

Great Lakes Fisheries Abstract
PA Sea Grant Year 7 Proposal and 68-Month Progress Report
2004 - 2005

PA Sea Grant is a bi-coastal Program (Great Lakes and Delaware Estuary) - this abstract includes only the Great Lakes portion of PA Sea Grant's fisheries goals and activities.

PA Sea Grant has identified aquaculture as a new theme area in which it expects to place its first research emphasis.

Assumed leadership role for key coastal issues:

- ✓ Development of standardized criteria for the analysis of fish tumors and other deformities in Great Lakes AOCs and standardized tumor sampling and monitoring criteria for use in all AOCs.
- ✓ Joint leadership (with New York and Ohio Sea Grant) on avian botulism in Lake Erie.

Other initiatives:

- ✓ Development of an economic survey of the Lake Erie steelhead fishery.
- ✓ Lake Erie Great Lakes Fishery Leadership Institute.
- ✓ Development of a statewide PA Invasive Species Management Plan (with state agencies).

Description of Watersheds - Lake Erie Watershed

The western end of Presque Isle Bay is considered to be a productive and valuable spawning area for a number of species including largemouth bass, northern pike, yellow perch, gar, and a number of sunfish and minnows. Overall, 63 fish species inhabit the bay. Seven of these species are classified as species of special concern. Fishes associated with streams include smallmouth bass, white suckers, smelt, emerald shiners, rainbow trout, steelhead, and coho and chinook salmon.

Extension Areas

1. Environmental

Fish and Wildlife Advisories

Fish consumption advisories are in effect on Lake Erie for numerous species of fish. These advisories are issued by Pennsylvania's Department of Environmental Protection (DEP) in conjunction with the Pennsylvania Fish & Boat Commission (PFBC) and Pennsylvania Department of Health, and are based on fish tissue samples from Lake Erie. The advisories are based on polychlorinated biphenyl (PCB) levels found in these fish. More recently, mercury levels have been added to the advisory. Because the advisories include several species of fish, each with different consumption advisories based on the species and length of fish, it was apparent that the advisory was confusing to anglers. Pennsylvania Sea Grant's approach was to put these advisories into easy-to-read formats for English-speaking and non-English-

speaking anglers.

A second area for concern in the Lake Erie watershed is avian botulism. Since 1999, avian botulism, a disease caused by the bacterium *Clostridium botulinum*, has caused the die-off of thousands of gulls, loons, and other fish-eating birds on Lake Erie. Botulism type E has been identified as the strain that is affecting these birds and has also been linked to numerous fish kills occurring on Lake Erie. Pennsylvania Sea Grant, in partnership with New York and Ohio Sea Grant, has taken the lead in developing an Avian Botulism Task Force to address this problem, including driving research efforts and helping to procure funding for related research.

Objectives:

1. Develop new, user-friendly fish consumption advisories.
2. Develop and distribute easy-to-read English and foreign language versions of the current fish advisory.
3. Work on potential human health and wildlife advisories.
4. Develop workshops that address problems associated with avian botulism on Lake Erie.

Projects:

1. *Freddy the Fish* - fish consumption advisory and how to properly prepare fish in order to minimize intake of PCBs. Produced in Bosnian, Vietnamese, Spanish, Arabic, and Russian to target subsistence anglers.
2. Developed a curriculum on fish advisories, contaminants, and tumors affecting Great Lakes fish.
3. Fact sheets and posters to identify the problems associated with avian botulism: dangers associated with the handling of dead birds and fish, food safety procedures pertaining to handling, cooking, and smoking of fish.
4. Botulism workshops - publication of the workshop proceedings. Updates to avian botulism task force members through a listserv.
5. Meeting with Pennsylvania agencies re botulism outbreak to leverage state agency support and resources.
6. Study on avian botulism mortality rates in waterfowl and disease transmission pathways
7. Collaborating to have fish tested for botulism in an effort to discover the pathways of transmission for this epidemic. Also arranged for botulism testing in live fish.

2005 Plans:

1. Continue working with the International Institute, DEP, and Erie County Health Department on the delivery of fish consumption advisories to anglers and at-risk members of the public.
2. Continue to support research on the development of

- consumption advisories for snapping turtles in northwest Pennsylvania and the Lake Erie watershed.
3. Continue to provide leadership for the Avian Botulism Task Force. A fourth botulism workshop would be held in early spring 2004.
 4. Continue to maintain the avian botulism listserv.

Aquatic Invasive Species (AIS)

Background - Pennsylvania Sea Grant is addressing ecological and economic impacts of AIS in Lake Erie. The National Sea Grant Network has long been recognized as the leader in providing information to the public on invasive species and has gained special prominence related to zebra mussel invasion of the Great Lakes. Pennsylvania Sea Grant has been involved in distributing public information on several invasive species that are affecting Lake Erie and inland waters. The species of particular concern are the zebra and quagga mussels, round goby, and spiny and fishhook water fleas (*Bythotrephes cederstroemi* and *Cercopagis penjoi*).

The round goby, a benthic fish, is of specific concern. It feeds primarily on zebra mussels and the recent population explosion of the round goby in Pennsylvania waters has fisheries biologists worried about several effects they may have on the ecosystem:

- May increase the biomagnification of contaminants to higher levels of the food chain. This could result in an increase in fish consumption advisories on Lake Erie.
- Suspected of playing a role in the transmission of botulism through the food chain.
- Affect fishing success of anglers of other fish species by stealing bait intended for target species.
- Out-competing native species and driving them from preferred habitat.
- Affect the reproductive success of native fish populations through their role as egg predators.
- May be transferred to inland streams and lakes through sales of baitfish from Lake Erie wholesalers.

As a deterrent to the spread of invasive species, Pennsylvania Sea Grant is collaborating with the Great Lakes Sea Grant Network to provide outreach related to ANS HACCP (Aquatic Nuisance Species Hazard Analysis of Critical Control Points). HACCP is a program that was modified by the Great Lakes Sea Grant Network from a quality assurance process developed by the Pillsbury Corporation to ensure that they could make food safe for space travel. The specific purpose of ANS HACCP is to stop the spread of invasive species through the sale and distribution of bait fish. The Great Lakes Sea Grant Network is teaching the mechanics of this process to bait dealers in order to exclude the transfer of unwanted species through wild harvest and bait

fish production. This process is also being used by conservation agencies to avoid AIS transfer through fish management trap and transfer programs.

Objectives:

1. Work with Pennsylvania agencies on the development of a statewide invasive species management plan.
2. Continue to facilitate ANS HACCP workshops at regional and state venues.

Progress to Date:

1. Development and implementation of new regulations banning possession of injurious invasive species.
2. Increase awareness of exotic species transfer laws. Stop the transfer of the round goby. PFBC designated space in their rules and regulation booklet pertaining to the legalities of baitfish and exotic species transfer laws.
3. Funded other applied research projects related to AIS problems:
 - a. Ecosystem impact of the round goby on Lake Erie tributary streams.
 - b. Round goby diet study in Lake Erie concerning the biomagnification of polycyclic aromatic hydrocarbons (PAHs) in round goby via zebra mussel consumption.
4. ANS HACCP baitfish training.
 - a. to FWS staff
 - b. to aquaculture producers
5. Developed an AIS outreach initiative geared toward anglers and boaters. Great Lakes Sea Grant Network Watch ID cards were distributed to various bait shops, marinas, and conservation agencies.

Plans:

1. ANS HACCP training workshops for federal and state agency staff; private bait fish dealers; fish production managers; and fish management personnel, consultants, and researchers.
2. Coordinate a Pennsylvania Agency effort in the development of an Invasive Species Management Plan for Pennsylvania.
3. Development of outreach materials related to the transfer of AIS.

Presque Isle Bay Area of Concern

Background: In January 1991, the International Joint Commission (IJC) declared Presque Isle Bay the forty-third Area of Concern (AOC). The use impairments listed for Presque Isle Bay in determining its status were fish tumors and deformities, and contaminated sediments.

Pennsylvania Sea Grant has played an active role as a member of the Presque Isle Bay Advisory Committee (PAC) in development of Remedial Action Plans (RAP) and has participated in studies to address Presque Isle Bay's status as an AOC.

Objectives

1. Assist the PAC in the monitoring of fish tumors and possible development of additional genetic biomarkers.
2. Assist in the collection and analysis of fish tissue samples for dioxin and other contaminants.
3. Assist in refining beneficial-use listing criteria in relation to fish tumors and deformities.
4. Support monitoring and histological studies pertaining to the Presque Isle Bay fish tumor studies.
5. Continue to support brown bullhead hybridization research studies.

Progress to Date

1. Histological and monitoring study of brown bullheads.
2. Study reproductive success of brown bullheads.
3. Genetic research on the development of a biomarker for brown bullheads. The biomarker was used to determine what chemicals were causing tumor formation in brown bullhead.
4. Collection of fish for dioxin analyses.
5. Develop a monitoring plan for fish tumors and assisted in obtaining funding to support these efforts.
6. Gannon University's Governor's School for Excellence Environmental Health program (HS summer camp). Sea Grant staff teach boat electrofishing techniques as students participate in the capture of tumored fish. In the classroom, students are taught how toxic contaminants produce cancer in fish and learn fish necropsy techniques in order to conduct a histological examination.
7. Fish tumor conferences (2) and proceedings to facilitate the coordination of standardized fish tumor rates and severity ratings for all AOCs and to develop standardized listing and monitoring criteria for fish tumors and deformities in Great Lakes AOCs.

Year 7 Approach

1. Assist DEP in fish tumor monitoring efforts for the Presque Isle Bay "AOC in Recovery".
2. Develop concept paper on standardized criteria for assessing fish tumors in Great Lakes AOCs and present it to the IJC.
3. Support fisheries studies related to Presque Isle Bay Area of Recovery including support for research on hybridization of brown bullheads and other species susceptible to tumor promotion.

Fisheries and Native Species

Background: Pennsylvania Sea Grant is working on several issues of concern related to fisheries and native species populations in Presque Isle Bay and Lake Erie; enhancing aquaculture opportunities in

Pennsylvania; studying the genetics and life cycle of native unionid mussels related to fish hosts that are surviving in Presque Isle Bay; promoting efforts to enhance fish habitat within Presque Isle Bay; and supporting applied research projects related to assessing and restoring populations of endangered fish species, such as *Etheostoma exile* (Iowa darter) and *Noturus gyrinus* (tadpole madtom).

Objectives

1. Culture and ultimately restore the Iowa darter (state endangered species) and other species in Lake Erie.
2. Support aquaculture in Pennsylvania by providing technical assistance to aquaculture producers, supporting research, and developing marketing and production fact sheets and brochures.
3. Support Great Lakes Fishery Leadership Institute workshops.
4. Support Presque Isle Bay fish habitat improvement.

Progress to Date

1. genetics study on native mussel and fish relationships.
2. worked with a local fisheries group to enhance native fish habitat structures in Presque Isle Bay. A fact sheet was compiled that described the type and location of underwater structures.
3. collected Iowa darters from Presque Isle Bay and attempting to develop brood stock for the restoration and restocking of this species to its historic range.
4. Assessed the habitat needs and range of the tadpole madtom in Presque Isle Bay.
5. Assisted aquaculture producers through the development of marketing plans and brochures for “What works best in Pennsylvania.”
6. facilitated two state workshops for the Great Lakes Fishery Institute
7. Sponsor the 2002 Penn Aquaculture Conference.
8. Developed curriculum for the Great Lakes Fishery Leadership Institute related to fish consumption advisories, contaminants, and fish tumors and disease issues.
9. Co-hosted a regional Lake Erie Fishery Leadership Institute

Year 7 Approach

1. Support Pennsylvania aquaculture production, research, and outreach.
2. Collaborate to develop programs to support aquaculture
3. Iowa darter and other species restoration projects.
4. Enhance native fish habitat in Presque Isle Bay.

5. Development of curricula and workshops for the Great Lakes Fishery Leadership Institute

2. Coastal Communities

In an effort to promote Erie's economy, Pennsylvania Sea Grant continues to provide technical assistance for the following coastal economic projects:

Steelhead Survey

Pennsylvania Sea Grant is helping support and facilitate an economic study on the value of the Lake Erie steelhead fishery to the Erie County economy. Partners on the study include PFBC, Erie County Convention and Visitors Bureau, Penn State University Department of Economics, Erie Port Authority, and Pennsylvania Sea Grant.

PFBC staff is in the process of conducting this survey through April 30, 2004. Anglers at 23 high-use sites are being interviewed. Each site will be visited 90 times over the survey period. The results of this survey will be disseminated with the assistance of Sea Grant staff. Sea grant has developed a relationship with a faculty member in economics at Penn State who would conduct the data analysis. These survey efforts could be a first step toward a data collection effort for the entire Lake Erie fishery.

Charter Boat Survey

An on-going area of interest is the charter boat industry. A charter boat company usually is made up of just one person - a captain. The captain has a responsibility to the client(s) for giving them a safe, exciting, and successful fishing trip that requires not only a thorough knowledge of safe boat handling but also the expertise to find fish and instruct the client(s) on successful angling techniques. The captain also has a responsibility of running a successful small business that requires bookkeeping, preparing taxes, advertising, and developing a business strategy.

In fall 2002 and winter 2003 the Great Lakes Sea Grant Network conducted a comprehensive survey of the charter fishing industry in the Great Lakes. The survey was an effort to provide an update on the status, characteristics, and economics of the charter fishing business in the Great Lakes and is modeled after a similar survey conducted in 1994.

Results of the survey include the number of licensed Pennsylvania captains, the number of years licensed and the type and value of his/her vessel and related equipment costs, the number of full-day and half-day paid charter trips per year, and the clients' cost per trip. The survey results also identified industry trends and strategies to advance future business.

As a follow up to the survey, Pennsylvania Sea Grant has developed the following work objectives:

1. Establish a relationship with charter boat operations conducting business on the Lake Erie shoreline of Pennsylvania, while providing data that would be of benefit to all.
2. Enhance the continued development and use of the Erie Bayfront as a charter boat tourism resource and destination for local and out-of-town anglers.
3. Share survey information with other Great Lakes Sea Grant programs.
4. Continue to support and participate in a variety of projects related to charter boats as opportunities arise.

3. Other Coastal Issues

Progress to date

1. ANS Hazard Analysis of Critical Control Points (HACCP) regional training workshop to train bait and aquaculture facility operators to minimize risk of AIS transport.
2. Conducted pilot survey of recreational boaters in coastal areas for comparison with statewide mail survey.

Internships

John Cingolani is conducting a hybridization study on Presque Isle Bay bullheads. The purpose of this research is to determine if the bullheads residing in Presque Isle Bay are pure brown bullheads or hybridizing with black or yellow bullheads. Some fish hybrids have shown a greater susceptibility to tumor development. John has also developed a series of AIS fact sheets, assisted with the Great Lakes Fisheries Leadership Institute curriculum development, and participated in round group research led by Penn State University researchers.

Jeanette Schnars is pursuing her doctorate in ecology at Penn State. Pennsylvania Sea Grant is supporting her doctoral research on snapping turtle toxin levels.

Marina Outreach and Boater Safety

Background: Recreational boating in the Pennsylvania waters of Lake Erie as well as in Presque Isle Bay is a popular activity, drawing many local as well as out-of-town participants. Pennsylvania Sea Grant is focusing its efforts in three areas: marina outreach, boater safety, and boater education.

- The clean boating fact sheet includes information regarding fish waste disposal and AIS spread prevention.

Year 7 Approach

- Survey local marinas to determine their interest in having a Web site established for marinas. An expanded Web site would highlight public access opportunities as well as other information.

- Install display cases containing information concerning safe boating, clean boating, AIS spread prevention measures, avian botulism, and other Pennsylvania Sea Grant extension efforts at the Walnut Creek Access area and Presque Isle Bay Boat Livery.

Education

Pennsylvania Sea Grant Office of the Fleet Surgeon

Background: Pennsylvania Sea Grant has the unique opportunity to offer the services of its newly created position of Fleet Surgeon. John C. Lyons, MD, FACS, MSME, has been recently appointed to the position of Fleet Surgeon for Pennsylvania Sea Grant. Dr. Lyons brings a wealth of medical experience in waterfront and open water health and safety issues to the National Sea Grant Network. He is an author and lecturer on various emergency and health safety issues such as extraction methods for boat passengers with serious spinal injuries, scuba hazards on Lake Erie, cold water immersion and drowning, fish hook injuries, and impaired night vision on the water. Dr. Lyons also instructs Presque Isle State Park's large contingent of lifeguards on surf rescue techniques and recently presented medical advice at the Pennsylvania, Ohio, and New York Sea Grant avian botulism workshop for Lake Erie fish and wildlife.

Objectives

- Develop a list of health and safety related subject areas for which Dr. Lyons can provide professional medical advice and lectures.
- Act as medical counselor and speaker at various Sea Grant education and outreach initiatives.
- Provide health and safety seminars to rescue first responders with a need for medical expertise, such as lifeguards, Coast Guard officers, Sheriffs' dive teams, firefighters, search and rescue teams, marina operators, law enforcement officers, and charter boat captains.
- Develop "train-the-trainer" courses for power squadrons, yacht clubs, dive clubs, crew clubs, and angling organizations.
- Provide training on a limited basis to local angling, boating, and sailing organizations.

Progress to Date

- Solicitation conducted of local non-profit, community-based, and governmental organizations as to their interests for services rendered through the Office of the Fleet Surgeon
- Work has begun on promotional literature that would be disseminated to the general public to inform them of the capacity of the Office of the Fleet Surgeon.

Year 7 Approach

Continue to develop the Office of the Fleet Surgeon, including compilation of fact sheets relating to topics such as fish hook injuries, boating and the environment, and ice fishing. A new page would be added to the Pennsylvania Sea Grant Web site to increase awareness of the Office of the Fleet Surgeon. Lectures and conferences would be coordinated for the public and private sector on a local or possibly regional scale.

Communication

Fact sheets developed to date include:

- *Round Goby*
- *Ruffe*
- *Rusty Crayfish*
- *Asian Carp*
- *Rudd*
- *Fish Habitat Structures in Presque Isle Bay*
- *Botulism*

Year 7 Approach

A series of fact sheets related to boating emergencies have been developed in conjunction with Erie surgeon Dr. John C. Lyons as part of Pennsylvania Sea Grant's Fleet Surgeon program. It is our plan to make these available throughout the Sea Grant Network. Selected topics include:

- *Fish Hook Injuries*
- *Boating Night Vision*
- *Lightning on the Water*
- *Safety Aboard the Ship*

Public Awareness

Progress to Date - Pennsylvania Sea Grant has two displays: a four-panel display and a new multipanel floor display. Information, photographs, and graphics have been used to convey introductory information about Pennsylvania Sea Grant as well as details on fish advisories, aquatic invasive species, and other specialized topics.

Promotional Items

Progress to Date - A variety of promotional items have been used by Pennsylvania Sea Grant to create awareness in the Lake Erie and Delaware Estuary regions, while delivering valuable information to selected audiences. One approach has been the continued production and distribution of items that incorporate useable information and the Pennsylvania Sea Grant logo:

- Revised bumper sticker, now 23-inches, with fish consumption advisory information related to the Pennsylvania waters of Lake Erie and Presque Isle Bay
- 11-inch bumper sticker with information about the round goby, an aquatic invasive species inhabiting Lake Erie

Involvement in Community Initiatives

Current organizational involvement and representation by staff:

- Lake Erie-Allegheny Earth Force Community Advisory Board chair
- Pennsylvania's sport fishing representative on the Lake Erie Advisory Committee for the Great Lakes Fishery Commission
- Member of the fish research subcommittee of the Presque Isle Advisory Committee
- Great Lakes Aquatic Nuisance Species Panel - Pennsylvania alternate

Sea Grant Network Initiatives

International

- *Avian Botulism* - Maintain avian botulism listserv and updates. Networking..
- *Standardized Fish Tumors* - lead efforts to develop standardized criteria for conducting histological and fish impairment assessments in Areas of Concern (AOCs).

National

- *Aquatic Nuisance Species Hazard Analysis of Critical Control Points (ANS HACCP)* - Facilitated ANS workshops for the U.S. Fish & Wildlife Service North East Region, and presented material at the Penn Aquaculture Conference for the Northeast states.

Regional

- *A Collaborative Approach to Advance Implementation of State Management Plans for Prevention and Control of Aquatic Invasive Species in the Great Lakes Region (Great Lakes Commission)* - host workshops to develop state invasive species management plans.
- *Great Lakes Fishery Leadership Institute*
- *ANS Mass Media Audience locations* - helped develop AIS video for an outreach campaign on preventing the spread of AIS by angling groups.
- *Seafood Sense Workshop - Seafood Sense 2002 and 2003*, which covered seafood safety and preparation issues.

Statewide

- *Pennsylvania Invasive Species Management Plan* - helped facilitate the development of a statewide invasive species management plan. The plan is being developed with input from all the state agencies that have jurisdiction or an interest in the plan's objectives.

Research

It has been determined that the first thrust area will be aquaculture. NSGO and Pennsylvania Sea Grant would initially work with the University of Pennsylvania's School of Veterinary Medicine to identify and support areas of expertise that would be a resource to the entire Sea Grant Network. Areas of interest include nutritional and disease prevention aspects of aquaculture. The funds would be used to support a series of proposals previously submitted to NSGO. Among those projects under consideration would be:

- A fish integrated nutrient system for hybrid striped bass.
- Water quality control, aquatic toxicology, and waste management in recirculating aquaculture systems.
- Control and prevention of infectious salmon anemia.

Long-Range Plan

The long-range plan addresses the following five principles as identified by NSGO leadership.

1. Principle One - *A Pennsylvania program should capitalize on the considerable intellectual talent located throughout Pennsylvania's universities, public and private.*

develop a strategic affiliation with the University of Pennsylvania, especially in areas related to nutritional and disease aspects of aquaculture, and farm pond and closed-system aquaculture strategies. Penn's veterinary program's approach to aquaculture is expected to serve as a resource for the entire Sea Grant Network.
2. Principle Three - *The program should be statewide with research and outreach that focuses on Lake Erie, Delaware Estuary, and Chesapeake Bay (longer-term) watershed issues.*
 - An outreach program fully established and staffed in the Lake Erie region.
 - Larger research projects - to support an initial aquaculture thrust area.