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University of Michigan
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Education

- 2007 Ph.D. Ecology and Evolutionary Biology
 The University of Michigan
- 2001 A.B. Biology with Specialization in Ecology and Evolution
 The University of Chicago
 Graduated with General Honors and Special Honors in Biology

Professional Appointments

- 2019-present Assistant Research Scientist
 The University of Michigan
 School for Environment and Sustainability
 Cooperative Institute for Great Lakes Research
- 2012-2019 Postdoctoral Researcher/Senior Research Associate (PI status obtained: 2017)
 The Ohio State University
 Department of Evolution, Ecology, and Organismal Biology
- 2009-11 Postdoctoral Researcher
 Oklahoma State University
 Department of Zoology
- 2007-8 Postdoctoral Researcher
 The University of Michigan
 Department of Molecular, Cellular, and Developmental Biology

Funding (including research grants, fellowships, and other awards)

- in review National Science Foundation (). Large-scale CoPe: Great Lakes Hub (GLHub) for
 advancing ecosystem and social science. PI. (\$17,645,357)
- 2019-2021 Great Lakes Fishery Commission (Fishery Research Program), Moving toward
 ecosystem-based fisheries management: developing an integrated ecosystem
 assessment of Lake Erie as a case study. PI. (\$136,582)
- 2016-21 National Science Foundation (IOS-1557831), The influence of the prey physiological
 stress response on predator-prey interactions. Co-PI and primary writer. (\$652,556)

- 2016-20 Great Lakes Fishery Commission (Fishery Research Program), Spatial variation in habitat quality as a driver of Lake Erie walleye population dynamics: past, present, and future. Co-PI. (\$284,691)
- 2015 The Ohio State University Open Access Fund (\$1,000)
- 2014-16 Ohio Sea Grant College Program, Biennial Large Grant Program, Linking Lake Erie agricultural production to ecosystem services. Co-PI. (\$199,630)
- 2012-15 Federal Sport Fish Restoration Program (Ohio DNR, F-69-P, Fish Management in Ohio), A biophysical modeling approach to understanding walleye recruitment in Lake Erie. Co-PI. (annually renewed; \$232,112 total)
- 2007 Rackham One-Term Dissertation Fellowship, The University of Michigan (tuition and stipend, 1 semester)
- 2005 Peter Okkelberg Award, The University of Michigan (\$1,058)
- 2004-6 E. S. George Reserve Scholarship, The University of Michigan (3 awards; \$8,488 total)
- 2004 Block Grant, The University of Michigan (\$1,257)
- 2001-5 Regents' Fellowship, The University of Michigan (tuition and stipend, 4 years)

Refereed Publications

In review or in preparation:

Fraker, M. E., Y. Zhao, and S. A. Ludsin. in review. Biophysical drivers of intra- and interannual variation in habitat quality for fish larvae. (Canadian Journal of Fisheries and Aquatic Sciences)

Fraker, M. E., B. Luttbeg, S. A. Ludsin, and R. J. Denver. in review. Stress hormone-mediated antipredator morphology improves escape performance in wood frog tadpoles. (American Naturalist)

J. S. Sinclair, K. A. Frank, J. M. Hood, S. A. Ludsin, and **M. E. Fraker**. to be submitted. Multiple stressors induce contrasting responses in the functional trait composition of fish assemblages in Lake Erie.

Fraker, M. E., J. S. Sinclair, K. A. Frank, J. M. Hood, and S. A. Ludsin. to be submitted. Ecosystem trends and drivers of a dynamic, large freshwater lake depend on the chosen perspective.

Fraker, M. E., A. Shrestha, L. Marshall, L. Mason, and R. Miller. to be submitted. Seasonal variation in subsurface chlorophyll in Lake Michigan observed by a glider.

Published:

- Fraker, M. E.**, S. C. Keitzer, J. S. Sinclair, N. R. Aloysius, D. A. Dippold, H. Yen, J. G. Arnold, P. Daggupati, M.-V. V. Johnson, J. F. Martin, D. M. Robertson, S. P. Sowa, M. J. White, and S. A. Ludsin. 2020. Projecting the effects of agricultural conservation practices on stream fish communities in a changing climate. *Science of the Total Environment* 747: 141112.
- Dippold, D. A., N. Aloysius, S. C. Keitzer, H. Yen, J. G. Arnold, P. Daggupati, **M. E. Fraker**, J. F. Martin, D. M. Robertson, S. P. Sowa, M.-V. V. Johnson, M. J. White, and S. A. Ludsin. 2020. Forecasting the combined effects of anticipated climate change and agricultural conservation practices on fish recruitment dynamics in Lake Erie. *Freshwater Biology* 65: 1487-1508.
- Goodla, L., M. Manubolu, K. Pathakoti, T. Jayakumar, J. R. Sheu, **M. Fraker**, P. B. Tchounwou, and P. R. Poondamalli. 2019. Protective effects of *Ammannia baccifera* against CCl₄-induced oxidative stress in rats. *International Journal of Environmental Research and Public Health* 16: 1440.
- Brown, T., **M. E. Fraker**, and S. A. Ludsin. 2018. Space use of predatory larval dragonflies and tadpole prey in response to chemical cues. *American Midland Naturalist* 181:53-63.
- DeVanna Fussell, K. M., R. E. H. Smith, **M. E. Fraker**, and 17 co-authors. 2016. A perspective on needed research, modeling, and management approaches that can enhance Great Lakes fisheries management under changing ecosystem conditions. *Journal of Great Lakes Research* 42:742-753.
- Brodnik, R. *, **M. E. Fraker***, E. J. Anderson, L. Carreon-Martinez, K. M. DeVanna, B. J. Fryer, D. D. Heath, J. M. Reichert, and S. A. Ludsin. 2016. Combining microsatellite data with dispersal trajectories of larvae reveals novel stock structure and demographically-important population connectivity in a freshwater fish. *Canadian Journal of Fisheries and Aquatic Sciences* 73:416-426. *co-first authors
- DuFour, M. R., C. J. May, E. F. Roseman, S. A. Ludsin, C. S. Vandergoot, J. J. Pritt, **M. E. Fraker**, J.J. Davis, J. T. Tyson, J. G. Miner, E. A. Marschall, and C. M. Mayer. 2015. Portfolio theory as a management tool to guide conservation and restoration of multi-stock fish populations. *Ecosphere* 6:art296.
- Fraker, M. E.**, E. J. Anderson, K.-Y. Chen, J. J. Davis, K. M. DeVanna, M. R. DuFour, E. A. Marschall, C. J. May, C. M. Mayer, J. G. Miner, K. L. Pangle, J. J. Pritt, E. F. Roseman, J. T. Tyson, Y. Zhao, and S. A. Ludsin. 2015. Variation in larval advection and early life history of Lake Erie walleye (*Sander vitreus*): insights from an individual-based biophysical model. *Journal of Great Lakes Research* 41:830-845.
- Fraker, M. E.**, E. J. Anderson, R. Brodnik, L. Carreon-Martinez, K. M. DeVanna, B. J. Fryer, D. D. Heath, J. M. Reichert, and S. A. Ludsin. 2014. Particle backtracking improves breeding subpopulation discrimination and natal-source identification in mixed populations. *PLoS ONE* 10:e0120752.
- Fraker, M. E.** and B. Luttbeg. 2012. A spatially explicit model of predator-prey space games. *Oikos* 121:1935-1944.

- Fraker, M. E.** and B. Luttbegg. 2012. Predator-prey space use and the spatial distribution of predation events. *Behaviour* 149:555-574.
- Fraker, M. E.** 2010. Risk perception and anti-predator behavior of wood frog (*Rana sylvatica*) tadpoles: a comparison with green frog (*Rana clamitans*) tadpoles. *Journal of Herpetology* 44:390-398.
- Fraker, M. E.**, V. Cuddapah, S. A. McCollum, R. A. Relyea, J. Hempel, and R. J. Denver. 2009. The behavioral and endocrine stress response of tadpoles to a chemical cue of predation secreted by conspecifics. *Hormones and Behavior* 55: 520-529.
- Fraker, M. E.** 2009. Predation risk assessment through chemical cues produced by multiple prey. *Behavioral Ecology and Sociobiology* 63: 1397-1402.
- Fraker, M. E.** 2009. The effect of prior experience on a prey's current perceived risk. *Oecologia* 158: 765-774.
- Fraker, M. E.** 2009. The perceptual ability of tadpoles limits the accuracy of their predation risk assessment. *Behaviour* 146: 1025-1036.
- Fraker, M. E.** 2008. The influence of the circadian rhythm of green frog (*Rana clamitans*) tadpoles on their antipredator behavior and the strength of the nonlethal effects of predators. *American Naturalist* 171: 545-552.
- Fraker, M. E.** 2008. The effect of hunger on the strength and duration of the anti-predator behavioral response of green frog (*Rana clamitans*) tadpoles. *Behavioral Ecology and Sociobiology* 62: 1201-1205.
- Fraker, M. E.** and S. D. Peacor. 2008. Statistical tests for biological interactions: a comparison of permutation tests and analysis of variance. *Acta Oecologia* 33: 66-72.
- Fraker, M. E.** 2008. The dynamics of predation risk assessment: responses of anuran larvae to chemical cues of predators. *Journal of Animal Ecology* 77: 638-645.
- Fraker, M. E.**, J. W. Snodgrass, and F. Morgan. 2002. Differences in growth and maturation of blacknose dace (*Rhinichthys atratulus*) across an urban-rural gradient. *Copeia* 2002: 1122-1127.

Final Reports (non-refereed)

- Glover, D., **M. E. Fraker**, S. C. Keitzer, and E. A. Marschall. 2016. Modeling the effects of climate change on anadromous fish populations in the Connecticut River. Final Report. NOAA Fisheries (National Marine Fisheries Service). Project IJ10-15.
- May, E., **M. E. Fraker**, S. Gebremariam, J. Martin, and W. Zhang. 2016. Linking agricultural production and Great Lakes ecosystem services: modeling and valuing the impacts of harmful algal blooms in Lake Erie. Ohio Sea Grant College Program. Project R/ME-038.
- May, C. J., **M. E. Fraker**, and S. A. Ludsin. 2016. The influences of hydrodynamics, early growth,

and larval movement on walleye recruitment in the western basin of Lake Erie. Final Report. Ohio DNR. Project FADR67.

Fraker, M. E. and S. A. Ludsin. 2015. A biophysical modeling approach to understanding walleye recruitment in Lake Erie. Final Report. Ohio DNR. Project FADR69.

Presentations (invited and contributed)

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| 2020 | Antipredator phenotypic plasticity in tadpoles: physiology to phenotype to outcome. Wayne State University, Department of Biology. (invited oral presentation) |
| 2020 | Ecosystem trends and drivers of a dynamic, large freshwater lake depend on the chosen perspective. Association for the Sciences of Limnology and Oceanography and Society for Freshwater Science Joint Meeting, Madison, Wisconsin. (contributed oral presentation; meeting cancelled) |
| 2020 | Lake Erie ecosystem trends and drivers during 1969-2018. NOAA-GLERL All Hands meeting, Ann Arbor, Michigan. (invited oral presentation) |
| 2019 | Stress hormone-mediated antipredator morphology improves escape performance in wood frog tadpoles, Ecological Society of America Annual Meeting, Louisville, Kentucky. (contributed oral presentation) |
| 2019 | Developing an integrated ecosystem assessment of Lake Erie fisheries, International Association of Great Lakes Research Annual Meeting, Brockport, New York. (contributed oral presentation) |
| 2019 | Individual- to ecosystem-level responses to the abiotic and biotic environment in freshwater systems, Murray State University, Department of Biological Sciences. (invited oral presentation) |
| 2019 | Individual- to ecosystem-level responses to the abiotic and biotic environment in freshwater systems, Kennesaw State University, Department of Ecology, Evolution, and Organismal Biology. (invited oral presentation) |
| 2019 | Individual- to ecosystem-level responses to the abiotic and biotic environment in freshwater systems, Emporia State University, Department of Biological Sciences. (invited oral presentation) |
| 2019 | Individual- to ecosystem-level responses to the abiotic and biotic environment in freshwater systems, St. Bonaventure University, Biology Department. (invited oral presentation) |
| 2017 | Linking stress physiology to the expression of the anti-predator phenotype, Lund University (Sweden), Department of Biology. (invited oral presentation) |
| 2016 | Spatial variation of impacts of ecosystem change on habitat quality for a Lake Erie fish, Ecological Society of America Annual Meeting, St. Petersburg, Florida. (contributed oral presentation) |

- 2016 Spatial variation of impacts of ecosystem change on habitat quality for a Lake Erie fish, 40th Annual Larval Fish Conference, Solomons, Maryland. (contributed oral presentation)
- 2015 The role of environmental heterogeneity in individual-level variation in performance, University of Mississippi, Department of Biology. (invited oral presentation)
- 2015 Hydrodynamic backtracking improves stock discrimination capability in Lake Erie yellow perch, Lake Erie-Inland Waters Annual Research Review, Columbus, Ohio. (invited oral presentation)
- 2014 Biophysical drivers of walleye recruitment variation in Lake Erie, International Association of Great Lakes Research Annual Meeting, Hamilton, Ontario. (invited oral presentation)
- 2014 The role of biophysical processes in the early life history of Great Lakes fish, Western Michigan University, Department of Biology. (invited oral presentation)
- 2014 Biophysical drivers of walleye recruitment variation in Lake Erie, Lake Erie-Inland Waters Annual Research Review, Columbus, Ohio. (invited oral presentation)
- 2013 The use of hydrodynamic backtracking as a tool for studying population connectivity, Ecological Society of America Annual Meeting, Minneapolis, Minnesota. (contributed oral presentation)
- 2013 A coupled biophysical model of walleye recruitment in western Lake Erie, International Association of Great Lakes Research Annual Meeting, West Lafayette, Indiana. (invited oral presentation)
- 2013 A coupled biophysical model of walleye recruitment in western Lake Erie, Lake Erie-Inland Waters Annual Research Review, Columbus, Ohio. (invited oral presentation)
- 2012 Predator-prey space games: a general model and empirical patterns, The Ohio State University, Department of Evolution, Ecology, and Organismal Biology. (invited oral presentation)
- 2011 An individual-based model of predator-prey space games, Evolution 2011, Norman, Oklahoma. (contributed oral presentation)
- 2011 Connecting predation risk assessment to prey behavior, The Ohio State University, School of Natural Resources and the Environment. (invited oral presentation)
- 2010 Connecting predation risk assessment to prey behavior, The University of Tulsa, Department of Biological Science. (invited oral presentation)
- 2010 Connecting predation risk assessment to prey behavior, Oklahoma State University, Department of Zoology. (invited oral presentation)

- 2007 Predation risk assessment and the anti-predator behavioral dynamics of larval anurans, The University of Michigan, Department of Ecology and Evolutionary Biology. (invited oral presentation)
- 2006 The effect of circadian rhythms on anti-predator behavior in green frog (*Rana clamitans*) tadpoles, Ecological Society of America Annual Meeting, Memphis, Tennessee. (contributed oral presentation)
- 2005 Some effects of short term temporal variation in predation risk on the behavior of green frog (*Rana clamitans*) tadpoles, Ecological Society of America Annual Meeting, Montreal, Quebec. (contributed poster)
- 2005 Some effects of short term temporal variation in predation risk on the behavior of green frog (*Rana clamitans*) tadpoles, Midwest Ecology and Evolution Conference, Carbondale, Illinois. (contributed oral presentation)

Teaching Experience

- Winter, 2016 Guest Lecturer, EEOB 3410, Introduction to Ecology, The Ohio State University
- Fall, 2015 Instructor of Record, EEOB 8896, Scientific Writing, The Ohio State University
- Winter, 2014 Guest Lecturer, EEOB 3410, Introduction to Ecology, The Ohio State University
- Spring, 2008 Instructor of Record, Biology 171, Introductory Biology: Ecology and Evolutionary Biology, The University of Michigan
- Fall, 2006 Lab Coordinator (Graduate Student Instructor, GSI), Biology 282, Field Ecology, The University of Michigan
- Winter, 2006 GSI, Biology 162, General Biology, The University of Michigan
- Fall, 2005 Lab Coordinator (GSI), Biology 282, Field Ecology, The University of Michigan
- Winter, 2005 GSI and Guest Lecturer, Biology 281, General Ecology, The University of Michigan
- Fall, 2004 Lab Coordinator (GSI), Biology 282, Field Ecology, The University of Michigan
- Fall, 2002 GSI, Biology 282, Field Ecology, The University of Michigan
- Winter, 2002 GSI, Biology 162, General Biology, The University of Michigan

Student Mentorship

September 2019-present

Undergraduate: Lauren Payne (2020, PitE Honor's project)

Master's: Group project: Emily Dusicska, Rae Green, Carol Rosenbaum, Xinjie Wu, and Kathy Sun (2020-21)

PhD committee: Brenna Friday (Wayne State University, 2020-present)

CIGLR Great Lakes Summer Fellows: Anisha Shrestha (2020, co-mentored with Russ Miller), Brenna Friday (2020)

2004-September 2019

High school: LaCarr Trent (2015), Kenton Colvin (2016)

Undergraduate: Sarah Szymanski (2004), Jon Falk (2005), Christine Balmes (2005-6), Sarah Seiter (2006), Sara Koelsch (2013-15), Jacob Lebamoff (2016), Taylor Brown (2016-18; Honor's thesis), Derek Huck (2017), Kaitlyn Scott (2017), Molly Kotick (2018-19, Honor's thesis)

Master's: Theses: Anna Moyer (2009-11), Reed Brodnik (2013-15)

PhD: David Dippold (2016-2020)

Service

- 2019 Judge, 71st Annual Ohio Academy of Science State Science Day, Columbus, Ohio
- 2019 Organized class visits on aquatic ecology with Jessica Florea, New Albany High School, Ohio
- 2018 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2018 Presenter, Museum of Biological Diversity Annual Open House, The Ohio State University
- 2017 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2017 Judge, 69th Annual Ohio Academy of Science State Science Day, Columbus, Ohio
- 2017 Presenter, Museum of Biological Diversity Annual Open House, The Ohio State University
- 2016 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2016 Judge, Blaxter Award, 40th Annual Larval Fish Conference, Solomons, Maryland.
- 2015 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2015 Judge, 67th Annual Ohio Academy of Science State Science Day, Columbus, Ohio

- 2015 Judge, 2015 NMS Undergraduate Research Forum, The Ohio State University
- 2014 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2014 Initiated weekly Behavioral Ecology Discussion Group, The Ohio State University
- 2014 Judge, student presentations, IAGLR Annual Meeting, Hamilton, Ontario
- 2014 Judge, 66th Annual Ohio Academy of Science State Science Day, Columbus, Ohio
- 2013 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2013 Judge, student presentations, IAGLR Annual Meeting, West Lafayette, Indiana
- 2013 Judge, Denman Undergraduate Research Forum, The Ohio State University
- 2012 Organizer/Presenter, Annual 6th Graders' AEL Field Trip, The Ohio State University
- 2006-7 Mentor, EEB Graduate Mentorship Program, The University of Michigan
- 2004 Coordinator, EEB Lunch Seminar series, The University of Michigan

Peer reviewing

September 2019-present

Journals: Ecological Modeling (2), Oecologia, Progress in Oceanography

2005-September 2019

Granting agencies: Great Lakes Fishery Trust, National Science Foundation, Natural Sciences and Engineering Research Council of Canada, Ohio Sea Grant

Book: Trophic Ecology (Garvey, J. E.)

Journals: Acta Herpetologica, Acta Oecologica, American Naturalist, Animal Behaviour, Animal Cognition, Annales Zoologica Fennici, Aquatic Ecology, Behaviour, Behavioral Ecology, Behavioral Ecology and Sociobiology, Biological Journal of the Linnean Society, Biology Letters, Canadian Journal of Fisheries and Aquatic Sciences, Canadian Journal of Zoology, Ecology and Evolution, Ecological Modelling, Ecosphere, Ethology, Ethology Ecology and Evolution, Evolutionary Biology, Frontiers in Biology, General and Comparative Endocrinology, Global Change Biology, The Herpetological Journal, Hydrobiologia, Journal of Animal Ecology, Journal of Biosciences, Journal of Chemical Ecology, Journal of Comparative Psychology, Journal of Great Lakes Research, Journal of Herpetology, Landscape Ecology, Marine and Freshwater Behaviour and Physiology, North American Journal of Fisheries Management, Oecologia, Oikos, PeerJ, Reviews in Fisheries Science and Aquaculture, Transactions of the American Fisheries Society

Training and Workshops

2013 Bayesian Hierarchical Modeling, The Ohio State University
2006-7 Preparing Future Faculty, The University of Michigan

Professional Membership

American Society of Naturalists, Association for the Sciences of Limnology and Oceanography,
Ecological Society of America, International Association for Great Lakes Research, Society for the
Study of Amphibians and Reptiles

References

Dr. Earl Werner (Ph.D. advisor)
Professor Emeritus
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The University of Michigan
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Dr. Stuart Ludsin (Postdoctoral supervisor)
Professor
Aquatic Ecology Laboratory
The Ohio State University
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Columbus, Ohio 43212-1156
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Dr. Barney Luttbeg (Postdoctoral supervisor)
Associate Professor
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Oklahoma State University
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Dr. Robert Denver (Postdoctoral supervisor)
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