Great Lakes Center Newsletter

Fall 2019

RESEARCHING THE GREAT LAKES AND THEIR TRIBUTARIES SINCE 1966

Natalia Mrozińska and Martyna Bąkowska (center) receive certificates at the GLC Open House.

IN THIS ISSUE

Buffalo State
Great Lakes Center
Since 1966

GLC hosts scholars from Poland

by Lyubov Burlakova

Natalia Mrozińska and Martyna Bąkowska aboard the R/V *Lake Guardian* during the Lake Erie CSMI.

This summer, the GLC hosted Martyna Bąkowska and Natalia Mrozińska, two Ph.D. students from Kazimierz Wielki University in Bydgoszcz, Poland. Both students were supported by the Ministry of Science and Higher Education of Poland as part of the "Regional Initiative of Excellence" program. This 3-month internship expanded their knowledge and skills in aquatic ecology, invasion biology, and monitoring of aquatic ecosystems. During the internship, Martyna and Natalia learned about the environmental history of the Laurentian Great Lakes, ecology of the Great Lakes benthic community, invasive species spread and effects on lake ecosystems. They also took part in the Cooperative Science and Monitoring benthic survey of Lake Erie in July 2019 and helped to generate the distribution maps of *Dreissena* spp. that will allow researchers and managers to assess the distribution of this exotic mollusc in real time.

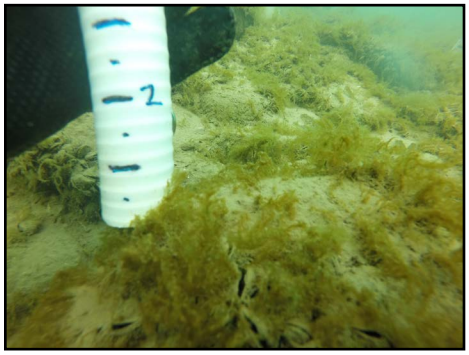
During the Fall GLC Open House, Martyna and Natalia received certificates acknowledging that they had completed training in methods of benthic community monitoring within the U.S. EPA Great Lakes National Program Office Great Lakes Biological Monitoring Program. The methods include benthic sample collection onboard the U.S. EPA R/V *Lake Guardian*, specimen sorting, processing, taxonomic identification, collecting and processing benthic video data, and quality assessment. In addition, both students participated in a project to reconstruct the biomass of Great Lakes benthic invertebrates in historic GLNPO samples. In September, their supervisor, Professor Krystian Obolewski, visited Buffalo State and signed an Agreement of Cooperation between SUNY Buffalo State and Kazimierz Wielki University. We are looking forward to continuing productive collaboration between our institutions. •

Lake Ontario *Cladophora* is alive and well

by Dr. Chris Pennuto

Georgia, Josh, and Kyle prepare to hit the lake in early summer 2019.

Summer 2019 was a season of diving and sample collection for students in Dr. Pennuto's lab. Jay Wagner and Josh Allen, grad students; and Kyle Glenn and Georgia Shaw, undergrad students, spent the summer assisting on a USGS-funded project to assess *Cladophora* biomass changes throughout the growing season in Lake Ontario near Olcott, NY. Every 10 days, the students joined Dr. Pennuto on the water collecting algal samples, as well as standard lake profile data, benthic and surface water samples, round goby videos, and benthic invertebrates. Back in the lab, they measured *Cladophora* and mussel biomass, algal chlorophyll a content, and C:N:P ratios. All benthic invertebrates were also identified. Concurrent with the in-lake work, colleagues at Michigan Technological Research Institute (MTRI) amassed Sentinel-3 satellite images for the same days the crew was on the lake. Sentinel-3 is the recently available European Space Agency satellite system offering very high resolution images. They will use the in-lake data coupled with the satellite images to refine a *Cladophora* growth model for the Great Lakes that will allow estimation of algal biomass and coverage from satellite data.



Close-up of *Cladophora* attached to mussels early in growing season.

The Lake Ontario nearshore zone is a very dramatic and variable part of the lake. Long-term temperature loggers at the dive site indicated at least 5 upwelling events occurred this past summer. These events typically resulted when wind direction shifted to become more northerly, resulting in water temperature drops to around 5-7° C in a matter of hours. These abrupt temperature changes can lead to amazing changes in the nearshore environment. For example, on July 8, water temperatures declined nearly 20° C in 6 hours. On that date, we did not observe any round goby at our collection sites even though they were hyperabundant both 10 days before and 10 days after that event. Where did they go? Were the fish seen 10 days after this event the same fish that were present 10 days prior to the event? How did the rapid temperature change affect the *Cladophora*? Did investment in chlorophyll decline over that period? Clearly more questions have arisen than can be answered at this time relative to these extreme temperature events.

Cladophora biomass was not excessive this past summer, with maximum estimates of around 90 g/m^2 recorded. A general 'rule-of-thumb' for nuisance levels is sometimes given as 50 g/m^2 within water quality entities. However, as early as mid-July the abundance of other green algae was obvious. *Spirogyra*, a non-attached filamentous green algae, was extremely abundant mid-summer and beyond, making estimates of *Cladophora* difficult. It is unclear at this time whether the dynamic temperature fluctuations played any role in the occurrence and vigor of the non-*Cladophora* algae this summer. Some of the nutrient data suggests that *Cladophora* and mussel aggregations collectively influence the microscale phosphorus concentrations in the nearshore, suggesting that any lakewide management options to control nuisance *Cladophora* growths will also need to address mussels and their nutrient excretion capabilities. •

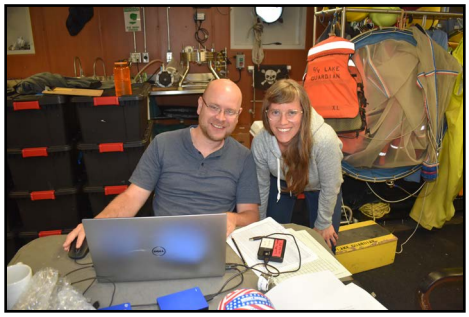
Great Lakes Summer Survey Report

by Susie Daniel

GLC researchers completed another successful summer survey aboard the R/V *Lake Guardian*. Every year, the 180-foot EPA vessel leaves Milwaukee, Wisconsin around August 1st and samples the Great Lakes during a month-long survey. Susan Daniel and Shivakumar Shivarudrappa sampled through four Great Lakes (Michigan, Huron, Erie, and Ontario) before stopping for a crew change in Rochester, NY. Several days later, Shiva and Sonya Bayba (graduate student) rejoined the 14 crew members and roughly 25 scientists in Sault Ste. Marie, Michigan and sampled Lake Superior for the next five days. All told, the ship traveled over 2800 nautical miles (~5200 km) before completing the survey on August 25th. Scientific crews from both Cornell University and SUNY Buffalo State rotated on a 12-hour shift, and their tasks while on duty included the collection of benthic macroinvertebrates, zooplankton, and chlorophyll in compliance with the U.S. EPA funded grant "Great Lakes Long-Term Biological Monitoring." This year, 189 samples from 63 stations were collected using a PONAR grab sampler. These samples, and previous data, will shed light on the current environmental status of the Great Lakes and provide a baseline for any future changes in water quality. •

CSMI Lake Erie Survey 2019

by Alexander Karatayev and Lyubov Burlakova



Knut Mehler (GLC) and Molly Wick (U.S. EPA Duluth) working on bottom image analysis.

Visiting scientist Natalia Mrozińska, Elizabeth Hinchey Malloy (U.S. EPA), and Lyuba Burlakova washing benthic samples.

This July, a team of GLC scientists in collaboration with EPA, USGS, and NOAA conducted a third Lake Erie lake-wide benthic survey as part of the Cooperative Science and Monitoring Initiative (CSMI) to assess the status of the macroinvertebrate community. Benthic samples were collected from 92 stations aboard the EPA's R/V *Lake Guardian*. In addition, benthic harpacticoids were sampled by Joe Connolly (Cornell University) to reveal species composition of this understudied group of invertebrates, and Leon Katona (Wright State University, Ohio) collected sediments for algal assemblage composition and benthic primary productivity.

U.S. EPA Administrator Andrew Wheeler and Region 5 Administrator Cathy Stepp with a group of scientists during 2019 CSMI Lake Erie benthic survey.

One of the most interesting additions to this benthic survey was probably the first attempt to produce a map of lake-wide *Dreissena* distribution in real time. At each of the benthic stations bottom images were recorded using a GoPro camera to estimate the presence and bottom coverage of dreissenid mussels. Bottom images were analyzed within 24 hours of collection and, by the end of the cruise, a map of *Dreissena* bottom coverage was produced. Preliminary analysis revealed a strong decline in *Dreissena* population in Lake Erie compared to the previous survey in 2014. This data will be verified after processing Ponar samples. If population assessments by both methods provide similar results, methods that we developed for *Dreissena* rapid assessment will be applied for all Great Lakes in the future as a valuable addition to conventional bottom grab monitoring.

During this cruise, on July 19th, U.S. EPA Administrator Andrew Wheeler and Region 5 Administrator Cathy Stepp visited the *Lake Guardian* in Cleveland to announce an upcoming new Great Lakes Restoration Initiative grant program specifically focused on funding trash-free water projects in the Great Lakes. •

More specimens sent off for genetic barcoding

by Susie Daniel

In the beginning of September, Susie Daniel sent another genetic barcoding plate to the Centre for Biodiversity Genomics at the University of Guelph in Ontario, Canada. This plate contained 95 individuals within the Annelida phylum, which includes Oligochaeta (freshwater worms) and Hirudinea (freshwater leeches). They will have their genetic material decoded and posted on the Centre's Barcode of Life Data (BOLD) System, where it will be made publicly available. This whole process can take several months from collection of typical specimens that represent the species, identification confirmation, photographs (over 113 in total), and harvesting tissue for genetic plating. Within this last batch of samples, the GLC sent 14 taxa of Oligochaeta and 12 species of Hirudinea. Specimens were collected from across the basin, including Ohio, Wisconsin, New York, Michigan, and Ontario, Canada. Some of the leeches sent were collected in a less than typical way – by pulling leeches attempting to feed from a collaborator's leg who was wading a swamp. Other species of leeches are free-living, and predate on unsuspecting aquatic insects, crustaceans, and snails.

Susie Daniel confirming species identification of Oligochaeta before taking pictures and preparing the Annelida plate.

In addition, there has been fruitful collaboration among teams in exchanging specimens for barcoding. Dr. Valerie Brady (Natural Resources Research Institute, University of Minnesota Duluth) shared with us 410 specimens of Mollusca and Annelida collected during Great Lakes coastal wetland sampling. In return, we shared over 1000 specimens and at least 13 species of Sphaeriidae (fingernail clams) collected from 28 sites over 2 years with Dr. Brady and graduate student Adam Frankiewicz (University of Minnesota), who are working on revising taxonomic keys. Cornell University employees and collaborators also shared with us specimens of Mollusca and Annelida, and we are planning to send them specimens of invasive crayfish. •

CSMI 2018 Lake Ontario Data Synthesis Workshop

by Knut Mehler, Adjunct Professor and Research Scientist

The GLC hosted a two-day workshop on June 19-20, 2019, bringing together 49 scientists from 15 agencies and academic institutions from the U.S. and Canada to report on the findings from the CSMI 2018 Lake Ontario survey. The Cooperative Science and Monitoring Initiative (CSMI) helps to address water quality and natural resource management questions by focusing binational monitoring resources on each of the Great Lakes in a five-year rotating cycle.

Participants of the 2018 CSMI Ontario Data Synthesis Workshop at SUNY Buffalo State.

Despite being the smallest of the five Great Lakes, Lake Ontario has a tremendous economic and ecological value for the region. More than 9 million people in Canada and the United States rely on Lake Ontario as a resource for drinking water, transportation, power generation, and recreation. Anthropogenic stressors, such as phosphorus and nitrogen loading, runoff from metropolitan and agricultural areas, and the introduction of invasive species make Lake Ontario the most environmentally stressed of the five Great Lakes. 2018 was the year of Lake Ontario and the CSMI focused on nearshore and offshore water quality and biological information to support whole-lake nutrient transport and algae growth models to better understand the apparent resurgence of nearshore nuisance algae problems. Further efforts assessed the open lake and benthic lower food webs, native prey fish, and coastal wetland status.

Workshop participants reporting and discussing their 2018 CSMI field year accomplishments.

The International Joint Commission granted $20,000 to the Great Lakes Center to organize and lead a data synthesis meeting. The objectives of this workshop were to report on accomplishments from the 2018 CSMI monitoring year, facilitate information and data sharing among the participating groups, develop collaborations for analysis and reporting around habitat and functional areas, and organize and preserve the data for future use. In preparation for the workshop, participants were asked to identify the most important topics for discussion during the workshop. The organizing team received 22 suggestions which were condensed into four major topics and discussed in breakout sessions during the first day of the meeting: water quality, contaminants, and modeling; open water food webs; benthic food webs; and wetlands and connecting channels.

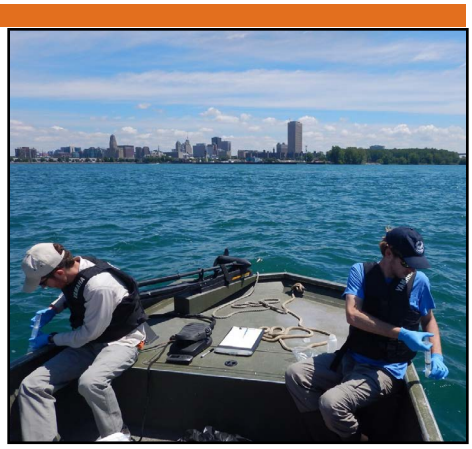
After the breakout session, the leader of each session reported on the preliminary findings in their fields, identified data needs, and provided suggestions on how priorities can be linked based on the accomplishments of the 2018 CSMI field year. Recurring topics that workshop participants felt needed to be to addressed included: nutrient loading impacts on water quality and the aquatic food web; rivers and connecting channels as phosphorus vectors; *Cladophora* monitoring and control; the relationship between zooplankton and deep chlorophyll; coregonines and benthic fish habitat and population dynamics; *Dreissena* population dynamics; *Dreissena*–round goby–*Cladophora* interactions; and the importance of wetlands for nutrient retention.

On the second day of the meeting, Jesse Lepak from NY Sea Grant and Helen Domske from the University at Buffalo discussed the importance of outreach and environmental education. With guidance from Lars Rudstam, participants also discussed potential papers involving the 2018 CSMI efforts. A detailed report about workshop activities is currently being prepared and will be posted on our website.

After two days of interesting presentations, vibrant discussions, and gathering ideas for future research on Lake Ontario, participants called the workshop a success. The Great Lakes Center is grateful to the International Joint Commission for their generous financial support and to our secretary, Susan Dickinson, without whom the workshop would not have been possible. •

2019 Field Notes: eDNA Sampling

by Ryan Elliott, 2019 Invasive Species Management Assistant



Dr. Simonin's team and Ryan Elliott, ISMA, take water quality samples to look for the eDNA of early detection invasive species in Lake Erie. Photo Credit: WNY PRISM

Surveying for aquatic invasive species is difficult, especially in large, open bodies of water like the Great Lakes. The tools used in traditional surveying including nets, traps, electrofishing and rake tosses can miss early infestations that may consist of only a few individuals. However, when surveying for invasive species, we want to find new infestations as early as possible and as such, WNY PRISM is always looking for innovative ways to assist our partners with invasive species surveying.

In July, we got that opportunity. WNY PRISM and staff from the Great Lakes Center helped Dr. Paul Simonin, a visiting researcher at Cornell University, collect and preserve water samples from the Buffalo Harbor. These water samples will be analyzed for the DNA of various invasive species that could pose a threat to Lake Erie. When water samples are collected and analyzed for DNA, researchers refer to it as collecting environmental DNA, or eDNA.

eDNA allows researchers to detect the presence of a species even if they never see the plant or animal they are searching for. When organisms exist in an area, their DNA can be found in, and extracted from, their environment, in this case the water. This method is highly sensitive and can be used to detect species before they reproduce to nuisance levels, which in turn reduces the amount of money and time spent on invasive species surveying and management.

As part of this study, Dr. Simonin and his team extract DNA from water samples taken from harbors in Lake Erie and Lake Ontario in search of early detection invasive species. They are also developing a novel method to analyze these water samples. This new method uses a single water sample to accurately detect the DNA of multiple species, which would greatly reduce the costs associated with eDNA surveys. In this study, they focus on nearly 20 aquatic early detection species including hydrilla, water lettuce, and silver carp.

The crew left on a GLC research boat from the Field Station in the mid-morning and had a beautiful day for collecting samples with sunny skies, a light breeze and calm waters. Water samples were first collected from the Buffalo River near the General Mills factory and later by the breakwall farther into Lake Erie. Though analyzing these water samples may be complex, the sample collection method was quite simple. Three water samples were collected in plastic bottles at each site. Water was passed through a filter and the filters were placed in a solution to prepare them for analysis in a lab.

All said and done, 15 water samples were collected, and the sampling trip took just over two hours. WNY PRISM sees eDNA sampling as a useful tool for efficiently gathering information about various aquatic invasive species in Lake Erie and other waterbodies in western New York. We will follow Dr. Simonin's research in the hopes of using their improved, cost-effective method in the future to enhance our knowledge about the presence of aquatic invasive species in western New York.

If you are interested in reading about the results of Dr. Simonin and his team's study, sign up for the WNY PRISM listserv. We will send out an email link with the findings of their study when it becomes available. •

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Boat Steward Progress Report

by Kit Hastings; data compiled by Kristin King

The first season of the Watercraft Inspection Steward Program hosted by WNY PRISM has come to a close. From Memorial Day until Labor Day, 20 stewards were stationed at 22 launches throughout Western New York weekly from Thursday through Sunday. The stewards perform voluntary watercraft inspections to remove visible aquatic plants and animals from all types of watercraft.

This season, there were 39,697 interactions and 17,065 inspections resulting in 1,843 invasive species removed. This included: 952 Eurasian watermilfoil, 749 curly leaf pondweed, 112 zebra mussels, 27 quagga mussels, and 1 each of European frogbit, spiny/fishhook waterflea, and water chestnut. The launch with the most inspections was Sturgeon Point, with over 3300 inspections during the boat season. •

Habitat plantings update

by Kit Hastings

It's been almost a year since three habitat gardens were installed at the Field Station, and our new plants are growing and producing flowers, berries, and seeds. There are 25 species of native plants in three beds: one by the shore under the osprey nesting platform that is full-sun, one by the fence that is full-sun but less exposed to wind, and one underneath some large box elders and cottonwoods that is full-shade.

The spring began with somewhat of a rough start. While we were assessing what plants had survived the first winter, we noticed that one of our existing cottonwood trees had been chewed on by a beaver. We put up countermeasures around the habitat plantings to protect our plants, but the beaver continued to return sporadically to chew on the cottonwood. We had the tree removed in July since we worried that it might fall on the boat dock. Thankfully all our other plants are safe! No one can recall beavers ever being an issue on Field Station grounds before.

Damage to a cottonwood tree from a beaver.

Monarch butterfly larva on butterfly weed.

One of the plants that I'm very surprised to see survive was the butterfly weed (*Asclepias tuberosa*). Last fall, all of these plants were eaten almost to the ground the first week they were put in. However, they had no problem bouncing back and producing plenty of cheerful orange flowers. As the summer went on, we observed many bright orange aphids, some lady bugs, and best of all many caterpillars! Butterfly weed is a type of milk weed and is the larval host for Monarch butterflies (*Danaus plexippus*), Queen butterflies (*Danaus gilippus*), and the Gray Hairstreak (*Strymon melinus*). It is recognized as important to native bees, bumble bees, and honey bees by the The Xerces Society for Invertebrate Conservation, and also attracts hummingbirds. Because this plant did so well this year, we'll be planting more for next season.

Students planting Black-eyed Susans.

Another aspect of this project is community engagement. We partnered with Riverside Academy and had students plant Black-eyed Susans (*Rudbeckia hirta*) this spring. These flowers are annuals and wouldn't have survived the winter if they had been planted when all the other plants were installed last fall. Black-eyed Susans are very easy to reseed from the dried flower heads, so now that they have had all summer to grow and produce flowers, the seeds that remain will be next year's flowers. The showy flowers attract bees, butterflies, and other pollinating insects, and are the larval host for Gorgone Checkerspot (*Chlosyne gorgone*) and Bordered Patch butterfly (*Chlosyne lacinia*). Lastly, the seeds are an excellent food source for migrating granivorous birds.

As we move into fall, some of our plants are producing fruits and berries. Soon, migrators will move through the region and hopefully find a little haven here. •

Sources: Lady Bird Johnson Wildflower Center

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