
Name of Organization: Pennsylvania State University Erie

Type of Organization: College or University

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Project Title: Effects of round goby on Lake Erie littoral zone communities

Project Category: Exotic Species

Rank by Organization (if applicable): 0

Total Funding Requested (\$): 78,994 **Project Duration:** 2 Years

Abstract:

A monitoring program for round goby, yellow perch, and other forage fishes will be established in the littoral shore area of Lake Erie and Presque Isle Bay, adjacent to Erie, PA. Fish monitoring will include seasonal SCUBA transects with an underwater video camera, gill-nets, and beach seine at eight locations. Variables of interest are fish abundances and stomach contents. Analyses of round goby, yellow perch, and other species with high abundances will be used to test for evidence of negative effects of round goby. In addition benthic and plankton samples will be collected at the same time as fish for calculating food availability.

Geographic Areas Affected by the Project

States:

- | | | | |
|--------------------------|-----------|-------------------------------------|--------------|
| <input type="checkbox"/> | Illinois | <input type="checkbox"/> | New York |
| <input type="checkbox"/> | Indiana | <input checked="" type="checkbox"/> | Pennsylvania |
| <input type="checkbox"/> | Michigan | <input type="checkbox"/> | Wisconsin |
| <input type="checkbox"/> | Minnesota | <input type="checkbox"/> | Ohio |

Lakes:

- | | | | |
|--------------------------|----------|-------------------------------------|-----------|
| <input type="checkbox"/> | Superior | <input checked="" type="checkbox"/> | Erie |
| <input type="checkbox"/> | Huron | <input type="checkbox"/> | Ontario |
| <input type="checkbox"/> | Michigan | <input type="checkbox"/> | All Lakes |

Geographic Initiatives:

- | | | | | | | | | | |
|--------------------------|-----------------|--------------------------|---------|--------------------------|------------|--------------------------|-------------|--------------------------|----------------|
| <input type="checkbox"/> | Greater Chicago | <input type="checkbox"/> | NE Ohio | <input type="checkbox"/> | NW Indiana | <input type="checkbox"/> | SE Michigan | <input type="checkbox"/> | Lake St. Clair |
|--------------------------|-----------------|--------------------------|---------|--------------------------|------------|--------------------------|-------------|--------------------------|----------------|

Primary Affected Area of Concern: Presque Isle Bay, PA

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Perch undergo three ontogenetic niche shifts: larval perch are pelagic and feed predominantly on zooplankton, juveniles shift to a littoral habitat feeding on macroinvertebrates, and adults are piscivores. Perch spend several years at the juvenile feeding stage until they are large enough to become piscivorous. If goby densities are high, perch may be prevented from shifting to a benthic diet when zooplankton in the lake are seasonally low. Under intense competition for resources during the benthivorous feeding stage, round goby can create a bottleneck in perch growth and delay the shift to piscivory. As a consequence perch may be vulnerable to predation for a longer period of time and predator-induced mortality may result in poor recruitment.

Significance of the study

Yellow perch has been an important component of the commercial and sport fisheries in the Great Lakes, especially Lake Erie and Lake Michigan. Severe fluctuations in yellow perch abundance have been linked with the introduction of exotic species such as alewife and white perch. The evaluation of exotic species effects on yellow perch populations will provide useful information that can be incorporated into fish management strategies for the yellow perch fisheries in the Great Lakes. Estimates of the effects of harvesting yellow perch may need to be modified if round goby are known to be negatively impacting growth of a portion of the yellow perch population. Because of the ubiquitous distribution of round goby throughout the Great Lakes our results will be of wider interest if there is evidence for a negative impact on fisheries.

Lake Erie is currently undergoing major changes in fish abundances as a result of past introductions. The impact of the project is expected to be an understanding of the effects of round goby on the near shore yellow perch fishery in Lake Erie. Round goby could directly compete with juvenile yellow perch since both species can consume zebra mussels and benthic invertebrates, thus yellow perch growth may be negatively affected by round goby in mussel habitat. Yellow perch are most likely to consume the same prey types as round goby in shallow habitats where the highest prey availability might be in the benthos. Yellow perch will consume benthic prey in these habitats. However, due to changes in diet exhibited by juvenile and adult perch (ontogenetic diet shifts) the outcome of the round goby-yellow perch interaction may be complex.

Proposed Work Outcome:

I propose detailed monitoring of inshore fish communities which includes quantifying abundances and stomach analyses of all fishes to test for direct and indirect effects of round goby on yellow perch (four sampling times per year). An indirect negative effect may occur through other forage fishes if round goby negatively effect prey fish of adult yellow perch. Plankton and benthic samples will be used to determine prey availability, and prey electivity indexes will be used to compare prey use of the fish species with highest abundances..

I will establish a program to monitor round goby and native fishes in littoral areas of Presque Isle Bay and Lake Erie. The sampling approach is a combination of beach seine, gill nets, and underwater video camera transects in Presque Isle Bay. I will choose three stations along the Lake Erie shoreline and five stations in Presque Isle Bay for seasonal sampling. I do not expect gill nets and seines to be as effective along the shorelines of Lake Erie and I expect to rely more on underwater video camera transects in these areas. Comparison of seine and gill net catches with underwater video results from Presque Isle Bay will allow us to better evaluate underwater video results from Lake Erie shorelines.

The outcome of this monitoring will be current population estimates for round goby in habitats in which yellow perch young-of-year occur. I expect to find evidence for competition between round goby and yellow perch, and evidence of effects of round goby on other species.

Project Milestones:	Dates:
QAPP	08/2000
Seasonal Field Monitoring begins	09/2000
Stomach, benthic, and plankton analyses	10/2000
Data analysis	07/2002
Draft report	09/2002
Final report	12/2002
	12/2002
Project End	12/2002

Project Addresses Environmental Justice

If So, Description of How:

Project Addresses Education/Outreach

If So, Description of How:

The PI and the collaborator are members of the Presque Isle Bay AOC RAP. We will present the results of this study to that organization. In addition the study includes several undergraduate students as technicians. These students will be assigned increments of the study as independent research projects. Final results of the project will be presented at professional conferences and in peer-reviewed journals.

Project Budget:

	Federal Share Requested (\$)	Applicant's Share (\$)
Personnel:	26,716	23,238
Fringe:	5,588	3,576
Travel:	4,000	0
Equipment:	0	7,760
Supplies:	20,000	0
Contracts:	0	0
Construction:	0	0
Other:	0	0
Total Direct Costs:	56,304	34,574
Indirect Costs:	22,690	13,933
Total:	78,994	48,507
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

Description of Collaboration/Community Based Support:

Robert Wellington of the Erie County Health Department is a collaborator on this project. Mr. Wellington has been involved in the fisheries of Lake Erie and Presque Isle Bay for more than 20 years. He will contribute to the project by participating in sampling, providing advice, and interpretation of results.