



# Innovative Outreach Buoys Marina Industry

Fishing at daybreak in one of our Great Lakes, an afternoon of family water skiing fun on Long Island Sound, and an elegant Hudson River dinner cruise have something in common. Each in part depends on the services of New York's marinas. According to Dave White, NYSG program coordinator in the Great Lakes district in a recent publication, *New York State Marina Guide*, New York has over 800 public and private marinas along its coastal zone and connected waterways. This marina guide was compiled as a result of an inventory conducted in 1997 by the New York State Department of

Environmental Conservation, New York Sea Grant and the Empire State Marine Trades Association.

According to Jay Tanski, NYSG marine facilities specialist, "marinas vary tremendously in average size, services offered and operating characteristics because of differences in boat use, number and size." So Tanski writes in his recent publication funded by the New York State Department of Environmental Conservation, *Stormwater Runoff: Best Management Practices for Marinas - A Guide for Operators*.

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COASTLINES



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I am pleased to introduce a new format for the first COASTLINES issued during my tenure. The coincidence of the arrival of NY Sea Grant's new communicator Barbara Branca and the presidentially-declared Year of the Ocean proved a propitious time to re-evaluate COASTLINES. The redesign focuses on the integration of NYSG staff and their activities to achieve the organization's mission. Most importantly, we hope that the new format will help us to more completely meet your needs with a more timely publication.

The slogan "Bringing Science to the Shore" expresses the NYSG mission: to engage in research, extension, and education to provide science-based information useful for the wise use, management, protection and development of New York State's (and the nation's) coastal resources to policy and decision makers, business and industry, the general public and future generations.

Notice the integration emphasis. The seafood safety program known as HACCP involves coordinated extension, research and education efforts to maintain the competitiveness of New York's seafood industry. The amazingly successful

interaction that extension specialist Ken Gall has with the seafood industry was recognized with an award from the Northeast Sea Grant Network. Integration of Great Lakes, Hudson River and Marine District efforts with marinas demonstrates how such collaboration can result in broad geographical generalizations that improve profitability of businesses that usually operate with very narrow profit margins. Finally, integrated research studies such as the Brown Tide Research Initiative are also dependent on the expert NYSG education and extension arms to maximize societal benefit and use of the research results.

COASTLINES also highlights recent success stories that exhibit NYSG's strong interactions with stakeholders, be they businesses (tourism), industries (zebra mussels, HACCP), the general public (Sound Gardening), or future generations (Pathfinder, Exotic Species Day Camp). Individuals also are important, so we'll call attention to milestones (Dave Greene's 20th anniversary), national and international presentations (Chuck O'Neill's in Ireland), and other activities that document NYSG staff efforts, alone and in concert, that contribute to wise coastal resource protection and use.

We are interested in your evaluation of these changes. After all, COASTLINES is prepared for you, not for us. Let us know your opinions.




**The staff of New York Sea Grant Institute invites you to celebrate the Year of the Ocean. From left to right: Sharon O'Donovan, Publications Assistant; Stefanie Massucci, Fiscal Officer; (at back) Cornelia Schlenk, Assistant Director; Patrick Dooley, Project Assistant; Mary Kethman, Administrative Secretary; Barbara Branca, Communicator; Susan Hamill, Administrative Secretary; Bonnie Biel, Administrative Assistant, and Jack Mattice, Director.**



## Welcome to the Year of the Ocean

"The Year of the Ocean (YOTO) provides an opportunity for governments, organizations and individuals to raise public awareness about the role the ocean plays in our lives, and to initiate changes needed to sustain the marine resources on which we depend."

—National  
Oceanographic and  
Atmospheric  
Administration

NOAA's Year of the Ocean information sheets have provided Sea Grant with some facts and figures that we would like to share with you. In tandem with each excerpt, you'll read how NYSG's research and outreach efforts described in this issue match up with these coastal issues.

### Coastal Development

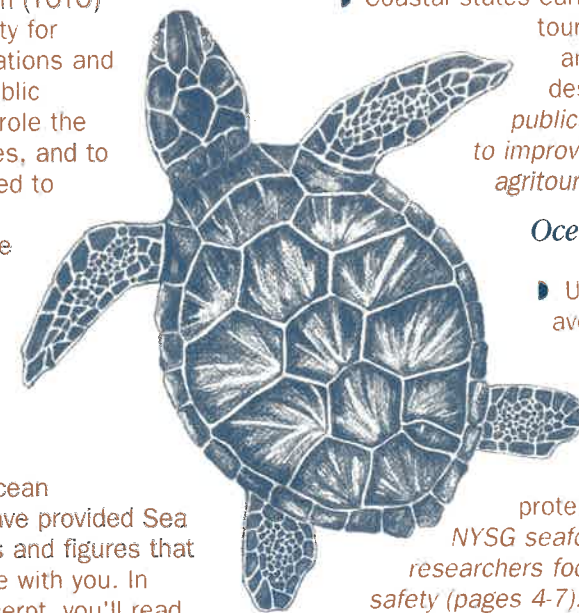
- ▶ The United States has more than 95,000 miles of coastline. *New York has 3400 of them.*
- ▶ One of every six US jobs is marine-related, and one-third of the nation's gross domestic product is produced in coastal areas through fishing, transportation, recreation and other industries dependent on healthy waters and aquatic habitats. *NYSG is supporting brown tide research into the cause and the cure for brown tide, the algal blooms which have affected both the ecology and economy of the northeast (pages 10-11). NYSG staff conducts research, education and outreach programs on exotic species, notably zebra mussels, which have threatened waters worldwide (pages 12, 14).*
- ▶ Non-point source pollution, commonly called runoff pollution, can make fresh and ocean water unsafe for humans and wildlife. *Sea Grant Extension staff throughout the state have worked to inventory marinas and provide important information about management practices that address problems associated with runoff (pages 1, 8).*

- ▶ Coastal states earn 85 percent of all US tourism dollars, and beaches are the leading tourist destination. *A new NYSG publication highlights practices to improve coastal tourism through agritourism (page 14).*

### Ocean Living Resources

- ▶ US residents ate an average of 15 pounds of fish and shellfish last year. Globally, seafood represents one-fifth of animal protein and 5 percent of the total protein in the human diet. *NYSG seafood specialist and researchers focus attention on seafood safety (pages 4-7).*

- ▶ Leading-edge anti-inflammatory drugs and potentially life-saving cancer treatments contain ingredients from fish and marine organisms. *A Sea Grant researcher is designing an anti-cancer drug that comes from a tiny coral reef invertebrate (page 9).*
- ▶ Threats to marine habitats have inspired people to take action in their own communities to preserve the oceans, which in turn, helps to protect related ecosystems within the global environment. *Sea Grant Extension and education staff take the message around the state, the nation and beyond (pages 12-14).*



“The United Nations has designated 1998 as the International Year of the Ocean.”



This summer, NYSG was "teaching the teachers" about marine education as marine district program director Robert Kent hosted Operation Pathfinder at SUNY Stony Brook. For two weeks, close to 30 teachers from around the state and beyond scoured the beaches and worked in laboratories. Photos by Barbara Branca





At Acme Smoked Fish Corporation, Frank Costanzo displays a cold smoked salmon.



## A Listeria Primer

Listeria are rod-shaped bacteria common to our environment. One species, *Listeria monocytogenes* can cause listeriosis, a disease that can be serious for some people over 60, newborns, pregnant women and those with compromised immune systems. Healthy people do not often develop symptoms after eating food contaminated with *L. monocytogenes*. Even for people at risk, symptoms may be limited to flu-like fever and nausea. However more serious cases of listeriosis may result in meningitis, septicemia, central nervous system complications, inflammation of the lining of the heart or miscarriage in pregnant women.

# Smoked Fish Industry: Using DNA Fingerprinting to Improve Safety

Bright coral-colored smoked salmon, glistening white smoked sable and tempting whitefish salad are delicacies found in gourmet shops all around the New York metro area. In fact, smoked fish and New York go together like—well, like bagels and lox. But in recent years government regulators have found the need to control a possible harmful pathogen that can occasionally be found in fish products as well as other foods such as soft cheeses. Its name is *Listeria monocytogenes*, and this common bacteria can sometimes harm people with compromised immune systems—elderly, newborns, pregnant women and persons with AIDS. The government answer to this potential danger has been to have a zero tolerance for the pathogen in ready-to-eat foods in order to assure consumers that they are buying and eating safe products. However, Martin Wiedmann, a researcher from Cornell's Food Science Laboratory has reason to think that only a fraction of the organisms classified as *Listeria monocytogenes* are actually responsible for human disease. Most other types may be harmless or at the worst affect only animal species or perhaps fish. The only way to find out which bacteria are likely to be found in fish products is to actually visit processing plants, take samples along each step of the way and then identify the bacteria

that are found with the latest DNA fingerprinting technology, a project he and doctoral student Dawn-Marie Norton are conducting with funding from New York Sea Grant.

"This is a very good example of NYSG's abilities to work with industry to examine potential problems," says NYSG Director Jack S. Mattice. "Because of NYSG's reputation as an objective information provider, the results are more likely to influence agency policy."



According to Wiedmann, of the 13 different types of the bacteria, only three types cause 89 to 96 percent of the human cases of listeriosis. The other ten types have never or rarely been linked to human disease. However, in regulations of facilities that handle smoked fish, there is a zero tolerance for all *L. monocytogenes*, even those that are naturally found in fish and that may not be harmful to humans. This research may shed light on the need for zero tolerance for *L. monocytogenes*. The smoked fish industry, which is subject to zero tolerance policy but has not been the source of any significant human illness, might be saved the financial loss of recalled product if the policy can be relaxed based on solid scientific information.

On a recent visit to smoked fish factories, Wiedmann asked Sea Grant staff to tag along to observe the process. So on a scorcher of an August day, the group set off to visit two such plants located in Brooklyn. The first, Service Smoked Fish, has been a family business for over 60 years and Jay Weiner, the present owner and operator, notes that they've been processing smoked fish for the last 20 specializing in salmon, smoked trout and chubbs. The 20 or so employees start off with an early day working from 4 am preparing daily orders.

The entire process generally starts out with frozen fish which may be from Chile, Alaska, the Baltic or Scotland that has been trucked in from cold storage warehouses in the wee hours. Weiner walked us through each stage: thawing, filleting, brining, drying, heating, smoking and packaging of the finished smoked product. After thawing in tanks so that conditions stay tough for bacteria, the fish are filleted and placed in brine in a refrigerated room for up to a week. The salt and sugar in the brine are added by strict formula. If the room deviates from its cold temperature an alarm sounds in Weiner's

office. Once the fish are removed from brine they may be placed in ovens to be dried and smoked.



Jay Weiner leads a tour of the ovens at Service Smoked Fish.

## One Tough Bug

*Listeria monocytogenes* is "one tough bug." It resists heat, salt, nitrite, and acidity. It may even increase in number under refrigeration. Data from the Centers for Disease Control (CDC) indicate that listeriosis causes about 5% of the 9,000 food poisoning deaths each year. But the rate has been declining as efforts have been intensified to reduce *L. monocytogenes* contamination. Of the small number of outbreaks reported, most of the cases were caused by dairy products, notably soft cheese, followed by undercooked chicken and delicatessen meats not thoroughly reheated. Only on extremely rare, sporadic instances has smoked seafood been implicated as the source.

"Getting just the right texture requires careful control, especially of the temperature," Weiner tells us as our own internal thermostats adjust to the increase of over 50 degrees near the ovens. We learned that smoked fish is either "cold" smoked or "hot" smoked with cold smoking taking a longer time with temperatures of only between 78 and 80 degrees Fahrenheit. Smoke is added for just part of the time. "A little goes a long way," comments Weiner. In walk-in ovens, smoke from smoldering wet sawdust of maple, hickory or cherry is circulated throughout. Here, high tech meets low tech. Temperature control and smoking times are monitored by digital readout, but the smoking is a pretty basic, ancient process.

Along our route, Wiedmann and Norton are getting samples, trying to find out the possible source of *L. monocytogenes*. Is it from the raw material—the fish itself? Is it in the brine, on the cutting boards or slicers? Another part of their study is to determine exactly which type of *L. monocytogenes* may be found in each sample. Will it be one of the three types of the bacteria that causes listeriosis or one of the ten types that have never or rarely been linked to human disease?

As Wiedmann and Norton leave Service Smoked Fish they carefully place the samples in coolers. Once back at the lab, each sample will be tested for the *L. monocytogenes* bacteria using culture and DNA-based methods developed by Qualicon, Incorporated.

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# Teaching New Food Safety Techniques to the Seafood Industry



Hats are for safety, too. Seafood specialist Ken Gall, right, consults with researchers Martin Wiedmann and Dawn-Marie Norton at the Acme Smoked Fish Corporation.

As the new Food and Drug Administration (FDA) seafood safety regulation went into effect on December 18, 1997, Sea Grant seafood specialist Ken Gall had already acted as supervisory instructor for three-day training courses all over New York state. The FDA regulation requires seafood processors, wholesalers, shippers, importers and other seafood businesses to conduct an analysis of the food safety hazards

and to develop a state-of-the art system of food safety controls in which processors and producers identify and anticipate potential food safety hazards and apply controls to prevent them *before* they occur. HACCP, an acronym for Hazard Analysis Critical Control Point (pronounced HAS sup), is currently being applied to the production of seafood and other food products. In New York alone, over 600 seafood businesses which contribute over \$1 billion to the economy of the state, have to comply with this new regulation. And Ken Gall has been there from the start of this initiative.

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In New York, Ken Gall is HACCP, remarked Roger Tollefson, President of New York Seafood Council

In New York, “Ken Gall is HACCP,” remarked Roger Tollefson, President of the New York Seafood Council who was also part of the state training team. New York has one of the largest seafood wholesale distribution systems in the US including the country’s largest wholesale seafood market, Fulton Market in New York City. The three-day Seafood HACCP Alliance course, developed in a national Sea Grant funded project, is recognized by the FDA. Gall coordinated the state training team for the seafood industry as well as for federal and state food inspectors in New York.

Through his team’s efforts, over 600 seafood business employees or owners and food safety inspectors completed the course. Most came from New York, but some from across the country and around the globe. A special teaching module for seafood wholesalers was developed to make the training course relevant and useful to the seafood industry not only in New York but the entire Northeast. This module has been incorporated into the National Training Program manual. Gall also taught about 150 individuals who attended specialized HACCP courses in New York City for seafood importers and smoked fish businesses.

While this was ongoing, Gall’s phone was constantly ringing as he responded to at least 500 calls for HACCP information and worked with the Fulton Fish Market to identify what was needed to comply with the FDA. His resultant report outlining potential problems and alternative solutions was used by over 50 companies at Fulton as well as New York City officials. He also found the time to develop a FAX on Demand system to provide the seafood industry with timely information on fisheries management and to market a series of four seasonal recipe brochures entitled *New York Seafood: A Meal for All Seasons*. His successes have led to recognition with numerous awards.



Ken Gall, holding his outstanding Outreach Program Award at the northeast Sea Grant meeting, is congratulated by New York Seafood Council Board members. From left to right they are: Bob Doxsee, Beth Doxsee, Ken Gall, Paul Houghton, Dave Schaper, Roger Tollefson, and Bill Zeller.



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Each confirmed *L. monocytogenes* isolate will be further classified using a DNA fingerprinting method. This analysis allows isolates to be grouped with other *L. monocytogenes* with the same fingerprint. According to Wiedmann, “We have a database of 153 human listeriosis case isolates which enables us to determine how often a given fingerprint group has been found in human listeriosis cases.” This team is able to determine within 48 hours exactly which type of *L. monocytogenes* is present in a sample — if they find any.

Around noon at Acme Fish Corporation, there is a hum and a buzz as 145 employees produce the company’s 125 different fish products. Acme, operating since the early 1900’s, started with very traditional smoked fish products and has branched out to include more novel products. According to Frank Costanzo, Director of Quality Assurance and Research & Development, Acme goes through about 5 million pounds of salmon annually. On this visit, the investigators are taking about 30 samples. They follow the same type of fish in its processing from raw to finished product. For example, as workers unload a hefty box of frozen salmon from Norway into thawing tanks, Wiedmann and Norton decide they’ll sample Norwegian salmon when its frozen, brined, then smoked in the final product. They might take samples of the raw iced whitefish from the Great Lakes and then sample the smoked whitefish salad. They also take samples from the cutting table, drains, skimmers, slicers, deboners and even the

condensation from the pipes above the thaw tanks. The investigators are doing a sampling job worthy of an inspection, but their science is a little more specific. The results? Acme, like Service Smoked Fish is doing an excellent job of meeting standards.

In an earlier visit to a smoked fish plant, the investigators isolated the bacteria from the drain in the raw materials cutting and brining room. “This was not surprising as the processing environment often serves as a source of this organism and other bacterial contaminants,” wrote Wiedmann in his report. Continuing to rigorously clean and sanitize this area as well as monitoring the thawing process helps minimize the risk of a final product having *L. monocytogenes* contamination from this potential source. However, in this instance, the DNA fingerprint results showed that the percentage of bacteria of this type associated with human disease is a low 5.2 percent. This example gives further credence to Wiedmann’s hypothesis that of the few occurrences of *L. monocytogenes* found in smoked fish plants, DNA fingerprinting reveals that only a fraction of them are actually harmful types in humans.

Back on our Acme tour, Frank Costanzo explained how “some fish, like whitefish are hung where drying is key. The skin gets rigid and the protein denatures. It’s smoked for one to two hours, then cooked to a required temperature.” The filets, however, like the bright beautiful orange Norwegian salmon are placed on racks, wheeled on hand trucks, dried and then smoked. Costanzo walks us into the largest cold-smoking room at Acme, and perhaps the country. Its two levels sport hand trucks full of the delicacy.

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Only three strains cause 89-96% of the human cases of listeriosis. Ten strains have never or rarely been linked to human disease.”

In the packaging room amid sparkling tile walls, men in hats and women with hairnets are using pneumatic slicers and specialized curved electric knives for removing the center portion of the salmon. Out the door, shippers are wrapping boxes ready to be loaded on trucks. Depending on traffic they can make it to shops by lunchtime. *Bon appetit.*

— Barbara Branca

An expert fillets salmon at Acme.

## Zero Tolerance

The Food and Drug Administration (FDA) and the USDA Food Safety and Inspection Service (FSIS) have “zero tolerance” for *Listeria monocytogenes* on cooked, ready-to-eat food. The FDA began monitoring cheese and dairy products, ready-to-eat meat and poultry products, and later expanded to include sandwiches, prepared salads and smoked fish. These agencies have identified the Hazard Analysis and Critical Control Point (HACCP) system as the best way to control the presence of bacteria on food products. To food processing plant managers, this means a vigorous program of sanitation and measures against cross-contamination subject to periodic inspection. Perhaps NYSG research which shows the high incidence of harmless *L. monocytogenes* in smoked fish plants may justify relaxation of the zero tolerance policy.



# Innovative Outreach Buoys Marina Industry

Continued from Front Cover

Tanski's bulletin is just one product from a larger demonstration project Tanski conducted with Coecles Harbor Marina owner Peter Needham that focused on actually implementing suggested practices at an existing marina and evaluating their effectiveness. The marina served as the site for educational workshops and the model for developing other materials. "Jay Tanski was diligent in finding alternative approaches to some of the practices," said Needham. "He found cost-effective solutions that I would not have found on my own," he concludes.

*Stormwater runoff and Best Management Practices*, or BMPs are buzzwords frequently used in discussions of environmental protection and water quality, sometimes with respect to marina facilities. Tanski's BMP bulletin explains these terms and provides planning, technical and cost information on a range of practical alternatives that facility owners can use to address the potential problem of stormwater runoff management. Helpful photographs and schematics illustrate each BMP, whether on hull maintenance or stormwater treatment, familiarizing readers with the options available.

Although intended primarily for marina owners and operators, this BMP bulletin may be of interest to others involved with boating facilities and environmental management including government and agency officials and planners. "The DEC was interested in an outreach manual for marina operators to educate them about nonpoint source pollution," said Phil DeGaetano, Director of the DEC's Bureau of Watershed Management. "Our earlier attempt to write one fell short and Jay's is much better!" In addition to the BMP bulletin, Tanski has produced a BMP slide show and 22-minute video that are available for use around the state.

An inventory of the state's diverse marinas required much coordination. "Dave White did a great job of establishing a usable questionnaire for marina owners," said Dick True, executive secretary of the Empire State Marine Trades Association who did much of the field work for the survey. True would like to see even more Sea Grant experts teach about best management practices and EPA runoff regulations. "The marina industry wants Sea Grant's input, a way to show the industry with hands-on, practical applications of what has to be done."

Nordica Holochuck, NYSG Hudson Estuary specialist, helped organize a workshop in December 1997 with Dottie Nott, executive secretary of the Hudson Valley Marine Trades Association (HVMTA). The full day workshop featured a keynote speech by state Commissioner of Parks and Recreation, Bernadette Castro and focused on Hudson River issues, marina management, boater education and safety, water quality, and striped bass management.

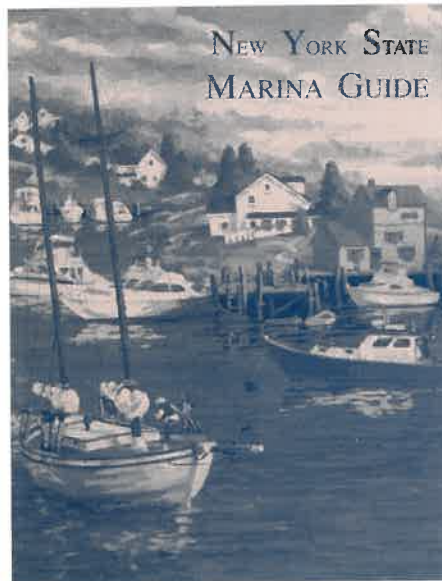
Nott heartily welcomes Holochuck's participation in HVMTA meetings. "She always imparts useful and much-needed information," Nott says of Holochuck. In a planned fall seminar, Holochuck will show Tanski's slide show on BMPs and participants will receive important TBT credits. Her previous experience showing them has met with great success.

Meetings are one way of disseminating information, but Dave White had another idea—to teach marina management at the college level. "Dave White is an innovator, always trying to figure out how to do it better," commented True about the idea. "The response was unbelievable," said Doug Nelson, Director of the Environmental Training Center at the SUNY College of Agriculture and Technology at Morrisville. "The course, *Marina Design and Management*, filled quickly," continues Nelson. In this course, White is teaching the next generation of marina managers, planners and decision makers who will go into the industry with a firm background in the best management practices.

There is no doubt that marina operators around the state face a balancing act. They try to provide good service to our state's many boaters and adhere to sound environmental practices while staying afloat financially. Whether in fresh water or salt, whether 10 slips or 500, Sea Grant is providing multimedia information and hands-on assistance to help meet this challenge.



NYSG's Dave White helped make the new Marina Guide a reality.



From left to right: Nordica Holochuck, NYSG Hudson Estuary specialist, Dottie Nott, executive secretary of the Hudson Valley Marine Trades Association and Sharon Jones of Certified Marine.

Not too far from the depths of New York Harbor, midtown Manhattan's Sheraton Hotel was the setting for a National Sea Grant panel entitled: Answers from the Sea — Biotechnology, Marine Natural Products, and Pharmaceuticals. This panel was one of the sessions of Bio '98, an international biotechnology meeting and exhibition held in June. Dr. Linda Kupfer of the National Sea Grant Office chaired a panel of six Sea Grant researchers who are on the frontier of developing drugs and other useful compounds from marine life. Organisms that spend their life cycles on a coral reef or other marine habitat often produce compounds for defense that prevent them from being somebody else's dinner or getting grown over.

"We see the survivors," said Dr. Jon Clardy, New York Sea Grant's panel speaker and Cornell chemistry professor as he discussed his work on structure-based drug design. "We see what worked." Sponges, corals and other delicately-laced invertebrates routinely produce compounds that have evolved by natural selection to bind to specific compounds. Many are inhibitors that prevent another species' protein from occupying the same space. These characteristics can be very useful, but the tricky part is figuring out the structure of these complex molecules, then modifying them to act on or for humans in a desired way.

You could say that Clardy is an "interior" designer. You can't get much more interior than the inside of a molecule. And evaluating just how atoms are attached together three dimensionally to form highly complex organic molecules is the specialty of Clardy's research group at Cornell. They find out what part of the molecule is the "business end" — the portion that "gums up the works" by preventing or inhibiting some kind of enzymatic reaction from taking place. Take the case of a compound from a Pacific marine sponge. Its business end prevents the formation of thrombin, the compound associated with blood coagulation. As an anticoagulant, this

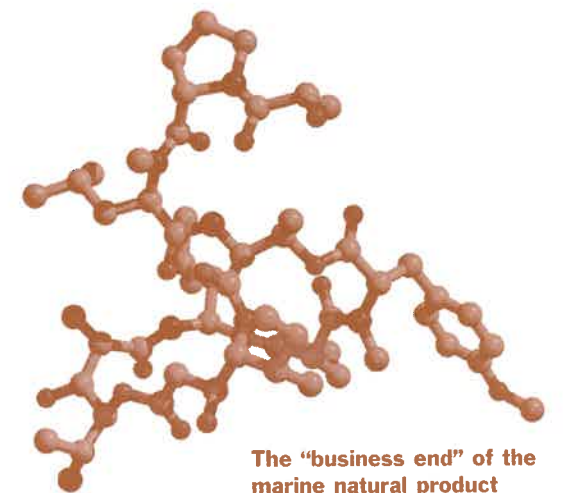
## Answers from the Sea

compound has potential as a drug for heart and circulatory system disorders.

In a New York Sea Grant project currently being funded, Clardy has been looking at molecules from a Caribbean marine invertebrate called *Trididemnum solidum*, a flat, brown tunicate that sits atop coral. Compounds derived from this tunicate have anticancer properties. Clinical trials have shown them to inhibit growth in non-Hodgkin's lymphoma, a common tumor among AIDS patients. However, the compounds also cause cardiotoxic effects and several researchers are finding ways to make these potential drugs less toxic. Clardy and his group are working on the compound's exact structure. X-ray pictures from all angles of the compound Didemnin B are fed into a computer to draw a 3-D model of the molecule. With special 3-D glasses, these models almost jump off the computer screen. With the structure known, he can begin to make modifications on the molecule so it can interact with human molecules in a safer, more targeted way. To eliminate portions that cause toxicity, Clardy "tailors" the molecules, but instead of scissors and thread, he uses enzymes to snip off a side chain here and there. What results will be a drug that can potentially control some of the deleterious health impacts of AIDS — helping patients while reducing costs of medical treatments.

— Barbara Branca

Photograph of tunicates on coral reef courtesy of Kenneth Rinehart of the University of Illinois at Urbana-Champaign



The "business end" of the marine natural product Didemnin B is likely to be the side chain shown protruding from the top of the cyclic molecule. Further X-ray crystallography to reveal how the molecule interacts with its target protein will be used to design new Didemnin-based therapeutic agents. Courtesy of John Bellizzi, Cornell University.



# Coast Watch



Checking mesocosms, 300-gallon plastic tanks containing water from Coecles Harbor, Shelter Island, that have been given experimental treatments as part of the Caron/Lonsdale brown tide project. Pictured are graduate students Katie Rose Boissoneault-Cellineri of the MIT/WHOI Joint program (left) and Becky Shaffner of SUNY Stony Brook (right). Photos by Barbara Branca

## Brown Tide Update

What is the cause of the brown tides that have periodically darkened some of Long Island's bays during the past dozen years? That's what a crowd of educators, baymen, concerned citizens, scientists, and members of the seafood industry came to find out at New York Sea Grant's Brown Tide Second Annual Informational Symposium on April 25, 1998 in Riverhead. The audience heard some answers as well as more questions from researchers who are looking into the cause and solution to the problem of brown tide. Brown tide refers to the bloom of microscopic algae in such densities that shallow bays turn coffee color affecting some shellfish, especially scallops. The brown tide algae have no known effect on human health.

Researchers gave the public an update of the Brown Tide Research Initiative or BTRI, a \$1.5 million program which started in 1996 and is administered by New York Sea Grant at the State



Becky Shaffner of SUNY Stony Brook prepares a water sample to be measured for chlorophyll content.

University of New York at Stony Brook and funded by NOAA's Coastal Ocean Program. From over a dozen universities and research institutions, the investigators came with their current research about this alga, *Aureococcus anophagefferens*, which has bloomed not only in New York, but also in New Jersey and Rhode Island. "Teamwork among the scientists, monitoring groups, and agencies will make a critical difference in the speed and effectiveness of our efforts to find answers," says Cornelia Schlenk, Assistant Director of New York Sea Grant and Chair of the BTRI Steering Committee. "New York Sea Grant's coordinated BTRI Program is an excellent example of how useful this collaboration can be."

The "take-home message" according to Gregory Boyer, associate professor of the SUNY College of Environmental Science and Forestry in Syracuse, is that the tiny alga — only one ten-thousandth of an inch — is "very ordinary" in how it goes about using nutrients such as iron. A number of researchers have theorized that iron, found in measurable quantities in our bays, might be linked to algal blooms.

Describing work done with Sergio Sanudo-Wilhelmy, assistant professor at SUNY Stony Brook, Sea Grant Scholar Christopher Gobler explained how different conditions triggered blooms in West Neck Bay, Shelter Island. "There's no magic bullet, no one factor that triggers blooms," observed Gobler. In that unspoiled, unpolluted bay, high organic nitrogen levels preceded the 1995 bloom. But in 1997, high iron content in the water came right before a bloom. These researchers conclude that organic nutrients may not be required to initiate a bloom, but may be important to sustain it.

Darcy Lonsdale, associate professor of SUNY Stony Brook and David Caron, senior scientist at Woods Hole Oceanographic Institution in Massachusetts

# Coast Watch

recounted their experiments in Coecles Harbor, Shelter Island, when they used 300-gallon plastic tanks (the mesocosms pictured) to simulate conditions of shallow bays. When sediment and sediment-containing seed clams were added to the tanks, it triggered a population explosion resembling an algal bloom. These investigators are examining factors that lead to the initiation of brown tide, with a focus on the complex feeding relationships among microscopic animal grazers and the phytoplankton that they consume.

Other researchers have examined the effect of the brown tide organism on shellfish. V. Monica Bricelj of the Canadian National Research Council, has investigated mussels, clams and oysters, finding that even when there is a mix of nutritious alga and brown tide in the water, these bivalves are still unable to feed normally. Stephen T. Tettibach, associate professor of biology and marine science at Long Island University's Southampton College has found that while bay scallops can reproduce under brown tide conditions, their subsequent growth and recruitment are



Mausmi Mehta, a student from MIT, measures salinity from a water sample in West Neck Bay, Shelter Island for the Caron/Lonsdale project.

hindered. The brown tide of 1985 led to a virtual eradication of the \$2 million annual bay scallop industry. These research efforts help to gauge what the critical levels of brown tide are for these economically-important shellfish.

So why does the brown tide alga bloom to the tune of a million strong in a tiny milliliter of bay water? At the end of a lively synthesis panel discussion, Theodore Smayda of the Graduate School of Oceanography at the University of

Rhode Island summarized that in his opinion there seem to be several bloom mechanisms. Some are stimulated by nutrients mixed in the sediment and water, others stimulated by chemicals such as iron, and still others by the physical conditions such as flushing of the bay and wind conditions. These factors may differ in importance according to location. In Peconic Bays, it's likely that nutrients are the most important factor whereas in Narragansett Bay, Rhode Island, inability of the bay water to flush seems to rule.

Not only location, but the "timing of the bloom" is important according to Terry Cucci, researcher at the Bigelow Laboratory for Ocean Sciences in Maine. As spring progresses into summer, then fall, the dynamic world of the bay changes, changing the balance of biological, chemical and physical factors that potentially could cause a brown tide.

"To date, not all the pieces are there yet, but it's nice to see parallel tracks among these projects," said Dr. Patricia Glibert of Horn Point Environmental Laboratories in Maryland. "The strength of the Brown Tide Research Initiative is the multi-faceted approach." Glibert continued, "But trying to predict harmful algal blooms is like trying to predict a tornado."

A thorough report on the research presented at the Brown Tide Symposium, BTRI Report #2, has been written by Symposium moderator Patrick Dooley, NYSG brown tide outreach specialist. That publication and several brown tide journal reprints are available from NYSG. See page 15 for details.

— Barbara Branca



Christopher Gobler measures a variety of conditions on West Neck Bay, Shelter Island considered a 'hot spot' for brown tide, probably due to its low flushing rates.

## Glow With The Flow

With funding from New York Sea Grant, Edward Carpenter and Senjie Lin of the Marine Sciences Research Center (MSRC) at the State University of New York at Stony Brook are developing a method to estimate growth rates in the brown tide alga. To date, there has been no easy way of finding the alga's growth rate in the field. The investigators have found two cell-cycle proteins which can be used as markers to indicate periods when cells are growing rapidly. They are perfecting an immunofluorescence technique that will allow them to use the "green glow" of the stained proteins to indicate the conditions and locations of brown tide alga exhibiting the rapid growth known as a bloom. At present, only cell density can be determined by immunofluorescence methods which were developed by Robert Nuzzi of the Suffolk County Department of Health Services.

“...trying to predict harmful algal blooms is like trying to predict a tornado.”

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## Great Lakes Underwater!

On March 28, Great Lakes Program Director Dave White and the Oswego Maritime Foundation's Philip Church hosted *Great Lakes Underwater!* along Lake Ontario on a spectacularly sunny, warm Saturday. With over 100 people in attendance, many of them divers, White updated the progress of several ongoing shipwreck search and documentation projects presently occurring. Electronics expert Tim Shippee demonstrated the use of side scan sonar and diver/photographer Mike Williams gave a pictorial cruise of shipwrecks and dive sites in northeast Lake Ontario.

The keynote speaker, Arthur B. Cohn of Lake Champlain Maritime Museum, related the recent discovery of Benedict Arnold's last gunboat that was lost during the 1776 Battle of Valcour Island in Lake Champlain. Said Cohn of this remarkable discovery, "You have a huge part to play to guide and preserve it" and "together with society, value this historical resource." Should such submerged cultural resources be left below and divers instructed to dive at their own risk and to leave cultural sites undisturbed? Should the lakes be inventoried and perhaps certain wrecks brought to the surface so that divers and non-divers alike can enjoy and learn about them? At present certain wrecks are threatened with obscurity by zebra mussel colonization. A lively discussion about this issue followed the thought-provoking presentations.

## O'Neill Spreads the Word in Ireland

"Zebra Mussels in Ireland: An International Workshop," was held February 19-21 in Galway, Ireland. The workshop was attended by more than 120 government, academic, and private sector representatives. Included in the roster of distinguished international workshop faculty was Sea Grant coastal specialist, Chuck O'Neill who presented three papers and served as the wrap-up speaker, summarizing what had

Photo NY Sea Grant



The Gunboat *Philadelphia II* under sail. The underwater wreck of a similar vessel, the last gunboat of Benedict Arnold's Revolutionary War Fleet, has recently been discovered in Lake Champlain. A management plan for the vessel is underway in conjunction with the US Navy. Courtesy Lake Champlain Maritime Museum, Basin Harbor, VT.

transpired during the workshop. O'Neill gave "the attendees their charge to go out, learn everything they can about the zebra mussel in Ireland, and to identify and implement the appropriate actions to minimize its spread throughout the island and mitigate its impacts on the island's natural and infrastructural resources." He worked to convey the importance of establishing good baseline data on the ecology of the pre-zebra mussel waterways so that the Irish agencies can better determine the mussel's ecological impacts as the invasion progresses and the mussel's Irish range expands.

O'Neill heard many comments on the value of Sea Grant and extension education, both of which are lacking in Ireland. The Irish agencies, especially utilities and researchers, are now much more aware of the potential impacts of the mussel on the country's water resources and economy.

## Dave Greene Celebrates 20 Years

In May, Sea Grant community issues specialist H. David Greene celebrated twenty years with New York Sea Grant. Greene started out as a youth education specialist. He wrote the ice fishing section for the national 4-H curriculum, resulting in a book, *Let's Go Ice Fishing*. He later wrote books on aquatic plants and aquatic activities for youth. Greene continues to be active in this area and regularly attends 4-H agent faculty meetings on science and technology at Cornell.

Greene has devoted much of his time to Youth Coastal Education. As part of Rochester's Science Exploration Days, he used information and a video from the Akwesasne Mohawks to talk about sturgeon restoration activities on the St. Lawrence. Recently, two students from the Rochester area received the Sea Grant award for their outstanding Marine Science projects entered in the thirteenth annual Rochester Area

## Sound Gardening: Not Just Child's Play



Sea Grant support specialist Kimberly Zimmer demonstrates runoff to third graders from East Woods School in Oyster Bay.



At the Great Lakes Network Conference in Duluth, Minnesota, Dave Greene (right) discusses Native American initiatives with John Bailey, a small business specialist from Michigan.

Science Congress. Greene has been arranging to give a junior high and senior high award for over ten of those years. He also gives sessions on boating safety to youth groups that cover small craft safety, hypothermia, and emergency measures.

Currently, Greene is working with Peter Smallidge to develop a proposal for a grant they received to work with the Akwesasne. With input from the community, they are mapping out the research aspects of the grant which will include several demonstration plots studying various black ash (*Fraxinus nigra*) management techniques. Greene has also arranged for presentation on the biology and control of zebra mussels to staff of the water utilities and environmental departments of the Akwesasne reserve. The commitment and responsibilities have been many and varied. In Greene's words, "It's been a great ride and I am still learning."

The Sound Gardening program, offered jointly by Sea Grant and Cornell Cooperative Extension of Nassau County, has established demonstration gardens that use environmentally-sound fertilizing and watering techniques to grow attractive, yet low maintenance plants. On May 20, a demonstration garden in Oyster Bay was the location of a day's learning fun with elementary students. Students rotated around the garden to see different steps in the process. With program coordinator and marine educator Robert Kent, they examined dark, rich compost while extension educators Richard Weir and Donna Moramarco were on hand to teach about soils. Sea Grant support specialist Kimberly Zimmer used a hands-on approach to demonstrate runoff. With colored powder standing in for home garden fertilizer and a plastic model of their community, kids used spray bottles to simulate runoff of fertilizer from homes into the bay. The result? The kids took a clear message home about runoff.



## Tuna

is a tasty and nutritious choice for everything from a formal dinner party to an outdoor barbecue especially in summer and fall when locally caught fish are most abundant in New York. An excellent source of protein, several vitamins and minerals, tuna is also a good choice for those seeking to reduce fats. A 3-oz. cooked portion of Bigeye or Yellowfin tuna averages about 1.5 g of total fat, while the same portion of fattier species like Albacore and Bluefin generally averages from 6 - 7 g. Albacore and Bluefin are particularly rich sources of omega-3 fatty acids with 2.1 g and 1.6 g respectively per 3-oz. cooked serving. Research suggests that increasing the amount of omega-3's in our diet by eating seafood once or twice a week can play a significant role in reducing heart disease and the risk of sudden cardiac arrest.

Annual commercial landings of tuna species in New York from 1990 to 1995 averaged 1.3 million pounds with a dockside value of \$3.6 million. Bigeye tuna accounted for about a third to half of all the tuna landed in New York and about two-thirds the annual dockside value. Yellowfin landings were second highest followed by Albacore and Bluefin.

*Bringing  
Science to  
the Shore*

# Seafood

# Corner

## *Grilled Tuna with Mango Basil Relish*

### Ingredients

Four 8 ounce Tuna Steaks about 3/4" - 1" thick (any firm fleshed fish steaks such as swordfish or shark may be substituted)

Vegetable oil for basting

Salt and fresh ground black pepper

### Relish

Two mangos, peeled and pitted, diced to 1/4" cubes (pears may be substituted)

1/2 red bell pepper, cleaned and diced into 1/4" cubes

1/2 cup orange juice

2 limes (about 4 tablespoons of juice)

1/4 cup fresh basil, chopped

Salt and fresh ground pepper to taste

### Method

Prepare relish ingredients as described, mix well and set aside.

Rinse tuna steaks under cold water and pat dry. Salt and pepper to taste and brush both sides lightly with vegetable oil. Over a medium hot fire, grill tuna steaks 3-6 minutes per side, turning once, until just opaque throughout.

Remove tuna from grill and serve each portion accompanied by several tablespoons of the mango basil relish.

*Serves 4.*

*About 20 minutes of preparation time required.*

*Recipe provided by the National Fish and Seafood Promotion Council.*



### New York Sea Grant

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