

ZACHARY W. CULUMBER

Department of Biological Sciences

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EDUCATION

Ph.D. Biology, Texas A&M University, 2011

Department of Biology & Program in Applied Biodiversity Science (NSF-IGERT)

Advisor: Dr. Gil G. Rosenthal

B.S. Integrative Biology, University of Illinois, 2007

High Distinction Honors, Environmental Fellows Program

Minor: Environmental Studies

Research Mentor: Dr. Kimberly A. Hughes

APPOINTMENTS

2018–present	Assistant Professor, University of Alabama in Huntsville (UAH)
2017–2018	Postdoctoral Research Associate, Florida State University
2014–2016	Postdoctoral Research Associate, Kansas State University
2012–2014	CONACyT Postdoctoral Fellow, Universidad Autónoma del Estado de Hidalgo, México
2011–2012	Restoration Project Manager, Pizzo & Associates, Ltd., Chicago, IL
2008–2011	NSF IGERT Trainee, Texas A&M University
2007–2010	Graduate Teaching Assistant, Texas A&M University
2004–2007	Undergraduate Research Assistant, University of Illinois

PUBLICATIONS

In review

Hernandez M †, Lemieux L †, Quering C, Taylor K †, and ZW Culumber. (In review).
 Perspective: The role of temperature and thermal biology in structuring biological diversity.
Evolution. † *Graduate students with equal contributions*

Culumber ZW, Dougherty J, & KA Giltner. (In review). Patterns of trait integration in an invasive species. *Evolutionary Ecology*.

Vianey Palomera-Hernández, Eugenia Zandonà, Jesualdo A. Fuentes-González, Karla N. García-Cabello, Karla Kruesi, Michael Tobler, Zachary W. Culumber, and J. Jaime Zúñiga-Vega. (In review). Sexually selected male traits and placental complexity contribute to the evolution of female eye size in viviparous fishes (Poeciliidae)

Published

35. Eastis AN, Fast KM, Gutierrez-Rodriguez C, Culumber ZW and M Sandel. (In press). Genomic Insights Into the Origins and Demographic History of the Invasive Green Swordtail (*Xiphophorus hellerii*). *Ecology of Freshwater Fishes*.
34. Culumber ZW, and KN Giltner. (In press). Detour-task performance in color polymorphic male mosquitofish. *Behavioral Processes*.
33. Dougherty J, and ZW Culumber. (2024). Effects of a common antidepressant on behavior and dispersal in the globally invasive freshwater eastern mosquitofish (*Gambusia holbrooki*). *Environmental Biology of Fishes*, 107(1):19-31.
32. Culumber ZW. 2022. Variation in behavioral traits across a broad latitudinal gradient in a livebearing fish. *Evolutionary Ecology*, 36:75-91.
31. Culumber ZW. 2020. Behavioural response to simulated avian predation varies with latitude and predation intensity of natural populations. *Evolutionary Ecology*, 34:1037-1046.
30. Culumber ZW. 2020. Thermal stress increases activity and risk-taking behavior but not anxiety in a livebearing fish. *Environmental Biology of Fishes*, 103(4):313-317.
29. Culumber ZW, Engel N, Travis J, and KA Hughes. 2020. Larger female brains do not reduce male sexual coercion. *Animal Behaviour*, 160, 15-24.
28. Culumber ZW, Anaya-Rojas JM, Booker WW, Hooks AP, Lange EC, Plier B, and J Travis. 2019. Widespread biases in ecological and evolutionary studies. *BioScience*, 69(8):631-640.
27. Culumber ZW, Kraft B, Travis J, and KA Hughes. 2018. GxG epistasis in growth and condition and the maintenance of genetic polymorphism in *Gambusia holbrooki*. *Evolution* 72(5):1146-1154.
26. Culumber ZW and M Tobler. 2018. Correlated evolution of thermal niches and functional physiology in tropical freshwater fishes. *Journal of Evolutionary Biology* 31(5):722-734.
25. ZW Culumber and M Tobler. 2017. Sex-specific evolution during the diversification of livebearing fishes. *Nature Ecology and Evolution* 1:1185-1191.
24. M Tobler and ZW Culumber. 2016. Perspective: Swimming in polluted waters. *Science* 354(6317):1232-1233.
23. Culumber ZW and M Tobler. 2016. Ecological divergence and conservatism: spatiotemporal patterns of niche evolution in a genus of livebearing fishes (Poeciliidae: *Xiphophorus*). *BMC Evolutionary Biology* 16(1):44.

22. Culumber ZW and M Tobler. 2016. Spatiotemporal environmental heterogeneity and the maintenance of the tailspot polymorphism in the variable platyfish (*Xiphophorus variatus*). *Evolution* 70(2):408-419.
21. Culumber ZW, G Hopper, N Barts CN Passow, S Morgan, A Brown, L Arias-Rodriguez and M Tobler. 2016. Habitat use of two extremophile, highly endemic, and critically endangered fish species (*Gambusia eurystoma* and *Poecilia sulphuraria*; Poeciliidae). *Aquatic Conservation: Marine and Freshwater Ecosystems*. 26(6):1155-1167.
20. Culumber ZW. 2016. Variation in the evolutionary integration of melanism with behavioral and physiological traits in *Xiphophorus variatus*. *Evolutionary Ecology* 30(1):9-20.
19. Culumber ZW. 2015. Poeciliid fry responses to conspecific, heterospecific, and predator visual cues. *Behaviour* 152:1463-1479.
18. Culumber ZW, M Schumer, S Monks, and M Tobler. 2015. Environmental heterogeneity generates opposite gene-by-environment interactions for two fitness-related traits within a population. *Evolution* 69(2):541-550.
17. Johnson JB, ZW Culumber, R Easterling and GG Rosenthal. 2015. Boldness and predator evasion in naturally hybridizing swordtails (Teleostei: *Xiphophorus*). *Current Zoology* 61(4):596-603.
16. Culumber ZW and S Monks. 2014. Does fin coloration signal social status in a dominance hierarchy of the livebearing fish *Xiphophorus variatus*? *Behavioural Processes* 107:158-162.
15. Culumber ZW, CE Bautista-Hernández, S Monks, L Arias-Rodriguez and M Tobler. 2014. Variation in melanism and female preference in proximate but ecologically distinct habitats. *Ethology* 120 (11):1090-1100.
14. Culumber ZW, OM Ochoa and GG Rosenthal. 2014. Assortative mating and the maintenance of population structure in a natural hybrid zone. *American Naturalist* 184(2):225-232.
13. Culumber ZW. 2014. Pigmentation in *Xiphophorus*: an emerging system in ecological and evolutionary genetics. *Zebrafish* 11(1):57-70.
12. Culumber ZW and S Monks. 2014. Resilience to extreme temperature events: acclimation capacity and body condition of a polymorphic fish in response to thermal stress. *Biological Journal of the Linnean Society* 111(3):504-510.
11. Culumber ZW, CE Bautista-Hernández and S Monks. 2014. Physiological stress and the maintenance of adaptive genetic variation in a livebearing fish. *Evolutionary Ecology* 28 (1):117-129.
10. Culumber ZW, R Miranda and S Monks. 2013. First report of *Xiphophorus hellerii* in the arid Metztitlán Canyon Biosphere Reserve in Mexico. *Environmental Biology of Fishes* 97 (2):157-161.

9. Culumber ZW and GG Rosenthal. 2013. Mating preferences do not maintain the conspicuous tailspot polymorphism in the platyfish, *Xiphophorus variatus*. *Behavioral Ecology* 24 (6):1286-1291.
8. Culumber ZW and GG Rosenthal. 2013. Population-level mating patterns and fluctuating asymmetry in swordtail hybrids. *Naturwissenschaften* 100 (8):801-804.
7. Culumber ZW, DB Shepard, SW Coleman, GG Rosenthal and M Tobler. 2012. Physiological adaptation along environmental gradients and replicated hybrid zone structure in swordtails (Teleostei: *Xiphophorus*). *Journal of Evolutionary Biology* 25 (9): 1800-1814.
6. Verzijden MN, ZW Culumber and GG Rosenthal. 2012. Opposite effects of learning cause asymmetric mate preferences in hybridizing species. *Behavioral Ecology* 23 (5): 1133-1139.
5. Plath M, R Riesch, ZW Culumber, B Streit and M Tobler. 2011. Giant water bug (*Belostoma sp.*) predation on a cave fish (*Poecilia mexicana*): effects of female body size and gestational state. *Evolutionary Ecology Research* 13:133-144.
4. Culumber ZW, HS Fisher, M Tobler, M Mateos, MD Sorenson, PH Barber and GG Rosenthal. 2011. Replicated hybrid zones of *Xiphophorus* swordtails along an elevational gradient. *Molecular Ecology* 20 (2):342-356.
3. Tobler M, ZW Culumber, M Plath, KO Winemiller and GG Rosenthal. 2011. An indigenous religious ritual selects for resistance to a toxicant in a fish (*Poecilia mexicana*, Poeciliidae). *Biology Letters* 7 (2): 229-232.
2. Coleman SW, ZW Culumber, A Meaders, J Henson and GG Rosenthal. 2009. Inducible molecular defenses, ultraviolet radiation, and melanomagenesis in natural *Xiphophorus* hybrids - a field-based investigation of lab-based cancer models. *Environmental Biology of Fishes* 86(2): 279-84.
1. Purdy Drew KR, LK Sanders, ZW Culumber, O Zribi and GCL Wong. 2008 Cationic amphiphiles increase activity of aminoglycoside antibiotic tobramycin in the presence of airway polyelectrolytes. *Journal of the American Chemical Society* 131(2):486-93.

FUNDING

Awarded

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|------|---|
| 2026 | CAREER Award, National Science Foundation (2544355)
PI, \$877,000. 2026-2031. |
| 2026 | Franklin Research Grant, American Philosophical Society, “
PI, \$6,500. 2026-2027. |
| 2025 | Research Grant, Mohamed Bin Zayed Species Conservation Fund. “ <i>Evaluating the status and establishing priorities for multiple species in a freshwater fish hotspot</i> ”. PI, \$9,000. 2026. |

- 2021 Research Grant, IdeaWild. “*Wireless sensor networks as a tool to conserve livebearing fishes and support basic science*”. PI, \$993.
- 2020 Research Grant. UAH New Faculty Research Award. 2019-837. “*Conserving biodiversity by understanding animal personality*”. PI, \$10,000.

STUDENT SUPERVISION

Graduate Students (primary thesis advisor)

Current

- FA25–ongoing Luka Lemeiux (M.S., Plan 1) Expected SP26
- FA24–ongoing Makailyn Hernandez (M.S., Plan 1) Expected FA26

Prior

- 2024–2026 Katherine Taylor (M.S., Plan 1), “Effects of energetic state on male mating preferences in poeciliid fishes with differing mating strategies
- 2023–2025 Joshua Fitts (M.S., Plan 1), “Factors affecting freshwater fish communities in two North Alabama counties”
- 2022–2024 Katelyn Giltner (M.S., Plan 1), “Potential mechanisms maintaining a conspicuous polymorphism in eastern mosquitofish (*Gambusia holbrooki*)”
- 2020–2022 Jennifer Dougherty (M.S., Plan 1), “Investigation of behavioral and cognitive traits affecting dispersal tendencies in eastern mosquitofish (*Gambusia holbrooki*)”

Graduate Student Committees

Ph.D.

- 2023 Joseph Benito (Biotechnology Science & Engineering),

M.S.

- Current Emily Roberts
Lynette Ong
Jacob Schaefer
Lael Anderson
Eric Maxwell
- 2025 Madison Richards
- 2025 Bjorn Peterson
- 2025 Jared Higgs
- 2024 Emma Jordan
- 2023 Jackson Schoettle

2022	Megan Carter
2021	Tessa Costley
2019	Spencer Boyd

External

2023	Anna Eastis (M.S.), University of West Alabama, Department of Biological & Environmental Sciences. Primary Advisor: Michael Sandel.
2017	Jesús Antonio Rocamontes Morales (M.S.), Instituto de Ecología (INECOL), Xalapa, México. Primary Advisor: Carla Gutiérrez.

Undergraduate Students Supervised

2026	Nolan Cooper, Mackenzie Snyder, Brooke Drinkard, Kiah D'Amour
2025-26	Caroline Moyer, Jack Newman, Scarlett Mangrum, Ash McCrory
2024-2025	Josh Peppers, Luka Lemieux
2024	Ana Popoca
2023-2025	Clay Bibby
2023-2024	Greta Hopf, Cuong Vo
2023	Cayden Olbert
2020–2022	Grace Oswald
2019–2022	Katelyn Giltner
2019–2022	Noah Daniels
2022	Andrew Morrissey, Zoe Ellis
2020–2021	Mason Holt, Trinity Tennant, Audrey Kirby
2020	Collin Ainslie, Hannah Lee, Jaeda Rochelle
2019	Samin Riyaz, Josephine Smith
2018	Tessa Costley
2017–2018	Gabriella Dean (Florida State)
2017	Nancy Engel (Cornell, NSF REU at Florida State)
2016–2017	Rachel McNemee (Kansas State)
2015	Shannon Drexler (U. Wisconsin-Platteville, NSF REU at Kansas State)
2014	Mattie Bieberly (Kansas State, poster & \$2000 award)
2010	Ryan Easterling, Suzanne Simpson (Texas A&M)
2009–2011	Courtney Passow (Texas A&M)
2009–2010	Olivia Ochoa (Texas A&M, author on Culumber et al. 2014 Am. Nat.)
2009	Sarah Classen (Texas A&M)
2008	Rachel McCreary (Texas A&M)
2007–2008	Jenna Christopher (Texas A&M)

TEACHING

Primary Instructor

2018-present	Evolution (BYS464/691) (Fall Semesters)
2019-present	Animal Behavior (BYS 467/567) (Spring Semesters)
2022-present	BYS Seminar (BYS 433/690) (most semesters since 2022)
2021-2022	Principles of Biology (BYS 119)
2021-2022	Human Evolution and Culture (BYS 491)
2019-2020	Molecular Methods in Ecology and Evolution
2019-2020	Ecophysiology (BYS491/691)

Teacher Training

2015	Science Communication Fellow, Sunset Zoo & Portal to the Public, Manhattan, KS (participant)
2014	Life Discovery Conference: Realizing vision and change, preparing for next generation biology, San Jose, CA. (Participant)
2014	Life Discovery Conference: Promoting University Attendance by Underrepresented Groups with Multi-year Mentoring: the CiM-Bio Model, San Jose, CA
2014	Experiencing Evolution: Professional Development Workshop for Undergraduate Educators, SSE Annual Meeting, Raleigh, NC. (Participant)

Teaching Assistant

2010	Ecology (BIOL357), Texas A&M University (Instructor: Dr. David Baumgardner)
2008	Ecology (BIOL357), Texas A&M University (Instructor: Dr. Robert Powell)
2007	Ecology (BIOL357), Texas A&M University (Instructor: Dr. Robert Powell)

Guest Lectures

2018	Intro to Biological Research (BYS 292)
2017	Population Ecology (PCB 5425), Individual Variation and Population Ecology
2016	NSF Research Experience for Undergraduates, Kansas State University
2008	Ecology (BIOL 357), Biomes of the World
2007	Ecology (BIOL 357), The Evolution of Sex

PRESENTATIONS**Invited Talks**

2023	Univ. Alabama in Birmingham, Biology Dept. Seminar
2019	Kennesaw State Univ., Ecology and Evolution Seminar
2017	Evolution Spotlight Session. Portland, OR.
2016	K-INBRE Symposium. Kansas City, MO

- 2015 Instituto de Ecología, Xalapa, México
 2015 2^{da} Jornada de Ciencia y Desarrollo Sustentable. Calnali, Hidalgo (Mexico)
 2015 Ecology and Evolutionary Biology Seminar, Kansas State University

Contributed Talks (12) & Posters (10)

- 2026 American Livebearer Association, Louisville, KY (K. Taylor)
 2026 American Livebearer Association, Louisville, KY (M. Hernandez)
 2026 Society for Integrative and Comparative Biology, Portland, OR (K. Taylor)
 2026 Society for Integrative and Comparative Biology, Portland, OR (M. Hernandez)
 2024 11th International Meeting of Poeciliid Biologists, San Marcos, TX
 2022 American Livebearer Association, Louisville, KY
 2022 Society for Integrative and Comparative Biology. Phoenix, AZ
 2020 Society for Integrative and Comparative Biology. Austin, TX
 2019 8th International Meeting of Poeciliid Biologists, Mexico City, MEX
 2017 Ecology and Evolution Seminar, Florida State University
 2017 Society for Integrative and Comparative Biology. New Orleans, LA
 2016a Society for Integrative and Comparative Biology. Portland, OR
 2016b Society for Integrative and Comparative Biology. Portland, OR
 2015 Ecological Genomics Symposium. Manhattan, KS
 2014 Evolution Annual Meeting. Raleigh, NC
 2014 XIV Congreso Nacional de Ictiología, Morelia, Michoacan, Mexico
 2014 International Society for Behavioral Ecology. New York, NY
 2013 Society for Molecular Biology and Evolution. Chicago, IL
 2012 CECYTEH (high school), Calnali, Hidalgo, Mexico
 2008 Applied Biodiversity Science Seminar, Texas A&M University
 2008 International Society for Behavioral Ecology. Ithaca, NY
 2008 NSF IGERT Project Meeting. Washington DC
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PROFESSIONAL SERVICE

Journal Referee

American Naturalist, Asian Fisheries Science, Behavior, Behavioral Ecology, Behavioral Ecology & Sociobiology, Biological Invasions, Biological Journal of the Linnean Society, Biology Letters, Canadian Journal of Zoology, Comparative Biology & Physiology, Copeia, Ecology, Ecology & Evolution, Environmental Biology of Fishes, Evolution, Evolutionary Ecology, Fish & Fisheries, Freshwater Science, Functional Ecology, Journal of Evolutionary Biology, Journal of Fish Biology, Molecular Ecology, Neotropical Ichthyology, Proceedings of the Royal Society B, Nature Ecology and Evolution, Southwestern Naturalist, Systematic Biology

Grant Referee

- 2023-25 NSF, Ad Hoc Reviewer (3)
 2022 (panel) NSF, Division of Integrative Organismal Systems, Integrative Ecological Physiology

- 2020 (panel) NSF, Division of Integrative Organismal Systems, Behavioral Systems
 2016 NSF, Division of Environmental Biology, Long Term Research in Environmental Biology
 2015 CONACyT, Becas en el Extranjero - Reviewed proposals in Spanish for Mexico's national science council for students seeking funding to obtain a PhD abroad

INSTITUTIONAL SERVICE

University

- Spring 2022–present Institutional Animal Care and Use Committee
 Fall 2022–Spring 2024 UAH Faculty Senate

College

- Fall 2021–present Biotechnology Science and Engineering Program Admissions
 Fall 2021–present College of Science Graduate Curriculum Committee
 Spring 2023–present UAH College of Science Undergraduate Curriculum Committee
 Spring 2021–Fall 2023 CoS Textbook Adoption Committee

Department

- Fall 2025–present BYS Graduate Curriculum Committee
 Summer 2022–present Liaison to the Dauphin Island Sea Lab
 Fall 2021–present BYS Undergraduate Curriculum Committee
 Fall 2021–Spring 2022 Biological Sciences Faculty Search Committee
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PUBLIC OUTREACH & EDUCATION

- 2025 Presentation to UAH Herpetological Society
 2022 Donation of live fish to American Livebearer Association
 2021 Presentation to Greater Akron Aquarium Society
 2017 Article for *Livebearers Journal*, "Impacts of environmental change on wild populations of livebearers"
 2012-2016 Coordinator & Advisory Board Member, CICHAZ Field Station
 2016 Featured Scientist at 'Science on Tap', jointly hosted by Sunset Zoo & K-State College of Arts & Sciences, Manhattan, KS
 2016 STEM Night, Lee Elementary School, Manhattan, KS
 2016 Science Outreach, Sunset Zoo, Science Saturday, Manhattan, KS
 2013-2015 Mentor, CICHAZ Mentoring in Biology (CiM-Bio) program, Mexico
 2015 Fish Morphology Activity, Grades 3-5, Marlatt Elementary School, Manhattan, KS
 2015 Science Outreach, Sunset Zoo, Military Appreciation Day, Manhattan, KS
 2015 Judge, Research Experience for Undergraduate Joint Poster Session, Kansas State University
 2014 Judge, Ruth M. Patrick Student Poster Award for the *American Society of Naturalists* (Evolution Annual Meeting). Raleigh, NC.
 2012 Article for *FishChum*, "Observation of a novel, pigmented sword in *X. malinche* in its natural habitat"
 2011 Article for *FishChum*, "Natural variation in wild-caught swordtails"

- 2009 Member of Organizing Committee, Ecological Integration Symposium (EIS),
Texas A&M University
- 2008 Video media, *C.S.I. Calnali*, Short movie featuring K-12 students in Mexico
using molecular biology to solve crime in swordtail hybrid zones (YouTube)