

Ann E. Holmes

Genomic Variation Laboratory
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EDUCATION

PhD, Ecology (expected 2023), University of California-Davis, Davis, CA

Area of Emphasis: Ecological Genetics and Genomics

Dissertation: Operationalizing non-invasive genetic methods for conservation of biodiversity

Dissertation Committee: Dr. Andrea Schreier, Dr. Ted Grosholz, Dr. Andrew Rypel

MS, Biology, San Francisco State University, San Francisco, CA

Concentration: Ecology, Evolution, and Conservation

Thesis: High-throughput sequencing reveals unexpected prey of an estuarine copepod

Thesis Committee: Dr. Wim Kimmerer, Dr. Jonathon Stillman, Dr. Andrea Swei

BA, Biology with Honors, Cornell University, Ithaca, NY

Concentration: Ecology and Evolution

Honors Thesis: Phylogenetic relationships of *Membranobalanus*, a sponge-inhabiting barnacle

Honors Thesis Advisors: Dr. Jim Morin, Dr. Bob Van Syoc (California Academy of Sciences)

SELECTED RESEARCH AND PROFESSIONAL EXPERIENCE

- 2016-Present **Graduate Student Researcher, PhD**, University of California-Davis, Davis, CA
- 2013-2016 **Graduate Student Researcher, MS**, San Francisco State University Estuary and Ocean
Science Center, San Francisco and Tiburon, CA
- 2005-2008 **Project Manager and Curatorial Assistant**, Academy of Natural Sciences, Philadelphia, PA
- 2002-2005 **Laboratory and Curatorial Assistant**, Museum of Comparative Zoology, Harvard
University, Cambridge, MA
- 2001-2002 **Scientific Research Aid**, California Department of Fish and Game, Belmont, CA
- 1999 **NSF Research Experiences for Undergraduates**, California Academy of Sciences Summer
Systematics Institute, San Francisco, CA

SKILLS

Molecular ecology laboratory techniques: DNA extraction; conventional and real-time PCR; Illumina library preparation and sequencing; environmental DNA (eDNA) methods

Data analysis in R and Python languages: Bioinformatics, statistics, modeling, and data visualization; phylogenetic analysis; reference sequence database construction

Field sampling: Water filtration and soil sampling for eDNA; specimen collection; field and boating safety

Mentoring: Undergraduate training and supervision for field sampling, molecular ecology laboratory techniques, and bioinformatic data analysis; student conference presentations; student grant applications

Grant writing: Awarded ~\$35,000 in external funding and ~\$45,000 in internal (academic) funding

Museum techniques: Curation of ethanol-preserved specimens; metadata management; georeferencing

PUBLICATIONS

Crandall, ED, Toczydlowski, RH, Liggins, L, **Holmes, A**, Ghoojaei, M, Gaither, MR, Wham, BE, Pritt, AL, Noble, C, Anderson, TJ, Barton, RL, Berg, JT, Beskid, SG, Delgado, A, Farrell, E, Himmelsbach, N, Queeno, SR, Trinh, T, Weyand, C, Bentley, A, Deck, J, Riginos, C, Bradburd, GS, and Toone, RJ. 2023. The importance of timely metadata curation to the global surveillance of genetic diversity. *Conservation Biology*, e14061. <https://doi.org/10.1111/cobi.14061>

Nagarajan, R, Bedwell, M, **Holmes, A**, Sanches, T, Acuña, S, Baerwald, M, Barnes, Blankenship, S, Connon, R., M. Deiner, K, Gille, D, Goldberg, C, Hunter, M, Liukart, G, Meyer, R, Watts, A, and Schreier, A. 2022. Environmental DNA Methods for Ecological Monitoring and Biodiversity Assessment in Estuaries. *Estuaries and Coasts*, 44, 2254-2273. <https://doi.org/10.1007/s12237-022-01080-y>

Holmes, A and Kimmerer, W. 2022. Phytoplankton prey of an abundant estuarine copepod identified in situ using DNA metabarcoding. *Journal of Plankton Research*, 44(2): 316-322. <https://doi.org/10.1093/plankt/fbac002>

Toczydlowski, R, Liggins, L, Gaither, M, Anderson, T, Barton, R, Berg, J, Beskid, S, Davis, B, Delgado, A, Farrell, E, Ghoojaei, M, Himmelsbach, N, **Holmes, A**, Queeno, S, Trinh, T, Weyand, C, Bradburd, G, Riginos, C, Toonen, R, and Crandall, E. 2021. Poor data stewardship will hinder global genetic diversity surveillance. *PNAS*, 118(34): e2107934118. <https://doi.org/10.1073/pnas.2107934118>

Kimmerer, W, Ignoffo, T, Bemowski, B, Modéran, J, **Holmes, A**, and Bergamaschi, B. 2018. Zooplankton Dynamics in the Cache Slough Complex of the Upper San Francisco Estuary. *San Francisco Estuary and Watershed Science*, 16(3). <https://escholarship.org/uc/item/63k1z819>

Manuscript in revision

Holmes, A, Baerwald, M, Rodzen, J, Schreier, B, Mahardja, B, and Finger, A. 2023. Experimental evaluation of environmental DNA methods for detection of a rare fish in turbid water. *Preprint*: <https://www.biorxiv.org/content/10.1101/2022.08.24.502857v2>

Technical Reports (not peer-reviewed)

Rypel, AL, Miner, MC, Hitt, L, **Holmes, A**, Baird, SE, Cocherell, DE, Schreier, AM and Fangué, NA. 2022. Origin and abundance of Chinook salmon in Putah Creek: Annual Report to the Solano County Water Agency 2021-2022. Department of Wildlife, Fish & Conservation Biology, University of California, Davis, CA.

Holmes, A, and Finger, AJ. 2019. Environmental DNA analysis of Delta Smelt. Technical report for the California Department of Fish and Wildlife, prepared by the Genomic Variation Laboratory, University of California-Davis, Davis, CA.

Williamson, M, Bellido, F, Broad, A, Gaffney, S, Hernandez, D, **Holmes, A**, Lo, V, Moore-O'leary, K, Pekny, J, Powelson, K, Preckler-Quisquater, S, Statham, M, Weiner, J, and Schwartz, M. 2019. Kern and Pixley Wildlife Refuge Climate and Water Threat Assessment. Report submitted to US Fish and Wildlife Service, University of California-Davis, Davis, CA.

AWARDS

2023	Best Student Poster , American Fisheries Society California-Nevada Chapter Annual Meeting, Long Beach, CA
2021	Chancellor's Award for Excellence in Mentoring Undergraduate Research , University of California, Davis, CA
2018	Best Student Presentation , Bay Delta Science Conference, Sacramento, CA
2016	Best Graduate Biology Poster , San Francisco State Poster Showcase, San Francisco, CA

GRANTS, FELLOWSHIPS, AND SCHOLARSHIPS

2022	Diablo Valley Flyfishing Club Wisecarver Memorial Scholarship	\$3000
2022	California Fly Fishers Unlimited Bob Bittner Scholarship	\$2250
2022	Marin Rod & Gun Club Scholarship	\$2000
2022	Fly Fishers of Davis Scholarship	\$1500
2022	Society for Conservation Biology Travel and Lodging Grants	\$350
2022	Experiment Foundation Ocean Solutions Fund Grant (with Helen Killeen and Keira Monuki)	\$4000
2022	UC Davis Graduate Student Association Travel Grant	\$250
2022	Davis Botanical Society Student Grant (with G. Tarbill)	\$1800
2020-2022	American Fisheries Society Small Grants (with H. Killeen & K. Monuki)	\$2725
2020	UC Davis Genome Center Seed Grant	\$2000
2019	UC Davis Sullivan Environmental Sciences Scholarship	\$2000
2019	The Garden Club of America Award in Coastal Wetlands Studies	\$5000
2018-2020	UC Davis Henry A. Jastro Research Fellowships	\$9397
2018-2019	Yolo Basin Foundation Graduate Student Fellowships	\$12,500
2016-2018	UC Davis Graduate Group in Ecology Fellowships	\$30,000
2015	SFSU Biology Graduate Student Council Travel Grant	\$669
2015	Romberg Tiburon Center Student Association Travel Grant	\$500
2015	Romberg Tiburon Center Travel Grant	\$350
2015	Coastal and Estuarine Research Federation Travel Grant	\$150
2014-2016	SFSU Instructionally Related Research Award	\$975
2014-2016	SFSU Romberg Tiburon Center San Francisco Bay Scholarship	\$1500
2006	Restore America's Estuaries Conference Travel Grant	\$750
1999	NSF Research Experiences for Undergraduates, California Academy of Sciences, San Francisco, CA	

PRESENTATIONS

Selected Conference Presentations

2202	International Bat Research Conference, Austin, TX
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2022 North American Congress for Conservation Biology, Reno, NV
 2022 American Fisheries Society California-Nevada Annual Meeting, Folsom, CA
 2021 International Congress for Conservation Biology, Virtual
 2020 Society for Freshwater Science California Chapter, Virtual
 2020 How to Achieve a Consensus for Best Environmental DNA Practices, Davis, CA.
 2019 eDNA Government Technical Exchange Workshop, St. Petersburg, FL
 2018 Bay Delta Science Conference, Sacramento, CA. **Best Student Presentation**

Invited talks

2023 Estuary & Ocean Science Center Seminar Series, San Francisco State University
 2023 Farallon Institute for Advanced Ecosystem Research Lunch Seminar, Virtual
 2021 “Discover Your Niche” Wildlife Professional Development Conference, Virtual

TEACHING AND MENTORING

Teaching Assistant

2022 Biology & Conservation of Fishes (WFC 120), UC Davis
 2020 Asking Different Questions: Intellectual Foundations of Justice-oriented STEM Research (STS 298), UC Davis
 2015 Marine Invertebrate Zoology Laboratory (BIO 555), San Francisco State University

Guest Lectures

2022 *Conservation genetics of fishes*, Biology & Conservation of Fishes (WFC 120), UC Davis
 2022 *Genetic methods for fish and wildlife conservation*, Principles of Ecology (NATR 320), American River College, Sacramento, CA

Graduate Seminar Organized (with Dr. Andrea Schreier)

2017 Recent Advances in Conservation Genetics and Genomics (ECL 290), UC Davis

Undergraduate Research Mentoring

University of California-Davis

2021- present Cristina Gonzalez, BS, Genetics & Genomics, 2023

- Independent project on eDNA bioinformatics of coastal marine fishes

2019-2022 Khyana Yearwood, BS, Biochemistry & Molecular Biology, 2022

- Independent project on genetic identification of bat endoparasites
- 2021 UC Davis Provost's Undergraduate Fellowship to KY (\$1360)
- 2022 North American Society for Bat Research DEI Grant to KY (\$3000)
- Current laboratory technician at UC Davis Genomic Variation Laboratory

- 2021-2022 Tien Ly, BS, Computer Science, 2022
- Bioinformatics of marine and freshwater fishes
 - Starting graduate school at San Jose State University (MS, Bioinformatics) in Fall 2023
- 2021-2022 Juan de la Torre, BS, Wildlife, Fish & Conservation Biology, 2022
- UC Davis Lloyd Swift Endowment Research Internship Grant to JT (\$3750)
 - Current Scientific Aid at the California Department of Water Resources
- 2019-2021 Serra Perry, BS, Environmental Science & Management, 2021
- Honors thesis on application of eDNA methods for aquatic species conservation
 - 2020 UC Davis Provost's Undergraduate Fellowship to SP (\$1234)
 - Current laboratory technician at UC Davis Genomic Variation Laboratory
- 2020-2021 Sami Araya, BS, Marine Biology, 2021
- UC Davis Coastal and Marine Science Institute Mentoring Program
 - 2021 UC Davis Provost's Undergraduate Fellowship to SA (\$1340)
 - Current laboratory technician at UC Davis Otolith Geochemistry & Fish Ecology Laboratory
- 2019-2020 Shayan Kaveh, BS, Ecotoxicology, 2020
- eDNA sample collection and laboratory techniques
 - Current graduate student at UC Santa Barbara (MS, Environmental Science & Management)
- 2019 Victor Martinez, BS, Neurobiology, Physiology & Behavior, 2020
- eDNA sample collection and laboratory techniques
- San Francisco State University*
- 2014-2015 David Franklin, BS, Biology, 2016 (Georgia Southern University)
- NSF Research Experiences for Undergraduates Summer Program
 - **Best Poster Award in Phylogenetics and Comparative Biology**, Society of Integrative and Comparative Biology Annual Meeting, Palm Beach, FL, 2015

SERVICE AND OUTREACH

Leadership, Committees, and Events

- 2022-present Co-founder, Metabarcoding Data Analysis Discussion Group, UC Davis
- 2019-2022 President, Davis Chapter of the Society for Conservation Biology
- 2019-2020 Media Committee, Ecology Graduation Student Association, UC Davis
- 2019 Co-organizer, Bay Area Conservation Biology Symposium, Davis, CA
- 2019 Admissions Committee, Graduate Group in Ecology, UC Davis
- 2019 Co-creator, *Undergraduate Research Opportunities in Ecology and the Environmental Sciences* job board and guidance document (<https://ecology.ucdavis.edu/undergraduate-opportunities>), Department of Environmental Science and Policy, UC Davis
- 2019 Co-organizer, *Navigating Academic Spaces* DEI Workshop, UC Davis
- 2018 Travel Award Committee, Graduate Student Association, UC Davis
- 2017-2019 Treasurer, Davis Chapter of the Society for Conservation Biology

2017-2019 Chair, Public Engagement Committee, Ecology Graduation Student Association, UC Davis
2016-2020 Diversity Committee, Ecology Graduation Student Association, UC Davis
2016 Panelist, Strategies for Ecology Education, Diversity, and Sustainability (SEEDS) career workshop, UC Davis

External Service and Outreach

2020 Community Science Talks, *Skype A Scientist* program, Virtual
2017 Guest Speaker, River City High School Honors Biology classes, West Sacramento, CA
2015-2016 Panelist and Mentor, STEM Career Day, UCSF Mission Bay, San Francisco, CA
2015 Instructor, *Integrated Technology, Engineering, Math, and Science*, San Francisco Bay, CA
2014 Instructor, *Set Sail Learn* 4th Grade Science, Treasure Island Sailing Club, San Francisco, CA
2014 Outreach Exhibit, "*Science, Neat*" Happy Hours for Adults, El Rio Bar, San Francisco, CA
2013-2014 Outreach Exhibit, Bay Area Science Festival, San Francisco and Alameda, CA

Journal Reviewer

California Fish and Wildlife Journal, Conservation Biology, Conservation Science and Practice, Environmental DNA, Scientific Reports

Media

2019 500 Women Scientists #MeetAScientist blog post, tinyurl.com/bdhc5scd
2015 Cast member in *Racing with Copepods* short film, vimeo.com/111275393

FIELD EXPERIENCE AND CERTIFICATIONS

2020-2021 California Collaborative Fisheries Research Project, Bodega Head State Marine Reserve and Stewarts Point State Marine Reserve, CA
2021 University of California Field Research Safety Center Leadership Training
2021 Divers Alert Network First Aid, CPR and Oxygen for Professional Divers
2019-2020 Suisun Marsh Fish and Invertebrate Survey, San Francisco Estuary
2019-2020 Bat guano collection, Yolo Basin Wildlife Area and Putah Creek Reserve, Davis, CA
2019 California Boater Card and UC Davis Boating Safety Training
2018 UC Davis Coastal Ecogeomorphology Field Course, Loreto National Marine Park, Mexico
2018 UC Davis Ecogeomorphology Field Course, Grand Canyon, AZ
2016 American Academy of Underwater Sciences Research Diver certification
2014-2016 Plankton collections, San Francisco Estuary

PROFESSIONAL AFFILIATIONS AND NETWORKS

American Fisheries Society, Society for Conservation Biology, North American Society for Bat Research, Global South Bats

LANGUAGES

English (fluent); French (intermediate)

ATHLETICS

2002-2016 US National and Olympic Team selection; National and international rowing competitions
1997-2001 Cornell University Varsity Rowing Team; Team Captain

REFERENCES

Dr. Andrea Schreier (PhD advisor), Adjunct Associate Professor and Director of Genomic Variation Laboratory, UC Davis
amdrauch@ucdavis.edu

Dr. Wim Kimmerer (MS advisor), Adjunct Professor Emeritus, Estuary and Ocean Science Center, San Francisco State University
kimmerer@sfsu.edu

Dr. Andrew Rypel (Dissertation committee), Professor, Director of the Center for Watershed Sciences, and Peter B. Moyle and California Trout Chair in Coldwater Fish Ecology, UC Davis
rypel@ucdavis.edu

Dr. Ted Grosholz (Dissertation committee), Professor and Alexander and Elizabeth Swantz Chair in Cooperative Extension, UC Davis
tedgrosholz@ucdavis.edu