

Timothy D. Swain, PhD

Nova Southeastern University

<http://scholar.google.com/citations?user=ZkNTCCgAAAAJ&hl=en&oi=ao>**Employment history:****Assistant Professor** 2019–present

Department of Marine and Environmental Sciences, Nova Southeastern University, 8000 N Ocean Dr, Dania Beach, FL 33004

Research Associate 2016–2019

Northwestern University, Department of Civil and Environmental Engineering, 2145 Sheridan Rd. Room A330, Evanston, IL 60208

Field Museum of Natural History, Integrative Research Center, 1400 South Lake Shore Drive, Chicago, IL 60605

Postdoctoral Fellow 2010–2016

Northwestern University, Department of Civil and Environmental Engineering, 2145 Sheridan Rd. Room A223, Evanston, IL 60208

Field Museum of Natural History, Biodiversity Synthesis Center, 1400 South Lake Shore Drive, Chicago, IL 60605

Instructional Coordinator for Animal Diversity 2005–2010

Florida State University, Department of Biological Science, 319 Stadium Dr, Tallahassee, FL 32304

Instructor/Teaching Assistant 2002–2005

Florida State University, Department of Biological Science, 319 Stadium Dr, Tallahassee, FL 32304

Instructor/Teaching Assistant /2002–2005

State University of New York at Buffalo, Department of Biological Sciences, 109 Cooke Hall, Buffalo, NY 14260

Education:

2010 Ph.D. Biology, Florida State University

2002 M.S. Biology, State University of New York at Buffalo

1998 B.S. Biology, State University of New York at Buffalo

Continuing Education:

2013 Howard Hughes Medical Institute Undergraduate Mentoring Fellows Program, Northwestern University

2011 Light and Photosynthesis on Coral Reefs, Universidad Nacional Autónoma de México

1997 Semester at Sea, Institute for Shipboard Education, University of Pittsburgh

1996 Marine Invertebrate Zoology, Harbor Branch Oceanographic Institution

Courses Taught (as an instructor):

Fall 2017 Environmental Microbiology; Instructor, sections on microbial ecology, Northwestern University

Fall 2015 Environmental Microbiology; Instructor, sections on microbial ecology, Northwestern University

Summer 2014 Phylogenetics; Instructor, NSF REU, Field Museum of Natural History

Spring 2013 Complex Interactions: Coevolution, Parasites, Mutualists, and Cheaters; Instructor, sections on coral symbioses and evolution, University of Chicago

Spring 2011 Development and Evolution of Neuromechanical systems; Instructor,
 sections on computational phylogenetics, NSF IGERT, University of Chicago
 Spring 2003-spring 2005 Animal Diversity Laboratory; Instructor, FSU
 Fall 2002 Introductory Biology Laboratory; Instructor, FSU
 Spring 2001 & 2002 Cell Biology Laboratory; Instructor, SUNY Buffalo
 Fall 2000 & 2001 Ecology Laboratory; Instructor, SUNY Buffalo

Courses Taught (as a teaching assistant):

Summer 2005 Marine Biology; TA, FSU
 Summer 2001 Arctic Molecular Ecology; TA, SUNY Buffalo

Directed Undergraduate Research:

1/2018–8/2018 Kelly Poulos (Northwestern University)
 10/2017–8/2018 Fiona Worsfold (Northwestern University)
 10/2017–8/2018 Gabriella Boone (Northwestern University)
 2/2016–6/2018 Phillip Osborn (Northwestern University)
 6/2016–6/2017 Emily Bold (Northwestern University)
 1/2016–5/2016 Gabriela Carr (Northwestern University)
 1/2016–5/2016 Hannah Ryon (Northwestern University)
 9/2015–5/2017 Scott Goldberg (Northwestern University)
 6/2015–5/2016 Jesse Vega-Perkins (Northwestern University)
 4/2015–6/2015 Nora Jandali (Northwestern University)
 9/2013–6/2015 William Oestreich (Northwestern University)
 7/2014–5/2015 Conrad Triebold (Field Museum)
 6/2013–5/2014 Michelle Wagner (Northwestern University)
 1/2013–6/2014 Kyla Williams (Northwestern University)
 8/2012–10/2012 Rebecca Pelka (Loyola University)
 12/2011–8/2012 Josh Traub (Loyola University)
 1/2012–5/2013 Hanna Grooms (Northwestern University)
 7/2012–1/2013 John Juranek (Loyola University)
 10/2011–3/2012 Kristine Park (Niles West High School)
 6/2011–5/2012 Paige Humecki (Northwestern University)
 5/2011–9/2013 Elizabeth Velazques (Northwestern University)
 5/2011–5/2013 Emily DuBois (Northwestern University)
 10/2010–5/2012 Natalie Lake (Northwestern University)
 10/2010–3/2011 Arielle Berens (Northwestern University)
 2009–2010 Kim Reuter (Florida State University)
 2008–2010 Megan O'Boyle (Florida State University)
 2008–2010 Margeret Cowie (Florida State University)
 2006–2008 Darnley Sobers (Bellairs Research Institute, Barbados)

Presentations – invited seminars:

2018 Phylogeny-informed quantitative symbiosis ecology: syntheses of existing and novel data provide actionable tools for research and conservation. Nova Southeastern University
 2018 Foreign-language translation of in scientific research. DePaul University
 2017 Current state of knowledge on differential coral bleaching: syntheses providing actionable data for research and resource management. Florida Fish and Wildlife Conservation Commission, St. Petersburg, Florida.

- 2017 Phylogenetic tools to identify potential determinants of differential coral bleaching. University of Copenhagen, Denmark.
- 2017 Use of foreign-language translations in scientific publications. DePaul University
- 2017 Biological consequences of climate change: the degradation of coral reefs in the Anthropocene. Northwestern University.
- 2016 How the Smithsonian Tropical Research Institute fit within the Indigenous Guna Community of Panamá. Transnational Latino Conference, DePaul University
- 2015 Coral bleaching is accelerated by skeletal optics. Shedd Aquarium.
- 2014 Skeletal light-scattering and bleaching response of reef-building corals. University of South Florida.
- 2014 Evolution of cnidarian symbioses. Auburn University.
- 2014 Evolution and ecology of cnidarian symbioses. Royal Ontario Museum, Canada.
- 2012 Symbiosis evolution. University of Louisiana at Lafayette.
- 2011 Ecology and evolution of symbioses. Lake Forest College (invited by Tri-Beta Undergraduate Biology Honors Society).
- 2011 Evolution of symbioses. Northwestern University.
- 2011 Evolutionary transitions in symbioses. Ohio State University.
- 2010 Evolution of symbioses in Zoanthidea. Field Museum of Natural History
- 2010 Evolution of host associations in symbiotic Zoanthidea. Florida State U.
- 2007 Evolution of host associations in symbiotic zoanthids. Florida State U.

Grants:

- 2017–2018 (\$16,000) Shedd Aquarium Collaborative Research
- 2016 (\$5,616) Experiment.com
- 2015 (\$1,820) Northwestern Open Access Fund
- 2010–2014 (\$56,000) Shedd Aquarium Collaborative Research
- 2009 (\$1,000) Margaret Y. Menzel Award for Outstanding Research
- 2009 (\$640) FSU Dissertation Research Grant
- 2007 (\$2,000) Jack Winn Gramling Award in Marine Biology
- 2005 (\$2,000) Lerner-Gray Fund for Marine Research, AMNH
- 2005 (\$2,000) Society of Systematic Biologists Graduate Student Award
- 2004 & 2005 (\$2,000) Sigma Xi Grants-in-aid-of-research
- 2004 (\$1,000) PADI Project AWARE
- 2003–2004 (\$3,000) Smithsonian Tropical Research Institute Short-term Fellow
- 2002 (\$1,500) SUNY Ecology and Evolution Graduate Group grant
- 1995–1998 (\$3,000) Howard Hughes Medical Institute Undergraduate Scholar
- 1995 (\$1,500) Harbor Branch Oceanographic Institution fellowship
- 1994 (\$3,000) NSF Research Experience for Undergraduates

Publications – peer reviewed (*student coauthors):

- Swain TD, Lax S*, Lake N*, Grooms H*, Backman V, Marcelino LA. 2018 Relating coral skeletal structures at different length scales to growth, light availability to *Symbiodinium*, and thermal bleaching. *Frontiers in Marine Science*. [Invited Submission]
- Swain TD, Westneat WM, Backman V, Marcelino LA. 2018. Phylogenetic analysis of symbiont transmission mechanisms reveal evolutionary patterns in thermotolerance and host specificity that enhance bleaching resistance among vertically transmitted *Symbiodinium*. *European Journal of Phycology* <https://doi.org/10.1080/09670262.2018.1466200>.

- Swain TD, Bold EC*, Osborn PC*, Baird A, Westneat WM, Backman V, Marcelino LA. 2018. Physiological integration of coral colonies is correlated with bleaching resilience. *Marine Ecology Progress Series* 586: 1–10. [Feature Article]
- Swain TD. 2018. Revisiting the phylogeny of Zoanthidea (Cnidaria: Anthozoa): staggered alignment of hypervariable sequences improves species tree inference. *Molecular Phylogenetics and Evolution* 118: 1–12.
- Swain TD, DuBois E*, Goldberg SJ*, Backman V, Marcelino LA. 2017. Bleaching response of coral species in the context of assemblage response. *Coral Reefs* 36: 395–400.
- Swain TD, Chandler J*, Backman V, Marcelino LA. 2017. Consensus thermotolerance ranking for 110 *Symbiodinium* phylotypes: an exemplar utilization of a novel iterative partial rank aggregation tool with broad application potential. *Functional Ecology* 31: 172–183.
- Swain TD, Strimaitis A*, Reuter K*, Boudreau W*. 2016. Towards integrative systematics of Anthozoa: Evolution of form in the order Zoanthidea (Anthozoa: Hexacorallia). *Zoologica Scripta* 46: 227–244.
- Swain TD, Vega-Perkins JB*, Oestreich WK*, Triebold C*, DuBois E*, Henss J, Ozdogan M, Baird A, Siple M*, Westneat M, Backman V, Marcelino LA. 2016. Coral bleaching response index: a new tool to standardize and compare susceptibility to thermal bleaching. *Global Change Biology* 22: 2475–2488.
- Swain TD, DuBois E*, Gomes A*, Stoyneva VP*, Radosevich AJ*, Henss J, Wagner ME*, Derbas J*, Grooms HW*, Velazquez EM*, Traub J*, Kennedy BJ*, Grigorescu AA, Westneat MW, Sanborn K, Levine S, Schick M, Parsons G, Biggs, BC, Rogers JD, Backman VB, Marcelino LA. 2016. Skeletal light-scattering accelerates bleaching response in reef-building corals. *BMC Ecology* 16:10.
- Swain TD, Schellinger J*, Strimaitis A*, Reuter K*. 2015. Evolution of anthozoan polyp retraction mechanisms: convergent functional morphology and evolutionary allometry of the marginal musculature in order Zoanthidea (Cnidaria: Anthozoa: Hexacorallia). *BMC Evolutionary Biology* 15:123.
- Swain TD, Swain LM*. 2014. Molecular parataxonomy as taxon description: examples from recently named Zoanthidea (Cnidaria: Anthozoa) with revision based on serial histology of microanatomy. *Zootaxa* 3796: 81–107.
- Marcelino LA, Westneat MW, Stoyneva V*, Henss J, Rogers JD, Radosevich A*, Turzhitsky V, Siple M*, Fang A, Swain TD, Fung J, Backman V. 2013. Modulation of light-enhancement to symbiotic algae by light-scattering properties in corals and evolutionary trends in bleaching. *PLoS ONE* 8: e61492.
- Swain TD. 2012. Context-dependent effects of symbiosis: Zoanthidea colonization generally improves Demospongiae condition in native habitats. *Marine Biology* 159: 1429–1438.
- Swain TD. 2010. Evolutionary transitions in symbioses: dramatic reductions in bathymetric and geographic ranges of Zoanthidea coincide with loss of symbioses with invertebrates. *Molecular Ecology* 19: 2587–2598.
- Swain TD. 2009. Phylogeny-based species delimitations and the evolution of host associations in symbiotic zoanthids (Anthozoa, Zoanthidea) of the wider Caribbean region. *Zoological Journal of the Linnean Society* 156: 223–238.
- Swain TD. 2009. *Isozoanthus antumbrosus*, a new species of zoanthid (Cnidaria: Anthozoa: Zoanthidea) symbiotic with Hydrozoa from the Caribbean, with a key to hydroid and sponge-symbiotic zoanthid species. *Zootaxa* 2051: 41–48.

Swain TD, Wulff JL. 2007. Diversity and specificity of Caribbean sponge-zoanthid symbioses: a foundation for understanding the adaptive significance of symbioses and generating hypotheses about higher-order systematics. *Biological Journal of the Linnean Society* 92: 695-711.

Swain TD, Taylor DJ. 2003. Structural rRNA characters support monophyly of raptorial limbs and paraphyly of limb specialization in water fleas. *Proceedings of the Royal Society of London, Series B-Biological Sciences* 270: 887-896.

Boller ML, Swain TD, Lasker HR. 2002. Skeletal morphology and material properties of a fragmenting gorgonian coral. *Marine Ecology Progress Series* 228: 131-141.

Swain TD, Kim K, Lasker HR. 1997. Use of fluorescence microscopy in an assay of sperm density for the gorgonian coral, *Plexaura kuna*. *Proceedings of the 8th International Coral Reef Symposium, Panama*, vol. II: p.1341-1344.

Publications – manuscripts in review (*student coauthors):

Swain TD, Lax S*, Backman V, Marcelino LA. (*in revision*) Uncovering the role of *Symbiodinium* assemblage composition and abundance structure in coral bleaching response by minimizing sampling and evolutionary biases.

Spicer GLC*, Swain TD, Winkelmann JA*, Eid A*, Yi J*, Marcelino LA. (*in review*) Spectroscopic optical coherence tomography reveals living coral micromorphology.

Swain TD, Lax S*, Backman V, Marcelino LA. (*in revision*) Role of *Symbiodinium* assemblage in coral response to thermal stress.

Publications – manuscripts in prep (*student coauthors):

Swain TD, Strimaitis A*, Reuter K*. (*in prep*) Revision of Zoanthidea (Cnidaria: Anthozoa) genera and families based on microanatomy and symbioses.

Swain TD, Lakner C*, Schellinger J*, Strimaitis A*, Cowie M*, O'Boyle M*, and Reuter K*. (*in prep*) A review of morphology and symbioses of non-brachyconemic Zoanthidea (Cnidaria, Anthozoa) with a new hypothesis of evolutionary relationships.

Publications – et cetera:

Swain LO, Swain TD. 2017. Language learning under classroom conditions during the transition to hybrid instruction: a case-study of student performance during the implementation of instructional technology. *European Journal of Foreign Language Teaching* 2: 49-64.

Swain TD. 2010. Evolution of host associations in symbiotic Zoanthidea. PhD Dissertation. Florida State University, Tallahassee, Florida. 120 p.

Wulff JL, Swain TD. 2006. Sponges of Navassa. Photo guide to sponges collected during the 2004 NOAA survey of the coral reefs of Navassa. http://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/1056/NavassaSponge_PhotoGuide.pdf

Swain TD. 1998. Photo: Symbiont shuffle. Both hard (left) and soft (above) corals mix and match algal partners. *Science* 279: 807.

Presentations – scientific meetings – oral (*student coauthors):

Swain TD, Backman VB, Marcelino LA. 2018. Phylogenetic analysis of *Symbiodinium* transmission modes reveal evolutionary patterns in thermotolerance and host specificity that may contribute to coral bleaching resistance. 9th International Symbiosis Society Congress, Corvallis, Oregon.

Swain TD, Backman VB, Marcelino LA. 2016. *Symbiodinium* thermotolerance and coral susceptibility to bleaching. 13th International Coral Reef Symposium, Honolulu, Hawaii.

- Marcelino LA, Swain TD, Backman VB. 2016. (presented by first author) Coral skeletal light scattering and susceptibility to thermal bleaching. 13th International Coral Reef Symposium, Honolulu, Hawaii.
- Swain TD, DuBois E*, Gomes A*, Stoyneva VP*, Radosevich AJ*, Henss J, Wagner ME*, Derbas J*, Grooms HW*, Velazquez EM*, Traub J*, Kennedy BJ*, Janczak CM, Grigorescu AA, Westneat MW, Sanborn K, Levine S, Schick M, Parsons G, Rogers JD, Backman VB, Marcelino LA. 2015. Efficient light transport through coral skeletons precipitates bleaching response. 44th Annual Benthic Ecology Meeting, Québec, Canada.
- Swain LO, Swain TD 2014. (presented by first author) Technological enhancement of instruction and its effect on performance in the Spanish language classroom. 96th American Association of Teachers of Spanish and Portuguese Conference, Panamá City, Panamá.
- Swain TD, Marcelino L, Gomes A*, Lake N*, Radosevich A*, Humecki P*, Kennedy B*, Pickard K*, Westneat M, Backman V. 2012. Coral skeletal fractality modulates light-backscattering to symbionts and bleaching susceptibility. 12th International Coral Reef Symposium, Cairns, Australia.
- Swain TD, Pickard K*, Lake N*, Henss J, Radosevich A*, Gomes A*, Westneat M, Backman V, Marcelino LA. 2011. Light-scattering properties of coral skeletons at multiple morphological length-scales increase the risk of coral bleaching. 40th Annual Benthic Ecology Meeting, Mobile, Alabama.
- Swain TD. 2011. Evolutionary loss of symbioses with invertebrates coincides with reduced distributions of Zoanthidea. 40th Annual Benthic Ecology Meeting, Mobile, Alabama.
- Swain TD. 2008. Phylogenetic conservatism in the evolution of host associations in Caribbean symbiotic zoanths. 11th International Coral Reef Symposium, Fort Lauderdale Florida.
- Swain TD. 2008. Phylogeny-based species delimitations: a novel alignment of hypervariable nucleotide sequences. Southeastern Ecology and Evolution Conference, Tallahassee, Florida.
- Swain TD. 2007. Specificity of Caribbean sponge-zoanthid symbioses. 36th Annual Benthic Ecology Meeting, Atlanta, Georgia. (chairman of section)
- Swain TD. 2006. Specificity of symbiosis as the foundation for understanding the adaptive significance of Caribbean zoanthid-sponge symbioses. 5th International Symbiosis Society Congress, Vienna, Austria.
- Swain TD. 2006. Specificity of zoanthid-sponge symbioses in the Central Western Atlantic region. 7th International Sponge Symposium, Búzios, Rio de Janeiro, Brazil.
- Swain TD. 2005. Effects of symbiotic-zoanthid colonization on Caribbean host sponges. 34th Annual Benthic Ecology Meeting, Williamsburg, Virginia.
- Swain TD, Taylor DJ. 2002. Nuclear rRNA structural characters support parallel evolution of limb specialization in Cladocera and a novel clade of non-ephippial orders. 6th International Symposium on Cladocera, Wierzba, Poland.
- Boller ML*, Swain TD, Lasker HR. 2000. (presented by first author) Mechanisms of fragmentation of a gorgonian coral. Society for Integrative and Comparative Biology, Atlanta, GA.
- Boller ML*, Swain TD, Lasker HR. 1999. (presented by first author) Axis constrictions as an adaptation for fragmentation of the gorgonian coral *Plexaura kuna*. 29th Benthic Ecology Meetings, Baton Rouge, LA.

Presentations – scientific meetings – poster (*student coauthors):

- Williams K*, Swain TD, Wagner M*, Marcelino L. 2013. (presented by first author) Does symbiont phylotype determine host susceptibility to stress? 3rd NU Bioscientist Symposium. Evanston, Illinois.
- Strimaitis A*, Schellinger J*, Swain TD. 2011. (presented by first author) Evolution of form in Zoanthidea. 40th Annual Benthic Ecology Meeting, Mobile, Alabama.
- Swain TD, Kim K*, Lasker HR. 1996. Use of fluorescence microscopy in an assay of sperm density for the gorgonian coral, *Plexaura kuna*. 8th International Coral Reef Symposium, Panamá City, Republic of Panamá.

Media reports on research:

- 2016 Interview on PBS; <http://chicagotonight.wttw.com/2016/05/04/local-scientists-institutions-join-global-fight-save-coral-reefs>
- 2016 Interview for Northwestern University Engineering News: <http://www.mccormick.northwestern.edu/news/articles/2016/06/algorithm-ranks-thermotolerance-of-algae.html>
- 2016 Interview for Northwestern University: <http://www.northwestern.edu/newscenter/stories/2016/04/web/using-data-to-protect-coral-reefs-from-climate-change.html#.VzJJY>
- 2016 Interview for VICE News: <https://news.vice.com/article/the-worlds-coral-reefs-are-undergoing-a-massive-die-off>

Major Field Operations:

- 2008 Summerland Key, Florida
- 2007 Mote Marine Laboratory, Summerland Key, Florida
- 2006–2008 Curaçao Seaquarium, Curaçao, Netherlands Antilles
- 2005–2006 Bellairs Research Institute, Barbados
- 2004 NOAA/NMFS/Shedd Aquarium biodiversity survey, Navassa
- 2004 Smithsonian (NMNH) biodiversity survey, Tobago
- 2003 Institute for Tropical Marine Ecology, Dominica
- 2002–2004 Smithsonian (STRI), Bocas Del Toro, Panamá
- 2001 Vancouver Island, British Colombia, Canada
- 2000 Nome, Alaska
- 2000 Caribbean Marine Research Center, LSI, Bahamas
- 1998–1999 Bahamian Field Station, San Salvador, Bahamas
- 1995 NOAA/NURC station, Key Largo, Florida
- 1994–1998 Smithsonian (STRI), San Blas, Panamá

Community Outreach:

- 2007 Guest instructor, DNA extraction and construction, Kate Sullivan Elementary
- 2003–2005 Instructor, Saturday-at-the-Sea Marine Science Program, FSU
- 2004 Biology and Chemistry tutor, Athletic Program, FSU

Professional Service:

- Peer reviews for Cahiers de Biologie Marine, Coral Reefs, ICES Journal of Marine Science, Marine Biodiversity, Marine Biology, Proceedings of the International Sponge Symposium, Symbiosis, Zoological Studies, & Zootaxa
- 2010–2016 Curator of Zoanthidea, Encyclopedia of Life
- Species identifications for NOAA and University of Louisiana, Lafayette

Professional Memberships:

- Society of Systematic Biologists

International Symbiosis Society
International Society for Reef Studies
Sigma Xi

SCUBA Certifications:

1998 NAUI Instructor; 1998 NAUI Rescue Diver; 1995 IANTD Nitrox; 1993 NASDS
Master Diver; 1992 NASDS Open Water Diver