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**Aquaculture Program Seeks to Preserve Native American Lifestyle**

![Aquaculturist Michael David grows trout in cages floating in the St. Lawrence River. Photo courtesy Joe Buttnre.](image)

By Joe Buttnner and Diana Puglisi

Along the Great Lakes and St. Lawrence River, fishing and eating fish are integral to many cultural and spiritual traditions of the Iroquois people. Today, however, many of these waters and the fish found in them are contaminated with environmental pollutants that make the fish unwise—if not unsafe—to consume. Native Americans face a dilemma: How can they maintain their heritage without risking their health, particularly the health of their children?

The concern is particularly acute at Akwesasne (pronounced “ak-wuh-sas-nee”), a Mohawk community that straddles the St. Lawrence River just east of Massena, NY.

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**New York Sea Grant Institute has a new address:**

115 Nassau Hall
SUNY at Stony Brook
Stony Brook NY 11794-5001

Our telephone number remains:

(516) 632-6905

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Aquaculture Program Seeks to Preserve Native American Lifestyle

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and border a National Priority Listed Superfund site and two State Superfund sites. In fish taken from several locations in the area, concentrations of five contaminants—polychlorinated biphenyls (PCBs), dioxin, DDE, dieldrin, and mercury—have been found to exceed both federal and New York State standards. Nevertheless, at least one prospect is positive.

Sea Grant funded researchers at the State University of New York (SUNY) College at Brockport, working with the New York State Science and Technology Foundation and Rochester Gas and Electric Corporation (RG&E), have demonstrated that aquaculture (fish farming) can be practiced by the Mohawk people at Akwesasne to produce contaminant-free fish—and help preserve the Mohawk cultural heritage.

The dramatic and positive changes that have taken place at Akwesasne began in 1989, when two independent but related events occurred. At that time, Drs. Joe Butner and Joseph Makaurewicz, along with research technician Theodore Lewis, all at the SUNY College at Brockport, began a Sea Grant funded research project investigating the uptake and retention of contaminants by fish grown in the Great Lakes under conditions that simulated a commercial aquaculture operation. Concurrently, the Mohawk Nation (Akwesasne, the American Indian Program at Cornell University, the New York State Department of Environmental Conservation and the DEC Aquaculture Service Committee (a nonprofit Quaker organization), and the SUNY College at Brockport entered into a cooperative arrangement to explore the potential of aquaculture at Akwesasne.

Production of Clean Fish in Lake Ontario

In the Sea Grant study, the Brockport researchers developed a multifaceted controlled study to determine whether fish that meet U.S. Food and Drug Administration (FDA) guidelines could be cultured in waters of the Great Lakes. Rainbow trout (Oncorhynchus mykiss) were provided by DEC and grown in raceways at RG&E's Russell Station Power Generating Facility near Rochester. Black bullhead (Amia calva) provided by SUNY College at Brockport were reared in floating cages and pens in Braddock Bay, a Lake Ontario embayment near Greece, NY. At the end of the culture season, fish were harvested and analyzed for PCBs, a persistent and prevalent contaminant in Lake Ontario. In addition, wild bullhead from Braddock Bay, wild bullhead from a nearby inland pond, and rainbow trout from Lake Ontario were collected and analyzed for PCBs.

Butner maintained on mirex-laced rations were found to contain elevated levels of the pesticide, as expected. Wild fish from Braddock Bay and Lake Ontario proper also contained PCBs at concentrations that were significantly higher than ex- ceed the FDA action level—the level of contamination concentration at which the fish should not be eaten. Bullhead maintained on natural food in the Braddock Bay pens contained PCBs at concentrations somewhat lower than those observed in fish that had spent their entire lives in Lake Ontario. Thirty-six rainbow trout and 20 black bullhead from DEC and contaminant-free rations were examined. Only three fish contained detectable levels of PCBs—and these levels were below the FDA action level. Clearly, mirex levels in cultured fish fed "clean" rations were more similar to those found in uncontaminated fish from inland ponds.

The data indicate that contaminant-free fish can be grown in waters of Lake Ontario by following standard aquaculture practices: starting with clean fingerlings, using a clean feed, and growing fish in systems (such as cages and raceways) that partially isolate them from the contaminant-laden food chain and contaminated sediments. Butner, Makaurewicz, and Lewis believe that other contaminants, such as dieldrin and PCAs, may act in a fashion similar to PCBs. With continued support from New York State Grant, they are currently studying accumulation of these other common organic contaminants in aquacultured fish.

Aquantuclture at Akwesasne

Exploring the potential of aquaculture at Akwesasne involved much more than identifying views and perspectives of aquaculturists and administrative leaders, and assessing available resources. Members of the Mohawk community visited Brockport and toured aquaculture facilities on campus, including experimental ponds, a field laboratory, two wet laboratories, and a wa- ter chemistry lab.

The formal activities started with a one-week "how-to" course on aquaculture offered at Akwesasne in January 1990. Nearly 20 members of the community learned about aquaculture in general and about water chemistry, fabricated cages, and ultimately coalesced into a team. By June, 10 cages were floated in the St. Lawrence River, over 400 members of the community had worked on fish culture in a contaminated area—known locally as an "containment cave."—during fall 1990 accumulatable detectable levels of PCBs in just 10 days. More study is needed to determine the critical sites for selection, the impacts larger-scale aquaculture would have on the environment, and how these impacts could be mitigated.

What has been accomplished at Akwesasne may be applied elsewhere. Native American communities (and others) throughout the entire Great Lakes basin could benefit from these efforts and experiences. In fact, the Mohawk community at Akwesasne, Canada is currently exploring the potential of fish culture in the Bay of Quinte. Cages were fabricated, installed, and the first fish (Leptonius sp.) and yellow perch for the first time last spring, and the first harvest is anticipated this fall.

Aquacultural ventures undertaken by Native American communities throughout the region can provide a way to grow clean, healthy fish that can help to maintain cultural traditions. The initiation of such new practices by Tyendinaga is particularly fitting. Tyendinaga has special significance to the Iroquois people as the birthplace of Degoumasidd, found of the Five Nation Iroquois Confederacy.

Dr. Joseph K. Butner is a research scientist and outreach specialist in the Center for Applied Aquatic Science and Aquaculture and the Department of Biological Sciences, SUNY College at Brockport.

Implications for the Great Lakes

As information has been gathered, new questions have materialized that require attention. While it has been demonstrated that fish that meet FDA guidelines can be grown in waters of the Great Lakes, it has also been determined that not all sites are equally appropriate. For instance, rainbow trout stocked in cages floating in a heavily contaminated area—known locally as a "containment cave."—during fall 1990 accumulatable detectable levels of PCBs in just 10 days. More study is needed to determine critical sites for selection, the impacts larger-scale aquaculture would have on the environment, and how these impacts could be mitigated.

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Aquaculture has provided the Mohawks at Akwesasne the means to maintain an important part of their culture. . .
Award Program Started to Promote Personal Environmental Stewardship

It is not unusual to see pictures of crowded landfills, industrial smokestacks belching smoke, and litter strewn about. However, we can take the proactive step of looking at the cumulative impact that individual actions have on the environment. This is what the Water Quality Stewardship Program is all about. By taking small but effective actions in our daily lives, we can all make a difference in protecting the environment.

The Water Quality Stewardship Program seeks to involve every concerned individual throughout the country in improving the quality of our coastal environment.

"We are trying to help people realize that the connections between their daily activities and water quality," explains Kent, who acknowledges that this is an important part of the Sea Grant Extension Program's public education mandate. "People often do not realize that their individual impacts on the environment, when taken together with millions of others', can be significant and far-reaching effects.

Not just in the rain forest or thousands of miles away, but right within our own communities.

The Water Quality Stewardship Program invites people to send in an application form that contains a 5-page check list of items covering eight different categories, including: environmentally sound gardening, storm-water conservation, community stewardship projects, and safe disposal of toxic materials around the home. Under each of these headings are numerous check list items, such as: "began composting," "left clippings on lawn to recycle nutrition," "used only full loads in washing machine and dishwasher," and "participated in a water quality monitoring program." The program's goal is for participants to be able to check off 10 environmentally sound practices that they have adopted.

Every individual who reaches in succeeding on this goal will earn a water quality stewardship certificate certifying that he or she has made a positive impact on the environment. This can be displayed in his or her home, apartment, car, or boat.

"Environmental stewardship is the key," says Kent. "Citizens can't rely entirely on the government to solve all these problems. And it's not just a question of correcting problems with big businesses. All of us must start to be more sensitive to activities that have impacts on the environment. We all need to be a little bit more environmentally responsible. That's what we are trying to encourage with this kind of program."

People who would like to participate in this program and live in or near the Hudson River counties south of Albany, New York City, or Long Island, should contact Robert Kent, New York Sea Grant, Extension 39, Sound Avenue, Riverhead NY 11091, 9161-720-3190. Those in or near the Great Lakes region should contact Karen Little, New York Sea Grant Extension, 21 South Grove Street, East Aurora NY 14052-2391, 716-652-4553. There should be a workshop for Long Island teachers interested in environmental stewardship of coastal habitats and resources, sponsored by New York Sea Grant and the Marine Sciences Research Center (MSCR) at the State University of New York at Stony Brook, will be held at the MSCR from 8:30 until 4:30 on Saturday, December 3. Registration is $12 through November 27. For further information, contact Robert Kent (see above).

As part of a nationwide initiative promoting zebra mussel research, New York Sea Grant will fund two projects totaling nearly $300,000 in the next two years. One research project is directed and potentially promising method of controlling the mussels, and another will explore questions of how basic zebra mussel biology can affect the availability of nutrients in a freshwater ecosystem.

In Application of Wide-Range Ultraviolet Radiation for Zebra Mussel Control, Drs. Linda Clark-Slater and James D. Scott of the department of biology at the State University of New York (SUNY) College at Buffalo will work jointly with James Titz of General Dynamics Electric Boat Division of Connecticut to use the use of ultraviolet (UV) irradiation as an environmentally safe method of controlling the settlement of zebra mussels in and on industrial and utility water intake pipes. The technology, with modifications, has the potential to repel or kill other biofouling organisms in a variety of aquatic settings.

In previous New York Sea Grant funded project, Clark-Slater showed that relatively low doses of ultraviolet-B (UV-B) radiation will quickly kill off zebra mussel veligers (larvae) that would otherwise infest industrial and utility plants, eventually clogging internal operating systems. UV-B radiation is the type of solar radiation that actually burns the skin and poses a long-term cancer risk in humans. "Although out current work has shown that acute doses of UV-B have been ineffective for controlling adult zebra mussels, it is likely that chronic doses would eventually kill them," says Clark-Slater. Because of the adult mussels' inorganic shells, they are essentially immune to UV radiation. However, Clark-Slater notes, "in order to feed, the mussels must open their shells, thus exposing their soft internal tissues to the effects of UV." She believes that chronic exposure could kill adult zebra mussels, by forcing them either to accumulate lethal doses of UV during feeding, or to starve if they keep their shells shut to avoid the UV. "In open water, the mussels could escape the deadly effects of the UV light, but when lodged in pipes they would have a difficult time trying to do so."

TOP: Biofouling on the "control" test fixture after 3 months of exposure. BOTTOM: "Active" test fixture after 3 months of exposure. Photos courtesy General Dynamics Electric Boat Division.

Sea Grant's Zebra Mussel Information Clearinghouse, located at the Brockport extension office, will expand its operations in the next two years, according to Charles O'Neill, extension specialist. O'Neill reports that a federal grant from the National Sea Grant College Program (NSGCP) has been received for $311,000, and that an additional grant of $66,000 has been obtained from the Empire State Energy Research Corporation (ESEERO). As a direct result of these grants, the Clearinghouse will now be able to provide technical information and educational materials to users, including schools and public agencies.

The federal funds from NSGCP and ESEERO will allow the continuation and improvement of the Clearinghouse's library and expansion of the newsletter Detroita polynema Information Review. The newsletter will:

- provide interested parties in the United States and Canada with a central clearinghouse for information on the biology of the zebra mussel, monitoring, and control techniques;
- provide academic and North American clearinghouses for current research; and
- provide other zebra mussel information to people throughout North America with access to current research and technology.

The Clearinghouse was originally established in September 1990 as the New York Zebra Mussel Information Clearinghouse with funds from ESEERO, the Monroe County (NY) Water Authority, Eastman Kodak, the Electric Power Research Institute (EPRI), the Great Lakes Sea Grant Network, and New York Sea Grant. During its first two years of operation, the Clearinghouse has disseminated information in the Great Lakes region. Future plans include the development of a national clearinghouse which will establish a network of regional clearinghouses, each of which will disseminate information to a local audience.

The Clearinghouse is located at 251 Campus Drive, Brockport, New York 14420. Contact Charles O'Neill at The Zebra Mussel Information Clearinghouse, 251 Campus Drive, Brockport, New York 14420-2928, (716) 955-5161.

Zebra Mussel Information Clearinghouse Awarded $197,000 for 1993-1994

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New Project Assistant Named

Trent R. Schneider has been hired as the New York Sea Grant Institute’s new project assistant. For the past 18 months, Schneider worked as a program assistant for New York State Marine Extension, serving as liaison between the public and the Long Island Sound Study.

In his new position as part of the Institute’s administrative staff, Schneider will be involved with obtaining, summarizing, and analyzing information on completed research projects and scholarships, helping in the effort to make the results of the research projects Sea Grant funds accessible to user groups. Cornelia Schlenk, Sea Grant’s assistant director, notes, “While Trent’s skills and effectiveness as a member of our Extension staff will be missed, his experience will be utilized in his new role with the Institute, strengthening the tracking of our research activities.”

Schneider holds a bachelor’s degree in Environmental Studies from Rollins College, Winter Park, FL.

Sea Grant Pubs

New Publications from NY Sea Grant

Clean Water Shopping Guide, New York Sea Grant Extension. Pocket card listing consumer alternatives to commercially produced general cleaning, dishwashing, laundry, drain cleaning, and floor polishing products.


Fact Sheets, Directories, and Guides

Journals

Do You Want to Stay on Our Mailing List?

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You can contact us at:
New York Sea Grant
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SUNY at Stony Brook
Stony Brook NY 11794-5001
Or call (516) 632-6905 for further information.

Sea Grant Pubs

NEW PROJECT ASSISTANT NAMED
Trent R. Schneider

WATER QUALITY RADIO ANNOUNCEMENTS HIT THE AIRWAYS

If you can hear this, you live in what is known as a watershed area. What this means is that your everyday products and practices can contribute to the pollution of those waterways close to your heart and home. To fight water pollution follow this simple tip from Sea Grant: use salt to scour and disintest sinks and tubs. Save our waterways by reducing your use of toxic household cleaning solutions. For further information contact the Sea Grant office nearest you. Be part of the solution in stopping water pollution.

—example of a Sea Grant radio PSA

There’s a good chance radio listeners in the New York metropolitan area this summer have been tuned in to Sea Grant’s 30-second public service announcements (PSAs) explaining watersheds, activities that may negatively impact water quality, and personal actions that will help protect water quality. The radio spots were sent to stations from Westchester to Suffolk counties, as well as stations in Connecticut and New Jersey. They will continue to be broadcast throughout the fall.

In addition, a series of 30-second PSAs explaining to homeowners how they can care for their lawn and gardens naturally, while reducing risk of contaminating local waters with pesticides and chemical fertilizers, has also been distributed for broadcast.

The first series of 30 PSAs was produced by the New York Sea Grant Extension Program in cooperation with the New Jersey and Connecticut Sea Grant Programs, New York and Connecticut also helped produce these second series of 10 PSAs, along with University of Connecticut Cooperative Extension and Connecticut Cooperative Extension of Westchester, Nassau, and Suffolk counties.

Both series were coordinated by Me- lissa Berstein, New York Sea Grant’s marine environmental quality extension specialist. Selected radio stations from the tri-state region were sent pre-recorded tapes or written PSAs. According to Berstein, each of the participating stations will air at least one week of PSA.

These spots were also adapted and distributed by the Washington (state), North Carolina, Virginia, and Rhode Island Sea Grant programs to radio stations in their areas.

The 30-part watershed series was produced by Gayle Mariner, and the 10-part gardening series was produced by June Markley-Collins. Both are media producers from Long Island who donated much of the time they spent on the project.
Zebra Mussel Research

Continued from Page 5

The new project will include expanding the testing of UV parameters to a freshwater field situation, using equipment originally designed to evaluate the effect of chronic UV radiation on marine life.

The effectiveness of the UV device has already been studied by General Dynamics Electric Boat Division, working in collaboration with Worcester Polytechnic Institute, Miami Marine Research and Testing Station, and Duke University. In this work, a prototype containing two xenon arc lamps (150 and 450 watts) was placed into a clear quartz tube allowing the passage of UV waves. The entire apparatus was purged with nitrogen gas to overcome hydrostatic pressure when submerged, and to ensure dry operation in case small leaks developed. A virtually identical "control" unit—lacking only the UV source—was also constructed. Both were submerged for several months. The surface continually exposed to UV radiation remained free of all forms of biofouling, while the control unit was heavily encrusted with a variety of organisms.

Similar field testing on zebra mussels during the next 12 months will help establish just how practical this UV control system will be in a real-world application.

Phosphorus Budget to be Studied.

Phosphorus, a naturally occurring substance that is known to play a major role in the growth of microorganisms in freshwater ecosystems, will be one focus of a New York Sea Grant funded study by Dr. Joseph C. Makarewicz, department of biological sciences at the State University of New York (SUNY) College at Brockport. According to Makarewicz, changes in phosphorus availability to microorganisms such as phytoplankton will ripple up the aquatic food web. In his New York Sea Grant funded research project, Phosphorus Budget of a Zebra Mussel Population, Makarewicz will determine how much phosphorus accumulates in zebra mussel shells and tissues, as well as the rate at which phosphorus flows through a population of zebra mussels located in the Erie Canal. He will compare this information to estimates of the phosphorus discharge and concentration (phosphorus load) to a downstream site as a means of determining the importance and impact of the mussels within the Erie Canal.

If zebra mussels excrete phosphorus at rates similar to zooplankton, they may do so at rates that will provide greater phosphorus availability. Another possibility Makarewicz will investigate is whether zebra mussels "lock up" phosphorus in their shells or body tissue, making phosphorus less accessible to the rest of the ecosystem.

In the future, Makarewicz also hopes to develop a computer model of the phosphorus budget for a zebra mussel population. A conceptual understanding of the fate and transport of phosphorus in the zebra mussel population will be directly applicable to other aquatic ecosystems.

3rd International Zebra Mussel Conference Set for Toronto

A 4-day conference that will highlight current research into the biology and impact of the zebra mussel, along with the latest control options and systems, is set for February 23 to 26, 1993 at Westin Harbour Castle, Toronto, Canada. According to conference organizers, this will be the only major zebra mussel conference to be held in North America in 1993.

The conference is sponsored by the Great Lakes Sea Grant Network, the Electrical Power Research Institute (EPRI), the American Water Works Association (AWWA) Research Foundation, the Canadian Ministry of Natural Resources, the Canadian Ministry of the Environment, Ontario Hydro, and the Canadian Department of Fisheries and Oceans. It combines conferences previously held separately by the Great Lakes Sea Grant Network, EPRI, and various Canadian agencies.

For further conference information contact one of the program organizers, Chris Brousseau (416) 832–7113 or Renata Claudio (416) 506–6874.

New York Sea Grant

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