

Christopher H. Martin

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Museum of Vertebrate Zoology
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Education

- 2013 **Ph.D. Population Biology**, University of California, Davis
Advisor: Peter Wainwright
- 2006-07 **Fulbright Scholar**, Chembe, Malaŵi
- 2005 **B. S. Biology**, Duke University, *cum laude* with distinction

Professional experience

- 2019-current **Assistant Professor and Curator of Ichthyology**, Integrative Biology and Museum of Vertebrate Zoology, University of California, Berkeley
- 2015-2019 **Assistant Professor**, Department of Biology, University of North Carolina at Chapel Hill
- 2013-2015 **Miller Postdoctoral Research Fellow**, University of California, Berkeley
Advisors: Erica Bree Rosenblum, Craig Miller

Honors

- 2018 **NSF CAREER Award**, National Science Foundation
- 2013 **Miller Postdoctoral Research Fellowship**, Miller Institute for Basic Research in the Sciences
- 2013 **NSF Postdoctoral Research Fellowship in Biology** (declined)
- 2013 **Merton Love Award**, best dissertation in Evolution & Ecology, University of California, Davis
- 2013 **Ernst Mayr Award**, best student systematics presentation at Evolution
- 2012 **Carl Hubbs Award**, best student presentation at Desert Fishes Council
- 2012 **Hamilton Award co-winner**, best student presentation at Evolution
- 2012 **Dissertation Year Fellowship**, University of California, Davis
- 2011 **Daphne and Ted Pengelley Award**, University of California, Davis
- 2011 **ARCS Foundation Scholar**, Northern California Chapter

2010 **Doctoral Dissertation Improvement Grant**, National Science Foundation
2007 **NSF Graduate Research Fellowship**, National Science Foundation
2007 **First Year Graduate Fellowship**, University of California, Davis
2005 **Horn Prize for Excellence in Biology**, Duke Biology Department

Peer-reviewed papers

*Graduate student, †Postdoctoral scholar, •Undergraduate student in my lab

- 2021 **McGirr JA***, **Martin CH**. Few fixed variants between trophic specialist pupfish species reveal candidate cis-regulatory alleles underlying rapid craniofacial divergence. *Molecular Biology and Evolution*. 38:405-423.
- 2020 Perevolotsky T, **Martin CH**, Rivlin A, Holzman R. Work that body: fin and body movements determine herbivore feeding behavior in a natural reef environment. *Proceedings of the Royal Society B*. 287:20201903.
- 2020 **Martin CH**, Gould K. Surprising spatiotemporal stability of a multi-peak fitness landscape revealed by field experiments measuring hybrid fitness. *Evolution Letters*. 4: 530-544
- 2020 KH Olsson, **Martin CH**, R Holzman. Hydrodynamic simulations of the performance landscape for suction-feeding fishes reveal multiple peaks for different prey types. *Integrative and Comparative Biology*. 60:1251-1267.
- 2020 **McGirr JA***, **Martin CH**. Ecological divergence in sympatry causes gene misexpression in hybrids. *Molecular Ecology*. 29:2707-2721.
- 2020 **ME St. John***, **K Dixon•**, **Martin CH**. Oral shelling within an adaptive radiation of pupfishes: testing the adaptive function of novel nasal protrusion and behavioral preference. *Journal of Fish Biology*. 97:163-171.
- 2020 **ME St. John***, R Holzman, **CH Martin**. Rapid adaptive evolution of scale-eating kinematics to a novel ecological niche. *Journal of Experimental Biology*. 223:jeb217570.
- 2020 Rosemary G Gillespie, Gordon M Bennett, Luc De Meester, Jeffrey L Feder, Robert C Fleischer, Luke J Harmon, Andrew P Hendry, Matthew L Knope, James Mallet, **Martin CH**, Christine E Parent, Austin H Patton, Karin S Pfennig, Daniel Rubinoff, Dolph Schluter, Ole Seehausen, Kerry L Shaw, Elizabeth Stacy, Martin Stervander, James T Stroud, Catherine Wagner, Guinevere Ou Wogan. Comparing adaptive radiations across space, time, and taxa. *Journal of Heredity*. 111:1-20.

- 2019 **Martin CH, Richards EJ***. The paradox behind the pattern of rapid adaptive radiation: how can the speciation process sustain itself through an early burst? *Annual Review of Ecology, Evolution, and Systematics*. 50:569-593.
- 2019 **Martin CH, McGirr JA*, Richards EJ*, St. John ME***. How to investigate the origins of novelty: insights gained from genetic, behavioral, and fitness perspectives. *Integrative and Organismal Biology* 1:obz018.
- 2019 **Richards EJ***, Servedio MR, **Martin CH**. Searching for sympatric speciation in the genomic era. *BioEssays* 41:1900047.
- 2019 **McGirr JA*, Martin CH**. Hybrid gene misregulation in multiple developing tissues within a recent adaptive radiation of Cypirnodon pupfishes. *PLOS One* 14:e0218899.
- 2019 **St. John M*, McGirr JA*, Martin CH**. The behavioral origins of novelty: did increased aggression lead to scale-eating in pupfishes? *Behavioral Ecology*. 30:557-569.
- 2019 **Davis AL., Babb MH., Lowe MC., Lee BT., Yeh AT., Martin CH**. Testing Darwin's hypothesis about the most wonderful plant in the world: the Venus flytrap's marginal spikes are a 'horrid prison' for moderate-sized insect prey. *American Naturalist*. 193:309-317.
- 2018 **Poelstra JW†, Richards EJ*, Martin CH**. Speciation in sympatry with ongoing secondary gene flow and a potential olfactory trigger in a radiation of Cameroon cichlids. *Molecular Ecology* 27:4270-4288.
- 2018 **Martin CH**, Turner BJ. Long-distance dispersal over land by fishes: extremely rare ecological events become probable over millennial timescales. *Proceedings of the Royal Society B* 285:20172436.
- 2018 **Richards EJ*, Poelstra JW†, Martin CH**. Don't throw out the sympatric speciation with the crater lake water: fine-scale investigation of introgression provides equivocal support for causal role of secondary gene flow in one of the clearest examples of sympatric speciation. *Evolution Letters* 2:524-540.
- 2018 **McGirr JA*, Martin CH**. Parallel evolution of gene expression between trophic specialists despite divergent genotypes and morphologies. *Evolution Letters* 2:62-75.
- 2017 **Martin CH**, Höhna S. New evidence for the recent divergence of Devil's Hole pupfish and the plausibility of elevated mutation rates in endangered taxa. *Molecular Ecology* 27:831-838.

- 2017 Hernandez LP, Adriaens D, **Martin CH**, Wainwright PC, Masschaele B, Derick B. Building trophic specializations that result in substantial niche partitioning within a young adaptive radiation. *Journal of Anatomy* 232:173-185.
- 2017 **Richards EJ***, **Martin CH**. Adaptive introgression from distant Caribbean islands contributed to the diversification of a microendemic radiation of trophic specialist pupfishes. *PLOS Genetics* 13:e1006919.
- 2017 **Martin CH**, Höhna S, Crawford JE, Turner BJ, **Richards EJ***, Simons LH. The complex effects of demographic history on the estimation of substitution rate: concatenated gene analysis results in no more than twofold overestimation. *Proceedings of the Royal Society B* 284:20170537.
- 2017 Stager JC, Alton K, **Martin CH**, King DT, Livingstone DT. On the age and origin of Lake Ejagham and its endemic fishes. *Quaternary Research* 1-12.
- 2017 **Martin CH**, Erickson PA, Miller CT. The genetic architecture of novel trophic specialists: higher effect sizes are associated with exceptional oral jaw diversification in a pupfish adaptive radiation. *Molecular Ecology* 26:624-638.
- 2016 **McGirr JA***, **Martin CH**. Novel candidate genes underlying extreme trophic specialization in Caribbean pupfishes. *Molecular Biology and Evolution* 34:873-888.
- 2016 **Martin CH**. The cryptic origins of evolutionary novelty: 1,000-fold-faster trophic diversification rates without increased ecological opportunity or hybrid swarm. *Evolution* 70:2504-2519.
- 2016 **Martin CH**. Context dependence in complex adaptive landscapes: frequency and trait-dependent selection surfaces within an adaptive radiation of Caribbean pupfishes. *Evolution* 70:1265-1282.
- 2016 Higham TE, Rogers SM, Langerhans RB, Jamniczky HA, Lauder GV, Stewart WJ, **Martin CH**, Reznick DN. Speciation through the lens of biomechanics: locomotion, prey capture, and reproductive isolation. *Proceedings of the Royal Society B* 283:1294-1304.
- 2016 **Martin CH**, Crawford JE, Turner BJ, Simons LH. Diabolical survival in Death Valley: recent pupfish colonization, gene flow, and genetic assimilation in the smallest species range on earth. *Proceedings of the Royal Society B* 283:23-34.

- 2015 **Martin CH**, Cutler JS, Friel JP, Denning Touokong C, Coop G, Wainwright PC. Complex histories of repeated gene flow in Cameroon crater lake cichlids cast doubt on one of the clearest examples of sympatric speciation. *Evolution* 69:1406-1422.
- 2014 Musilova Z, Indermaur A, Nyom ARB, Tropek R, **Martin CH**, Schliewen UK. Persistence of *Stomatepia mongo*, an endemic cichlid fish of the Barombi Mbo crater lake, Southwestern Cameroon, with notes on its life history and behavior. *Copeia* 3:556-560.
- 2014 **Martin CH**, Feinstein LC. Novel trophic niches drive variable progress toward ecological speciation within an adaptive radiation of pupfishes. *Molecular Ecology* 23:1846-1862.
- 2013 Schmitz L, Motani R, Oufiero CE, **Martin CH**, McGee MD, Gamarra AR, Lee JJ, Wainwright PC. Potential enhanced ability of giant squid to detect sperm whales is an exaptation tied to their large body size. *BMC Evolutionary Biology*. 13:226.
- 2013 **Martin CH**, Wainwright PC. A remarkable species flock of *Cyprinodon* pupfishes endemic to San Salvador Island, Bahamas. *Bulletin of the Peabody Museum of Natural History*. 54:231-240.
- 2013 Friedman M, Keck BP, Dornburg A, Eytan RI, **Martin CH**, Hulsey CD, Wainwright PC, Near TJ. Molecular and fossil evidence place the origin of cichlid fishes long after Gondwanan rifting. *Proceedings of the Royal Society London B* 280:1770.
- 2013 **Martin CH**, Wainwright PC. On the measurement of ecological novelty: scale-eating pupfish are separated by 168 my from other scale-eating fishes. *PLOS One*. 8:e71164.
- 2013 **Martin CH**. Strong assortative mating by diet, color, size, and morphology but limited progress toward sympatric speciation in a classic example: Cameroon crater lake cichlids. *Evolution*. 67:2114-2123.
- 2013 **Martin CH**, Wainwright PC. Multiple fitness peaks on the adaptive landscape drive adaptive radiation in the wild. *Science*. 339:208-211.
- 2013 Schmitz L, Motani R, Oufiero CE, **Martin CH**, McGee MD, Gamarra AR, Lee JJ, Wainwright PC. Allometry indicates giant eyes of giant squid are not exceptional. *BMC Evolutionary Biology*. 13:45.
- 2012 **Martin CH**. Weak disruptive selection and incomplete phenotypic divergence in two classic examples of sympatric speciation: Cameroon crater lake cichlids. *American Naturalist*. 180:E90-109.

- 2011 **Martin CH**, Wainwright PC. Trophic novelty is linked to exceptional rates of morphological diversification in two adaptive radiations of *Cyprinodon* pupfish. *Evolution*. 65:2197-2212.
- 2010 **Martin CH**. Unexploited females and unreliable signals of male quality in a Malawi cichlid bower polymorphism. *Behavioral Ecology*. 21:1195-1202.
- 2009 **Martin CH**, Genner MJ. High niche overlap between two successfully coexisting pairs of Lake Malawi cichlids. *Canadian Journal of Fisheries and Aquatic Sciences*. 66:579-588.
- 2009 **Martin CH**, Genner MJ. A role for male bower size as an intrasexual signal in a Lake Malawi cichlid fish. *Behaviour*. 146:963-978.
- 2007 **Martin CH**, Johnsen S. A field test of the Hamilton-Zuk hypothesis in the guppy *Poecilia reticulata*. *Behavioral Ecology and Sociobiology*. 61:1897-1909.
- 2004 Yang AS, **Martin CH**, Nijhout HF. Geographic variation of caste structure among ant populations. *Current Biology*. 14: 514-519.

Preprints

*Graduate student, †Postdoctoral scholar, •Undergraduate student in my lab

- Preprint **Richards EJ***, **McGirr JA***, Wang J, **St. John ME***, **Poelstra JW†**, **Solano MJ•**, **O'Connell D•**, Turner BJ, **Martin CH**. 2021. Major stages of vertebrate adaptive radiation are assembled from a disjunct spatiotemporal landscape. <https://doi.org/10.1101/2020.03.12.988774>
- Preprint **Heras J†**, **Martin CH**. 2021. Nonadaptive radiation of the gut microbiome in an adaptive radiation of *Cyprinodon* pupfishes with minor shifts for scale-eating. <https://doi.org/10.1101/2021.01.06.425529>
- Preprint Keren T, Kiflawi M, **Martin CH**, China V, Mann O, Holzman R. 2017. A complex performance landscape for suction-feeding constrains the evolution of morphological diversity in a reef damselfish. *bioRxiv* doi: <https://doi.org/10.1101/239418>
- Preprint **Zeng Y•**, **Martin CH**. 2016. Oxford Nanopore sequencing in a research-based undergraduate course. *bioRxiv* doi: <https://doi.org/10.1101/227439>

Grants

(funded) PI, \$24,000 (total cost), U.S. Fish and Wildlife Service, 8/1/2020 – 7/31/2021. *Devils Hole pupfish genome assembly and annotation.*

(funded) Co-PI, \$110,000 (direct cost), Binational Science Foundation, 6/1/2018 – 5/30/2022, Co-PI Roi Holzman, *Adaptive diversification on performance landscapes.*

(funded) PI, \$890,719 (total cost), National Science Foundation, 6/1/2018 – 5/30/2023, *CAREER: Cryptic origins of evolutionary novelty in Caribbean pupfishes: genomic, functional, and ecological conditions for crossing fitness valleys and colonizing adaptive peaks.*

(funded) PI, \$1,841,958 (total cost), National Institutes of Health, R01 NIDCR, 6/1/2018 – 5/30/2023, *Discovery and functional analysis of novel candidate genes and variants underlying craniofacial diversification in *Cyprinodon* pupfishes.*

Presentations and Invited Seminars

- 2021 *Invited speaker.* Department of Zoology, University of British Columbia, Vancouver, Canada.
- 2020 *Contributed talk.* Society for Integrative and Comparative Biology meeting, Austin, TX.
- 2019 *Invited speaker.* Inter-University Institute for Marine Sciences. Eilat, Israel.
- 2019 *Contributed talk.* Cichlid Science 2019 Meeting. Madrid, Spain.
- 2019 *Contributed talk.* Evolution meetings. Providence, RI
- 2019 *Invited talk.* Ecological Biomechanics working group. Portland, OR
- 2019 *Contributed talk.* Society for Integrative and Comparative Biology meeting, Tampa, FL
- 2019 *Invited speaker.* Evolution and Ecology Department, University of Tennessee, Knoxville, TN
- 2018 *Contributed talk.* Desert Fishes Council meeting, Death Valley National Park, NV
- 2018 *Invited speaker.* AGA President's Symposium: Origins of Adaptive Radiation, Waimea, HI
- 2018 *Invited speaker.* Department of Integrative Biology, University of California, Berkeley, CA
- 2018 *Invited speaker.* Museum of Vertebrate Zoology, University of California, Berkeley, CA
- 2018 *Contributed talk.* Society for Integrative and Comparative Biology meeting, San Francisco, CA
- 2017 *Invited speaker.* Biological Sciences Department, Clemson University, SC
- 2017 *Contributed talk.* Evolution meetings, Portland, OR

- 2017 *Contributed talk.* Society for Molecular Biology and Evolution, Austin, TX
- 2016 *Invited speaker.* International Prize for Biology Symposium. Japan Society for the Promotion of Science. Tokyo, Japan.
- 2016 *Plenary speaker.* Physical Biology of Organisms symposium. Regional Society for Integrative and Comparative Biology. Biology Department, Duke University, Durham, NC.
- 2016 *Invited speaker.* Department of Biology. University of Florida, Gainesville, FL.
- 2016 *Contributed talk.* Evolution meetings, Austin, TX
- 2016 *Invited speaker.* Department of Applied Ecology, North Carolina State University, NC
- 2016 *Invited speaker.* Department of Biology. Eastern Carolina University, NC
- 2016 *Invited speaker.* Department of Biology. University of North Carolina, Asheville, NC
- 2016 *Contributed talk.* Society for Integrative and Comparative Biology meeting, Portland, OR
- 2015 *Invited speaker.* Department of Biological Sciences, Virginia Tech, VA
- 2015 *Contributed talk.* Genome 10K Conference, Santa Cruz, CA
- 2015 *Invited speaker.* American Killifish Association Annual Convention. Detroit, MI
- 2015 *Invited speaker.* Miller Institute for Basic Sciences, lunch seminar series. University of California, Berkeley, CA
- 2015 *Invited speaker.* Museum of Vertebrate Zoology, University of California, Berkeley, CA
- 2014 *Contributed talk.* Evolution meetings, Raleigh, NC
- 2014 *Invited speaker.* Simons Institute, University of California, Berkeley
- 2014 *Invited speaker.* Biology Department, University of North Carolina, Chapel Hill, NC
- 2013 *Invited speaker.* California Academy of Sciences, San Francisco, CA
- 2013 *Invited speaker.* ***Merton Love Award winner.** Dissertation seminar. Department of Ecology and Evolution, University of California, Davis
- 2013 *Contributed talk.* ***Ernst Mayr Award winner.** Evolution meetings, Snowbird, UT
- 2013 *Contributed talk.* Society for Integrative and Comparative Biology meeting, San Francisco, CA
- 2012 *Contributed talk.* ***Hamilton Award co-winner.** Evolution meetings, Ottawa, Canada
- 2012 *Contributed talk.* ***Carl Hubbs Award winner.** Desert Fishes Council meeting, Death Valley National Park, NV
- 2011 *Invited speaker.* Bay Area Killifish Association. Annual convention, San Francisco, CA
- 2011 *Contributed talk.* Evolution meetings, Norman, OK
- 2010 *Invited speaker.* Sacramento Aquarium Society, Sacramento, CA
- 2010 *Contributed talk.* ***Hamilton Award honorable mention.** Evolution meetings, Portland, OR

2009 *Contributed talk.* Society for Integrative and Comparative Biology meeting, Boston, MA

Teaching Activities

University of California, Berkeley:

Spring 2021

IB 77B: Integrative Human Biology

IB 281: Evolution Seminar

Fall 2020

IB 177LF: Ichthyology: An introduction to the scientific process through research on fishes.

Spring 2020

Guest lecturer: IB200: Principles of Phylogenetics

University of North Carolina at Chapel Hill:

Spring 2019

BIO 659: Recent topics in micro/macroevolution

Spring 2018

BIO 221L: ‘Evolution of Extraordinary Adaptations’ (initially taught as a section of Seafood Forensics)

Fall 2017

BIO 221L: ‘Evolution of Extraordinary Adaptations’ (initially taught as a section of Seafood Forensics)

Spring 2017

BIO 659: Recent topics in speciation genomics

Fall 2016

BIO 221L: Seafood mislabeling, conservation, and human health

Graduate students supervised:

Jacquelyn Galvez, 2019 – 2025 (projected) *Cameroon crater lake cichlid adaptive radiation*

David Tian, 2019 – 2025 (projected) *Genetic restoration of the Devil’s Hole pupfish*

Michelle St. John, 2017 – 2023 (projected) *The cascading effects of trophic specialization on mate choice, aggression, and functional performance*

Emilie Richards, 2016 - 2022 (projected) *The role of adaptive introgression in adaptive radiation and sympatric speciation*

Joseph McGirr, 2015 – 2020 *The genetic basis of adaptive traits in a pupfish adaptive radiation.*

First-year Advisory committee member:

Jennifer Hoeflich 2020

Qualifying exam committee member:

Diler Haji 2020

Trinity Walls 2020

Maggie Grundler 2020

Dissertation committee member:

Alina Nguyen 2019-present

Alison Earley 2017-2018

Bryan Reatini 2016-2018

Sofia de la Serna Buzon 2016-2019

Antonio Serrato-Capuchina 2016-2019

Charlie Miller 2015-2016

Chris Ackali 2015-2019

Audrey Kelly 2015-2020

Work-study/paid undergraduate student assistants supervised:

University of California, Berkeley:

April Pilon, Heather McCandless, Kelly Rice, Elias Nash, Joyce Zhu, Nicole Elgersma

University of North Carolina at Chapel Hill:

Clare Bocklage, Alexander Payne, Christina Lim, Qiongqiong Mei, Ivan Piedad, Sarah Bencuya, Keara Mclean, Stephanie Jeselson, Courtney Farge, Kristi Dixon, David Richard, Claire Sorenson, Delaney O’Connell, Tanas Gangadhar, Gabriel Harris, Amelia Ward, Casey Charbonneau, Maria Solano

Independent study undergraduate students supervised:

University of California, Berkeley:

Kelly Morgan, Spring 2021

Valery Yanez, Spring 2021

HoWan Chan, Spring 2021

Julia Dunker, Fall 2020-Spring 2021

University of North Carolina at Chapel Hill:

Yi Zeng, Spring 2017

Adam Yeh, Spring 2018

Matthew Lowe, Spring 2018

Matthew Babb, Spring 2018

Professional Service

Faculty committee service:

Integrative Biology Undergraduate Awards Committee 2020

Integrative Biology Undergraduate Advisor 2019-2021

EEOB Graduate Studies and Admissions Committee 2017-2018

Faculty meeting secretary 2015-2016

New faculty welcome committee 2015-2018

Journal reviewer: *Science, Proceedings of the National Academy of Sciences USA, Nature Communications, Nature Ecology & Evolution, Trends in Ecology and Evolution, Evolution, Molecular Ecology, American Naturalist, Systematic Biology, Proceedings of the Royal Society B, Genetics, Evolutionary Biology, Bioessays, BMC Evolutionary Biology, Journal of Evolutionary Biology, Evolutionary Ecology, Evolution and Development, Bioessays, Molecular Ecology Resources, Heredity, Functional Ecology, Behavioral Ecology, Conservation Genetics, Aquatic Conservation, Journal of Heredity, PLOS One, Biological Journal of the Linnaean Society, International Journal of Evolutionary Biology, Behavioral Ecology and Sociobiology, Copeia, Ecology of Freshwater Fishes, Journal of Animal Ecology, Journal of Fish Biology, Hydrobiologia, African Journal of Aquatic Sciences, Southwestern Naturalist, Zoology, Molecular Phylogenetics and Evolution, Journal of Comparative Physiology B, Cambridge University Press, Oxford University Press, Oxford Bibliographies, Planta, Axios Review*

Grant reviewer: *National Science Foundation, National Geographic Society, Graduate Women in Science Fellowships, BBSRC, Czech National Science Foundation*

Invited scientific outreach presentations:

Long Island Killifish Association, New York, NY, March 2021

American Cichlid Association, Annual Convention, Sacramento, CA, June 2020
(postponed)

American Killifish Association, Annual Convention, Detroit, MI, May 2015

Bay Area Killifish Association's West Coast Weekend, San Francisco, CA, May 2011

Sacramento Aquarium Society, Sacramento, CA, December 2010

2013-present **Lead organizer**, *Cyprinodon* Species Maintenance Group, American Killifish Association

2013-2015 **Member**, Devils Hole Pupfish Genetic Advisory Panel, U.S. Fish & Wildlife Service