

Nathan V. Whelan

Lab Address

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Education

- 2013** Ph.D. Biological Sciences—The University of Alabama, Tuscaloosa, AL
Dissertation: Systematics, Life History, and Conservation of *Leptoxis* (Gastropoda: Cerithioidea: Pleuroceridae).
Adviser: Phillip M. Harris. **Co-Adviser:** Paul D. Johnson
- 2008** B.S. Biology. Cum Laude. Chemistry Minor, Spanish Minor—Truman State University, Kirksville, MO.

Current Positions

- March 2018-present** *Assistant Professor*
Auburn University-Auburn, Alabama
- Member of School of Fisheries, Aquaculture, and Aquatic Sciences in the College of Agriculture
 - Educating and advising students and postdocs
- July 2016-present** *Director Southeast Conservation Genetics Lab*
US Fish and Wildlife Service-Auburn, Alabama
- Principal investigator of government research lab.
 - My lab studies evolutionary genomics, molecular ecology, and systematics of aquatic organisms with an emphasis on mollusks and other species of conservation concern.
- November 2013-present** *Research Associate*
Smithsonian Institution; National Museum of Natural History-Washington, DC
- Collaborating on research projects involving the systematics and genomics of freshwater gastropods, primarily Pleuroceridae and Semisulcospiridae.

Previous Positions

- February 2014-July 2016** *Postdoctoral Fellow*
Auburn University-Auburn, AL **Adviser:** Kenneth Halanych
- Researched the evolution of non-bilaterian metazoans and other marine invertebrates using genomic tools. Explored performance of amino acid substitution models with phylogenomic sized datasets in simulation and with empirical data. Instructor of record for graduate-level bioinformatics class.
- May 2013-August 2013** *Mollusk Research Assistant*
May 2011-August 2011
Alabama Department of Conservation and Natural Resources-Marion, AL
- Designed and implemented novel captive propagation and conservation protocols for freshwater snails.
 - Curated collections from state-wide mollusk surveys.

May 2012-August 2012 *Predoctoral Fellow* **Adviser:** Ellen Strong

Smithsonian Institution; National Museum of Natural History-Washington, DC

- Performed a research project on the population genetics, phylogeny, and species boundaries of imperiled freshwater snails including the federally threatened Round Rocksnail (*Leptoxis ampla*)

Peer-Reviewed Articles (*Student author)

29. Townsend, J.P.* , M.G. Tassia*, A. Damian-Serrano* , **N.V. Whelan**, K.M. Halanych, A.M. Sweeney. (2020) New deep-sea ctenophore *Vampyroctena delmarvensis* gen. nov., sp. nov. with a revision of Mertensiidae L. Agassiz, 1860 (Ctenophora: Cydippida). *Marine Biodiversity*. 50: 34. DOI: 10.1007/s12526-020-01049-9
28. Kspeka, S.P.* , **N.V. Whelan**, C.M. Whipps, S.A. Bullard. (2020) A new species of *Thelohanellus* Kudo, 1933 (Myxozoa: Bilvalvulida) infecting somatic muscle of blacktail shiners, *Cyprinella venusta* Girard, 1856 (Cypriniformes: Cyprinidae) in the Chattahoochee River Basin, Georgia, USA. *Journal of Parasitology*. IN PRESS. DOI: 10.1645/19-162
27. Bogantes, V.E.* , **N.V. Whelan**, K. Webster*, A.R. Mahon, K.M. Halanych (2020) Unrecognized diversity of a scale worm, *Polyeunoa laevis* (Annelida: Polynoidae), that feeds on soft coral. *Zoological Scripta*. 48: 236-249. DOI: 10.1111/zsc.12400
26. Ksepka, S.P.* , J.M. Rash, **N.V. Whelan**, S.A. Bullard. (2019) A new species of *Myxobolus* (Myxozoa: Bivalvulida) infecting the medulla oblongata and nerve cord of brook trout *Salvelinus fontinalis* in southern Appalachia (New River, North Carolina, USA). *Parasitology Research*. 118: 3241-3252. DOI: 10.1007/s00436-019-06472-x
25. **Whelan, N.V.**, M.P. Galaska*, B.N. Siple*, J.M. Weber*, P. D. Johnson, K.M. Halanych, B.S. Helms. (2019) Riverscape genetic variation, migration patterns, and morphological variation of the threatened Round Rocksnail, *Leptoxis ampla*. *Molecular Ecology*. 28: 1593-1610. DOI: 10.1111/mec.15032
24. Bullard, S.A., J.R. Roberts*, M.B. Warren*, H.R. Dutton*, **N.V. Whelan**, C.F. Ruiz*, T.R. Platt, V.V. Tkach, S.V. Brant, K.M. Halanych. (2019) Neotropical turtle blood flukes: two new genera and species from the Amazon River basin with a key to genera and comments on a marine-derived parasite lineage in South America. *Journal of Parasitology*. 105: 497-523. DOI: 10.1645/19-27
23. Strong, E.E., **N.V. Whelan**. (2019) Assessing the diversity of western North American *Juga* (Semisulcospiridae, Gastropoda). *Molecular Phylogenetics and Evolution*. 136: 87-103. DOI: 10.1016/j.ympev.2019.04.009
22. Warren, M.B.* , H.R. Dutton*, **N.V. Whelan**, R.P.E. Yanong, S.A. Bullard. (2019) First Record of a Species of Mermithidae Braun, 1883 Infecting a Decapod, *Palaemon paludosus* (Palaemonidae). *Journal of Parasitology*. 105: 237-247. DOI: 10.1645/18-168
21. Warren, M.B.* , C.F. Ruiz*, **N.V. Whelan**, D.C. Kritsky, S.A. Bullard. (2019) *Gymnurahemecus bulbosus* gen. et sp. nov. (Digenea: Aporocotylidae) infecting smooth butterfly rays, *Gymnura micrura* (Myliobatiformes: Gymnuridae) in the northern Gulf of Mexico, with a taxonomic key and further evidence for monophyly of chondrichthyan blood flukes. *Parasitology Research*. 118:751-762. DOI: 10.1007/s00436-018-06202-9

20. **Whelan, N.V.**, K.M. Kocot, T.P. Moroz, K. Mukherjee, P. Williams, G. Paulay, L.L. Moroz, K.M. Halanych. (2017) Ctenophore relationships and their placement as the sister group to all other animals. *Nature Ecology and Evolution*. 1: 1737-1746. DOI: 10.1038/s41559-017-0331-3
19. **Whelan, N.V.**, P.D. Johnson, J.T. Garner, E.E. Strong. (2017) On the identity of *Leptoxis taeniata* – a misapplied name for the federally threatened Painted Rocksnail (Cerithioidea: Pleuroceridae). *Zookeys*. 697: 21-36. DOI: 10.3897/zookeys.697.14060
18. Tassia, M.G.* , **N.V. Whelan**, K.M. Halanych. (2017) Toll-like receptor pathway evolution in deuterostomes. *Proceedings of the National Academy of Sciences*. 114: 7055–7060. DOI: 10.1073/pnas.1617722114
17. Costa-Paiva E.M.* , **N.V. Whelan**, D.S. Waits*, S. Santos, C.G. Schrago, K.M. Halanych. (2017) Discovery and evolution of novel hemerythrin genes in annelid worms. *BMC Evolutionary Biology*. 17: 85. DOI: 10.1186/s12862-017-0933-z
16. **Whelan, N.V.**, K.M. Halanych. (2017) Who let the CAT Out of the Bag? Accurately dealing with substitutional heterogeneity in phylogenomics. *Systematic Biology*. 66: 232-255. DOI: 10.1093/sysbio/syw084
15. Yuanning, Li*, K.M. Kocot, **N.V. Whelan**, S.R. Santos, D.S. Waits*, D.J. Thornhill, K.M. Halanych. (2017) Phylogenomics of tubeworms (Siboglinidae, Annelida) and comparative performance of different reconstruction methods. *Zoologica Scripta*. 46: 200-213. DOI: 10.1111/zsc.12201
14. **Whelan, N.V.**, K.M. Halanych, K.M. Kocot, A.B. Kohn, L.L. Moroz. (2016) Miscues misplace sponges. *Proceedings of the National Academy of Sciences*. 113: E946-E947. DOI: 10.1073/pnas.1525332113
13. **Whelan, N.V.**, E.E. Strong. (2016) Morphology, molecules and taxonomy: extreme incongruence in pleurocerids (Gastropoda, Cerithioidea, Pleuroceridae). *Zoologica Scripta*. 45: 62-87. DOI: 10.1111/zsc.12139
12. **Whelan, N.V.** (2016) Radular morphology of extinct pleurocerids (Gastropoda: Cerithioidea: Pleuroceridae). *American Malacological Bulletin*. 33: 221-226. DOI: 10.4003/006.033.0202
11. **Whelan, N.V.**, K.M. Kocot, K.M. Halanych. (2015) Employing phylogenomics to resolve the relationships among cnidarians, ctenophores, sponges, placozoans, and bilaterians. *Integrative and Comparative Biology*. 55: 1084-1095. DOI: 10.1093/icb/icv037
10. **Whelan, N.V.**, K.M. Kocot, L.L. Moroz, K.M. Halanych. (2015) Error, signal, and the placement of Ctenophora sister to all other animals. *Proceedings of the National Academy of Sciences*. 112: 5773-5778. DOI: 10.1073/pnas.1503453112
9. **Whelan, N.V.**, P.D. Johnson, P.M. Harris. (2015) Life-history traits and shell morphology in the genus *Leptoxis* Rafinesque, 1819 (Gastropoda: Cerithioidea: Pleuroceridae). *Journal of Molluscan Studies*. 81: 85-95. DOI: 10.1093/mollus/EYU058
8. **Whelan, N.V.**, K.M. Kocot, S.R. Santos, K.M. Halanych. (2014) Transcriptome sequencing of nemerteans reveals a diverse suite of toxin genes. *Genome Biology and Evolution*. 6: 3314-3325. DOI: 10.1093/gbe/evu258

7. **Whelan, N.V.**, E.E. Strong. (2014) Seasonal reproductive anatomy and sperm storage in pleurocerid gastropods (Cerithioidea: Pleuroceridae). *Canadian Journal of Zoology*. 92: 989-995. DOI: 10.1139/cjz-2014-0165
6. Benstead, J.P., J.M. Hood, **N.V. Whelan**, M.R. Kendrick, D. Nelson, A.F. Hanninen, L.M. Demi. (2014) Dietary P-growth coupling across diverse fish taxa: a meta-analysis of experimental aquaculture studies. *Ecology*. 95: 2768-2777. DOI: 10.1890/13-1859.1
5. Johnson, P.D., A.E. Bogan, K.M. Brown, N.M. Burkhead, J.R. Cordeiro, J.T. Garner, P.D. Hartfield, D.A. Lepitzki, G.L. Mackie, E. Pip, T.A. Tarpley, J.S. Tiemann, **N.V. Whelan**, E.E. Strong. (2013) Conservation status of freshwater gastropods of Canada and the United States. *Fisheries*. 38: 247-282. DOI: 10.1080/03632415.2013.785396
4. **Whelan N.V.**, P.D. Johnson, P.M. Harris. (2012) Rediscovery of *Leptoxis compacta* (Anthony, 1854) (Gastropoda: Cerithioidea: Pleuroceridae). *PLoS One*. 7: e42499. DOI: 10.1371/journal.pone.0042499
3. **Whelan, N.V.**, P.D. Johnson, P.M. Harris. (2012) Presence or absence of carinae between closely related populations of *Leptoxis ampla* (Anthony, 1854) (Gastropoda: Pleuroceridae) is not the result of ecophenotypic plasticity. *Journal of Molluscan Studies*. 78: 231-233. DOI: 10.1093/mollus/ey005
2. **Whelan, N.V.** (2011) Species tree inference in the age of genomics. *Trends in Evolutionary Biology*. 3: e5. DOI: 10.4081/eb.2011.e5
1. **Whelan, N.V.**, A. Geneva, D.L. Graf. (2011) Molecular phylogenetic analysis of tropical freshwater mussels (Mollusca: Bivalvia: Unionoida) resolves the position of *Coelatura* and supports a monophyletic Unionidae. *Molecular Phylogenetics and Evolution*. 61: 504-514. DOI: 10.1016/j.ympev.2011.07.016

Unpublished Preprints (*student author, ‡advised postdoc author)

2. Wright, A.D.* , N.L. Garrison‡, A.S. Williams, P.D. Johnson, **N.V. Whelan**. (2020) Range reduction of the Oblong Rocksnail, *Leptoxis compacta*, shapes riverscape genetic patterns. *Biorxiv*. DOI: 10.1101/2020.05.12.090662.
1. Garrison, N.L., P.D. Johnson, N.V. Whelan. (2020) Conservation genomics reveals low genetic diversity and multiple parentage in the threatened freshwater mussel, *Margaritifera hembeli*. *Biorxiv*. 10.1101/2020.03.31.018689

Articles in Review (*Student author, ‡advised postdoc author)

2. Wright, A.D.* , N.L. Garrison‡, A.S. Williams, P.D. Johnson, N.V. Whelan. Range reduction of the Oblong Rocksnail, *Leptoxis compacta*, shapes riverscape genetic patterns. IN REVIEW at *PeerJ*.
3. Garrison, N.L., P.D. Johnson, N.V. Whelan. (2020) Conservation genomics reveals low genetic diversity and multiple parentage in the threatened freshwater mussel, *Margaritifera hembeli*. IN REVIEW at *Conservation Genetics*.
1. Ksepka, S.P.* , B. Hickson, **N.V. Whelan**, S.A. Bullard. A new species of *Myxobolus* Bütschli, 1882 (Bivalvulida: Myxobolidae) infecting stratum spongiosum of the cryptic sicklefin redhorse,

Moxostoma sp., (Cypriniformes: Catostomidae) from the Little Tennessee River, North Carolina, USA. IN REVIEW at *Folia Parasitologica*.

Government Reports, Newsletter Articles, and Scientific Blogs (*Student author)

15. Williams, A.S., **N.V. Whelan**. (2019) Molecular identification of Gopher Frog (*Rana capito*) raised at Bears Bluff National Fish Hatchery. Report submitted to USFWS and Bears Bluff National Fish Hatchery.
14. **Whelan, N.V.**, N.L. Garrison, J.T. Garner, P.D. Johnson. (2019) Conservation genetics of listed and candidate freshwater snails in the Mobile and Tennessee River drainages, interim report. Report submitted to Alabama Department of Conservation and Natural Resources.
13. Williams, A.S., **N.V. Whelan**. (2019) Assessment of hatchery contribution and genetic diversity of American shad (*Alosa sapidissima*) in the Edisto River, SC, an update. Report submitted to USFWS and Bears Bluff National Fish Hatchery.
12. Williams, A.S., **N.V. Whelan**. (2019) Genetic evaluation of lake sturgeon reintroduction program in the Tennessee River, 2019 Annual Report. Report submitted to USFWS and Tennessee River Lake Sturgeon Reintroduction Working Group.
11. Williams, A.S., **N.V. Whelan**. (2018) Assessment of hatchery contribution and genetic diversity of American shad (*Alosa sapidissima*) in the Edisto River, SC. Report submitted to USFWS and Bears Bluff National Fish Hatchery
10. Williams, A.S., **N.V. Whelan**. (2018) Genetic assessment of Striped Bass (*Monroe saxatilis*) brood stock repository lakes in the Apalachicola-Chattahoochee-Flint (ACF) River Systems. Report submitted to USFWS and Gulf Strain Striped Bass Recovery Committee.
9. Williams, A.S., **N.V. Whelan**. (2018) Genetic evaluation of lake sturgeon reintroduction program in the Tennessee River, 2018 Annual Report. Report submitted to USFWS and Tennessee River Lake Sturgeon Reintroduction Working Group.
8. Helms, B.S., **N.V. Whelan**, L. Tolley-Jordan, K.M. Halanych, B.N. Siple*, D. Wicker*, J. Weber*, M.P. Galaska*. (2017) Population structure of the Round Rocksnail (*Leptoxis ampla*) in the Cahaba River. Report submitted to Alabama Department of Conservation and Natural Resources.
7. Strong, E.E., **N.V. Whelan**, J.T. Garner, P.D. Johnson. (2015) Genetic diversity of the Black Mudalia, *Elimia melanoidea* (Conrad 1834) (Caenogastropoda, Pleuroceridae). Report submitted to U.S. Fish and Wildlife Service.
6. **Whelan, N.V.** (2014) Classical methods shed new light on freshwater snail reproduction, with conservation implications. *No Bones About It: NMNH's Invertebrate Biology Blog*. http://nrmnh.typepad.com/no_bones/2014/11/classical-methods-shed-new-light-on-freshwater-snail-reproduction-with-conservation-implications.html
5. Evans, R., **N.V. Whelan**. (2014) Recent observation of *Leptoxis* from the Rockcastle River, Kentucky. *Ellipsaria*. 16:4.
4. **Whelan, N.V.** (2014) Contemporary surveys and new explorations. *Cracking the Collections*. <https://crackingthecollections.wordpress.com/2014/07/10/new-explorations/>

3. **Whelan, N.V.** (2012) *Leptoxis compacta* (Gastropoda: Pleuroceridae) found for the first time in over 75 years. *Ellipsaria* (cover article). 14:3.
2. **Whelan, N.V.** (2010) Preliminary results of life history strategies of the freshwater snail genus *Leptoxis* (Cerithioidea: Pleuroceridae) from the southeastern United States. *American Malacological Society Newsletter*. 41:2.
1. **Whelan, N.V.**, P.M. Harris, P.D. Johnson. (2010) Microsatellite DNA loci primers for *Leptoxis ampla* (Gastropoda: Pleuroceridae). Report submitted to Alabama Department of Conservation and Natural Resources.

Grants and Fellowships \$2,613,000 awarded since 2008

- 2019 Sea Grant, National Oceanic and Atmospheric Administration.** *Pelagic Ecosystem Research Consortium (PERC) for highly migratory species (HMS) in the Gulf of Mexico and NW Atlantic Ocean.* (Listed as Co-PI). \$1,600,000 (Auburn University Component: \$400,00).
- 2019 Competitive 1311 funds for Fisheries and Aquatic Conservation, U.S. Fish and Wildlife Service.** *Systematics and phylogenetics of Myxobolus: a needed tool for preventing invasion and controlling spread of disease causing fish parasites.* (Listed as PI). \$102,000.
- 2019 Competitive 1311 funds for Fisheries and Aquatic Conservation, U.S. Fish and Wildlife Service.** *Whole nuclear genome sequencing of a freshwater mussels and two fish.* (Listed as PI) \$59,000
- 2018 Aquatic Nuisance Species Grant, Gulf States Marine Fisheries Commission.** *Novel tools to detect, track, and trace Myxobolus cerebralis, (causative agent of whirling disease) in the southeastern United States.* (Listed as Co-PI). \$25,000.
- 2018 Endangered Species Research Funding, Ecological Services, U.S. Fish and Wildlife Service.** *Conservation genomics of Spotfin Chub *Cyprinella monacha* (Cypriniformes: Cyprinidae: Leuciscinae).* (Listed as PI) \$20,000.
- 2017 Competitive 1311 funds for Fisheries and Aquatic Conservation, U.S. Fish and Wildlife Service.** *Development of genetics management plans for six federally listed animal species.* (Listed as PI) \$372,151.
- 2017 Alabama Department of Conservation Section 6 Grant.** *Conservation genetics of listed and candidate freshwater snails in the Mobile and Tennessee River drainages.* (Listed as Co-PI) \$62,067
- 2016 Smithsonian Institution Global Genome Initiative Research Grant.** *Targeted sequencing and phylogenomics of the critically imperiled Pleuroceridae.* (Listed as Co-PI) \$29,973
- 2016 Alabama Department of Conservation Section 6 Grant.** *Population structure of the Round Rocksnail (*Leptoxis ampla*) in the Cahaba River.* (Listed as Co-PI) \$33,244
- 2014 Alabama Department of Conservation Section 6 Grant.** *Development of Nuclear Molecular Markers for Pleuroceridae Systematics and Conservation Assessment.* (Listed as Co-PI) \$21,143
- 2013 The University of Alabama Graduate Student Travel Award.** \$800
- 2012 Smithsonian Institution Predoctoral Fellowship.** *Do extreme genetic differences translate to internal morphological differences within "species" of Pleuroceridae (Gastropoda: Cerithioidea)?* \$7,650
- 2012 American Malacological Society Student Travel Award.** \$770
- 2012 The University of Alabama Graduate Student Travel Award.** \$1150

- 2011 National Science Foundation Doctoral Dissertation Improvement Grant.** *Remnants of a diverse past: assessing the phylogenetic position of recently extinct pleurocerid snails (Gastropoda: Pleuroceridae).* DEB-1110638. (Listed as Co-PI) \$14,996
- 2011 The University of Alabama Graduate Council Fellowship.** \$36,356
- 2011 The University of Alabama Graduate School Student Research Grant.** \$600
- 2010 Alabama Department of Conservation and Natural Resources.** *Microsatellite Development Grant.* (Listed as subcontractor) \$5,000
- 2010 The University of Alabama Graduate Student Travel Award and International Travel Supplement.** \$900
- 2010 Conchologists of America Student Research Award.** \$1,400
- 2010 The University of Alabama Graduate Student Association Travel Grant.** \$400
- 2010 The University of Alabama Graduate School Travel Grant.** \$600
- 2009 Birmingham Audubon Society Walter F. Coxe Research Grant.** \$1,000
- 2009 American Malacological Society Melbourne R. Carriker Student Research Award.** \$800
- 2008 The University of Alabama, Ecology, Evolution and Systematics 2 year enhancement fellowship.** \$55,000

Professional Service

- 2018-present Voting Member.** Gastropod Names Committee, Freshwater Mollusk Conservation Society.
- 2017 Invited Panel Reviewer.** National Science Foundation, Biodiversity and Systematics.
- 2017 Invited Expert Reviewer.** Red Wolf Recovery Committee, United States Fish and Wildlife Service.
- 2017-present Invited Internal Reviewer for Species Status Assessments.** U.S. Fish and Wildlife Service.
- 2017-2018 Invited Proposal Reviewer.** Society of Systematic Biologists Annual Student Research Grants.
- 2016-present Editorial Board Member.** *Systematic Biology*
- 2016-present Lead Geneticist.** Tennessee River Lake Sturgeon Recovery Committee.
- 2016-present Lead Geneticist.** Sicklefin Redhorse Working Group.
- 2016-present Lead Geneticist.** Gulf Striped Bass Recovery Committee.
- 2016-2018 Member.** Snail Darter Recover Committee.
- 2013-present Chair.** Gastropod Distribution and Status Committee, Freshwater Mollusk Conservation Society.
- 2012-present Appointed Member.** Alabama State Gastropod Conservation Priority Committee.
- 2012-present Invited Reviewer.** *Biological Invasions, Freshwater Mollusk Biology and Conservation, Freshwater Science, Hydrobiologia, Invertebrate Systematics, Journal of Molluscan Studies, Molecular Biology and Evolution, Molecular Ecology, North American Journal of Fisheries Management, PLoS One, Polar Biology, PeerJ, Proceedings of the Royal Society B, Scientific Reports, Southwestern Naturalist, Systematic Biology, Toxicon, US Fish and Wildlife Service Mollusk Recovery Plans and Threat Assessments, Zoological Studies.*

- 2011-2014** **Appointed Member.** Endangered Species Committee, American Fisheries Society.
2011-2013 **Student Councilor at Large.** American Malacological Society Executive Council.

Awards and Honors

- 2018** **Against All Odds Award for commitment to freshwater mollusk conservation in the Cahaba River.** Cahaba River Society.
2016 **30 under 30 award for exceptional young professionals.** Pi Kappa Phi.
2014 **Annual Award for Outstanding Initial Contribution to Malacology.** London Malacological Society.
2012 **Ralph L. Chermock Prize for Most Outstanding Graduate Student.** The University of Alabama, Department of Biological Sciences.
2012 **Selected to attend Bodega Bay Phylogenetics Workshop.**
2010 **2nd Prize, Best Student Talk.** The Systematics Association.
2010 **Best Student Oral Presentation.** American Malacological Society.
2009 **Honorable Mention, Best Oral Presentation.** Association of Southeastern Biologists.
2008 **Presidents Academic Achievement Award.** Truman State University.
2004 **President's Combined Ability Scholarship.** Truman State University.
2004 **Foreign Language Scholarship.** Truman State University.
2004 **Missouri Bright Flight Scholarship.**
2004 **National Eagle Scout Association Scholarship.**

Invited Talks

- 10. Whelan, N.V.** Modeling substitutional heterogeneity and its impact on inferring relationships. www.phyloseminar.org. October 2016. Recorded at <https://www.youtube.com/watch?v=VLcn-jQq5CQ>
- 9. Whelan, N.V.** Gastropod and ctenophore phylogenetics, difficult questions require fresh perspectives. **Academy of Natural Sciences Research Seminar Series.** Philadelphia, Pennsylvania. September 2016.
- 8. Whelan, N.V.** Is everything we think we know about animal phylogeny and snail life history wrong? **Auburn University Fisheries and Aquaculture Seminar Series.** Auburn, Alabama. August 2016.
- 7. Whelan, N.V.** (speaker), K.M. Kocot, A.B. Kohn, T.P. Tatiana, K. Mukherjee, P. Williams, C. Mills, G. Paulay, L.L. Moroz, K.M. Halanych. Body plan and lifestyle evolution of ctenophores. **Ctenopoolooza.** St. Augustine, Florida. March 2016.
- 6. Whelan, N.V.** Utilizing genomics to understand aquatic invertebrate evolution. **Field Museum, A. Watson Armour Seminar Series .** Chicago, Illinois. December 2015.
- 5. Whelan, N.V.** (speaker), K.M. Kocot, K.M. Halanych. Resolving the metazoan tree of life with advanced bioinformatics pipelines and phylogenetic methods. *Society for Integrative and Comparative Biology Annual Meeting.* **Origins of neurons and parallel evolution of nervous systems: the dawn of neuronal evolution symposium.** West Palm Beach, Florida. January 2015.

4. Halanych, K.M. (speaker), K.M. Kocot, **N.V. Whelan**. Early animal relationships: alternative hypotheses and character inference. *Society for Integrative and Comparative Biology Annual Meeting. Origins of neurons and parallel evolution of nervous systems: the dawn of neuronal evolution symposium*. West Palm Beach, Florida. January 2015.
3. **Whelan, N.V.** Systematics and Life History Evolution of Pleurocerid Snails (Cerithioidea: Pleuroceridae). **Truman State University Biology Seminar Series**. Kirksville, Missouri. April 2014.
2. **Whelan, N.V.** Systematics and Life History Evolution of Freshwater Mollusks. **Arkansas State University Biology Seminar Series**. Jonesboro, Arkansas. January 2014.
1. **Whelan, N.V.** Systematics and egg laying evolution of Pleuroceridae (Gastropoda: Cerithioidea). *Annual Meeting of the American Malacological Society. Conchologists of America grant winners symposium*. Philadelphia, Pennsylvania. June 2012.

Oral Presentations (*Student author)

30. **Whelan, N.V.** (speaker), A.S. Williams, C. Redak*, A.A. Wright*, N.L. Garrison, K.M. Halanych, P.D. Johnson, J.T. Garner. Migration patterns and fragmentation drive landscape genomic patterns in freshwater snails. *Society for Integrative and Comparative Biology Annual Meeting*. Austin, Texas January 2020.
29. Strong, E.E. (speaker), **N.V. Whelan**, N. Garrison, P.D. Johnson, J.T. Garner. Targeted sequencing and phylogenomics of the critically imperiled pleuroceridae (Gastropoda: Cerithioidea). *World Congress of Malacology*. Pacific Grove, California. August 2019.
28. **Whelan, N.V.** (speaker), N. Garrison, J.T. Garner, P.D. Johnson, E.E. Strong. Phylogenomics reveals relationships and biogeographic patterns of a critically imperiled group of freshwater snails (Cerithioidea: Pleuroceridae). *Evolution*. Providence, Rhode Island. June 2019.
27. **Whelan, N.V.** (speaker), P.D. Johnson, J.T. Garner, E.E. Strong. More is better: hundreds of nuclear genes improve understanding of Pleuroceridae (Gastropoda: Cerithioidea) relationships. *Freshwater Mollusk Conservation Society Biennial Symposium*. San Antonio, Texas. April 2019.
26. Garrison, N (speaker), P.D. Johnson, **N.V. Whelan**. Conservation genomic assessment of wild and captive populations of the Louisiana Pearlsnail, *Margaritifera hembeli* (Conrad), using RADSEQ. *Freshwater Mollusk Conservation Society Biennial Symposium*. San Antonio, Texas. April 2019.
25. Warren, M.B.* (speaker), **N.V. Whelan**, S.A. Bullard. Systematics of two species of elasmobranch blood flukes (Digenea: Aporocotylidae) suggest both host-switching and cophyly. *Southeastern Society of Parasitologists*. Starkville, Mississippi. April 2018.
24. Warren, M.B.* (speaker), **N.V. Whelan**, R. Yanong, S.A. Bullard. When something seemingly simple turns out to be not simple: Mermithid-infected eastern grass shrimp (*Palaemonetes paludosus*) (Decapoda: Palaemonidae). *43rd Annual Eastern Fish Health Workshop*. Chattanooga, Tennessee. April 2018
23. Warren, M.B.* (speaker), **N.V. Whelan**, S.A. Bullard. Host-switching and cophyly among blood parasites of early branching gnathostomes. *This is Research Student Symposium*. Auburn Alabama. March 2018

22. **Whelan, N.V.** (speaker), B.N. Siple*, M.P. Galaska*, B.S. Helms, P.D. Johnson, K.M. Halanych. Populations of *Leptoxis ampla*, a federally threatened snail species, are surprisingly distinct. *Society for Integrative and Comparative Biology*. San Francisco, California. January 2018.
21. **Whelan, N.V.** (speaker), A. Maloy, M.Curtis, M. Bartron. Mitochondrial genome sequencing and phylogenetic placement of the functionally extinct Alabama Sturgeon. *Southeastern Fishes Council Annual Meeting*. Chattanooga, Tennessee. November 2017.
20. Johnson, P.D (speaker), **N.V. Whelan**, J. Archambault. Identification of research priorities for North American freshwater gastropods. *Society for Freshwater Science Annual Meeting*. Raleigh, North Carolina. June 2017.
19. Abdelrahman, H.A. (speaker), M. Clay*, C. Figiel, **N.V. Whelan**, B.S. Helms, J. Stoeckel. Use of environmental DNA (eDNA) and the electron transport system (ETS) assay to assess current and future spread of invasive *Orconectes virilis* in the southeastern United States. *Society for Freshwater Science Annual Meeting*. Raleigh, North Carolina. June 2017.
18. **Whelan, N.V.** (speaker), P.D. Johnson, J.T. Garner, K.M. Halanych, B.S. Helms, E.S. Strong. Applying genomics to advance our understanding of freshwater mollusks. *Freshwater Mollusk Conservation Society Biennial Symposium*. Cleveland, Ohio. March 2017.
17. Strong, E.S. (speaker), **N.V. Whelan**. Filling the gaps: the importance of dense geographic sampling for assessing the diversity of western North American *Juga* (Gastropoda: Semisulcospiridae). *Freshwater Mollusk Conservation Society Biennial Symposium*. Cleveland, Ohio. March 2017.
16. **Whelan, N.V.** (speaker), K.M. Halanych. Who Let the CAT Out of the Bag? Handling substitutional heterogeneity with data partitioning results in more accurate phylogenies. *Evolution*. Austin, Texas. June 2016.
15. **Whelan, N.V.** (speaker), K.M. Kocot, A.B. Kohn, T.P. Tatiana, K. Mukherjee, P. Williams, C. Mills, G. Paulay, L.L. Moroz, K.M. Halanych. Phylogenomics resolves relationships among major Ctenophora lineages. *Society for Integrative and Comparative Biology*. Portland, Oregon. January 2016.
14. **Whelan, N.V.** (speaker), K.M. Halanych. Model choice and metazoan phylogenomics: model complexity does not ensure accurate phylogenetic hypotheses. *The Origins of Metazoa International Workshop*. Giens, France. October 2015.
13. Johnson, P.D. (speaker), A.E. Bogan, K.M. Brown, N.M. Burkhead, J.R. Cordeiro, J.T. Garner, P.D. Hartfield, D.A.W. Lepitzki, G.R. Mackie, E. Pip, T.A. Tarpley, J.R. Tiemann, **N.V. Whelan**, E.E. Strong. Update to the conservation status of freshwater gastropods of Canada and the United States. *American Malacological Society Annual Meeting*. Pellston, Michigan. August 2015.
12. **Whelan, N.V.** (speaker), K.M. Kocot, L.L. Moroz, K.M. Halanych. Error, signal, and the placement of Ctenophora sister to all other animals. *Evolution*. Guarujá, Brazil. June 2015.
11. **Whelan, N.V.** (speaker), P.D. Johnson, E.E. Strong. Draft genome assembly of *Leptoxis ampla* (Pleuroceridae): a resource for conservation studies. *Freshwater Mollusk Conservation Society Biennial Symposium and Joint Meeting with the Upper Mississippi River Conservation Committee*. St. Charles, Missouri. March 2015

10. Johnson, P.D. (speaker), A.E. Bogan, K.M. Brown, N.M. Burkhead, J.R. Cordeiro, J.T. Garner, P.D. Hartfield, D.A.W. Lepitzki, G.R. Mackie, E. Pip, T.A. Tarpley, J.R. Tiemann, **N.V. Whelan**, E.E. Strong. Update to the conservation status of freshwater gastropods of Canada and the United States. *Freshwater Mollusk Conservation Society Symposium and Joint Meeting with the Upper Mississippi River Conservation Committee*. St. Charles, Missouri. March 2015.
9. **Whelan, N.V.** Modeling life history evolution of a critically imperiled family of freshwater gastropods. *Evolution*. Snowbird, Utah. June 2013.
8. **Whelan, N.V.** (speaker), E.E. Strong, P.D. Johnson. Morphology, molecules, and taxonomy: the pleurocerid problem. *Freshwater Mollusk Conservation Society Symposium*. Guntersville, Alabama. March 2013.
7. Strong, E.E. (speaker), J.T. Garner, P.D. Johnson, **N.V. Whelan**. Divergent haplotypes and implications for phylogeny of the Pleuroceridae using mitochondrial markers. *Freshwater Mollusk Conservation Society Biennial Symposium*. Guntersville, Alabama. March 2013.
6. **Whelan, N.V.** Systematics of *Leptoxis* (Gastropoda: Pleuroceridae). *American Malacological Society Annual Meeting*. Pittsburgh, Pennsylvania. July 2011.
5. **Whelan, N.V.** (speaker), P.M. Harris, P.D. Johnson. Conservation and systematics of *Leptoxis* (Gastropoda: Pleuroceridae). *Freshwater Mollusk Conservation Society Biennial Symposium*. Louisville, Kentucky. April 2011.
4. **Whelan, N.V.** Life history evolution of *Leptoxis* (Gastropoda: Pleuroceridae). *Young Systematists Forum*. London, United Kingdom. December 2010.
3. **Whelan, N.V.** Life history of *Leptoxis* (Gastropoda: Pleuroceridae). *Joint Meeting of the American Malacological Society and the Western Society of Malacologists*. San Diego, California. July 2010.
2. **Whelan, N.V.** (speaker), B. Hartwig, T. Blasingame, D.R. DeCock, J.C. Gering. Advances in the statistical methodology of phylogenetic community ecology. *Association of Southeastern Biologists Annual Meeting*. Birmingham, Alabama. April 2009.
1. **Whelan, N.V.** Team katydid: the math-bio experience. *21st Annual Student Research Conference*. Truman State University, Kirksville, Missouri. April 2008.

Poster Presentations (*Student author)

8. Wright, A.D.*, A.S. Williams, N.L. Garrison, **N.V. Whelan**. Conservation Genetics of *Leptoxis compacta*. *Society for Integrative and Comparative Biology Annual Meeting*. Austin, Texas January 2020.
7. Redak, C.*, A.S. Williams, K.M. Halanych, **N.V. Whelan**. Genetic diversity and gene flow of an endangered freshwater snail, *Pleurocera foremani*. *Society for Integrative and Comparative Biology Annual Meeting*. Austin, Texas January 2020.
6. Williams, A.S., **N.V. Whelan**. Assessment of hatchery contribution and genetic diversity of American shas (*Alosa sapidissima*) in the Edisto River, South Carolina. *Southeastern Fishes Council Annual Meeting*. November 2019.

5. Townsend, J.P., M.G. Tassia, A. Damian-Serrano, **N.V. Whelan**, K.M. Halanych, A.M. Sweeney. A colorful, deep sea ctenophore species from the northwest Atlantic Ocean. *Society for Integrative and Comparative Biology Annual Meeting*. San Francisco, California. January 2018.
4. Webster, K.J.*, **N.V. Whelan**, K.M. Halanych. A molecular investigation into the biodiversity and biogeography of Antarctic *Thouarella* (Cnidaria: Octocorallia: Primnoidae). *Society for Integrative and Comparative Biology Annual Meeting*. West Palm Beach, Florida. January 2015.
3. **Whelan, N.V.**, E.E. Strong. Extreme mitochondrial and nuclear phylogenetic discordance in Pleuroceridae (Gastropoda: Cerithioidea). *Evolution*. Snowbird, Utah. June 2013.
2. **Whelan, N.V.**, A. Geneva, D.L. Graf. What if anything is a Unionid? *Ceolatura* Conrad 1852 and the monophyly of the Unionidae (Mollusca: Bivalvia: Unionoida). *London Malacological Society's Malacology Forum*. London, United Kingdom. November 2010.
1. **Whelan, N.V.**, B. Hartwig, T. Blasingame, D.R. DeCock, J.C. Gering. Effects of phylogenetic tree topology and local and regional species richness on NRI and NTI distributions. *Annual Conference for the Society of Mathematical Biology*. San Jose, California. August 2007.

Teaching Experience

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|-------------|---|
| 2019 | <i>Instructor</i> . Bioinformatics and Genome Assembly for Conservation Genetics week-long workshop. Auburn University. |
| 2019 | <i>Guest Lecturer</i> . Agriculture Genetics. Auburn University. |
| 2019 | <i>Guest Lecturer</i> . Conservation Ecology of Freshwater Invertebrates. Auburn University. |
| 2018 | <i>Instructor</i> . Gastropod Classification and Identification Workshop. Freshwater Mollusk Conservation Society. |
| 2018 | <i>Instructor</i> . Phylogenetics Crash Course Workshop. Auburn University. |
| 2017 | <i>Guest Lecturer</i> . Conservation Biology Learning Community. Auburn University. |
| 2017 | <i>Guest Lecturer</i> . Agriculture Genetics. Auburn University. |
| 2017 | <i>Guest Lecturer</i> . Conservation Ecology of Freshwater Invertebrates. Auburn University. |
| 2016 | <i>Guest Lecturer</i> . Conservation Biology Learning Community. Auburn University. |
| 2016 | <i>Guest Lecturer</i> . Agriculture Genetics. Auburn University. |
| 2016 | <i>Guest Lecturer</i> . Introduction to Bioinformatics. Auburn University. |
| 2014 | <i>Instructor of Record</i> . Python for Bioinformatics. Auburn University. |
| 2014 | <i>Guest Lecturer</i> . Phylogenetics. Auburn University. |
| 2014 | <i>Guest Lecturer</i> . Invertebrate Biology. Auburn University. |
| 2013 | <i>Graduate Teaching Assistant</i> . Anatomy and Physiology II Lab. The University of Alabama. |
| 2013 | <i>Guest Lecturer</i> . Conservation Biology. The University of Alabama. |
| 2012 | <i>Graduate Teaching Assistant</i> . Vertebrate Zoology. The University of Alabama. |
| 2012 | <i>Guest Lecturer</i> . Principles of Systematics. The University of Alabama. |

- 2012** *Guest Lecturer.* Genomics. The University of Alabama.
- 2011** *Graduate Teaching Assistant.* Introductory Biology II Lab. The University of Alabama.
- 2007-2008** *Undergraduate Teaching Assistant.* Chemistry for Non-Majors I & II. Truman State University.
- 2006** *Undergraduate Teaching Assistant.* Introductory Biology II. Truman State University.
- 2005** *Undergraduate Teaching Assistant.* Introductory Biology I. Truman State University.

Student and Postdoctoral Mentoring

- 2020-present** **Systematics and conservation of Pleuroeridae**
I advise a Ph.D. student, Nicholas Gladstone, who is working on systematics and conservation genetics of pleurocerid gastropods.
- 2019-present** **Conservation genomics of freshwater gastropods.**
I co-advise a graduate student, Caitlin Redak, on a conservation genetics project for the federally endangered *Pleurocera foremani*.
- 2019** **NSF Research Experience for Undergraduates**
I advised an undergraduate researcher, Aaliyah Wright, as a part of the NSF funded REU warm-water aquatic ecology site at Auburn University. The student-led independent research project focused on conservation genomics of the critically imperiled freshwater gastropod *Leptoxis compacta*.
- 2018-present** **Conservation genomics of freshwater mussels**
I advise a post-doctoral researcher, Nicole Garrison, on a variety of projects that broadly aim to improve our understanding of conservation genomics of freshwater mussels. This work has a large policy component as it includes development of US Fish and Wildlife Service genetics management plans for threatened and endangered species.
- 2016-2019** **eDNA monitoring of invasive crayfish.**
I co-advise a post-doctoral researcher, Hisham Abdelrahman, on his development of an eDNA assay for invasive crayfish species currently present in Alabama.
- 2016-2018** **Population genomics of Round Rocksnail.**
I co-advise a graduate student, Breanna Siple, on her project focusing on conservation genomics and biogeography of a federally threatened freshwater snail.
- 2014-2015** **Biogeography and population genetics of Antarctic *Thouarella* Octocorals.**
I mentored an undergraduate researcher, Katie Webster, on DNA extraction, PCR, sequence analysis, and composing a scientific manuscript.
- 2014-2015** **Population genomics of *Sterechinus* sea urchins.**
I mentored an undergraduate student, Hallie McCarthy, as she worked on the population genomics of *Sterechinus* sea urchins from Antarctica using a 2bRAD approach.

Outreach

- 2019** **Staff training for the Cahaba Environmental Center.** One day training on freshwater mollusk biodiversity and identification in the Cahaba River in central Alabama.

- 2019-present** **Warm Springs National Fish Hatchery Kids-Go-Fish Day.** Annual program to educate kids about recreational fishing and teach basic fishing skills.
- 2019** **Auburn University School of Fisheries, Aquaculture, and Aquatic Sciences Open House.** Day-long exhibit on freshwater invertebrate ecology with live animal exhibits.
- 2016-present** **Warm Springs National Fish Hatchery Open Houses.** Participate in annual open house outreach events at USFWS Warm Springs National Fish Hatchery Complex.
- 2016** **Greater East Alabama Science and Engineering Fair Judge.** Auburn University. Judged science fair projects of middle school students from across eastern Alabama.
- 2015** **NPR's Science Friday video feature.**
I was interviewed for the weekly national broadcast. A video produced by Science Friday about my research was featured on their website:
<http://www.sciencefriday.com/video/08/03/2015/the-unlikely-tale-of-a-tenacious-snail.html>
- 2014-2016** **Icy Invertebrates Outreach Team.** Auburn University.
We make presentations to K-12 students in Alabama about Antarctic biology and our work on Antarctica's invertebrate fauna.
- 2014-2016** **AU Explore.** Auburn University
Annual science outreach program to middle school students in eastern Alabama.
- 2008-2012** **Volunteer Elementary School Science Tutor.** Tuscaloosa's One Place.

Bioinformatics Repositories Available from <http://github.com/nathanwhelan>

- 6. Generate-Sequences** Python and bash scripts for simulating phylogenomic-like datasets using known trees and Indel-Seq-Gen
- 5. Order-Genes-by-Evolutionary-Rate** Python script for ranking evolutionary rate of a set of genes using single-gene trees.
- 4. Post-HaMStR-Orthology-Script** Shell script for initial orthology determination using homologous amino acid sequences inferred by HaMStR
- 3. Split-Supermatrix-Into-Partitions** R script for splitting a sequence super matrix into individual genes; used primarily to aid analyses on published datasets that require alignments of each gene.
- 2. Make-gene-list** Bash script to make a partition list for programs like PartitionFinder and BaCoCa from many single gene alignments.
- 1. Automate-PAML-codeml** Python script that automates evolutionary rate analyses for hundreds or thousands of genes using the PAML package codeml.

Field Experience

- 2017-present** *Freshwater mussel sampling.* Since 2017 I have worked on population genomics projects for freshwater mussels, which has include considerable fieldwork. I have experience sampling a number of freshwater mussels species, including threatened and endangered species (e.g., *Margaritifera hembeli*, *Epioblasma brevidens*, *Hamiota altilus*).
- 2008-present** *Freshwater gastropod sampling.* Since 2008 I have done frequent sampling for snails for population genetics and systematics of freshwater gastropods. I have also done full drainage qualitative surveys, in collaboration with the Alabama Department of

Conservation and Natural Resources. Sampling has included threatened and endangered species (e.g., *Leptoxis ampla*, *Leptoxis plicata*, *Athearnia anthonyi*).

Research Cruises

- 2016** *Research Vessel Sharp*. Chief Scientist: Alison Sweeny. Atlantic Ocean
Midwater sampling of invertebrates with an emphasis on ctenophores and mollusks.
- 2014** *Research Vessel Oceanus*. Chief Scientist: Craig R. Smith. Pacific Ocean
Recovery of deep-sea landers and processing of samples, particularly *Xylophaga* bivalves
and *Osedax* annelids.