

Investigating Lake Sturgeon habitat use, feeding ecology and benthic resource availability in the lower Niagara River

Funded through the Ecological Greenway Fund

Progress Report for 2015

Knut Mehler – Great Lakes Center

Eric Bruestle – Great Lakes Center

Alexander Karatayev – Great Lakes Center

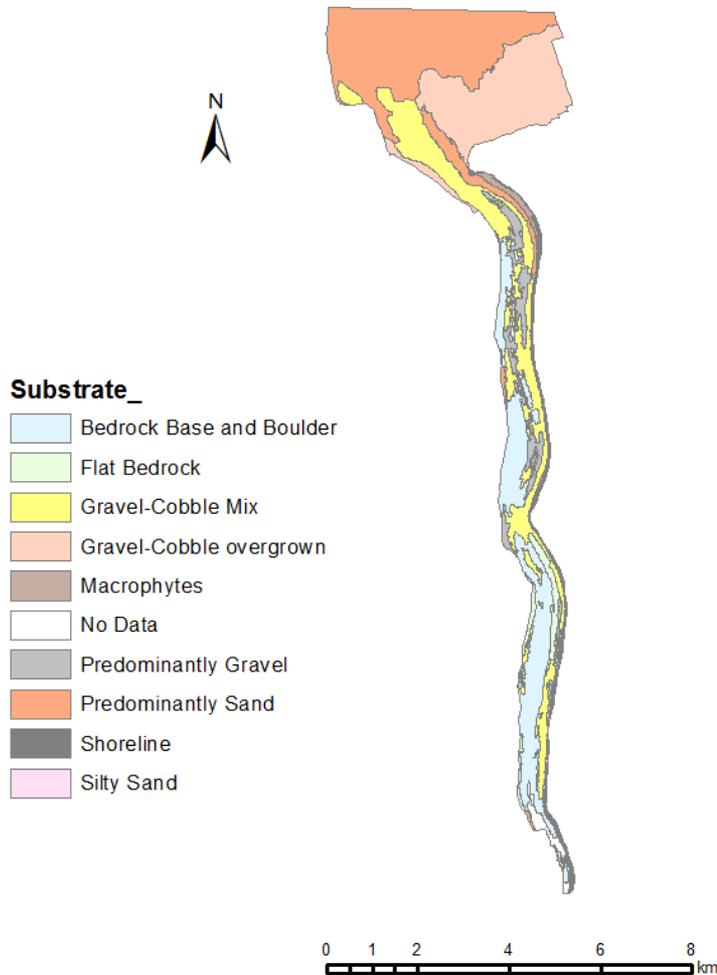
Lyuba Burlakova – Great Lakes Center

Dimitry Gorsky – U.S. Fish and Wildlife Service

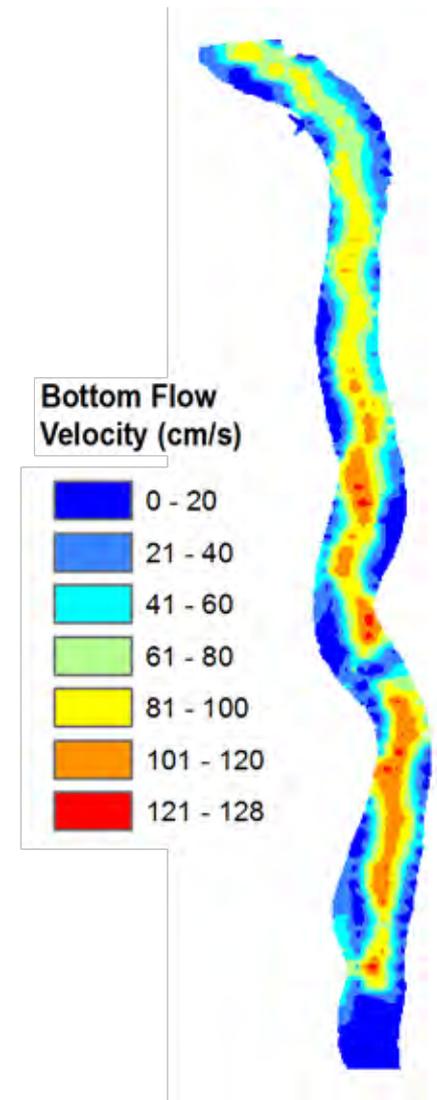
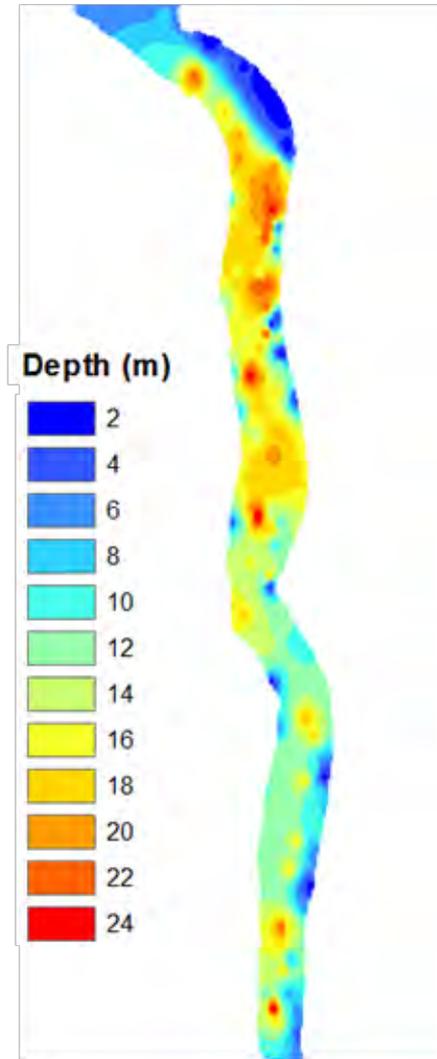
Objectives

1. *Use bathymetric and habitat data obtained from USFWS's side-scan sonar project on the lower Niagara River to **create benthic habitat maps**. Using the habitat maps, **assess diversity and community structure of benthic invertebrates** in the lower Niagara River.*
2. ***Document habitat use, movements, and diet of lake sturgeon** in the lower Niagara River.*

1. Use bathymetric and habitat data obtained from USFWS's side-scan sonar project on the lower Niagara River to **create benthic habitat maps**.



Benthic substrate map was revised based on underwater videos

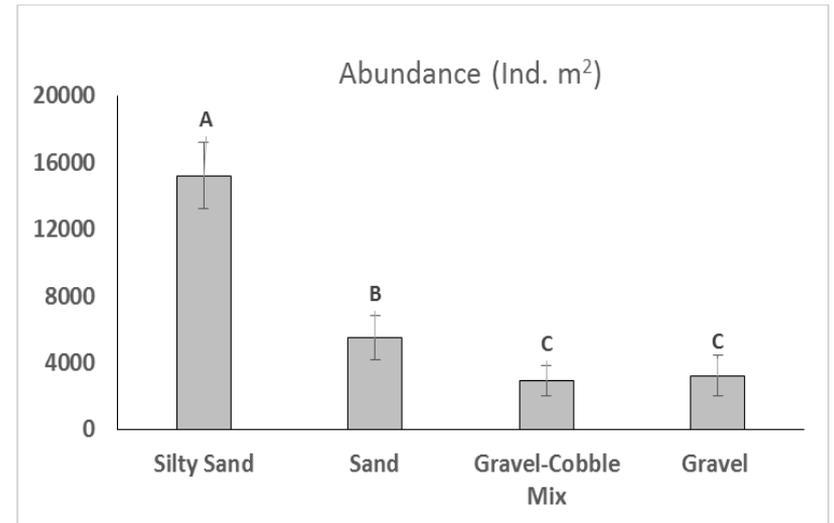
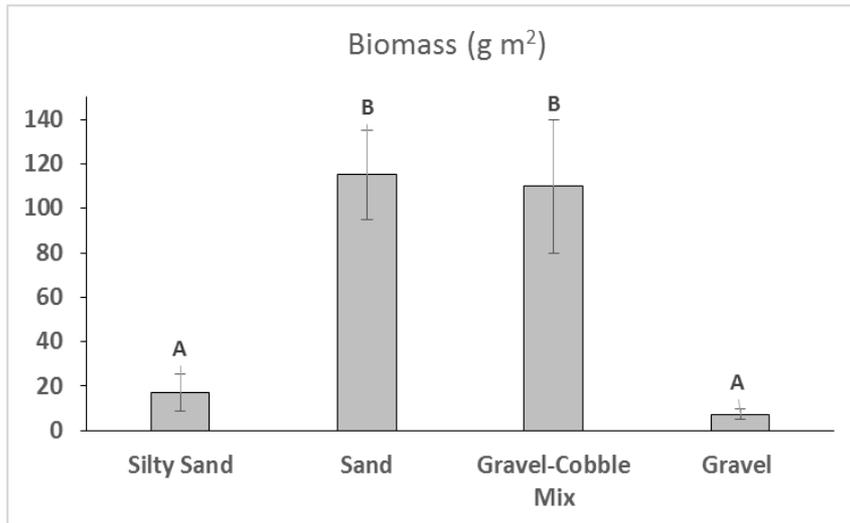


Bathymetric and Flow Velocity layers were generated as both are important abiotic variables affecting benthic communities and bottom-feeding fish

1. Using the habitat maps, **assess diversity and community structure of benthic invertebrates in the lower Niagara River.**

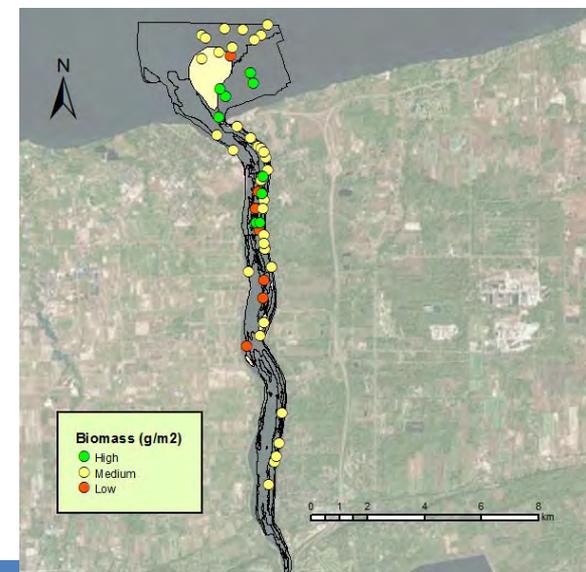
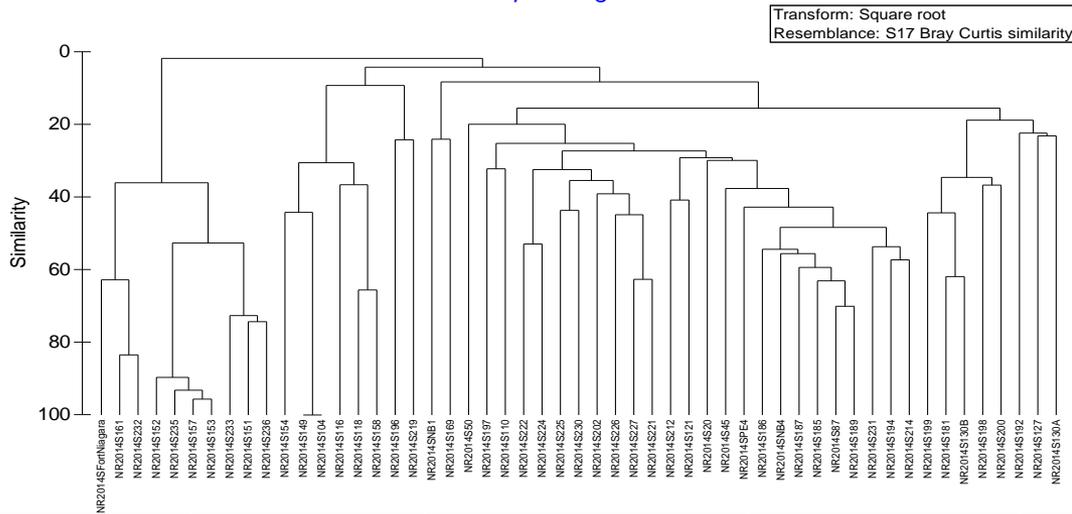
Benthic sampling has been done and the majority of species has been identified

Statistical analyses and habitat modelling to relate biological data to physical habitat



Niagara River benthic biomass 2014

Group average



	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Depth	Medium	Deep	Medium	Medium	Shallow	Shallow
Major Substrate	Gravel	Gravel	Gravel/Cobble-Gravel	Sand/Gravel	Sand	Gravel
Organic Matter	Low	Low	Low	Low	High	Medium
% sites with macrophytes	22	0	0	0	40	60
% site with invasive species	90	85	50	100	30	60
Total Species	6	3	9	15	16	21
Total Biomass (g/m ²)	342	0.47	0.26	10.6	5.4	3.9
Dominant Taxa (per biomass)	<i>Dreissena bugensis</i> <i>Pleurocera acuta</i> <i>Leptoxis carinata</i>	(<i>Bythotrephes longimanus</i>) <i>Echinogammarus ischnus</i>	<i>Tanytarsus</i> <i>Cryptochironomus</i>	<i>Bithynia tentaculata</i> <i>Carinata leptoxis</i>	<i>Chironomus</i> Immature <i>Tubificinae</i> <i>Limnodrilus hoffmeisteri</i>	<i>Phaenopsectra</i> <i>Chironomus</i> <i>Helicopsyche</i>

Clusters benthic community with similar biomass in a certain habitat

Maps locate areas of high, moderate or low biomass in the river

Benthic Habitat Maps

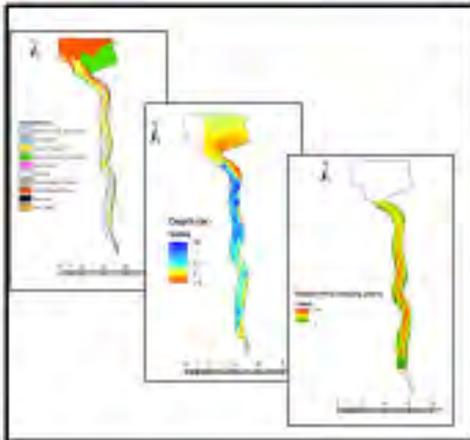
Link benthic communities with physical habitat information to provide information on spatial distribution, abundance and biomass

Information from statistical analyses important basis to map spatial distribution of benthic communities (incl. abundance and biomass) at the ecosystem scale

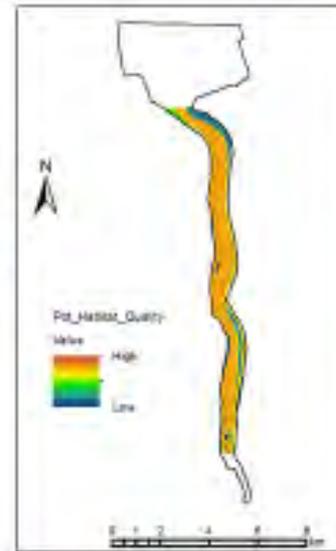
Biological Data



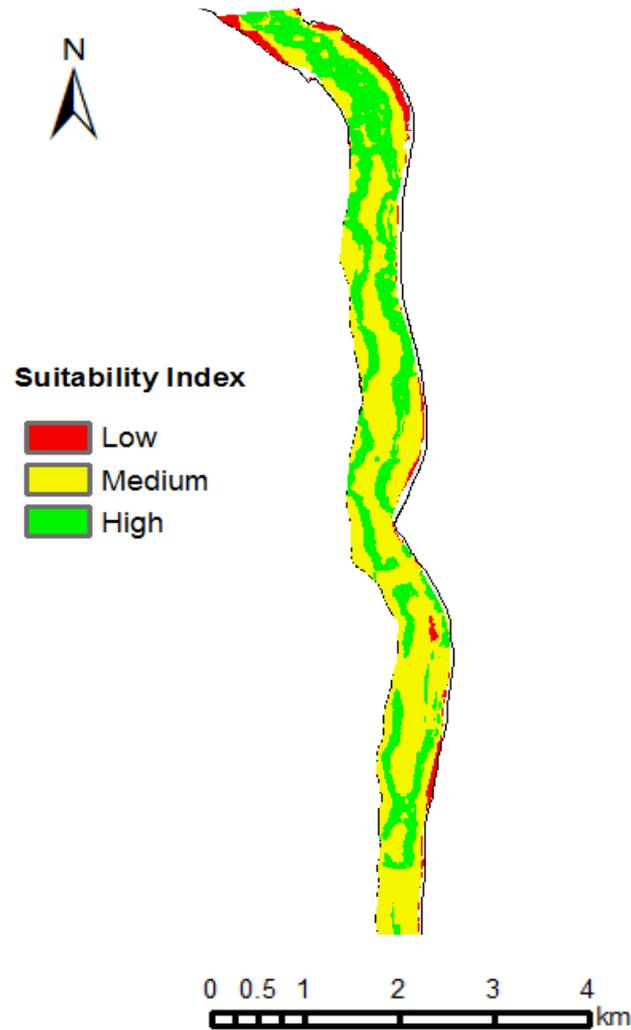
Physical Habitat Data



Integrate habitat samples and physical data to create habitat maps

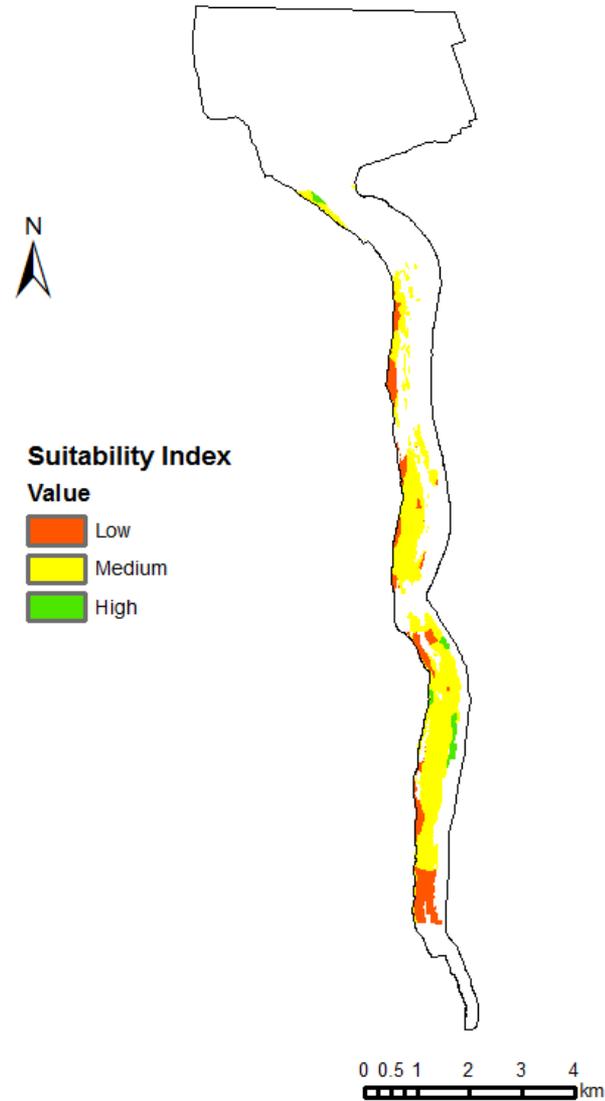


Results: *Dreissena* habitat suitability map



Mehler, K., Karatayev, A. Y., Burlakova, L. E., Biesinger, Z., Valle-Lewinson, A., C. Castiglione, and D. Gorsky. Sonar technology and underwater analysis can enhance invasive *Dreissena* habitat in large rivers. Submitted to Hydrobiologia.

Results: Sturgeon Spawning Habitat map



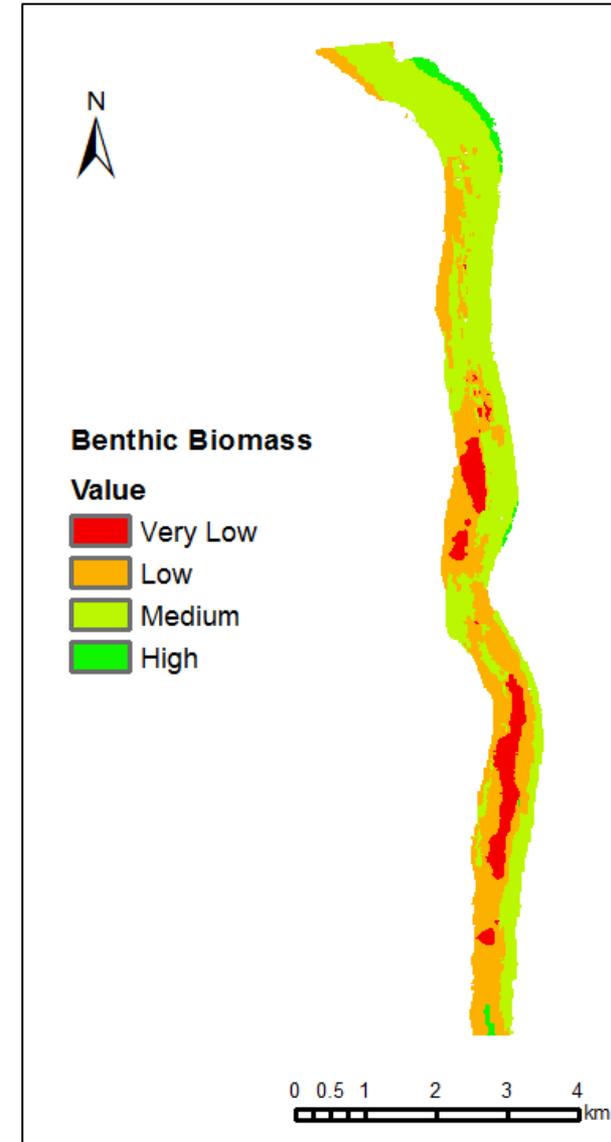
Seasonal Sampling 2014-2015

Spatiotemporal changes in forage resources for lake sturgeon

62 samples collected from April 2014 until March 2015

Samples are currently being processed and will be finished in summer 2016.

Benthic maps showing temporal changes in forage resources will be done in summer 2016



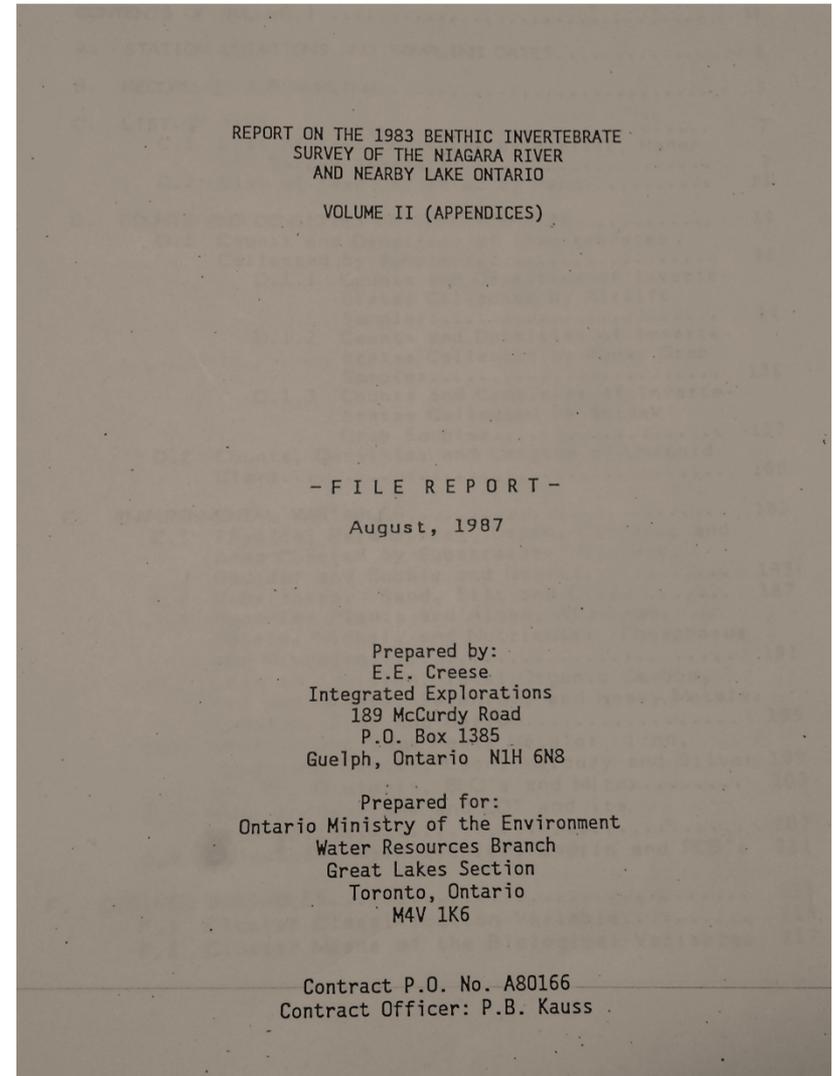
Benthic Biomass for July 2014

Resampling Historic Sites 2015

Compare the current benthic community composition with the historic community

15 benthic samples from historic sites (surveyed in 1983)

Data analysis in progress



2. Objective

*Document movements and diet
of lake sturgeon in the lower Niagara River*



*Document **movements** and diet of lake sturgeon in the lower Niagara River*



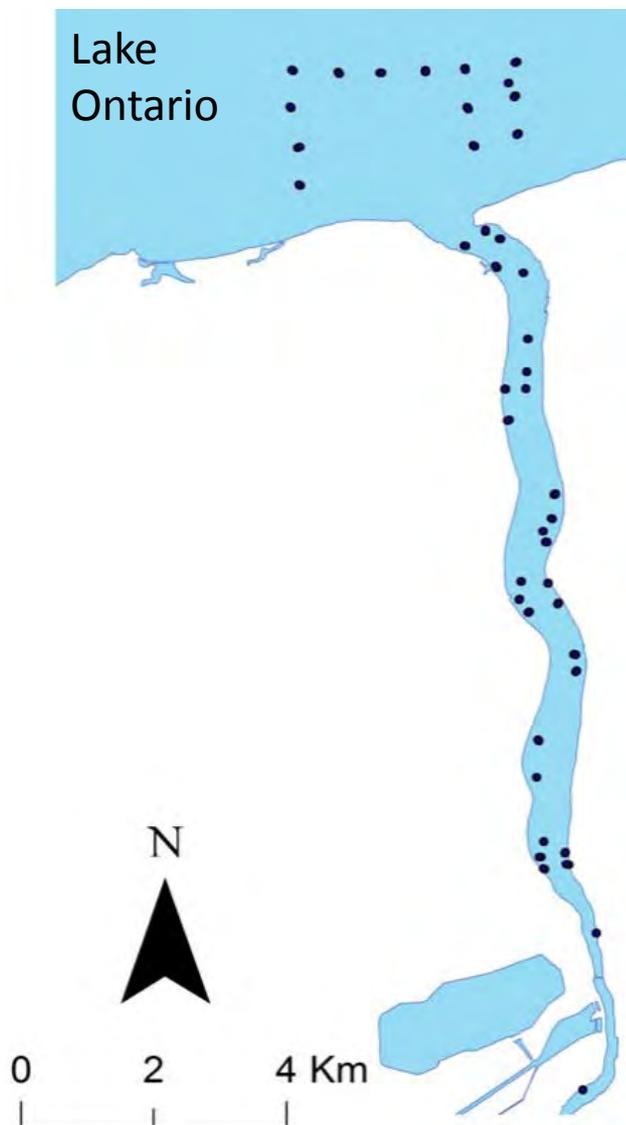
Document habitat use and movements of lake sturgeon in the lower Niagara River.

Deployed **39** acoustic receivers

Retrieved and downloaded
data from **35** receivers

Started adding acoustic
releases to the array

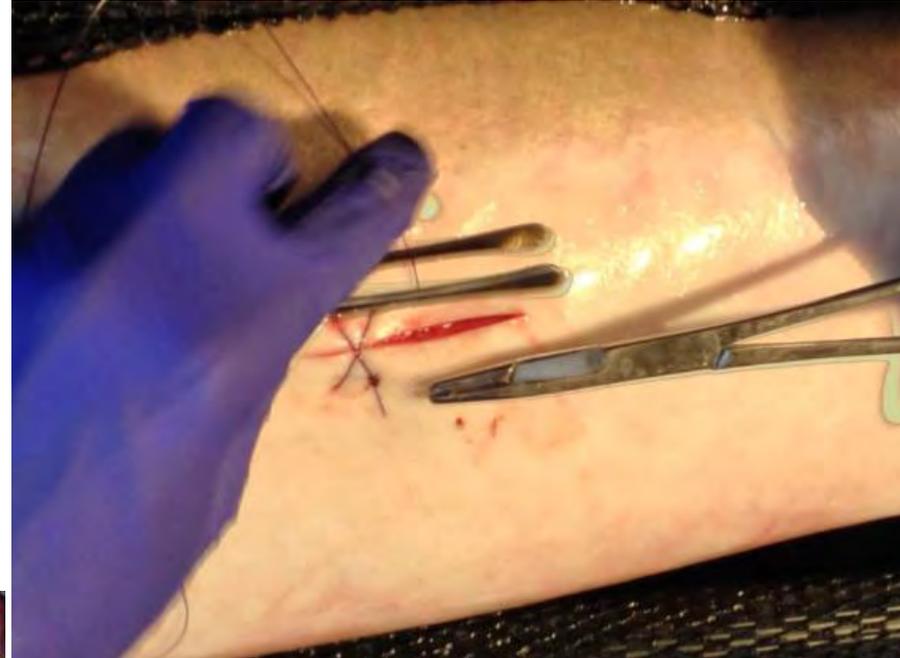
Telemetry data collection is
complete.

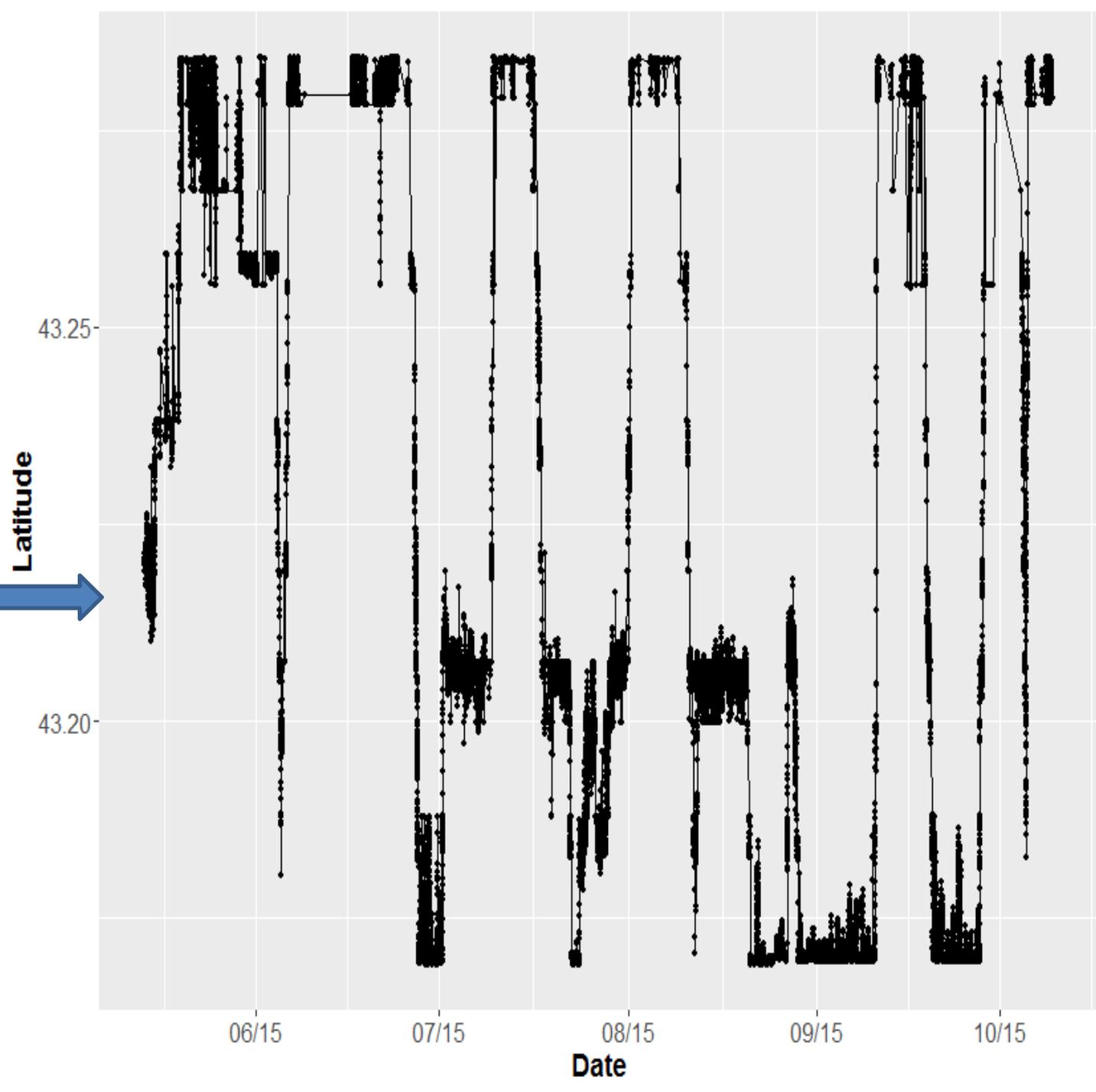
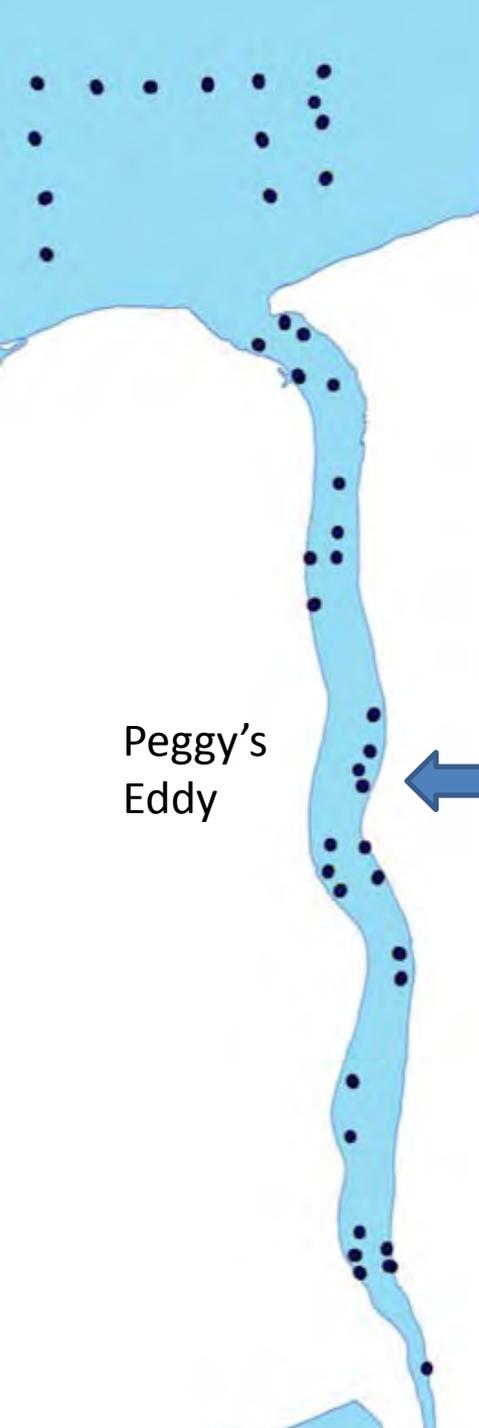


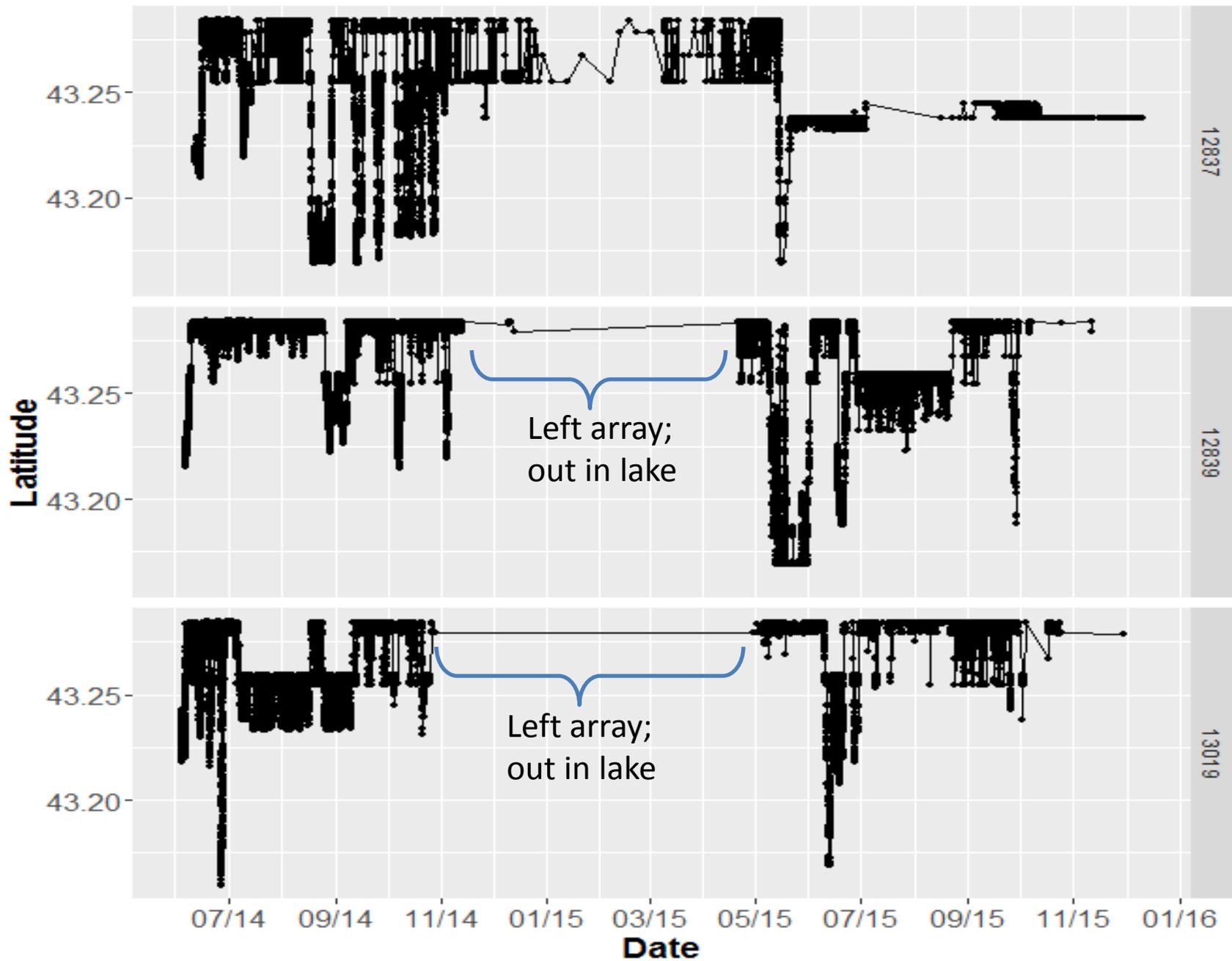
Acoustic Tagging

181 lake sturgeon captured this season

Surgically implanted the all remaining acoustic tags (30)



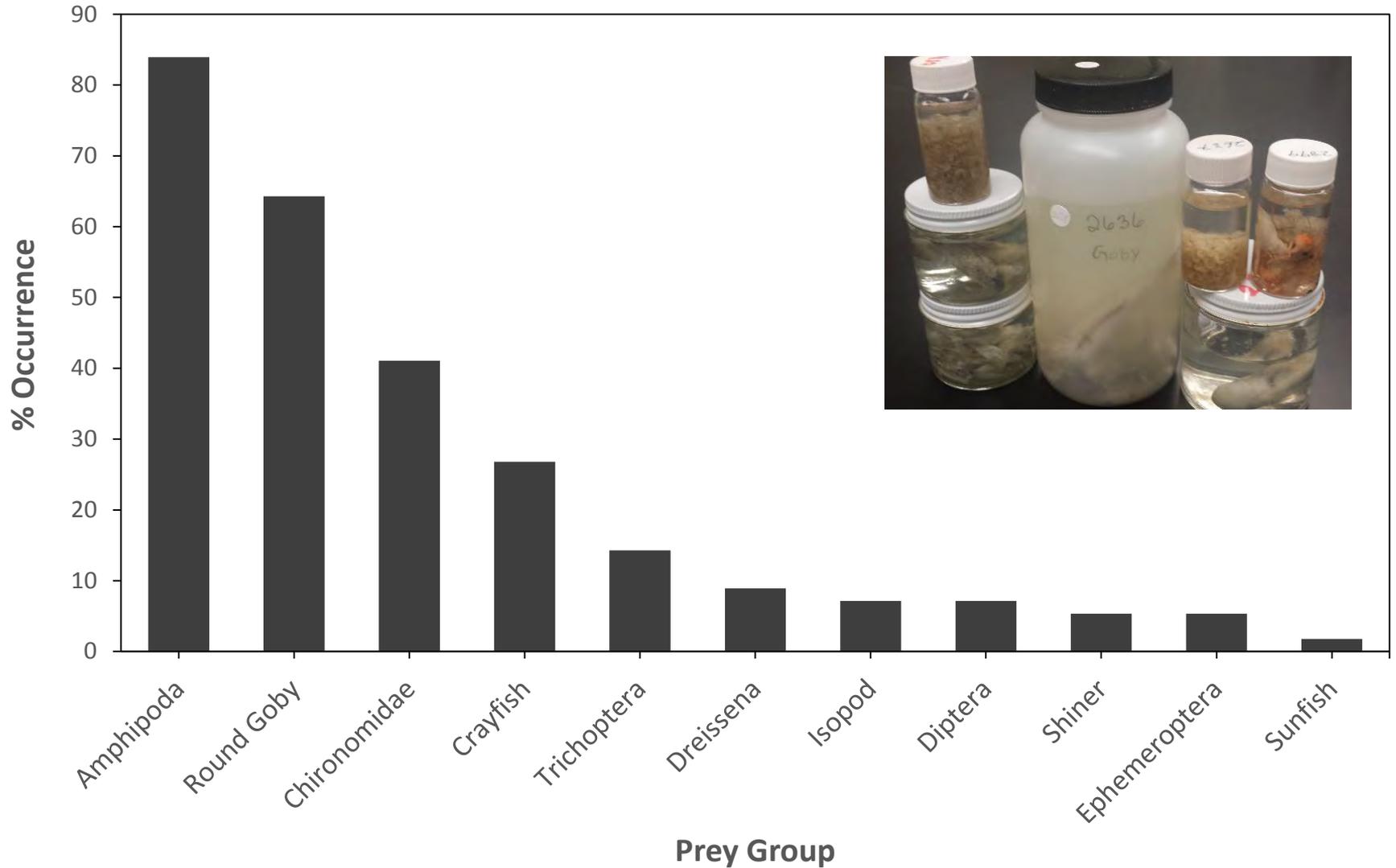




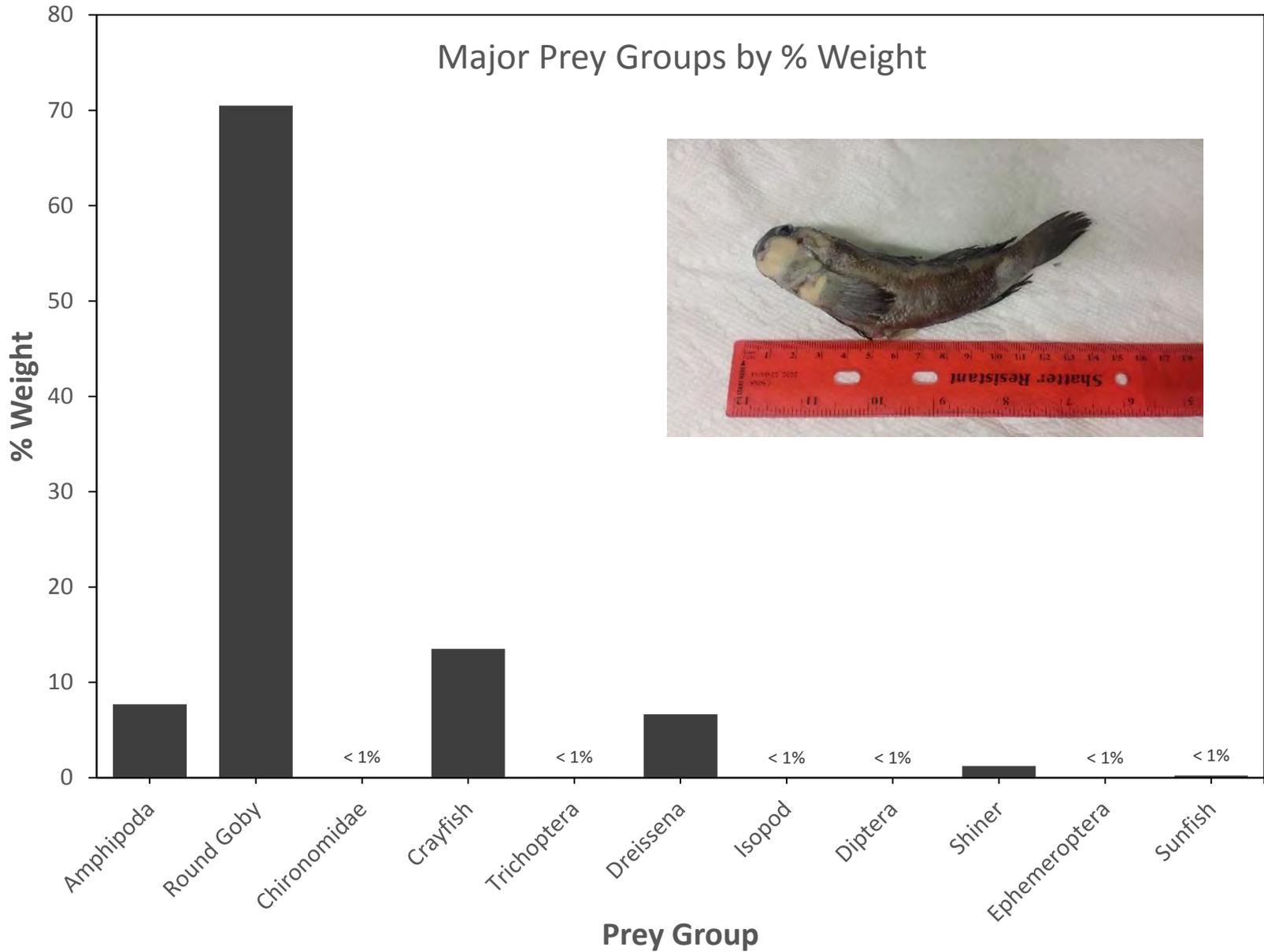
*Document movements and **diet**
of lake sturgeon in the lower Niagara River*

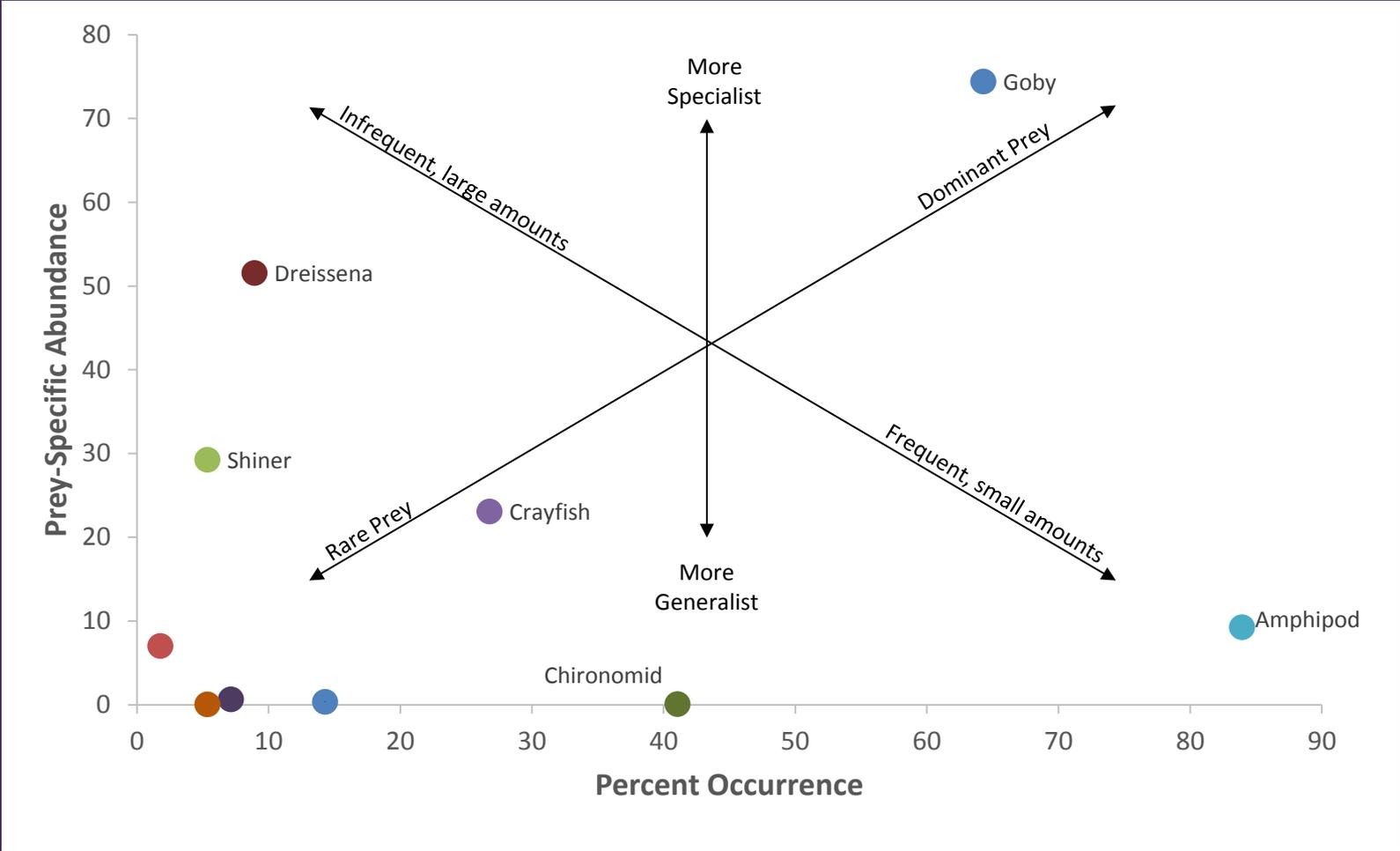


Frequency of occurrence of major prey groups

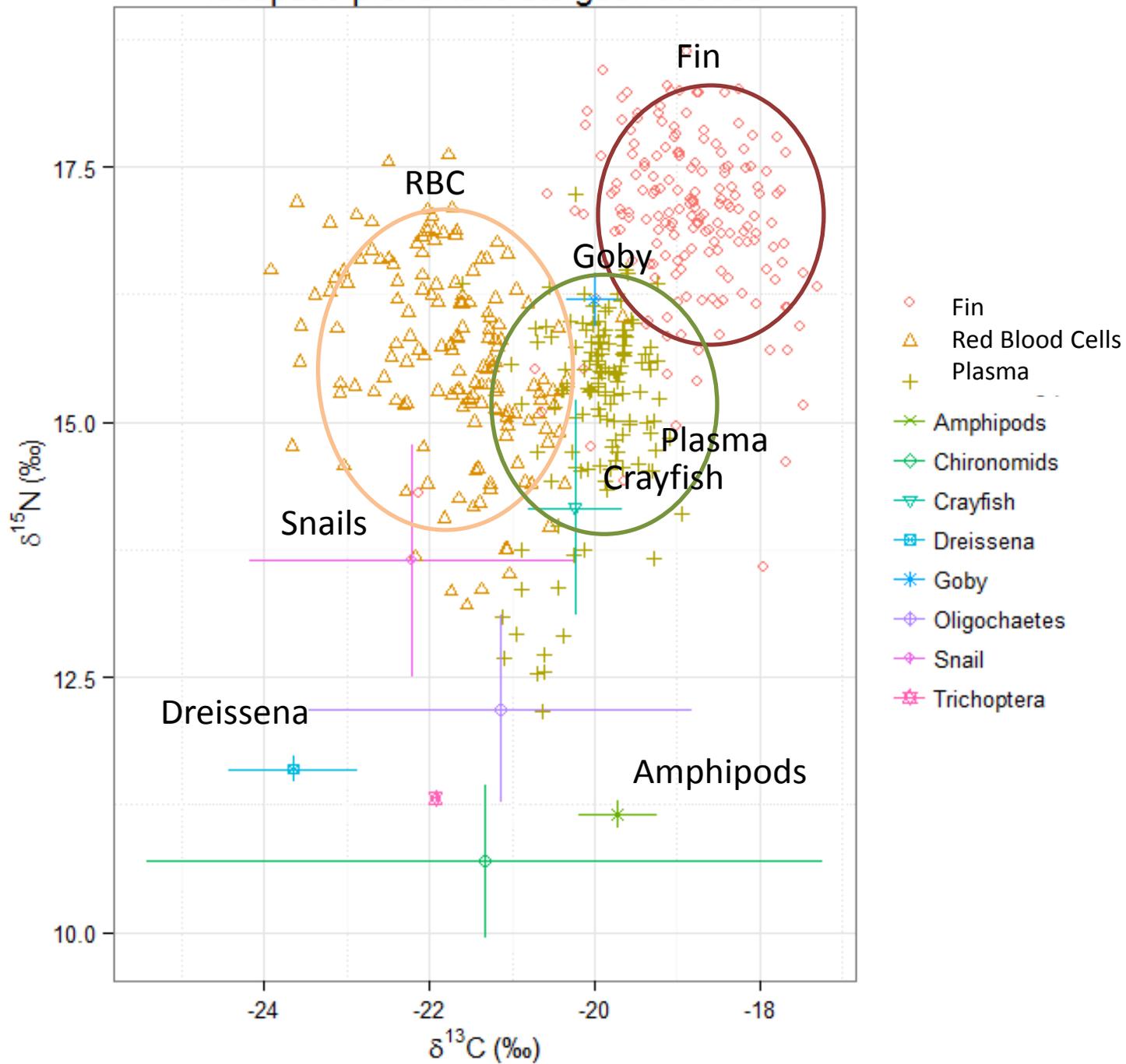


Major Prey Groups by % Weight

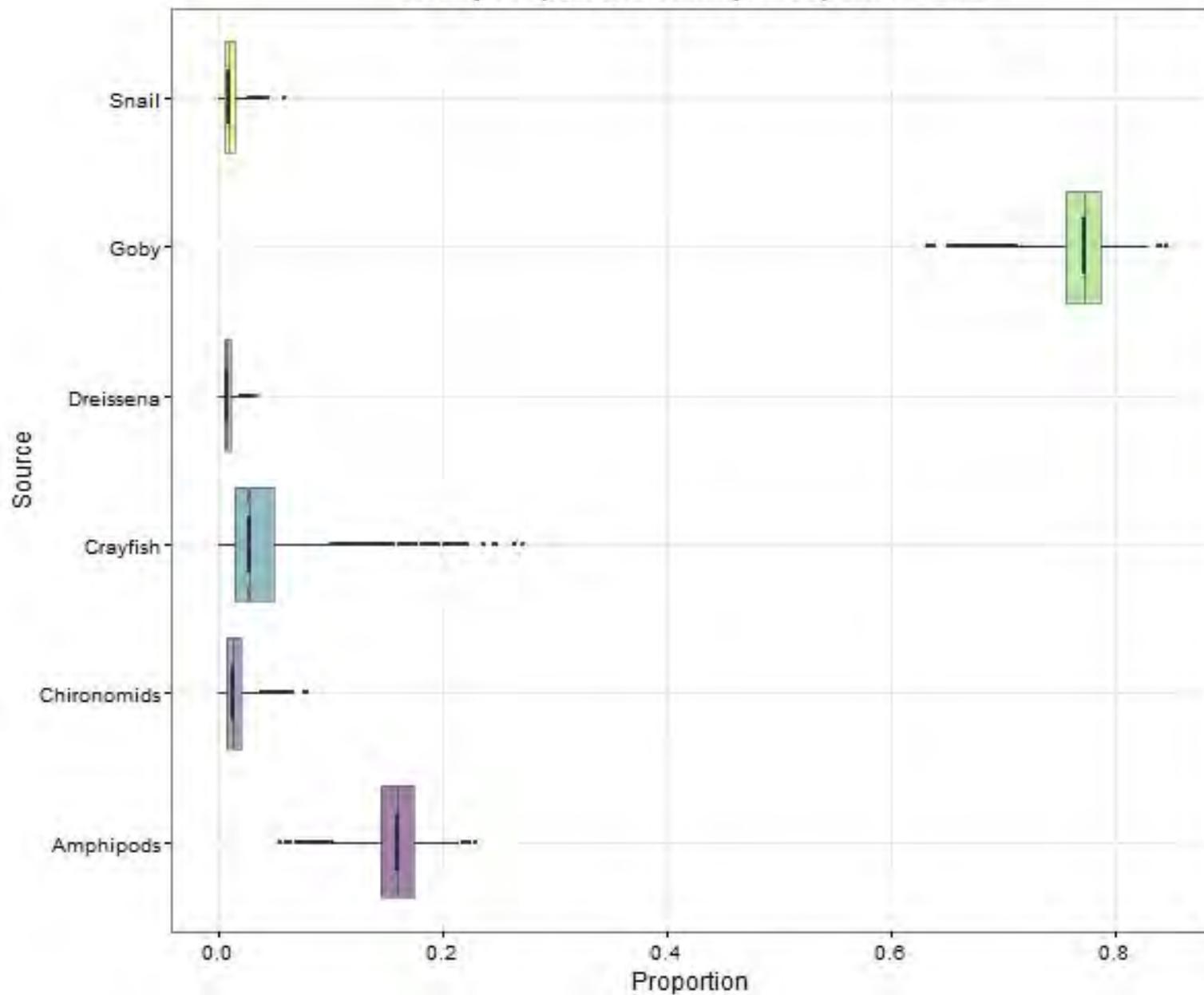




Isospace plot of lake sturgeon tissues

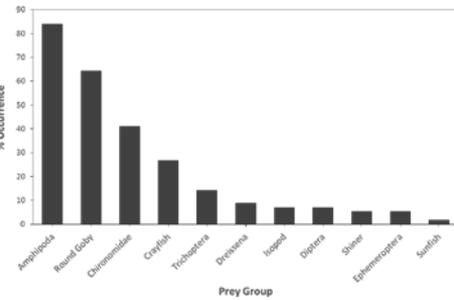
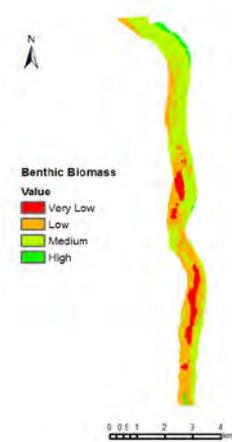
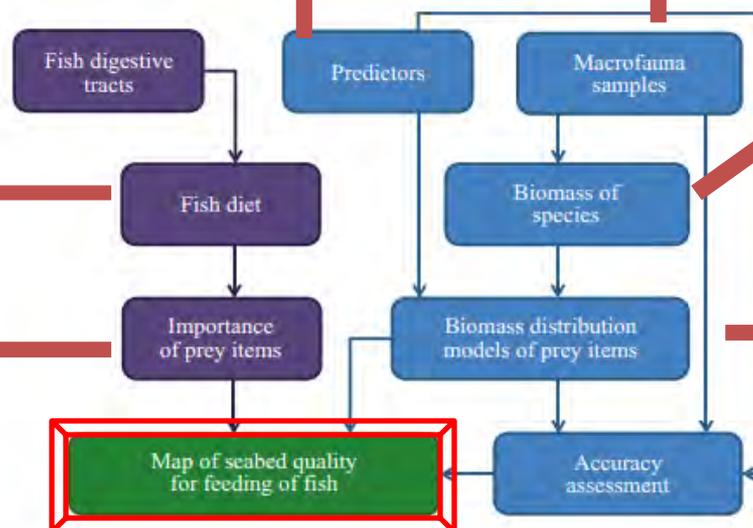
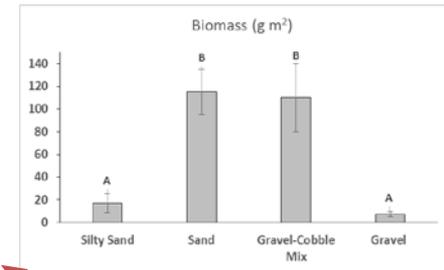
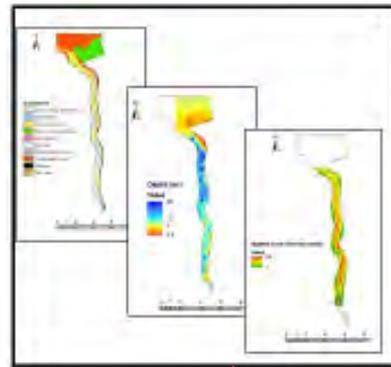


Dietary Proportions of Prey Groups in Plasma



Map Sturgeon Feeding Grounds

Combine objectives 1 and 2 to derive feeding ground maps for higher trophic levels (i.e. lake sturgeon)



Future Tasks: 1. Objective

Analysis is in progress from seasonal sampling sites and historic sites

Set Goby and crayfish traps to estimate biomass and abundance as both are important prey items for sturgeon even though not in proposal

Future Tasks: 2. Objective

Telemetry

- Continue to analyze detection data and generate home range estimates

Diet Analysis

- Continue analyzing and interpreting stable isotope data

Publications in submitted and in progress

Mehler, K., Karatayev, A. Y., Burlakova, L. E., Biesinger, Z., Valle-Lewinson, A., C. Castiglione, and D. Gorsky. Sonar technology and underwater analysis can enhance invasive *Dreissena* habitat in large rivers. Submitted to Hydrobiologia.

Jacobs, G. R., Bruestle, E., Hussey, A., Gorsky, D., and Fisk, A. T. In review. Invasive species alter ontogenetic shifts in trophic ecology for lake sturgeon (*Acipenser fulvescens*) in the Great Lakes. Submitted to Biological Invasions.

Mehler, K., Biesinger, Z., Karatayev, A. Y., and L. E. Burlakova. Distribution of bottom sediments in the lower Niagara River.

Mehler, K., Karatayev, A. Y., and L. E. Burlakova. Spatiotemporal changes in the benthic community in the Niagara River.

Mehler, K., Bruestle, E., Gorsky, D., Biesinger, Z., Karatayev, A. Y., and L. E. Burlakova. Mapping feeding ground quality for lake sturgeon (*Acipenser fulvencsens*) in the Niagara River.

Proposal submitted for upper Niagara River

International Conferences

- Mehler, K., Karatayev, A. Y., Burlakova, L. E. 2015. Estimation of exotic bivalve distribution and coverage in a large river using traditional sampling, remote sensing, and GIS-derived benthic habitat maps. 2nd International Meeting on Biology and Conservation of Freshwater Bivalves. Buffalo, New York, USA, October 4-8th 2015.
- Mehler, K., A. Karatayev, L. Burlakova, and D. Gorsky. Benthic habitat mapping using remote sensing and GIS in the Niagara River. 58th Annual Conference on Great Lakes Research. Burlington, Vermont, USA. May 25-29th 2015.
- Bruestle, E., Gorsky, D., Mehler, K., Karatayev, A.Y. and L. Burlakova. 2015. Investigating lake sturgeon habitat use and residency in the lower Niagara River. 58th Annual Conference on Great Lakes Research. Burlington, Vermont, USA. May 25-29th 2015.
- Mehler, K., A. Y. Karatayev, and L. Burlakova. 2015. Long-term dynamics of *Dreissena* spp. In Lake Erie: Insight for population boom and bust. Oral Presentation at Society of Freshwater Science, Annual Meeting, Milwaukee, Wisconsin USA, May 17-21th 2015.

Public Outreach

1. Mehler, K., Bruestle, E., Burlakova, L. E. and A. Y. Karatayev. 2015. Estimation of exotic bivalve distribution and coverage in a large river using traditional sampling, remote sensing, and GIS-derived benthic habitat maps. Poster Presentation at the 16th Annual Faculty/Staff Research and Creativity Fall Forum. Buffalo State. The State University of New York, October 29th 2015.
2. Bruestle, E., Gorsky, D., Mehler, K., Karatayev, A.Y. and L. Burlakova. 2014. Investigating lake sturgeon habitat use and feeding ecology in the lower Niagara River. Poster Presentation at the 15th Annual Faculty/Staff Research and Creativity Fall Forum. Buffalo State. The State University of New York, October 29th 2014.
3. Bruestle, E., Gorsky, D., Mehler, K., Karatayev, A.Y. and L. Burlakova. 2015. Lake sturgeon habitat preference and feeding ecology in the lower Niagara River. New York Chapter of the American Fisheries Society Annual Meeting. Feb 4-6, 2015, Lake Placid, New York.
4. Mehler, K., Burlakova, L. Karatayev, A. Y. and E. Bruestle. 2014. Using remote sensing to develop benthic habitat maps in the lower Niagara River. Poster Presentation at the 15th Annual Faculty/Staff Research and Creativity Fall Forum. Buffalo State. The State University of New York, October 29th, 2014.
5. Gorsky, D. 2015. Lake Sturgeon population in the lower Niagara River. NYS DEC Lake Ontario State of the Lake Public meeting Lockport, NY.
6. Gorsky, D. 2015. What was lost, now is found: The story of lake sturgeon recovery in the lower Niagara River. Cornell Biological Field Station at Shackleton Point, NY.
7. Gorsky, D. 2015. Restoration of Lake Sturgeon in the Great Lakes. Niagara County Fish Expo. Niagara Falls, NY.
8. Gorsky, D. 2015. Region 5 Lake Sturgeon Restoration Update. Region3/5 Coordination Meeting Basom, NY.