

Ann E. Holmes

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EDUCATION

PhD, Ecology (Ecological Genetics & Genomics), University of California, Davis, 2023

Dissertation: Operationalizing non-invasive genetic approaches for conservation in aquatic and wetland ecosystems

MS, Biology (Ecology, Evolution & Conservation), San Francisco State University, 2018

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

BA cum laude, Biology (Ecology & Evolution), Cornell University, 2001

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

SELECTED RESEARCH AND PROFESSIONAL EXPERIENCE

2024-present	Research Scientist I , NOAA Affiliate, Northern Gulf Institute, Mississippi State University, NOAA Atlantic Oceanographic & Meteorological Laboratory Miami, FL
2016-2023	Graduate Student Researcher (PhD) , University of California, Davis, CA
2013-2016	Graduate Student Researcher (MS) , San Francisco State University, CA
2005-2008	Project Manager & Curatorial Assistant , Academy of Natural Sciences, Philadelphia, PA
2002-2005	Laboratory & 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 (REU) , California Academy of Sciences Summer Systematics Institute, San Francisco, CA

SKILLS

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

Data analysis: Bioinformatics, statistics, modeling, and data visualization of community and population genetic data in R and Python; biogeography and phylogenetic analysis; metadata management

Fieldwork: eDNA sampling; trawl and seine surveys; field leadership and boating safety; Scientific Diving

Mentoring: Undergraduate field sampling, molecular ecology laboratory work, bioinformatic data analysis and conference presentations; support for grant, job, and graduate school applications

Grants & fellowships: ~47,000 USD in external funding and ~45,000 USD in internal (academic) funding

Museum techniques: Curation of ethanol-preserved specimens; relational databases; georeferencing

PUBLICATIONS

Holmes, AE, Baerwald, MR, Rodzen, J, Schreier, BM, Mahardja, B, and Finger, AJ. 2024. Evaluating environmental DNA detection of a rare fish in turbid water using field and experimental approaches. *PeerJ*, 11, e16453. <https://doi.org/10.7717/peerj.16453> (Special Issue: *Advancing the Environmental DNA and RNA Toolkit for Aquatic Ecosystem Monitoring and Management*)

Crandall, ED, Toczydlowski, RH, Liggins, L, **Holmes, AE**, 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 Toonen, 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, AE**, 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, AE 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, AE**, 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>

Manuscripts in preparation

Holmes, AE, Schreier, AM, Cocherell, DE, Ly, T, Miner, MC, Fangue, NA, and Rypel, AL. Characterizing spatiotemporal dynamics of novel fish assemblages along a regulated stream using environmental DNA. Target journal: *Ecological Applications*

Holmes, AE, Harris, LS, Yearwood, KN, Perry, SC, Kaveh, SD, and Schreier, AM. Ecosystem services and aquatic-terrestrial food web linkages of a generalist bat predator in California's Central Valley. Target journal: *Conservation Genetics*

Ayers, DE, Schroeder, JR, Michel, CJ, **Holmes, AE**, and Rypel, AL. Relative predation of fish in a restored tidal wetland. Target journal: *Estuaries and Coasts*

Datasets and technical reports

Nagarajan, R, **Holmes, A**, and Schreier, A. 2023. Reference sequence databases for eDNA metabarcoding of San Francisco Estuary fishes and invertebrates [Dataset]. *Dryad*. <https://doi.org/10.5061/dryad.0p2ngf25z>

Rypel, AL, Miner, MC, Hitt, L, **Holmes, A**, Baird, SE, Cocherell, DE, Schreier, AM and Fangue, 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

2024	3 rd National Marine eDNA Workshop Travel Award	\$667
2023	National Park Service Point Reyes Grant (with H. Killeen & K. Monuki)	\$8160
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 (with H. Killeen & K. 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	National Science Foundation Research Experiences for Undergraduates, California Academy of Sciences, San Francisco, CA	

CONFERENCE PRESENTATIONS AND SEMINARS

2024	3rd National Workshop on Marine Environmental DNA, Laurel, MD and Washington, DC
2023	International Congress for Conservation Biology, Kigali, Rwanda
2023	American Fisheries Society California-Nevada Chapter Annual Meeting, Long Beach, CA
2202	International Bat Research Conference, Austin, TX, US
2022	North American Congress for Conservation Biology, Reno, NV, US
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
2019	American Fisheries Society and The Wildlife Society Joint Meeting, Reno, NV
2019	Interagency Ecological Program Annual Meeting, Folsom, CA
2018	Bay Delta Science Conference, Sacramento, CA
2017	Ecological Society of American, Portland, OR
2017	Interagency Ecological Program Annual Meeting, Folsom, CA
2016	San Francisco State University Student Poster Showcase, San Francisco, CA
2015	Coastal & Estuarine Research Federation, Portland, OR, US
2015	Society for Integrative and Comparative Biology, West Palm Beach, FL

Invited Seminars

2023	US Fish and Wildlife Service Continuing Education, Sacramento (CA) Field Office, Virtual
2023	Estuary & Ocean Science Center Seminar, San Francisco State University, Tiburon, CA, US
2023	Farallon Institute for Advanced Ecosystem Research Lunch Seminar, Virtual
2021	Discover Your Niche Wildlife Professional Development Conference, Virtual

TEACHING AND MENTORING

Teaching Assistantships

2023	Coastal and Marine Sciences Pre-College Program, Bodega Marine Laboratory, UC Davis
2022, 2023	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

- 2024 *Environmental DNA and genetic methods for fisheries management*, Applied Fisheries Management (WFC 137), UC Davis
- 2022, 2023 *California fish conservation genetics and environmental DNA*, 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

- 2021-2023 Cristina Gonzalez, BS, Genetics & Genomics, 2023
- 2019-2022 Khyana Yearwood, BS, Biochemistry & Molecular Biology, 2022
- UC Davis Provost's Undergraduate Fellowship (\$1360), 2021
 - North American Society for Bat Research DEI Grant (\$3000), 2022
- 2021-2022 Tien Ly, BS, Computer Science, 2022
- 2021-2022 Juan de la Torre, BS, Wildlife, Fish & Conservation Biology, 2022
- UC Davis Lloyd Swift Endowment Research Internship Grant (\$3750), 2022
- 2019-2021 Serra Perry, BS, Environmental Science & Management, 2021
- UC Davis Provost's Undergraduate Fellowship (\$1234), 2020
- 2020-2021 Sami Araya, BS, Marine Biology, 2021
- UC Davis Provost's Undergraduate Fellowship (\$1340), 2021
- 2019-2020 Shayan Kaveh, BS, Ecotoxicology, 2020
- 2019 Victor Martinez, BS, Neurobiology, Physiology & Behavior, 2020

Undergraduate Research Mentoring, San Francisco State University REU Program

- 2014-2015 David Franklin, BS, Biology, 2016 (Georgia Southern University)
- 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

- 2022-2023 Co-organizer, 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, <i>Undergraduate Research Opportunities in Ecology and the Environmental Sciences</i> job board and guidance document (https://ecology.ucdavis.edu/undergraduate-opportunities), Department of Environmental Science and Policy, UC Davis
2019	Co-organizer, <i>Navigating Academic Spaces</i> 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

2024	Bohart Museum of Entomology educational drawer on bat diets, UC Davis, CA
2020	Community Science Talks, <i>Skype A Scientist</i> 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, <i>Integrated Technology, Engineering, Math, and Science</i> , San Francisco Bay, CA
2014	Instructor, <i>Set Sail Learn</i> 4 th Grade Science, Treasure Island Sailing Club, San Francisco, CA
2014	Outreach Exhibit, " <i>Science, Neat</i> " Happy Hours for Adults, El Rio Bar, San Francisco, CA
2013-2014	Outreach Exhibit, Bay Area Science Festival, San Francisco and Alameda, CA

Peer Reviewer

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

Media

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

FIELD EXPERIENCE AND CERTIFICATIONS

2023	First Aid, CPR and Oxygen for Professional Divers, Divers Alert Network (renewal)
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
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

ATHLETICS

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