Shine on, you tiny Emeralds

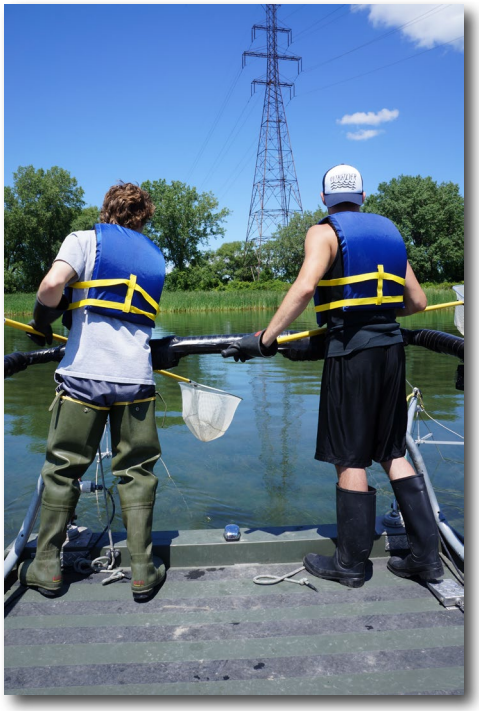
by John Lang, Jacob Cochran, and Christopher Osborne

In June we began field research for a project investigating the biology and ecological role of emerald shiners in the upper Niagara River. Since then, we have had the opportunity to experience this dynamic and ecologically important river on a weekly basis. Our team rotates biweekly between adult electroshocking and larval seining for emerald shiners, collecting as much data as we can before cold water temperatures shut down our sampling season.

Electroshocking weeks generally take three days in which we sample eleven sites located from Strawberry and Motor islands to the northern tip of Grand Island. We shock each site for a uniform time and collect as many emerald shiners as we can. The shiners are then taken back to the field station where they are weighed, measured, and preserved for future analysis. Along with shocking each site, we record water conditions. During these weeks, we also collect plankton, total phosphorous, and chlorophyll samples at three specific sites in the river.

Chris and Jake seining for larval fish at Strawberry Island.

Larval seining weeks are shorter and are conducted at six sites in the upper river. Two seine nets are utilized: one for juvenile fish and another that has a much smaller mesh, allowing for the collection of larval fish. With the field season coming to a close, we will turn our focus to analyzing what we have collected this summer and begin to prepare ourselves for next year's field season.



John and Chris netting fish on the electrofishing boat in the Uperr Niagara River.

For us, getting out on the river and sampling the fish community has been a humbling way to spend the summer. Our sampling methods, for the most part, are not species-specific, so we are able to observe the river's fish community as a whole. From this, we have a better understanding of the river's ecosystem and this has led to a greater appreciation for the role emerald shiners play within it. Being a part of this team sometimes entails long days on the river or in the lab, but being surrounded with individuals that truly care about the state of this species' population makes it more than worth it. As a team, we've grown to understand the importance of this fish to the upper Niagara River and the role it plays as a key species in the river's food web.

Some of the electrofishing collections took place at night.

Working out in the field has given us the opportunity to obtain a skill set that will benefit us in the professional world of scientific research. Spending a lot of time on a unique river like the Niagara has allowed us to experience how complex and diverse large riverine systems are. Unfortunately, such systems are often influenced by a number of anthropogenic stressors. The impacts that humans generate on these systems are portrayed throughout the upper Niagara River through habitat degradation, shoreline development, pollution, flow modification and much more. Our project aims to quantify how some of these factors influence the emerald shiner population, along with understanding many other aspects of this understudied species. We are excited for the future of this project and expect that our accomplishments will benefit the Niagara River and potentially other aquatic ecosystems. •

OTHER COLLECTION METHODS

Josh deploying the bongo nets, side-by-side plankton nets with different mesh sizes for collecting ichthyoplankton (larval fish).

Emerald shiners in a net.

Jake and John processing emerald shiners in the lab.

Hulgrid Gourgue, Stephen Fleck, and John Lang (not pictured) worked on ichthyoplankton collections with the bongo nets.

Meet the Shiner Crew

My name is Jacob Cochran and I'm in my first year in the Great Lakes Ecosystem Science (GLES) M.A. program. I'm from Ohio where I obtained my bachelor's degree in environmental science at Heidelberg University. As a kid I spent many of my days exploring local aquatic systems and have been interested in them ever since. As an avid angler and fish enthusiast, I am drawn to fisheries biology and management, in which I hope to obtain a career within the Great Lakes region. I am a part of the emerald shiner project on the upper Niagara River and will conduct my thesis work on larval fish ecology.

My name is John Lang; I'm in the Biology M.A. program. I hail from the Crystal City - Corning, NY. I received my B.A. in Biology from Buffalo State, where I took advantage of a number of research opportunities. It was through these projects that I have developed a very broad interest in biology. Primarily, I am interested in the link between the molecular and ecological worlds and how such an understanding can be applied to conservation efforts. My master's thesis will focus on relating the population genetic structure of the emerald shiners to their morphology from two locations: the Niagara River and Lake Erie. I expect this program to prepare me for research in study at the Ph.D. level in the future.

My name is Christopher Allen Osborne. I moved to Buffalo this past summer from Northwest Ohio where I obtained a B.S. in Environmental Biology from Heidelberg University. I am currently working on my M.A. in Biology at Buffalo State. I am a research assistant on a project studying the Emerald Shiners in the Niagara River. My thesis work is on the reproduction of emerald shiners, under the guidance of Dr. Randal J. Snyder. I aspire to obtain a Ph.D. after my work here and eventually become a professor of fish physiology.

Round gobies linked to altered stream metabolism

How stream ecosystems process and use nutrients is a central theme in stream ecology. GLC biologist Dr. Chris Pennuto and his graduate students have been investigating how fish community structure might play a role in nutrient dynamics in streams of the Niagara Frontier.

Dr. Pennuto's most recent students, Allyse Fischer and Steve Tentinger, have focused on streams with and without round gobies as model systems having different fish community structure to investigate leaf decomposition dynamics. Both students showed leaves break down more rapidly when round gobies are absent for streams, and that this results from round goby predation on key leaf-consuming invertebrates. Tentinger has shown that crayfish (*Orconectes propinquus*) foraging is not disrupted by round gobies and Fischer showed round gobies do not alter microbial community composition, but both documented reductions in amphipod and other invertebrate shredder biomass and abundance when round gobies are present.

This work shows how food web structure, in this case the presence or absence of an invasive benthic fish, ultimately has impacts on stream ecosystem processes through indirect effects. It also suggests that loss of key invertebrate taxa following species invasion has ecosystem-wide impacts. Future studies are planned to assess these impacts across a wider array of stream types and fish communities. •

Graduate student Stephen Tentinger checking traps investigating round goby effects on crayfish leaf litter consumption in Ellicott Creek.

At left, trap array with different fish and crayfish treatments in Ellicott Creek.