

# MILTON TAN, PhD

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## AFFILIATIONS

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Aug 2018 – **Assistant Research Scientist in Biodiversity Genomics** Illinois Natural History Survey at University of Illinois at Urbana-Champaign  
Visiting Assistant Research Scientist Aug 2018 – Mar 2019  
Affiliate, Department of Ecology, Evolution, and Behavior (Sep 2018–)  
Affiliate, Program in Ecology, Evolution & Conservation Biology (June 2019–)  
Affiliate, Informatics PhD Program (Aug 2020–)

2018 Jan–  
Aug **National Science Foundation Postdoctoral Fellow**  
George Washington University Visiting Scholar  
Smithsonian Institution Fellow with the National Museum of Natural History  
Funded by NSF Postdoctoral Research Fellowship in Research Using Biological Collections  
Research Focus: Evolution of Defensive Traits and Diversification in Catfishes  
Sponsors: Guillermo Ortí, George Washington University; Carole Baldwin, Smithsonian Institution

2016 – 2017 **Emory University**  
Postdoctoral Fellow  
Research Focus: Whale shark comparative genomics and bioinformatics  
Advisors: Timothy D. Read, Alistair D. M. Dove

## EDUCATION

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2016 Aug 8 **Auburn University**  
Ph.D, Biological Sciences  
Dissertation: Evolution of Miniaturization and Paedomorphism in Fishes of the Order Cypriniformes  
Major Advisor: Jonathan W. Armbruster  
Committee: Jason W. Bond, Eric Peatman, and Scott R. Santos

2009 May 30 **University of Delaware**  
Bachelor of Sciences, Biological Sciences with Concentration in Ecology and Organismal Biology, Honors Degree With Distinction  
Minors: Marine Studies, Business Administration  
Magna Cum Laude (Cumulative GPA: 3.859)  
Senior Thesis: The Effect of Alien Plants on the Survival of Larval Lepidoptera. University of Delaware, Senior Thesis. (Thesis Advisor: Doug Tallamy)

## PUBLICATIONS

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14. *In press*. AD Sweet, KP Johnson, Y Cao, RS de Moya, RK Skinner, **M Tan**, S Virrueta-Herrera, SL Cameron. Structure, gene order, and nucleotide composition of mitochondrial genomes in parasitic lice from Amblycera. *Gene*. doi: 10.1016/j.gene.2020.145312
13. 2020. SE Miller, LN Barrow, SE Ehlman, JA Goodheart, SE Greiman, HL Lutz, TM Misiewicz, SM Smith, **M Tan**, CJ Thawley, JA Cook, JE Light. Building natural history collections for the 21<sup>st</sup> century and beyond. *BioScience* 70(8): 674-687. doi: 10.1093/biosci/biaa069
12. 2019. ED Burress, **M Tan**, PC Wainwright. Head shape modulates diversification of a classic cichlid pharyngeal jaw innovation. *American Naturalist* 194 (5): 693-706. doi: 10.1086/705392
11. 2018. **M Tan**, JW Armbruster. Phylogenetic classification of extant genera of fishes of the order Cypriniformes (Teleostei: Ostariophysi). *Zootaxa* 4476(1): 006–039. doi: 10.11646/zootaxa.4476.1.4
10. 2018. ED Burress, L Piálek, J Casciotta, A Almirón, **M Tan**, JW Armbruster, O Říčan. Island- and lake-like parallel adaptive radiations replicated in rivers. *Proceedings of the Royal Society B* 285: 20171762. doi: 10.1098/rspb.2017.1762
9. 2017. ED Burress, **M Tan**. Ecological opportunity alters the timing and shape of adaptive radiation. *Evolution* 71(11): 2650–2660. doi: 10.1111/evo.13362
8. 2017. TD Read, RA Petit III, SJ Joseph, MT Alam, MR Weil, Maida Ahmad, R Bhimani, JS Vuong, CP Haase, DH Webb, **M Tan (corresponding author)**, ADM Dove. Draft sequencing and assembly of the genome of the world's largest fish, the whale shark: *Rhincodon typus* Smith 1828. *BMC Genomics* 18: 532. doi: 10.1186/s12864-017-3926-9
7. 2017. ED Burress, JM Holcomb, **M Tan**, JW Armbruster. Ecological diversification associated with the benthic-to-pelagic transition by North American minnows. *Journal of Evolutionary Biology* 30(3): 549–560. doi: 10.1111/jeb.13024
6. 2016. CC Stout, **M Tan (co-first author)**, AR Lemmon, EM Lemmon, JW Armbruster. Resolving Cypriniformes relationships using an Anchored Hybrid Enrichment approach. *BMC Evolutionary Biology* 16: 244. doi: 10.1186/s12862-016-0819-5  
*Media features:*  
Auburn University Featured Story [[http://ocm.auburn.edu/featured\\_story/minnows.html](http://ocm.auburn.edu/featured_story/minnows.html)]
5. 2016. **M Tan**, LS de Souza, JW Armbruster. A new species of *Panaqolus* (Siluriformes: Loricariidae) from the rio Branco. *Neotropical Ichthyology* 14(2): e150033. doi: 10.1590/1982-0224-20150033  
*Selected media features:*

Amazonas Magazine Nov/Dec 2016: [<http://www.reef2rainforest.com/2016/09/20/amazonas-magazine-table-of-contents-nov-dec-2016/>]

4. 2016. **M Tan**, JW Armbruster. Two new species of spotted *Hypancistrus* from the Rio Negro Drainage (Loricariidae, Hypostominae). ZooKeys 552: 123–135. doi: 10.3897/zookeys.552.5956

*Selected media features:*

Amazonas Magazine Nov/Dec 2016: [<http://www.reef2rainforest.com/2016/09/20/amazonas-magazine-table-of-contents-nov-dec-2016/>]

3. 2015. JW Armbruster, DC Werneke, **M Tan**. Three new species of saddled loricariid catfishes, and a review of *Hemiancistrus*, *Peckoltia*, and allied genera (Siluriformes). ZooKeys 480: 97–123. doi: 10.3897/zookeys.480.6540

*Selected media features:*

CNN [<http://www.cnn.com/2015/03/17/us/feat-greedy-catfish-species/>]

Auburn University Newsroom [[http://ocm.auburn.edu/newsroom/news\\_articles/2015/03/auburn-universitys-armbruster-discovers-catfish-species-names-it-for-star-wars-character.htm](http://ocm.auburn.edu/newsroom/news_articles/2015/03/auburn-universitys-armbruster-discovers-catfish-species-names-it-for-star-wars-character.htm)]

Nerdist [<http://www.nerdist.com/2015/02/the-closest-thing-to-star-wars-greedy-is-now-a-catfish/>]

2. 2014. CK Ray, **M Tan**, JW Armbruster. First record of *Chrosomus erythrogaster* (Cypriniformes: Cyprinidae) in the Mobile Basin. Southeastern Naturalist 13(4): N33–N36. doi: 10.1656/058.013.0402

1. 2012. **M Tan**, JW Armbruster. *Cordylancistrus santarosensis* (Siluriformes: Loricariidae), a new species with unique snout deplation from the Río Santa Rosa, Ecuador. Zootaxa 3243:52–58.

*Selected media features:*

National Geographic Daily News

[<http://news.nationalgeographic.com/news/2012/04/pictures/120410-new-armored-suckermouth-catfish-discovery-animals-science/>]

Zootaxa Top 10 most accessed papers 2012 (8<sup>th</sup> in March)

[<http://www.mapress.com/zootaxa/collections/mostaccess/2012.html>]

Auburn University Graduate School Magazine Fall 2012/Winter 2013

[<http://issuu.com/augraduateschool/docs/fall2012-winter2013>]

### Non-Peer Reviewed Reports

1. 2020. ML Niemiller, R Hardman, D Thames, D Istvanko, C Ogle, MA Davis, **M Tan**, JJ Apodaca, J Benito, J Campbell, T Clark, K Dooley, D Miller, KDK Niemiller, C Simpson, P Upchurch. Assessment of geographic range, habitat, and population genetics of the Green Salamander (*Aneides aeneus*) in Tennessee. Southeastern Association of Fish & Wildlife Agencies. 86 pp.

### Not Peer-Reviewed Preprints

1. (Submitted) **M Tan**, AK Redmond, H Dooley, R Nozu, K Sato, S Kuraku, S Koren, AM Phillippy, ADM Dove, TD Read. The whale shark genome reveals patterns of vertebrate gene family evolution. bioRxiv. doi: 10.1101/685743

## OTHER PRODUCTS

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*Bioinformatic tools* (Available on GitHub: <https://github.com/miltontan>)

Stages analysis – Scripts for testing for differences in timing of diversification in two uni- or multivariate traits.

## GRANTS & FELLOWSHIPS

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2020 Upper Mississippi River Restoration (UMRR) Program Science in Support of Management: Augmenting the UMRR fish vital rates project with greater species representation for genetics and otolith microchemistry. (PIs: Andy Bartels, Jim Lamer, co-PIs: Kristen Bouska, Mark Davis, Milton Tan, Greg Whitledge; \$228,283 for INHS).

Illinois Department of Natural Resources Wildlife Preservation Fund: “Evaluating Population Genomic Heterogeneity for the Illinois’ Remnant Mottled Sculpin (*Cottus bairdi*)” (PI: Mark A. Davis, co-PIs: **Milton Tan**, \$17,244).

2020 Dovetail Tree of Life Grant Award. (PI: Milton Tan, co-PI: Roberto Cucalon, \$15,000 value). *Declined*.

2020 PAG PacBio Single Molecular, Real-Time (SMRT) Contest. (PI: **Milton Tan**, \$2,500 value)

2019 Herbert H. Ross Memorial Fund, University of Illinois Urbana-Champaign, School of Integrative Biology: “Preliminary assessment of ddRADseq for comparative biogeography in North American Minnows (Leuciscidae) of Champaign County, Illinois” (PI: **Milton Tan**, \$2,000).

Illinois Department of Natural Resources Wildlife Preservation Fund: “Predicting post-extirpation colonization potential: Connectivity of Illinois’ relictual Ironcolor Shiner (*Notropis chalybaeus*) via Population Genomics” (PI: Mark A. Davis, co-PIs: Jeff A. Stein, **Milton Tan**, \$6,700).

2018 Genome Sciences Center GenoPitch Award, University of Minnesota: “All the better to fight you with? Developmental transcriptomics in the facial weaponry of Neotropical electric fishes” (PI: Kory Evans, co-PI: **Milton Tan**, \$2,500).

2017 National Science Foundation: Postdoctoral Research Fellowships in Biology in Research Using Biological Collections: “Evolution of Defensive Traits and Diversification in Catfishes” (**PI**, 2 year fellowship: \$138,000 total stipend, \$30,000 research funds; DBI-1711854). *Terminated early*.

Smithsonian National Museum of Natural History: Global Genome Initiative Fellowship. (**PI**, 2 year fellowship: \$104,000 = \$96,000 total stipend, \$8,000 research funds). *Declined*.

2013– Auburn University Cellular & Molecular Biosciences Peaks in Excellence Research  
2015 Fellowship (awarded three times, \$4,500 stipend each award).

2009– Graduate Dean's Fellowship from Auburn University (\$1,200).  
2010

## PRESENTATIONS

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Presentations are oral presentations unless indicated. Undergraduate mentees are underlined.

### *Summary of Presentation Honors and Awards*

- 2017 Society of Systematic Biologists Ernst Mayr Student Award Symposium Finalist at Evolution 2017 [Title: Diagnosing Effects of Systematic Error and Phylogenetic Signal in Phylogenomics: A Case Study on the Order Cypriniformes]
- 2013 American Society of Ichthyologists & Herpetologists Stoye Award for Best Student Oral Presentation in General Ichthyology at JMIH [Title: What is Miniaturization?: Lack of Miniaturization in the Evolution of Body Size in a Group Including Some of the Smallest Fishes in the World (Danioninae: Cyprinidae)]
- 2011 Neotropical Ichthyological Association Best Student Poster Award winner at JMIH [Title: Molecular phylogenetics of *Hypancistrus* (Loricariidae: Siluriformes) using cytochrome *b*]

### *Invited Talks and Symposia*

- 2019 “Solving the World's Challenges” Panel, Funk ACES Library, Urbana-Champaign, IL.
- “Evolution of Defenses and Diversification in Catfishes” National Science Foundation Postdoctoral Research Fellowship in Biology for Research Using Biological Collections Mini-Symposium, University of New Mexico Sevilleta Field Station, La Joya, NM.
- 2017 “Diagnosing Effects of Systematic Error and Phylogenetic Signal in Phylogenomics: A Case Study on the Order Cypriniformes.” **Ernst Mayr Symposium Student Award Competition Finalist**, Society of Systematic Biologists, Evolution 2017, Portland, OR. [ Watch online: <https://youtu.be/nSNyejRKdW0> ]
- 2015 “The All Cypriniformes Tree of Life: a resource for comparative studies applied to diversification and evolution of body size.” American Society of Ichthyologists and Herpetologists, Joint Meeting of Ichthyologists and Herpetologists, Reno, NV.

### *Invited Institutional Seminars*

- 2020 Feb 14 Darwin Day, Department of Biological Sciences, DePaul University.
- 2018 Aug 29 Program in Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign.
- Feb 2 Illinois Natural History Survey, University of Illinois at Urbana-Champaign.

2017 Feb 17 Florida Museum of Natural History, University of Florida.

Feb 3 Program in Population Biology, Ecology & Evolution, Emory University.

*Contributed Presentations*

I was presenter only on first-author presentations.

Underlined authors were undergraduate mentees.

Presentations were oral presentations unless indicated.

**2020**

49. Niemiller ML, MA Davis, **M Tan**, JJ Apodaca, KE Dooley, J Benito, KDK Niemiller, R Hardman, D Istvanko, C Ogle, D Thames, D Miller, J Campbell, C Simpson, P Upchurch. Two for one? Phylogenomics and population genetic analyses of the Green Salamander (*Aneides aeneus*) reveal two lineages in Tennessee. 2020 Annual Southeast Partners in Amphibian and Reptile Conservation Meeting, Nauvoo, AL, 27–29 February [oral 5 min].

**2019**

47. **M Tan**, JW Armbruster. Shape Evolution and Diversification in North American Leuciscidae (Cypriniformes). Joint Meeting of Ichthyologists and Herpetologists, Snowbird, UT.
46. **M Tan**, JW Armbruster. Shape Evolution and Diversification in North American Leuciscidae (Cypriniformes). Evolution 2019, Providence, RI.
45. **M Tan**, JW Armbruster. Body Shape Diversification Varies by Clade but not Habitat in North American Minnows (Leuciscidae: Cyprinoidei). Society for the Preservation of Natural History Collections, Chicago, IL.
44. **M Tan**, AK Redmond, H Dooley, R Nozu, K Sato, S Kuraku, S Koren, AM Phillippy, ADM Dove, TD Read. Vertebrate gene family evolution and the whale shark genome. University of Illinois Institute for Genomic Biology Fellows Symposium, Champaign, IL.
43. J Elsherbini, **M Tan**. Shape variation among catfishes of the superfamily Aspredinoidea (Siluriformes). University of Illinois Undergraduate Research Symposium, Champaign, IL.
42. I Sadler, **M Tan**. Body shape variation among catfishes of the superfamily Pimelodoidea (Siluriformes). University of Illinois Undergraduate Research Symposium, Champaign, IL. Poster.
41. **M Tan**. Minnows on the EDGE: Conservation prioritization incorporating evolutionary distinctiveness. Illinois chapter of the American Fisheries Society, Champaign, IL.

**2018**

- 40. **M Tan**, G Ortí. Identification of Putative Venom Genes in Catfishes. Gordon Research Conference: Venom Evolution, Function and Biomedical Applications, West Dover, VT. Poster.
- 39. **M Tan**, ADM Dove, Tim Read. Comparative genomics of the whale shark and the evolution of vertebrate gigantism. Joint Meeting of Ichthyologists and Herpetologists, Rochester, NY.
- 38. ED Burress, **M Tan**. Ecological opportunity alters the timing and shape of adaptive radiation. Society of Integrative and Comparative Biology, San Francisco, CA.

**2017**

- 37. **M Tan**. A New and Improved Genome Assembly of the Whale Shark (*Rhincodon typus*). Emory University Postdoc Research Symposium. Poster.
- 36. **M Tan**, ADM Dove, TD Read. A New and Improved Genome Assembly of the Whale Shark (*Rhincodon typus*). Joint Meeting of Ichthyologists and Herpetologists, Austin, TX.
- 35. **M Tan**, JW Armbruster. Phylogenomic Interrogation of Deep Relationships in the Cypriniformes: Diagnosing the Effects of Error, Signal, and Noise. Joint Meeting of Ichthyologists and Herpetologists, Austin, TX. Poster.
- 34. ED Burress, **M Tan**, JW Armbruster. Evolution of pharyngeal jaw shape, size, and associated musculature across the Neotropical cichlid phylogeny. Society for Comparative and Integrative Biologists, New Orleans, LA.

**2016**

- 33. **M Tan**, JW Armbruster. Functional genomic evolution of paedomorphic Cypriniformes. Joint Meeting of Ichthyologists and Herpetologists, New Orleans, LA.
- 32. ED Burress, O Říčan, L Piálek, J Casciotta, **M Tan**, JW Armbruster. Parallel phenotypic diversification and rapid speciation of *Crenicichla* species flocks: riverine analogs to the East African Great Lake cichlids. Joint Meeting of Ichthyologists and Herpetologists, New Orleans, LA.
- 31. ED Burress, O Říčan, L Piálek, J Casciotta, **M Tan**, JW Armbruster. Parallel phenotypic diversification and rapid speciation of *Crenicichla* species flocks: riverine analogs to the East African Great Lake cichlids. Evolution 2016, Austin, TX.
- 30. **M Tan**, JW Armbruster. Functional genomic evolution of paedomorphic Cypriniformes. Evolution, Austin, TX.

**2015**

- 29. **M Tan**, JW Armbruster. Minnows on the EDGE: Incorporating phylogeny into conservation biology. Southeastern Fishes Council, Gainesville, FL.
- 28. JW Armbruster, ED Burress, S Ferdous, **M Tan**. The evolutionary ecology of cyprinids. Southeastern Fishes Council, Gainesville, FL.
- 27. KC Benesh, **M Tan**, JW Armbruster. Range Stability of *Etheostoma tallapoosae* and *Etheostoma stigmaeum*. Southeastern Fishes Council, Gainesville, FL. Poster.
- 26. **M Tan**, JW Armbruster. Transcriptome Evolution of Paedomorphic Cyprinidae. Joint Meeting of Ichthyologists and Herpetologists, Reno, NV. Poster.

25. JW Armbruster, **M Tan**, M Hayes, CC Stout. The Cypriniform African Invasion. Joint Meeting of Ichthyologists and Herpetologists, Reno, NV.
24. CC Stout, **M Tan**, JW Armbruster. Phylogeography of Leuciscinae. Joint Meeting of Ichthyologists and Herpetologists, Reno, NV.
23. KC Benesh, **M Tan**, JW Armbruster. Shape variation and evolution of the genus *Phenacobius*. Joint Meeting of Ichthyologists and Herpetologists, Reno, NV. Poster.
22. ED Burress, **M Tan**, JW Armbruster. Craniofacial diversification across the cichlid fish adaptive radiation. Joint Meeting of Ichthyologists and Herpetologists, Reno, NV.
21. **M Tan**, JW Armbruster. Building the All Cypriniformes Tree of Life. Auburn University "This Is Research!" Symposium.
20. KC Benesh, **M Tan**, JW Armbruster. Investigation of the Correlation Between Shape Variation of Species in *Phenacobius* and Their Evolutionary Relationships. Auburn University "This Is Research!" Symposium.
19. AA Boggio, **M Tan**, JW Armbruster. Shape evolution in genus *Luxilus*. Auburn University "This Is Research!" Symposium.
18. KE Wright, **M Tan**, JW Armbruster. Geometric morphometrics and shape evolution of *Hybognathus*. Auburn University "This Is Research!" Symposium. Poster.
17. **M Tan**, JW Armbruster. Building the All Cypriniformes Tree of Life. Southeastern Ecology & Evolution Conference, University of Georgia, GA.
16. **M Tan**, CC Stout, AR Lemmon, EM Lemmon, JW Armbruster. Phylogeny of paedomorphic fishes of Cypriniformes using anchored phylogenomics. Society of Integrative and Comparative Biology, West Palm Beach, FL.

## 2014

15. CC Stout, **M Tan**, AR Lemmon, EM Lemmon, JW Armbruster. Preliminary phylogeny of Cypriniformes Based on Anchored Hybrid Enrichment with a Focus on Leuciscinae. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.
14. **M Tan**, CC Stout, AR Lemmon, EM Lemmon, JW Armbruster. Phylogenomics and the evolution of paedomorphism in Cyprinidae. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.
13. ED Burress, **M Tan**, JW Armbruster. Ecological diversification among adaptive radiations of Neotropical cichlids. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.
12. **M Tan**, CC Stout, AR Lemmon, EM Lemmon, JW Armbruster. Phylogenomics and the evolution of paedomorphism in Cyprinidae. Evolution 2014, Raleigh, NC.
11. **M Tan**, CC Stout, AR Lemmon, JW Armbruster. Many Trees for Mini Fishes: Phylogenomic analysis and gene tree discordance in paedomorphic cyprinid fishes. Southeastern Ecology and Evolution Conference, Georgia Southern University, GA.
10. CC Stout, **M Tan**, AR Lemmon, JW Armbruster. Preliminary phylogeny of Cypriniformes based on anchored hybrid enrichment with a focus on Leuciscinae (true minnows). Southeastern Ecology and Evolution Conference, Georgia Southern University, GA.
9. **M Tan** & JW Armbruster. What is Miniaturization? Evolution of body size in diminutive southeast Asian minnows of the subfamily Danioninae. Auburn University Graduate Scholars Forum.



**2013**

8. **M Tan** & JW Armbruster. What is Miniaturization?: Lack of Miniaturization in the Evolution of Body Size in a Group Including Some of the Smallest Fishes in the World (Danioninae: Cyprinidae). Joint Meeting of Ichthyologists and Herpetologists, Albuquerque, NM. **ASIH Stoye Award for best student oral presentation in General Ichthyology.**
7. **M Tan**. Little Fish, Big Questions: In Search of the Genomic Basis of Paedomorphism in Miniature Fishes (Cyprinidae). Auburn University 3 Minute Thesis competition.
6. **M Tan** & JW Armbruster. Body size evolution of the Danioninae. Southeastern Ecology and Evolution Conference, University of Central Florida, FL.

**2012**

5. **M Tan** & JW Armbruster. Molecular phylogenetics of *Hypancistrus* (Loricariidae: Siluriformes) using cytochrome *b*. Evolution 2012, Montreal, Canada. Poster.
4. **M Tan** & JW Armbruster. Phylogenetics of Venezuelan *Hypancistrus* (Loricariidae: Siluriformes): a recent radiation of catfishes? Southeastern Ecology and Evolution Conference, Clemson University, SC.

**2011**

3. **M Tan**, EC Wheeler, JW Armbruster. Geometric morphometric analysis of the genus *Hybopsis* (Cyprinidae: Ostariophysi). Southeastern Fishes Council, Chattanooga, TN.
2. **M Tan** & JW Armbruster. Molecular phylogenetics of *Hypancistrus* (Loricariidae: Siluriformes) using cytochrome *b*. Joint Meeting of Ichthyologists and Herpetologists, Minneapolis, MN. Poster. **Neotropical Ichthyological Association Best Student Poster Award winner.**
1. **M Tan**. Three new species of suckermouth armored catfishes (Siluriformes: Loricariidae: Ancistrini). Southeastern Ecology and Evolution Conference, Auburn University, AL. Poster.

**RESEARCH MENTORSHIP AND ADVISING**

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*As Graduate Advisor**Current:*

Roberto Cucalon Tamayo (PhD). University of Illinois, PEEC. Summer 2020 –

*As Graduate Student Committee Member**Current:*

Wesley Au (PhD). University of Illinois, Informatics. Fall 2020 –

Jules Chabain (PhD). University of Illinois, EEB. Spring 2020 –

Robert de Moya (PhD). University of Illinois, Entomology. Spring 2020 –

Kathleen Quibedeaux (MS). University of Illinois, NRES. Fall 2019 –

*Previous:*

Loralee Wilson (MS). University of Illinois, EEB. Summer 2020 – Summer 2020

*Current Undergraduate Research Mentees*

Alexis Alvey (2019–), Jacob Norbot (2019–), Emma Grassi (2020).

*Past Undergraduate Research Mentees*

UIUC: Shianglin Menez (2019–20), Jemima Elsherbini (2019–20, now pursuing Ph.D.), Emily Davis (2018–2019, now pursuing Ph.D.); Caeley Bryan, Abby Knipp, Isabella Sadler, Ryan Hill, Gracie Jasper, Sydney Koelper, Karlana Livengood, Bridget Smith (2019); Roqayah Mohammed, Hana Ostrander, Alyssa Petko, Hien Than (UIUC, 2018).

GWU: Tyler Cholankeril, Hadeel Saad (GWU, 2018).

AUM: Kasey Benesh (2014–16), Nicholas Chaffin, Robin Lloyd, Jessica McCarthy, Danielle Sander (2015–2016), Travia Johnson (2016), Audrey A Boggio, Akaash Singh, Hunter Turner, Kristen E. Wright (2014–15); Erin Hartsfield, E. Claire Wheeler (2011).

**TEACHING EXPERIENCE**

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*Courses*

Spring 2021 Co-Instructor for Current Topics in Systematics seminar  
Co-Instructor for Innovations in Conservation and Evolutionary Genetics  
Fall 2020 Co-Instructor for Principles of Systematics

*Guest Lecture*

Spring 2018 Guest lecturer for Molecular Phylogenetics (GWU)  
Summer 2016 Guest lecturer for Human Anatomy & Physiology II (Auburn)  
Fall 2015 Guest lecturer for Evolution & Systematics undergraduate class (Auburn)  
Fall 2012 Guest lecturer for Evolution & Systematics undergraduate class (Auburn)  
Spring 2011 Graduate student lecturer for Developmental Molecular Biology (Auburn)  
I prepared and gave four lectures for a graduate level class on topics in developmental molecular biology, such as axis specification, homeobox genes, and reproductive strategies.

*Graduate Teaching Assistant*

2016 Comparative Anatomy – 1 semester at Auburn University, AL  
Tasks included assisting students with active learning through various laboratory activities based on specimens and dissections  
2009–2015 Human Anatomy & Physiology lab – 15 semesters (Auburn)  
Tasks included teaching anatomical terminology and leading laboratory activities (including cat dissection), and use of virtual laboratory experiments (simulated on computers), to diverse undergraduate students

*Training in Teaching*

2013–2014 Auburn University Preparing Future Faculty program  
This program developed my skills in teaching through seminars, discussion groups, workshops, and microteaching with teaching critique.

*Outside the Classroom*

2016 R workshop, Joint Meeting of Ichthyologists and Herpetologists 2016  
I helped design and give a one-day workshop to teach basics in data manipulation, analysis, basic programming, and graphics in R

2015–2016 Biology Tutor for Office of Diversity and Multicultural Affairs  
Served as a tutor at drop-in center for minority students to receive free tutoring

## SERVICE

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### *Organizational Service*

2019 ASIH Genetics, Development, and Morphology student oral presentation judge  
 2019 ASIH Ichthyology Best Paper in Copeia Committee  
 2019 Graduates in Ecology and Evolutionary Biology Symposium judge  
 2017 Emory-LGS STEM Research and Career Symposium volunteer: abstract reviewer  
 2017 Neotropical Ichthyological Association student presentation judge  
 2016 JMIH 2016 R workshop planning and instructing  
 2014–2015 Auburn University Biological Sciences Graduate Student Association Biolunch Coordinator  
 2015 Session moderator, Oral presentation judge: Southeastern Ecology & Evolution Conference  
 2015 Session Co-Chair: Society of Integrative and Comparative Biology  
 2013–2014 Auburn University Biological Sciences Graduate Student Association President

### *Editorship*

2016 Check List – Quality Editor

### *Peer Review*

2020 Copeia, Ecology and Evolution, Frontiers in Genetics, Molecular Phylogenetics & Evolution (4), Journal of Biogeography (2), Journal of Fish Biology, Journal of Genomics, Zoological Journal of the Linnean Society  
 2019 Molecular Phylogenetics & Evolution (2), North American Journal of Fisheries Management, PeerJ, SAGE Evolutionary Bioinformatics, Systematic Biology, Zoological Journal of the Linnean Society, Zoological Research  
 2018 Cogent Biology, Genome Biology & Evolution, Genomics (2), Hydrobiologia, Molecular Ecology, Molecular Phylogenetics & Evolution  
 2017 Molecular Phylogenetics & Evolution (2), Reviews in Fish Biology and Evolution, Royal Society Open Science, Scientific Reports, Systematics & Biodiversity, Zootaxa (2)  
 2016 Biological Journal of the Linnean Society, Hydrobiologia, Journal of Fish Biology, ZooKeys  
 2015 Journal of Fish Biology, Zoological Scripta  
 2014 Biodiversity Data Journal, ZooKeys

### *Organizations*

2010– American Society of Ichthyologists and Herpetologists  
 2016– Society of Systematic Biologists  
 2019 Society for the Preservation of Natural History Collections  
 2019 American Fisheries Society Illinois Chapter  
 2010–2015 Southeastern Fishes Council  
 2009–2016 Auburn University Biological Sciences Graduate Student Association  
 2015 Society of Integrative and Comparative Biology

- 2012, 2014 Society for Study of Evolution  
 2012 Canadian Society for Ecology and Evolution  
 2009 University of Delaware chapter Phi Beta Kappa – honors society  
 2006 University of Delaware chapter Alpha Lambda Delta – first years honors society

## PROFESSIONAL DEVELOPMENT

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- 2020 SSB 2020 Systematics in the Swamp workshops – I attended workshops at this conference provided training with RevBayes, georeferencing, and species distribution modeling  
 2016 SciPhD: The Business of Science for Scientists program – This four-day certificate program provides hands-on preparation for academic scientists for professional positions.  
 2016 Larval Fish Workshop – This two-week workshop provided practical training in identification, curation, and photography of larval fishes  
 2013–2014 Preparing Future Faculty – This year-long certification program developed my skills in teaching through seminars, discussion groups, workshops, and microteaching with teaching critique.  
 2014 NESCent Academy Summer 2014 Course: Next-generation sequencing for phylogenetics and phylogeography – A one week workshop offered providing tools for analysis of next-generating sequencing data for assembling the Tree of Life, delimiting species, and understanding speciation.

## OUTREACH

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### *Research Features*

- 2017 Georgia Aquarium Research & Conservation Newsletter Winter 2017  
 [<http://www.georgiaaquarium.org/docs/default-source/pdfs/georgia-aquarium-research-and-conservation-newsletter-winter-2017.pdf>]  
 2013 Auburn University's Graduate School Magazine cover story in Fall 2012/Winter 2013 [<http://issuu.com/augraduateschool/docs/gradmagvolume6>].

### *Public Outreach*

- 2018 George Washington University Earth Day Symposium  
 Helped prepare information flyers on fishes featured in an art exhibition of *gyotaku* Japanese-style fish prints created by Guillermo Ortí and Josie B. Vosoba.  
 2013–2016 Auburn University Biodiversity Learning Center open house events  
 Showcase fish research and specimens in the fish collection to educate on fish diversity and the importance of museum collections in research several times a year  
 2010–2016 AU Explore  
 Set up and run hands-on exhibits for middle-school children to showcase fish research as part of the Auburn University College of Sciences & Mathematics annual, spring outreach event.  
 2007–2009 Wikipedia  
 Extensive editing and addition of pages, especially about catfishes, on Wikipedia.  
 October 2007 Coast Day

Helped run fish biology exhibit as part of the University of Delaware's College of Marine and Earth Studies annual outreach event open to the public.

## FIELD EXPERIENCE

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Dec 2018 Fish collection by trawling in the Amazon and tributaries in Iquitos, Peru.  
 2011–2016 Fish collection by seine/electrofishing in various rivers in the Southeastern US.  
 January 2016 Fish collection by seine and dip-net across northern Thailand in collaboration with Florida Museum of Natural History.  
 June 2012 Lead organizer on collecting trips in Delaware.  
 Jan 2012 Fish collection by seine/electrofishing in Ubon Ratchathani province, Thailand.  
 July 2011 Fish collection by seine/electrofishing in Michigan, Minnesota, and Wisconsin.  
 Dec 2010 Suriname: Contract work with ERM and Suralco involving fish collection by seine and identification of fishes on Nassau plateau.  
 Summer 2008 Performed fieldwork as part of senior thesis work in Dr. Douglas Tallamy's entomology lab at the University of Delaware. Tasks included experimental garden maintenance, data collection, and sample sorting.  
 Fall 2007 Trained in various field collection techniques such as seining, coring sediments, and trawling in a number of coastal habitats of the Delaware Bay.

## SKILLS

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### Bioinformatics

Familiar with using command line interface and submitting jobs for various cluster computing environments (LSF, SGE, SLURM)

Computing languages: bash, R, python

Next-generation DNA sequence assembly and analysis (eg. FastQC, BWA, samtools, Bowtie, Tuxedo pipeline, Trinity, DESeq2)

Statistical analysis in various R packages and basic R scripting skill focusing on comparative phylogenetic methods (eg. ape, phytools, geiger, BAMMtools, etc.)

Phylogenetic analysis (PAUP\*, RAxML/ExaML, IQ-TREE, mrBayes, Beauti/BEAST, ASTRAL, PAML, etc.)

Molecular laboratory techniques (DNA extraction, RNA extraction, PCR, gel electrophoresis)

Fish collection by seine, backpack electrofishing, dip net, international fieldwork

Fish specimen preservation/curation, clearing and staining

Fish husbandry

Web design with HTML, CSS, Google Sites, WordPress

Experience with Word, Excel, Powerpoint/Keynote

Graphic design in Adobe Photoshop, Illustrator, Flash

Designed t-shirts for AU Biological Sciences Graduate Student Association

### Training

Prevention of Workplace Harassment Course (2018)

Red Cross CPR Training (2011, 2013)

National Safety Council Defensive Driving Course Online 9<sup>th</sup> Edition (2011-2016)

Coaching Systems LLC Coaching the Van Driver – 15 passenger program (2011-2016)