

## Nathaniel T. Marshall, Ph.D.

Cooperative Institute for Great Lakes Research (CIGLR)  
University of Michigan | National Oceanic and Atmospheric Administration  
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### RESEARCH INTERESTS

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Molecular Ecology	Population Genetics	Freshwater Ecology	DNA Metabarcoding	Environmental DNA
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### EDUCATION

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*Ph.D., Biology (Ecology track)* *May 2019*

University of Toledo, Toledo, OH

Advisor: Dr. Carol A. Stepien

Dissertation: *Advancing genetic analyses and implementing eDNA metabarcoding for invasive species detection and macroinvertebrate community composition*

GPA: 3.96

*M.S., Biology* *May 2014*

University of Texas at Tyler, Tyler, TX

Advisor: Dr. John S. Placyk, Jr.

Thesis: *Identification of potential fish hosts from wild populations of state-threatened east Texas freshwater mussels using a molecular identification dataset*

GPA: 4.00

*B.S., Zoology* *June 2010*

The Ohio State University, Columbus, OH

GPA: 3.38

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### PROFESSIONAL EXPERIENCE

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*Postdoctoral Research Fellow* *2019 – Present*

University of Michigan Cooperative Institute for Great Lakes Research (CIGLR) and National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Laboratory (GLERL) 'Omics Group, Ann Arbor, MI

*Sponsored Guest Researcher* *2017 – 2018*

National Oceanic and Atmospheric Administration (NOAA) Pacific Marine Environmental Laboratory (PMEL) Genetic Genomics Group (G3), Seattle, WA

*Great Lakes Genetics/Genomics Laboratory Graduate Research Assistant* *2014 – 2019*

Great Lakes Genetics/Genomics Lab (GLGL), Department of Environmental Sciences, University of Toledo, OH

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## PUBLICATIONS

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9. **Marshall, N.**, C. Stepien. 2020. Targeted metabarcoding of environmental (e)DNA for freshwater molluscs. *In Prep (Genes)*.
8. **Marshall, N.**, C. Stepien. 2020. Trajectories of zebra and quagga mussels across two North American populations: Investigating temporal invasion genetic patterns. *In Review (Aquatic Invasions)*.
7. **Marshall, N.**, C. Stepien. 2020. Macroinvertebrate community diversity and habitat quality relationships along a large river from targeted eDNA metabarcoding assays. *Accepted: Environmental DNA*.
6. Snyder, M., C. Stepien, K. Czajkowski, **N. Marshall**, H. Scheppler, C. Black. 2020. Detecting aquatic invasive species in bait and pond stores with targeted environmental (e)DNA high-throughput sequencing metabarcoding assays: Angler, retailer, and manager implications. *Accepted: Biological Conservation*.
5. **Marshall, N.**, C. Stepien. 2019. Invasion genetics from eDNA and thousands of larvae: A targeted metabarcoding assay that distinguishes species and population variation of zebra and quagga mussels. *Ecology and Evolution*. 9(1): 3515-3538. <https://doi.org/10.1002/ece3.4985>
4. Stepien, C., D. Eddins, M. Snyder, **N. Marshall**. 2018. Genetic change versus stasis over the time course of invasions: Trajectories of two concurrent, allopatric introductions of the Eurasian Ruffe. *Aquatic Invasions*. 13(4): 537-552. <https://doi.org/10.3391/ai.2018.13.4.11>
3. **Marshall, N.**, J. Banta, L. Williams, M. Williams, J. Placyk, Jr. 2018. DNA barcoding permits identification of potential fish hosts of unionid freshwater mussels. *American Malacological Bulletin*. 36(1): 42-56. <https://doi.org/10.4003/006.036.0114>
2. \*Klymus, K., **N. Marshall**, C. Stepien. 2017. Environmental DNA (eDNA) metabarcoding assays to detect invasive invertebrate species in the Great Lakes. *PloS One*. 12(5): e0177643. <https://doi.org/10.1371/journal.pone.0177643>
1. Ford, N., K. Heffentrager, D. Ford, A. Walters, **N. Marshall**. 2014. Significant recent records of unionid mussels in northeast Texas rivers. *Walkerana*. 17(1): 6-18. <https://doi.org/10.31931/fmbc.v17i1.2014.8-15>

\*Top 10% most cited papers published from 2017 in *PlosOne*

### Book Chapters

1. **Marshall, N.**, C. Stepien. 2019. Dreissenidae Gray, 1840. In K. Cummings and C. Lydeard (Eds.), *Freshwater mollusk families of the world: A distribution atlas* (pp. 193-196). Baltimore, MD: John Hopkins Press.

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## AWARDS AND FELLOWSHIPS

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*Participant in Best Student Paper Competition* (2018) – American Fisheries Science national meeting in Atlantic City, NJ, August 2018

*James E. Wright Graduate Award/Genetics Section* (2018) – Awarded to one Ph.D. student to assist with travel to attend and present at the national AFS annual meeting (\$500)

*IAGLR Scholarship* (2018) – Awarded to two promising Ph.D. students whose dissertation research is likely to make a significant contribution to the understanding of large lakes (\$2000)

*Malacological Society of London Travel Award* (2017) – Travel award to attend the 20th International Conference on Aquatic Invasive Species, Malacological Society of London (£500)

*Robert N. Whiteford Memorial Scholarship* (2017) – College of Graduate Studies, University of Toledo, Toledo, OH (\$600)

*Mark B. Bain Graduate Fellowship* (2016) – Hudson River Foundation, New York, NY (\$16,000)

*Ph.D. Friends of the Lake Erie Center Award* (2016) – Department of Environmental Sciences, University of Toledo, Lake Erie Center, Toledo, OH (\$500)  
*Malacological Society of London Travel Award* (2015) – Travel award to attend the 2nd International Meeting on Biology and Conservation of Freshwater Bivalves, Malacological Society of London (£500)

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## RECENT GRANTS DRAFTED

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<i>Year</i>	<i>Amount Requested</i>	<i>Funding Agency</i>	<i>Title of Grant</i>	<i>Status</i>
2019	\$340,045	NOAA	Environmental DNA and metabarcoding of gut contents for analysis of food web dynamics: Determining ecological impacts of an abundant invasive dreissenid veliger	Pending
2016	\$957.90	American Malacological Society	Invasional genetic patterns across time and space in North American <i>Dreissena</i> mussels	Not Awarded
2016	\$639.20	Sigma Xi	Ground-Truthing of a Next-Generation Sequencing Assay for the Detection and Population Monitoring of Invasive <i>Dreissena</i>	Awarded
2015	\$2,250	Malacological Society of London	Temporal genetic patterns of an invasive and native Lake Erie bivalve community	Not Awarded

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## PRESENTATIONS

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### Invited Speaker

- “A perspective for eDNA in aquatic ecology”. BIO 5180 – Field Investigations in Biological Sciences: Molecular Aquatic Ecology. Wayne State University. *July 2019*.
- “Utilizing environmental DNA for species detection and community composition”, EPRI Great Lakes IG Webcast. *August 2018*.
- “Bioinformatics for analysis of large genetic/genomic datasets”. PMEL developer/technical talks. NOAA PMEL, Seattle, WA, *May 2017*.
- “Fishing for invaders and viruses in the Great Lakes”, Science Saturday at the Belle Isle Aquarium. *January 2017*.
- “Genetic assays for ecological issues”. BIO 5180 – Field Investigations in Biological Sciences: Molecular Aquatic Ecology. Wayne State University. *August 2015*.

### Selected Oral Conference Presentations

- Marshall, N., C. Stepien.** Utilizing Environmental DNA High-Throughput Sequencing Assays for Diagnosing Species and Population Genetics of Aquatic Invasive Species. American Fisheries Society, Atlantic City, New Jersey, August 2018.
- Marshall, N., C. Stepien.** Invasional Genetic Patterns Across Time and Space in North American *Dreissena* Mussels. International Conference on Aquatic Invasive Species, Fort Lauderdale, Florida, *October 2017*.

- Marshall, N., K. Klymus, C. Stepien.** Using a High-Throughput Sequencing Assay to Assess Dreissenid Mussel Communities. International Conference on Aquatic Invasive Species, Fort Lauderdale, Florida, *October 2017*.
- Marshall, N., K. Klymus, C. Stepien.** Evaluating Genetic Diversity of Dreissenid Mussel Communities with High-Throughput Sequencing. International Association for Great Lakes Research, Detroit, Michigan, *May 2017*.
- Marshall, N., K. Klymus, C. Stepien.** Evaluation of a high-throughput sequencing assay for description of invasive dreissenid mussel communities. Midwest Graduate Research Symposium. Toledo, OH. *March 2017*.
- Marshall, N., K. Klymus, C. Stepien.** A High-Throughput Sequencing Assay for Detection and Population Demographics of *Dreissena* Communities. International Association of Great Lakes Research, Guelph, ON. *June 2016*.
- Marshall, N., K. Klymus, C. Stepien.** Ground-Truthing a High-Throughput Sequencing Assay for Invasive *Dreissena* Detection Using Simulated Communities. Midwest Graduate Research Symposium. Toledo, OH. *April 2016*.
- Marshall, N., K. Klymus, C. Stepien.** Utilizing environmental DNA for biological and population genetic inferences with a next-generation sequencing assay. Midwest Graduate Research Symposium. Toledo, OH. *March 2015*.
- Marshall N., L. Williams, M. Williams, N. Ford, J. Banta, J. Placyk, Jr.** Using a molecular dataset to identify unionid glochidia. Southwestern Association of Naturalists. Stillwater, Oklahoma, *April 2014*.
- Marshall N., L. Williams, N. Ford, J. Placyk, Jr.** Identification of potential fish hosts utilized by East Texas mussels. Texas Chapters of American Fisheries Society. Pottsboro, Texas, *February 2014*.

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## COMPUTATIONAL TRAINING

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- “Programming for Everybody (Getting Started with Python)”, University of Michigan, Ann Arbor, MI, *February 2020*. <https://online.umich.edu/series/python-for-everybody/>
- 3<sup>rd</sup> Environmental DNA Technical Exchange Workshop, Computer Workshop for eDNA Occupancy R package and metabarcoding packages. USGS. St. Petersburg, FL, *November 2019*.
- “Python for Data Analysis”, Luke Thompson, Assistant Professor at NOAA Northern Gulf Institute. *August 2019*. <https://github.com/cuttlefishh/python-for-data-analysis>.

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## MENTORING AND TEACHING

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### Training

Postdoctoral Short Course on College Teaching in Science and Engineering, University of Michigan, *Spring 2020*.

### Teaching Assistant

Biodiversity Lab (EEES 2160), Department of Environmental Sciences, University of Toledo, *Fall 2018*.  
Environmental Problems & Solutions Lab (EEES 1140), Department of Environmental Sciences, University of Toledo, *Fall 2018*  
Field Ecology and Behavior of Amphibians and Reptiles (EEES 4980/6980), Department of Environmental Sciences, University of Toledo, *Summer 2015*.  
General Biology I Lab (BIOL 1106), Department of Biology, University of Texas at Tyler, *Fall 2013*.  
General Biology II Lab (BIOL 1107), Department of Biology, University of Texas at Tyler, *Spring 2013*.

### Guest Lecture

Presented an hour lecture on animal biodiversity, Department of Biology, University of Texas at Tyler, Spring 2013.

### Undergraduate Mentor

The Undergraduate Research Program at the University of Michigan

- Emma Roggenbuck, University of Michigan, 2019–2020
  - “Improving identification of coregonid larval fishers: Implementing morphology, genetics, and machine learning”. Anticipated publication in *Journal of Great Lakes Research*.

NSF Research Experience for Undergraduates (DBI-1461124: “Using the Lake Erie Sensor Network to Study Land-Lake Ecological Linkage”) Graduate Mentor summer 2015 and summer 2016.

- Hannah Scheppler, University of Toledo, 2016
  - “Identifying species from bait shops and pond stores: Potential vectors for invasives in the Great Lakes?”. Publication pending in *Biological Conservation*.
- Devon Eddins, University of Toledo, 2015
  - “Temporal genetic patterns of the invasive Eurasian ruffe”. Published in *Aquatic Invasions*.

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## **SERVICE AND PUBLIC OUTREACH**

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### Media

“Using Environmental DNA and RNA to Inform Biomonitoring and Bioassessment Management Plans”. *CIGLR Fall 2019 eNewsletter*, Ann Arbor, MI, December 2019. <https://ciglr.seas.umich.edu/fall-2019-e-newsletter/featured-research-edna-erna/>

Expert panelist for WGTE Toledo public town hall on “Detecting invasive species in the Great Lakes”, *WGTE Public Media*, Toledo, OH, April 2018. <https://www.wgte.org/tv/programs/detecting-invasive-species-great-lakes>

“College students across country spend summer at UT for research experience”, *Toledo News*, University of Toledo, Toledo, OH, June 2016. [http://utnews.utoledo.edu/index.php/07\\_06\\_2016/college-students-from-across-country-spend-summer-at-ut-for-research-experience](http://utnews.utoledo.edu/index.php/07_06_2016/college-students-from-across-country-spend-summer-at-ut-for-research-experience)

“Something in the water?”, *Patriot Talon*, University of Texas at Tyler, Tyler, TX, May 2013. [http://www.patriottalon.com/pulse/article\\_5334a75a-6f0a-11e2-8b1a-001a4bcf6878.html?mode=image&photo=1](http://www.patriottalon.com/pulse/article_5334a75a-6f0a-11e2-8b1a-001a4bcf6878.html?mode=image&photo=1)

### Public Outreach

Imagine Hill Academy Science Day Judge (2018–2019)

Washington Sea Grant Science Camp Volunteer and Science Show Judge (2017)

NOAA Western Regional Center Open House (2017)

Northwest Ohio District 2 Science Day (2015–2017)

- Judge for the Governor's Thomas Edison Award for Excellence in Student Research- *Water Resources Award*

The Maumee Bay River Festival (2015–2016)

Sigma Xi Science Café (2014–2016)

- Organize and run public forums discussing current events in topics related to science

### Service to the Lake Erie Center and the University of Toledo

Lake Erie Center Assistant (2014–2016)

- Prepared and conducted IAUC inspections of wet lab
- Curator of aquaria for public display and organized tours of Lake Erie Center facility

- Organized field sampling demonstration for summer elementary camp
- Organized and prepared laboratory demos for the Lake Erie Center annual open house event
- Graduate student representative at Lake Erie Center Annual Board Meeting

*Service to the Department of Biology at the University of Texas at Tyler*

Graduate student representative for computational biologist search committee (2013–2014)

Graduate student representative for departmental meetings (2013–2014)

Promote and develop undergraduate research scholarships (2012–2014)

*Journal Reviewer*

Ecology and Evolution

Ecological Science and Technology

Hydrobiologia

Molecular Phylogenetics and Evolution

Southeastern Association of Naturalists

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**PROFESSIONAL AFFILIATIONS**

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American Fisheries Society (2013–present)

American Malacological Society (2016–present)

Freshwater Mollusk Conservation Society (2012–present)

International Association of Great Lakes Research (2015–present)