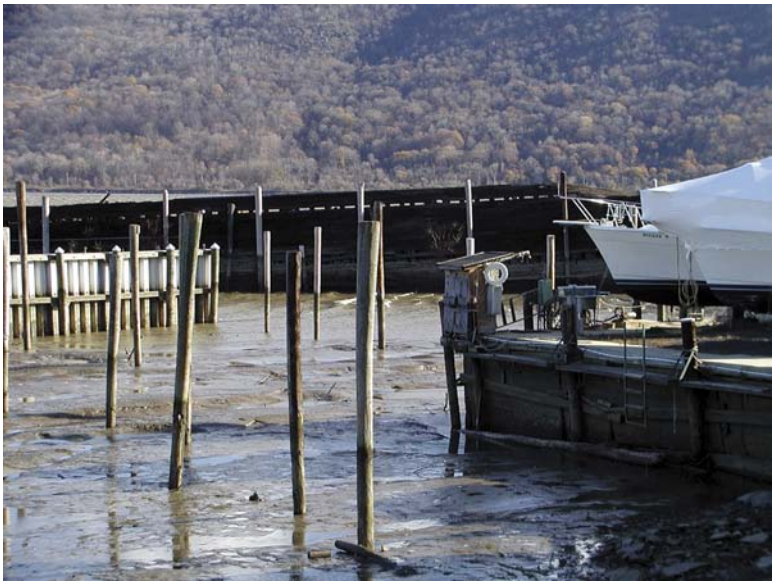
Hudson River Dredging: Problems and Solutions

On March 1, 2006, New York Sea Grant was one of several organizations cosponsoring a Hudson River Environment Society (HRES) meeting, *Hudson River Dredging Problems and Solutions* at the Pirate Canoe Club in Poughkeepsie, NY. Disposal options for dredged material in the Hudson estuary have become problematic due to the presence of chlorinated organics in many sections of the River's bottom sediments. The conference focused on scientific and engineering solutions for managing dredged material and potential funding sources for facility owners for costs of sampling and sediment analysis. Also discused were disposal or beneficial use options provided and responsibilities and opportunities by federal and state governments.

NYSG Hudson River Estuary Specialist Nordica Holochuck said, "The meeting was a success. Over 60 people, including many marina and boat club operators, local, state and federal agency representatives, and environmental consultants had the day to hold substantive conversations and consider solutions to this critical issue in a region of New York where recreational boating generates over 50 million dollars in economic impacts annually." Holochuck, a long time member and former board member of HRES, applauds the non-profit volunteer organization which continues to provide a networking forum for communication and cooperation among Hudson valley researchers, concerned citizens and public officials. For more on this meeting and HRES, visit **www.hres.org**

Hudson River Dredging: A Guide For Marina Operators, a stepwise guide to the dredging permit process in the mid-Hudson region was produced and distributed by Holochuck and can be obtained in pdf via her email at **nch8@cornell.edu**.

— Nordica Holochuck



Low tides at Hudson River boat clubs reveal necessity for dredging. Photo courtesy of Nordica Holochuck

NYSG Fellow Is Recognized With Prestigious Award

Kathy Mills (left) receives her award from Dr. Barbara Knuth at the September 2005 AFS annual meeting. Photo by Dave Partee, Alaska Sea Grant

Kathy Mills, a Ph.D. candidate in the Department of Natural Resources at Cornell University and a current NMFS-Sea Grant Population Dynamics Fellow, was selected as the runner-up for the American Fisheries Society's (AFS) J. Frances Allen Scholarship. Established in 1986 to honor J. Frances Allen who pioneered women's involvement in the field of fisheries, this yearly award goes to a female Ph.D student and serves to encourage women to become fisheries professionals.

Mills' dissertation research focuses on ecosystem-based management of marine fisheries in the Gulf of Maine. One aspect of her research seeks to identify useful indicators for tracking the status of the ecosystem and to develop ways to link these indicators to management decision-making. Another component of her research evaluates suitable governance approaches for implementing ecosystem-based management in the Gulf of Maine. Her work is conducted in conjunction with the Northeast Fisheries Science Center, where she is mentored by **Dr. Wendy Gabriel**.

Her Cornell advisor, **Dr. Patrick Sullivan**, says "Kathy's work brings together two very challenging and seemingly distinct topics, namely ecosystem indicators and marine governance. But by ascertaining the basics of each and seeking a conceptual bridge between them, she is establishing the groundwork for the next step in fisheries management."

Mills received her BA in environmental science and political science from Duke University and her MS in natural resources from Cornell University where she studied fish community structure in tidal wetlands and became a 1998 Hudson River National Estuaries Research Reserve/Sea Grant Fellow. NYSG Board of Governors member, **Dr. Mark Bain**, is currently Mills' co-advisor with Dr. Patrick Sullivan; both have done research funded by NYSG. Says Bain: "Kathy's research is ground breaking in its scope and rigor—spanning fish biology, oceanography, policy making, and coastal communities and economies. NYSG paved the way for this dissertation by supporting Ms. Mills past work from Hudson River wetlands to the US Senate's Commerce Committee."

Mills was also NYSG's sponsored Knauss Fellow in 2001 when she worked in the US Senate Subcommittee on Oceans, Atmosphere, and Fisheries Office and handled many marine habitat issues, including marine protected areas (see *Coastlines*, Fall '01 issue).

Another NYSG researcher of long standing and the past president of AFS, **Dr. Barbara Knuth**, advises the governance component of Mills' dissertation. Says Knuth: "Kathy is the epitome of student excellence and professionalism that the Sea Grant program seeks to nurture. Her experience as a Knauss Fellow demonstrated her leadership potential. Her dissertation research shows clearly her abilities to tackle natural resource management challenges with an eye toward interdisciplinary solutions, an approach that will be critical for addressing fisheries, coastal, and ocean management issues into the future."

Upon completion of her dissertation, Mills plans to continue working on matters related to ecosystem-based management in the Gulf of Maine. She hopes to pursue research with management implications and to play an active role in integrating scientific results into decision-making processes, either through a position in government or academia.

— Barbara A. Branca

Continued from page 7

Estrogenic Compounds in Urban Waterways

finding adult male fish, we expanded our project to include young (> 1 year old) fish which we obtained with help from staff at the New York Department of Environmental Conservation who regularly sample these fish as part of their annual surveys. We ended up sampling fish over almost a four year period from 2002 to 2005. Although this significantly increased our level of effort, we ended up with a much more robust field sample including adult fish from multiple sites over a two year period as well as young-of-the-year (YOY) fish from multiple sites within each area.

So serendipity applies to research, too?
Sure. You can't always predict what is going to happen in the field with real animals. As a researcher, you make the most out of the field experience. Sometimes this makes for very good collaborations among scientists from different fields. I'm a toxicologist, not a fish biologist or pathologist. But by working with others from those fields, we get to integrate our disciplines and broaden the scope of the work.

Who were some of those researchers who helped out on this project?
We worked closely with staff at the Gateway National Recreation Area, the NYS DEC Division of Fish and Wildlife and expanded collaborative efforts with Dr. Nancy Denslow at the University of Florida. **Dr. Augustine Awruke** from Norway provided antibodies required for protein analysis and **Dr. Alistair Dove** of the Stony Brook Marine Pathology Laboratory provided advice on histological analysis.

What kinds of results did your extended three-year sampling reveal?
There were some unexpected results. We did not see classical evidence of endocrine disruption we had hypothesized from adult male fish living in Jamaica Bay, despite the extremely high concentrations of the endocrine disruptor nonylphenol present in some sediments. The Vtg levels in adult male fish were not significantly elevated over those in reference fish and preliminary analysis of gonads from adult fish provided no evidence of abnormalities. But the YOY fish from all sites in Jamaica Bay showed significantly elevated Vtg as compared to YOY

Sea Grant Scholar, grad student Julia Todorov with samples of effluent from a municipal waste treatment plant in New York City. Photo courtesy of Anne McElroy

fish from Shinnecock Bay, and adult male fish had depressed levels of reproductive hormones. Some of the most compelling evidence we have is highly female biased sex ratios in both YOY and adult fish caught in some parts of Jamaica Bay. It can be as high as 10:1 females to males. We also have observed developmental delays in winter flounder embryos exposed to sediments from Jamaica Bay, and clean sediments dosed with NPEOs.

How about female fish in Grassy Bay? Isn't that the most polluted part of Jamaica Bay?
Yes. Grassy Bay, right off the runways to JFK Airport is the most sewage-impacted site in the Bay. There we saw significantly elevated levels of Vtg in female fish. We are not sure what the biological importance of this is yet, but it has been observed in other female fish exposed to estrogen mimics.

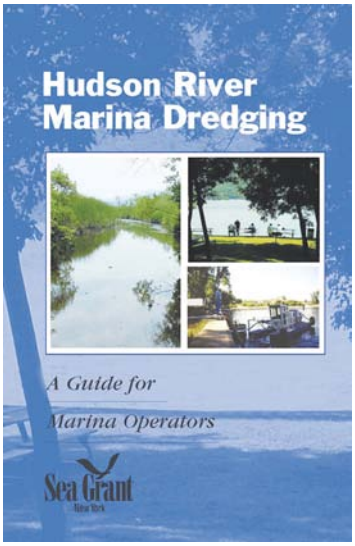
So where does your work lead you?
We have strong evidence that chemicals in Jamaica Bay are altering enzyme activities and expression in resident fish, and that chemicals in Jamaica Bay sediment can cause developmental delays in young fish. The sex ratio data also indicate that population level impacts may be likely. Doctoral student **Lourdes Mena** is continuing to work on all these questions. The next step would be to see if winter flounder in other parts of the New York metropolitan area are being affected and to estimate potential population impacts. There's a lot more work for us to do.

— Barbara A. Branca and Patrick Dooley

LastWave

"Web Extras": Log on to NYSeaGrant.org for more....

- Brown Tide: Look back on this 10+-year effort and view video clips from March's public symposium.
- GLU '06: Read the press release and related media from April's 10th Annual Great Lakes Underwater, held at SUNY Oswego.
- I FISH NY: More event pictures and insights on the Sea Grant-DEC partnership from those involved in the program.
- Sturgeon research: More photos of these fascinating fish.



A guide for Hudson River marina owners, operators and boat clubs that describes sediment contaminants likely found in lower Hudson River sub-basins, based on marina maintainence dredging projects permitted through NYSDEC. Includes Q & A on the NYSDEC's dredging permit process and river sediment contaminant data from a NYSG-sponsored study by Rensselaer Polytechnic Institute (RPI).

Journal Reprints

A fluorometric technique for the *in vitro* measurement of growth and viability in Quahog parasite unknown (QPX). D.M. Buggé and B. Allam. 2005. *Journal of Shellfish Research* 24(4): 1013-1018. Pub ID# 2955. *Free*

Comparison of mitochondrial DNA control region sequence and microsatellite DNA analyses in estimating population structure and gene flow rates in Atlantic sturgeon *Acipenser oxyrinchus*. I. Wirgin, J. Waldman, J. Stabile, B. Lubinski, and T. King. 2002. *Journal of Applied Ichthyology* 18(4-6): 313-319. Pub ID# 2606. *Free*

Range-wide population structure of shortnose sturgeon *Acipenser brevirostrum* based on sequence analysis of the mitochondrial DNA control region. I Wirgin, C. Grunwald, E. Carlson, J. Stabile, D.L. Peterson, and J. Waldman. 2005. *Estuaries* 28(3): 406-421. Pub ID# 2687. *Free*

Sea Grant Publications

Brown Tide Research Initiative Report # 9. P. Dooley. 2006. New York Sea Grant. Stony Brook, NY. Pub ID# 2969. *Free*

Hudson River Marina Dredging: A Guide for Marina Operators. N. Holochuck. 2005. Order pdf at: nch8@cornell.edu 24 pp.. Pub ID# 2751. *Free*

Collaborative

Proceedings: Jamaica Bay's Disappearing Marshes. National Park Service, New York Aquarium and B.A. Branca, editor. 2004. 55 pp. Pub ID# 2980. *Free*

Responding to a Resource Disaster: American Lobsters in Long Island Sound 1999-2004. N. Balcom and P. Howell, CT SG 2006. Pub ID# CT SG 06-02. 22 pp. *Free*

Sound Health 2006. Long Island Sound Study staff and partner organizations. 2006. A report on status and trends in the health of the Long Island Sound. 16 pp. *Free*

Ordering publications is easy: Simply

- ***order by mail:*** New York Sea Grant, 115 Discovery Hall, Stony Brook University, Stony Brook, NY 11794-5001
- ***order by fax:*** 631.632.6917
- ***order by email:*** Susan.Hamill.1@stonybrook.edu
- ***order online:*** www.nyseagrant.org
- make check payable to New York Sea Grant

Seafood Corner

Blue Mussels

Blue mussels, (*Mytilus edulis*) are harvested year-round in the northeast and are most abundant April through October. These bivalves use byssal threads, often referred to as the mussel's "beard" to anchor themselves to rocks and pilings. Their elongated blue-black shells contain a succulent yellow to orange "meaty" flesh that makes mussels a favorite in red tomato or white wine sauce. The briny broth their juices create as they cook lends to their versatility in many recipes. Mussels may be steamed to get them out of their shells for grilling, frying, broiling on the half shell, or even for use in a cold salad.

Fresh mussels should be scrubbed clean with a stiff brush and refrigerated with their byssal threads intact in a bowl covered with a wet paper towel to maintain humidity. Never soak mussels in tap water as fresh water will kill them. Remove the byssal threads just before cooking. Test-tapping the mussel shell before cooking ensures its viability. If it doesn't close within a minute or two of tapping, it can be presumed dead and should be discarded.

— New York Seafood Council

Maxime's Moules-Frites
(Mussels with Fried Potatoes)

Ingredients

For mussels with white wine

2 to 2.5 pounds of cleaned, fresh mussels
1 clove garlic, peeled and finely chopped
4 ounces of unsalted butter
2 shallots, peeled and finely chopped
1 cup dry white wine
1 bay leaf
large handful flat leaf parsley, chopped

Method

Heat half the butter in a large saucepan. When hot and foaming, add garlic, shallots, wine and bay leaf. Cook over a medium heat until shallots are soft and translucent. Bring the shallots and wine mixture to a boil. Add mussels, cover the saucepan, and gently shake the pan and cook over a high heat for 2-3 minutes until the mussels open. Discard any mussels that remain closed after cooking. Use a colander to strain the mussels over a second saucepan. Transfer the mussels to a large bowl. Return the pan with the mussel liquor to the heat. Add parsley and remaining butter and bring to a boil. Pour the mixture over the mussels and serve immediately with fried potatoes. Bon appétit.

Maxime's hints for frying potatoes: Cut the potatoes in long rectangles (leave skins on for homemade appearance and flavor), soak them in hot, salty water for 10 minutes to remove excess starch, then wipe with paper towels. For traditional frites, first fry the potatoes in a moderately hot frying pan for 10-15 minutes (until a crust appears), then remove from pan. Fry a second time at a hotter temperature just before serving.

Likely to have originated in Flemish culture, "les moules-frites" is considered a classic national dish in both Belgium and northern France where Sea Grant Scholar Maxime Bridoux calls home. In Europe, the dish is often accompanied by a pale Belgian ale. Maxime recommends a similar ale from Brewery Ommegang in Cooperstown. Bridoux, a grad student at the University at Albany working under Katherine Alben, studies algal pigments in zebra mussels.

Sea Grant New York

New York Sea Grant
121 Discovery Hall
Stony Brook University
Stony Brook, New York
11794-5001

NONPROFIT
U.S. POSTAGE PAID
UNIVERSITY AT
STONY BROOK

ADDRESS SERVICE REQUESTED

Bringing Science to the Shore

http://www.nyseagrant.org