MICHAEL T. CONNELLY, PH.D.

Postdoctoral researcher, coral biology, ecology, and conservation
Smithsonian Institution Biodiversity Genomics Fellow
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EDUCATION

Ph.D., Marine Biology and Ecology, 2016 - 2021
Rosenstiel School of Marine and Atmospheric Science (RSMAS), Miami, FL
GPA 3.541

BSc., Marine Science and Biology, additional Chemistry major, 2012 - 2016
University of Miami (UM), Coral Gables, FL
GPA 3.938, graduated *magna cum laude* with departmental honors
2016 RSMAS Outstanding Student Award

RESEARCH EXPERIENCE

Biodiversity Genomics Fellow, Smithsonian Institution, 2021 - present
Smithsonian Tropical Research Institute (STRI), Republic of Panamá
National Museum of Natural History (NMNH), Washington, D.C.
Fellowship Advisors: Dr. David Kline (STRI), Dr. Andrea Quattrini (NMNH)
Project title: "Host-microbe coevolution and cryptic speciation in eastern Pacific *Pocillopora* corals"
Techniques: Species delimitation, phylogenomics, 3D photogrammetry, morphometrics, metagenomics, fieldwork in Panamá

Ph.D. Candidate, RSMAS Cnidarian Immunity Laboratory, 2016 - 2021
Advisor: Dr. Nikki Traylor-Knowles
Dissertation title: "Interactions between the *Pocillopora* coral innate immune system and coral-associated bacteria communities"
Techniques: Transcriptomics, microbiome analysis, cell and molecular biology, fieldwork in Florida, Costa Rica, Ecuador and Taiwan

Research Assistant, RSMAS Fish Disease Processes Laboratory, 2014 - 2016
Advisor: Dr. Michael Schmale
Thesis title: "Effects of nickel (II) chloride on zebrafish (*Danio rerio*) embryonic cell cultures"
Techniques: Cell culture, fluorescence microscopy, metal toxicology, zebrafish husbandry

Hollings Research Intern, NOAA Southeast Fisheries Science Center, 2014 - 2016
Advisor: Dr. Margaret Miller
Techniques: Coral restoration, photographic monitoring, image analysis, coral gamete collection

Research Assistant, RSMAS Corals and Climate Change Laboratory, 2013 - 2014
Advisor: Dr. Chris Langdon
Techniques: Coral stress physiology, aquarium maintenance

PEER-REVIEWED PUBLICATIONS

Published:

(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

SCHOLARSHIPS, FELLOWSHIPS, & AWARDS

2021: Smithsonian Institution Biodiversity Genomics Postdoctoral Fellowship ($8000)
2020: RSMAS Marine Biology and Ecology Department Best Student Seminar Award
UM Institute for Advanced Study of the Americas Field Research Grant ($2000)
UM Three-Minute Thesis Competition (3MT) People's Choice Award
2018: RSMAS David Rowland Endowed Fellowship ($3500)
Marine Aquarium Societies of North America Graduate Scholarship ($5000)
Global Invertebrate Genomics Alliance Student Travel Scholarship ($800)
2017: RSMAS Graduate Career Development Fund for CompBio-athon ($2500)
2016: NSF East Asia and Pacific Summer Institute Taiwan Fellow ($5000)
Outstanding Undergraduate RSMAS Student Award
NSF Graduate Research Fellowship Honorable Mention
2015: RSMAS Small Undergraduate Research Grant ($2000)
American Chemical Society Undergraduate Award in Analytical Chemistry
Barry M. Goldwater Scholarship Honorable Mention
2014: NOAA Ernest F. Hollings Scholarship ($8000)
2012: Moorestown High School Cross Country Coaches Award for Leadership

CONFERENCE PRESENTATIONS

Conference talks:

M.T. Connelly, and N. Traylor-Knowles, 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

M.T. Connelly, C.J. McRae, P.J. Liu, and N. Traylor-Knowles, 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

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

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

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

M.T. Connelly, C.J. McRae, P.J. Liu, and N. Traylor-Knowles, 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

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

Posters:

M.T. Connelly, A.M. Quattrini and D.I. Kline, 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.**, and N. Traylor-Knowles, 2020. “Investigation of tumor necrosis factor receptor-associated factors in *Pocillopora damicornis*” RSMAS Undergraduate Poster Symposium, Miami, FL

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

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

M.T. Connelly, C.J. McRae, P.J. Liu, and N. Traylor-Knowles, 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

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

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

M.T. Connelly, E. Pontes, M. Letourneau, C. 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

TEACHING & MENTORING EXPERIENCE

Natural History Research Experiences (NHRE) summer internship mentor

- Currently working with M.G. Catapang on historical specimen DNA extraction

Coral Genetics for Conservation and Restoration workshop coordinator, July 2022

- Planned and organized workshop to teach *Pocillopora* coral DNA extraction and molecular species identification techniques to Costa Rican university students in San José with local collaborators Raising Coral Costa Rica
- https://michaeltconnelly.github.io/RaisingCoral_CoralGeneticsWorkshop_2022/

RSMAS undergraduate student mentorship, 2016 - 2021

- Mentored four undergraduate students to completed honors theses (R. Sandquist, J. Nowotny, B. Walters, A. Bonacolta)

Stony Coral Tissue Loss Disease transcriptomics workshop coordinator, November 2020

- Developed materials to teach coral disease RNAseq and transcriptome assembly to RSMAS and UM Biology department graduate students, resulting in a collaborative, peer-reviewed publication

Teaching Assistant, Marine Ecology of the Galápagos, March 2020

- Supervised class snorkeling field trips to Isabela and Floreana islands and delivered lectures on basic statistics and Galápagos coral ecology

Teaching Assistant, Statistics for Environmental Management, 2018

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

Guest Lecturer, Intro. To Marine Biology and Comparative Immunology (MSC 465)

- Delivered marine symbiosis and coral innate immunity lectures

Summer Student Mentor, Frost Museum of Science IMPACT Program, 2018

- Mentored high school students Donald and Sasha summer research projects

RSMAS CompBio-athon workshop coordinator, 2018

- Planned RNAseq and population genetics workshop for 15 graduate students

Organic Chemistry Workshop Leader, University of Miami Chemistry Department, 2016

- Led weekly chemistry group tutoring and problem-solving sessions

Student Tutor, University of Miami Athletic Department, 2014

- Tutored student-athletes in chemistry, physics, and calculus classes

LEADERSHIP & OUTREACH EXPERIENCE

Smithsonian Senate of Scientists Postdoctoral Fellow Representative
Smithsonian Science Café

- Presentation: https://youtu.be/TS_mhT6FOdA?t=1660

UM Three-Minute Thesis People's Choice Award winner, March 2020

- Presentation: https://youtu.be/7HzH5N05cMI?t=300

Student Leadership, Evaluation and Development Committee (SLED), 2019 - 2021

- Conduct bi-annual RSMAS student professional development surveys and share results with RSMAS Graduate Academic Committee

Subtropical Experiments Guest Speaker: "Corals Above and Below", July 2020

- Delivered a presentation on coral conservation in South Florida to a public audience at WDNA radio studio (https://youtu.be/ksZ_jfji86M?t=1381)

University of Miami Aquarium Club (UMAC) President, 2014 - 2016

- 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 UMAC meeting room

RESEARCH SKILLS AND SERVICE

Data Analysis

- Github profile: https://github.com/michaeltconnelly
- Programming in Unix bash environment, interface with Pegasus Supercomputer at University of Miami Center for Computational Sciences, Smithsonian HPC Hydra
- Statistical analysis in R using base R and tidyverse functions, data visualization with R base graphics and ggplot2
- RNAseq quality control and alignment using FASTQC, Trimmomatic, STAR, subRead, and samtools programs, differential gene expression analysis with R packages DESeq2, edgeR, genefilter and pheatmap, gene co-expression network analysis with R package WGCNA, gene ontology enrichment analysis with R package TopGO
- Bacteria 16S rRNA gene analysis using QIIME2 pipeline and plugins, microbial community analysis with R packages phyloseq, microbiome, vegan
- Proficient in Microsoft Excel and Microsoft Access

Cell and Molecular Biology

- DNA and RNA extraction using Qiagen and Zymo kits, and modified phenol-chloroform methods
- Polymerase chain reaction of eukaryote and bacterial DNA
- PCR product cleanup and Sanger sequencing preparation
- cDNA library preparation using Illumina TruSeq v2 kit, Lexogen QuantSeq 3' FWD kit
- 16S rDNA amplicon library preparation using 515F/806R primers
- Primary cell culture establishment, feeding, passaging, and cell counting
- Flow cytometry on the BD LSR Fortessa using propidium iodide staining
- Fluorescence-activated cell sorting on the SONY SH800S cell sorter

- Fluorescence microscopy using Leica M205FA and DM5500B microscopes and Zeiss inverted microscope
- Image analysis using Leica LASX, ImageJ (FIJI) software

Museum Collections and Specimen Curation

- Historical specimen DNA extraction using modified Qiagen protocols
- 3D photogrammetry and morphometrics analysis using AgiSoft Metashape sofware

Marine Operations and Aquarium Husbandry

- Aquarium system design, construction and maintenance
- Coral respiration and photosynthesis rate measurement using intermittent flow respirometry and Loligo Systems microplate respirometer
- Photosynthetic yield (Fv/Fm) assessment with pulse-amplitude modulated fluorimetry using Walz I-PAM fluorometer
- American Academy of Underwater Sciences (AAUS) Research Diver authorized at the University of Miami, May 2015; PADI Advanced Open Water/Nitrox SCUBA Diver, certified April 2013
- Smithsonian Institution Research Diver authorized February 2022
- Department of Interior Marine Operator Certification Course boat operator, certified May 2017

Scientific Peer Review

- Ecology (1), Coral Reefs (2), Life: The Excitement of Biology (1)