# MICHAEL T. CONNELLY

Postdoctoral Researcher, Cnidarian Genomics & Evolution
National Institutes of Health (NIH), National Human Genome Research Institute (NHGRI)
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## EDUCATION

2021 **Ph.D.** Marine Biology and Ecology
University of Miami, Rosenstiel School of Marine, Atmospheric, and Earth Science (RSMAES)

2016 **B.Sc.** Marine Science, Biology, and Chemistry
University of Miami, Rosenstiel School of Marine, Atmospheric, and Earth Science (RSMAES)
**Magna cum laude* with Marine Science Department Honors, 2016 Outstanding Student Award

## RESEARCH & ACADEMIC HISTORY

2023 **Postdoctoral Fellow**, National Institutes of Health (NIH), National Human Genome Research Institute (NHGRI), Bethesda, MD
Supervisor: Dr. Andy Baxevanis
Project: "Genomics and single-cell RNAseq of *Podocoryna carnea*"
Techniques: Genome assembly and annotation, comparative genomics, single-cell RNAseq

2021 **Biodiversity Genomics Fellow**, National Museum of Natural History (NMNH), Washington, D.C., and Smithsonian Tropical Research Institute (STRI), Panama
Co-advisors: Dr. Andrea Quattrini (NMNH) and Dr. Sean Connolly (STRI)
Project: "Host-microbe coevolution and cryptic speciation in eastern Pacific *Pocillopora* corals"
Techniques: Phylogenomic species delimitation, 3D photogrammetry and morphometrics, metagenomics, SCUBA diving in Panamá, museum specimen curation in Washington, D.C.

2016 **Ph.D. Graduate Researcher**, RSMAES Cnidarian Immunity Laboratory
Advisor: Dr. Nikki Traylor-Knowles
Dissertation: "Interactions between the *Pocillopora* coral innate immune system and coral-associated bacteria communities"
Techniques: Transcriptome and microbiome analysis, cell and molecular biology techniques

2014 **Assistant Researcher**, RSMAES Fish Disease Processes Laboratory
Advisor: Dr. Michael Schmale
Honors thesis: "Effects of nickel (II) chloride on zebrafish (*Danio rerio*) embryonic cell cultures"
Techniques: Cell culture, fluorescence microscopy, metal toxicology, zebrafish husbandry

2014 **NOAA Hollings Scholar**, NOAA Southeast Fisheries Science Center
Advisor: Dr. Margaret Miller
Internship report: "Genet and habitat effects on outplanted *Acropora palmata* fragment growth, survivorship and bleaching response"
Techniques: Coral restoration, photographic monitoring, image analysis, coral gamete collection

## PUBLICATIONS

***Submitted:***

(1) McRae, C.J., Holloway, N., Chen. G., **Connelly, M.T.**, *et al.* (2024) "A comparison of coral performance in an acute heat-stress assay and a marine heatwave reveals a mismatch in bleaching trends" in review *Coral Reefs*

***Published:***

(10) **Connelly, M.T.**, Catapang, M.G. and Quattrini, A.M. (2024) "Unlocking the treasure trove: leveraging dry coral specimens for museum genomics" *Coral Reefs* https://doi.org/10.1007/s00338-024-02525-5

(9) **Connelly, M.T.**, Snyder, G.A., Palacio-Castro, A.M., Gillette, P.R., Baker, A.C. and Traylor-Knowles, N.T. (2023) "Antibiotics reduce *Pocillopora* coral-associated bacteria diversity, decrease holobiont oxygen consumption, and activate immune gene expression" *Molecular Ecology* https://doi.org/10.1111/mec.17049

(8) **Connelly, M.T.**, McRae, C.J., Liu, P.J., Martin, C.E. and Traylor-Knowles, N.T. (2022) "Antibiotics Alter *Pocillopora* Coral-Symbiodiniaceae-Bacteria Interactions and Cause Microbial Dybiosis During Heat Stress" *Frontiers in Marine Science* https://doi.org/10.3389/fmars.2021.814124

(7) Snyder, G.A., **Connelly, M.T.**, Eliachar, S., Girshoni-Yahalom, O., Browne, W.E., Palmer, C.V., Rosental, B., and Traylor-Knowles, N.T. (2021) "Functional Characterization of Hexacorallia Phagocytic Cells" *Frontiers in Immunology* https://doi.org/10.3389/fimmu.2021.662803

(6) Traylor-Knowles, N.T., **Connelly, M.T.**, Young, B.D., Eaton, K., Muller, E., Paul, V.J., Ushijima, B., DeMerlis, A., Drown, M. K., Goncalves, A., Kron, N., Martin, C.E., and Rodriguez, K. (2021) "Gene Expression Response to Stony Coral Tissue Loss Disease Transmission in *M. cavernosa* and *O. faveolata* from Florida" *Frontiers in Marine Science* https://doi.org/10.3389/fmars.2021.681563

(5) Nowotny, J.D., **Connelly, M.T.**, and Traylor-Knowles, N.T. (2021) "Novel Methods to Establish Whole-Body Primary Cell Cultures for the Cnidarians *Nematostella vectensis* and *Pocillopora damicornis*" *Scientific Reports* https://doi.org/10.1038/s41598-021-83549-7

(4) Bonacolta, A.M., **Connelly, M.T.**, Rosales, S., del Campo, J., and Traylor-Knowles, N.T. (2020) "Microniche sampling of the bacteriome in the Starlet Sea Anemone, *Nematostella vectensis*, reveals a compartment-specific dominance of Spirochetes" *FEMS Microbiology Ecology Letters* https://doi.org/10.1093/femsle/fnab002

(3) Walters, B., **Connelly, M.T.**, Young, B., and Traylor-Knowles, N.T. (2020) "The Complicated Evolutionary Diversification of the Mpeg-1/Perforin-2 Family in Cnidarians" *Frontiers in Immunology* (11):1690, https://doi.org/10.3389/fimmu.2020.01690

(2) **Connelly, M.T.**, McRae, C.J., Liu, P.J., and Traylor-Knowles, N.T. (2020) "Lipopolysaccharide treatment stimulates *Pocillopora* coral genotype-specific immune responses but does not alter coral-associated bacteria communities" *Developmental and Comparative Immunology* (109):103717, https://doi.org/10.1016/j.dci.2020.103717

(1) Traylor-Knowles, N.T. and **Connelly, M.T.** (2017) "What Is Currently Known About the Effects of Climate Change on the Coral Immune Response?" *Current Climate Change Reports* (3):252-260, https://doi.org/10.1007/s40641-017-0077-7

***Technical reports:***

(1) Pausch, R., Miller, M., **Connelly, M.T.**, Williams, D.E., (2015) "Effects of habitat and genet on outplanted *Acropora palmata* fragments' survival and performance" *NOAA Southeast Fisheries Science Center, in collaboration with Coral Restoration Foundation*

## FUNDING *($149,837 total)*

2022 Smithsonian Institution Barcoding Network Grant ($9,837)
2021 Smithsonian Institution Biodiversity Genomics Postdoctoral Fellowship ($118,000)
2020 University of Miami Institute for the Americas Field Research Grant ($2,000)
2018 RSMAES David Rowland Endowed Fellowship ($3,500)
2018 Marine Aquarium Societies of North America Graduate Scholarship ($5,000)
2017 RSMAES Graduate Career Development Fund for CompBio-athon ($2,500)
2016 NSF East Asia and Pacific Summer Institute Taiwan Fellow ($5,000)
2015 RSMAES Small Undergraduate Research Grant ($2,000)
2014 NOAA Ernest F. Hollings Scholarship ($8,000)

## AWARDS *($1,000 total)*

2020 RSMAES Marine Biology and Ecology Department Best Student Seminar ($150)
2020 UM Three-Minute Thesis Competition People's Choice Award ($50)
2018 Global Invertebrate Genomics Alliance Student Travel Award ($800)
2016 Outstanding Undergraduate RSMAES Student Award
2016 NSF Graduate Research Fellowship Honorable Mention
2015 American Chemical Society Undergraduate Award in Analytical Chemistry
2015 Barry M. Goldwater Scholarship Honorable Mention

## TEACHING EXPERIENCE

2022 **Workshop Coordinator**, Coral Genetics for Conservation and Restoration Workshop
- Developed, organized, and taught 4-day workshop on *Pocillopora* coral DNA extraction and molecular species identification techniques to Costa Rican university students and conservation professionals in San José with local collaborators Raising Coral Costa Rica. Course website link

2020 **Workshop Coordinator**, Stony Coral Tissue Loss Disease Transcriptomics Workshop
- Developed materials to 4-day workshop on coral disease RNAseq and transcriptome assembly to RSMAS and UM Biology department graduate students, resulting in a collaborative, peer-reviewed publication

2020 **Teaching Assistant**, Marine Ecology of the Galápagos (MSC 422)
- Supervised class snorkeling field trips to Isabela and Floreana islands and delivered lectures on introductory statistics and Galápagos coral ecology

2018 **Teaching Assistan**t, Statistics for Environmental Management (RSM 612)

- Hosted weekly office hours, graded homework, and provided course support

2018 **Guest Lecturer**, Introduction to Marine Biology (MSC 230)

- Delivered lecture on the importance of symbiosis in biology and coral reef ecology

2018 **Guest Lecturer**, Introduction to Comparative Immunology (MSC 465)

- Delivered lecture on cellular and molecular techniques used in coral immunology

2018 **Workshop Coordinator**, RSMAS CompBio-athon

- Planned RNAseq and population genetics workshop for 15 graduate students

## MENTORING EXPERIENCE

2024 Jonah Petty, NGHRI summer research intern
2022 Esme Kline, STRI/NMNH bioinformatics research intern
2022 Mary Grace Catapang, Natural History Research Experiences (NHRE) summer intern
2019 Rachel Sandquist*, RSMAES Cnidarian Immunity Laboratory
2019 James Nowotny*, RSMAES Cnidarian Immunity Laboratory
2018 Brian Walters*, RSMAES Cnidarian Immunity Laboratory
2018 Anthony Bonacolta*, RSMAES Cnidarian Immunity Laboratory
2018 Madison Emery, RSMAES Cnidarian Immunity Laboratory
2016 Megan Howson, RSMAES Cnidarian Immunity Laboratory
2016 Jessica Daly, RSMAES Cnidarian Immunity Laboratory
2016 Alanna Wasserman, RSMAES Cnidarian Immunity Laboratory

**completed Marine Science Department Honors thesis*

## CONFERENCE PROCEEDINGS

***Presentations:***

**Connelly, M.T.**, Rivera, A.M., Travert, M., Stoilova, M.I., Cartwright, P., Baxevanis, A.D., (2024). "Single-cell transcriptomics of polyps and medusae of the hydrozoan *Podocoryna carnea*" Cnidofest 2024, Lehigh University, Bethlehem, PA

**Connelly, M.T.**, Glynn, V.M., Cornejo, A., Leray, M. Connolly, S.R., Quattrini, A.M., (2024). "Genome skimming reveals species diversity and patterns of adaptation and gene flow in east Pacific *Pocillopora* corals" 3rd Joint Congress on Evolutionary Biology, Montreal, Canada

**Connelly, M.T.**, Glynn, V.M., Cornejo, A., Leray, M. Connolly, S.R., Quattrini, A.M., (2024). "Genome skimming resolves east Pacific *Pocillopora* species diversity and population differentiation" Society of Integrative & Comparative Biology 2024 Annual Meeting, Seattle, WA

**Connelly, M.T.**, and Traylor-Knowles, N., (2021). "Interactions between the *Pocillopora* coral innate immune system and coral-associated bacteria communities" Frontiers in Tropical Marine and Terrestrial Microbial Ecology Symposium, virtual conference, Smithsonian Tropical Research Institute

**Connelly, M.T.**, McRae, C.J. Liu, P.J., Traylor-Knowles, N., (2021). "Experimental treatment of *Pocillopora* corals with LPS stimulates genotype-specific immune responses but does not alter associated bacteria communities" International Coral Reef Symposium, Bremen, Germany

Traylor-Knowles, N., Snyder, G.A., **Connelly, M.T.**, Browne, W.E., Rosental, B., (2021). "From cells to genes: the surprising immune system of *Pocillopora damicornis*" International Coral Reef Symposium, Bremen, Germany

**Connelly, M.T.** McRae, C.J., Liu, P.J.,Traylor-Knowles, N., (2018). "Patterns of *Pocillopora damicornis* immune gene expression in response to antibiotics treatment, heat stress, and lipopolysaccharide exposure" Global Invertebrate Genomics Alliance Conference, Curaçao

Traylor-Knowles, N., Snyder, G.A., **Connelly, M.T.**, Browne, W.E., Rosental, B., (2018). "From cells to genes: the surprising immune system of *Pocillopora damicornis*" Cnidofest Conference, University of Florida Whitney Marine Laboratory, St. Augustine, FL

**Connelly, M.T.** McRae, C.J., Liu, P.J., Traylor-Knowles, N., (2018). "Differential immune gene expression of *Pocillopora damicornis* corals in response to antibiotics treatment, heat stress, and lipopolysaccharide exposure" Southeastern Ecology and Evolution Conference, Miami, FL

**Connelly, M.T.**, Pausch, R., Bright, A., Williams, D.E., Miller, M. (2016). "Genet and habitat effects on outplanted *Acropora palmata* fragment growth, survivorship and bleaching response" Benthic Ecology Meeting, Portland, ME

***Posters:***

Petty, J.A., Rivera, A.M., **Connelly, M.T.**, Baxevanis, A.D., (2024) "Comparative protein structural analysis of diverse Cnidarian allorecognition systems" NIH Summer Internship Program Research Symposium, Bethesda, MD

Catapang, M.G.L., **Connelly, M.T.**, Quattrini, A.M., (2022). "Assessing historical DNA from *Pocillopora* museum specimens" NHRE Poster Symposium, Washington, D.C. link to online accessible poster

**Connelly, M.T.**, Quattrini, A.M., Kline, D.I. (2022). "Towards a modern integrative taxonomy of *Pocillopora* corals: a literature synthesis and meta-analysis of genetic data" Ocean Sciences Meeting, virtual conference, Association for the Sciences of Limnology and Oceanography

Sandquist, R., **Connelly, M.T.**, Traylor-Knowles, N., (2020). "Investigation of tumor necrosis factor receptor-associated factors in *Pocillopora damicornis*" RSMAS Undergraduate Poster Symposium, Miami, FL

Nowotny, J.D., Snyder, G.A., **Connelly, M.T.**, Rosental, B., Traylor-Knowles, N., (2020). "Working towards the establishment of long-term cnidarian cell culture and stem cell characterization through FACS" RSMAS Undergraduate Poster Symposium, Miami, FL

Bonacolta, A.B., **Connelly, M.T.**, Rosales, S., Snyder, G.A., Traylor-Knowles, N., (2020). "Organismal compartmentalization of the microbiome in the starlet sea anemone, *Nematostella vectensis*" RSMAS Undergraduate Poster Symposium, Miami, FL

**Connelly, M.T.** McRae, C.J., Liu, P.J., Traylor-Knowles, N., (2018). "Patterns of *Pocillopora damicornis* immune gene expression in response to antibiotics treatment, heat stress, and lipopolysaccharide exposure" Cnidofest Conference, University of Florida Whitney Marine Laboratory, St. Augustine, FL

**Connelly, M.T.**, Gibbs, P.D., Schmale, M.C. (2016). "Effects of nickel (II) chloride exposure on zebrafish (*Danio rerio*) embryonic cell cultures" RSMAS Undergraduate Poster Symposium, Miami, FL

**Connelly, M.T.**, Gibbs, P.D., Schmale, M.C. (2014). "Transgenic Zebrafish Cell Culture and Cell Response to External Stimuli" University of Miami Honors Summer Research Forum, Miami FL

**Connelly, M.T.**, Pontes, E., Letourneau, M., Langdon, (2013). "Understanding the combined impacts of rising temperature and atmospheric $CO_2$ on calcification and photosynthetic rates of *Porites* and *Acropora* corals" University of Miami Research, Creativity, and Innovation Forum, Miami, FL

## INVITED PRESENTATIONS

2022 New York Society of Cosmetic Chemists, “Sources and Impacts of Pollution on Coral Reefs”
2022 McGill University Redpath Museum, “*Pocillopora* coral host-microbe interactions and coevolution”
2021 No Bones, Department of Invertebrate Zoology, NMNH, “Investigating *Pocillopora* coral host-microbe interactions, holobiont coevolution and cryptic speciation”
2021 STRI Ecological and Evolutionary Genomics Group, “Host-microbe coevolution and cryptic speciation in eastern tropical Pacific *Pocillopora* corals”
2018 Kenting National Park Headquarters, Taiwan, “Examining the innate immunity of *Pocillopora damicornis* corals from thermally variable reefs in Kenting National Park”

## OUTREACH ACTIVITIES

2022 Smithsonian Science Café
- Participated in science communication workshop and delivered a presentation on coral biodiversity research at the Smithsonian Institution, “Coral Microbiomes and the Key to Resilience” (https://youtu.be/TS_mhT6FOdA?t=1660)

2021 Great American Teach-In
- Participated in a Zoom call with 3rd-grade students in Ruskin, FL, to answer questions about Florida’s coral reefs and marine ecosystems

2020 University of Miami Three-Minute Thesis Competition
- Presented a three-minute synopsis of dissertation research findings and won the People’s Choice Award after a public audience vote (https://youtu.be/7HzH5N05cMI?t=300)

2020 Subtropical Experiments: “Corals Above and Below”
- Delivered a presentation on coral conservation in South Florida to a public audience at WDNA radio studio (https://youtu.be/ksZ_jfji86M?t=1381)

2018 Frost Museum of Science IMPACT Program Mentor
- Mentored Miami-Dade County high school students Donald and Sasha for 8-week projects

2016 President, University of Miami Aquarium Club
- Organized educational club trips to the Mote Marine Laboratory, Georgia Aquarium, Shedd Aquarium, New England Aquarium and Ripley’s Aquarium of Canada, installed a 150-gallon reef aquarium in club meeting room

## PROFESSIONAL SERVICE

2024 NIH Genome Trainee Advisory Committee (GTAC) Representative

2021 Smithsonian Senate of Scientists Postdoctoral Fellow Representative
- Attend monthly senate meetings to represent the NMNH postdoctoral fellow community

2019 Student Leadership, Evaluation and Development Committee (SLED), 2019 - 2021
- Served as Marine Biology and Ecology Department representative and helped to conduct bi-annual RSMAES student professional development surveys and share results with RSMAES Graduate Academic Committee

Scientific Peer Review: Ecology (1), Coral Reefs (2), PLOS ONE (4), Life: The Excitement of Biology (1)

## PROFESSIONAL DEVELOPMENT

2022 NMNH Science Café Science Communication Workshop
2021 NMNH Virtual Species Delimitation Workshop
2020 RSMAES Stony Coral Tissue Loss Disease Transcriptomics Workshop (also coordinator)
2017 RSMAES CompBio-athon (also coordinator)

2016 Mount Desert Island Biological Laboratory Environmental Genomics Workshop

## PROFESSIONAL CERTIFICATIONS

2022 Smithsonian Institution Scientific Diver, 33 career SI dives in Panamá and Galápagos, Ecuador
2019 Miami-Dade College Continuing Education Department Spanish I-V course completion
2017 Department of the Interior Motorboat Operator Certification Course
2015 American Academy of Underwater Sciences authorized diver, 66 career dives with RSMAS, NOAA, and international teams in Florida, Puerto Rico, and Taiwan