

Benjamin M. Titus

Marie Curie Postdoctoral Fellow
Department of Computational Biology
University of Lausanne
1015 Lausanne, Switzerland

Research Associate
Division of Invertebrate Zoology
American Museum of Natural History
New York, NY 10024

E-Mail: bentitus3@gmail.com; benjamin.titus@unil.ch

Website: <https://reefsymbiosis.com>

EDUCATION

PhD	The Ohio State University (OH, USA). Evolution, Ecology, & Org. Biology. PI: Dr. Marymegan Daly	2012-2017
MSc	Auburn University (AL, USA) Marine Biology PI: Dr. Nanette Chadwick	2008-2011
BSc	Otterbein University (OH, USA) Ecology (with Distinction).	2005-2008

PROFESSIONAL APPOINTMENTS

2020-	Marie Sklodowska-Curie Postdoctoral Fellow, University of Lausanne, Switzerland
2020-	Research Associate, The American Museum of Natural History, New York, NY
2018-2020	Gerstner Scholar & Lerner Gray Postdoctoral Fellow, The American Museum of Natural History, New York, NY
2017	University Presidential Fellow, The Ohio State University

FUNDING [\$1,200,000 in competitive awards]

U.S. FEDERAL & STATE GRANTS

2020-present	Lead PI , National Science Foundation, DEB-SBS, PURSUIT: Finding Nemo's home: systematics and species delimitation of the clownfish-hosting sea anemones. (Co-PI: Estefania Rodriguez). DEB-1934274 [\$740,000]
--------------	---

****Funds from this grant are not being spent while I am being funded by my Marie Curie Fellowship from the European Union.**

2016-2017 National Science Foundation, Doctoral Dissertation Improvement Grant, DEB1601645. [**\$19,897**]

2015-2017 Florida Fish & Wildlife Conservation Commission [**\$35,000**]

FELLOWSHIPS

2020- Marie Sklodowska-Curie Individual Fellowship, University of Lausanne, Switzerland [**€200,000**].

2018-2020 Gerstner Scholar & Lerner Gray Postdoctoral Fellow, Division of Invertebrate Zoology, American Museum of Natural History (NY, USA) [**\$145,000**]

2017 Presidential Fellowship, The Ohio State University [**\$27,312**]

SMALL GRANTS & AWARDS

2017 Marine and Aquarium Society of North America, Graduate Fellowship [**\$4,000**]

2016 Osburn Scholarship for Excellence in Research, The Ohio State University [**\$1,500**]

2015 Lewis & Clark Field Exploration Grant, American Philosophical Society [**\$1,500**]

2015 PADI Foundation Grant [**\$4688**]

2015 International Society for Reef Studies, Graduate Fellowship [**\$2,500**]

2015 Open Access Grant, The Ohio State University [**\$1,000**]

2014 Tinker Field Research Grant, The Ohio State University [**\$1,500**]

2013 Lerner Gray Fund for Marine Research, American Museum of Natural History [**\$2,000**]

2013 Operation Wallacea (UK) PhD Research Fellowship [**\$5,000**]

2012 SciFund Challenge [**\$800**]

2010 PADI Foundation Grant [**\$4,170**]

2010 Graduate Student Travel Award, Auburn University [**\$500**]

2008 Student Research Fund, Otterbein University [**\$1,000**]

2008 Dr. George H. Phinney Endowed Award for academic performance and research, Otterbein University [**\$500**]

PUBLICATIONS

†Equal contributions; *Mentored Undergraduate

(21) **Titus, B.M.**, Gibbs, H.L., Simoes, N., Daly, M. (2021). Topology testing and demographic modeling reveal a novel diversification pathway in the Caribbean Sea following the formation of the Isthmus of Panama. *Biorxiv* preprint 427733
<https://doi.org/10.1101/2021.01.22.427733>

- (20) **Titus, B.M.**, Daly, M. (In Revision). Population genomics for symbiotic anthozoans: can reduced representation approaches be used for taxa without reference genomes? *Heredity (Biorxiv preprint)*, 440289, doi: <https://doi.org/10.1101/440289>
- (19) Rose, A.*., **Titus, B.M.**, Romain, J.J.*., Vondriska*, C.V. Exton, D.A., (2020) Multiple cleaner species provide simultaneous services to reef fish clients. *Biology Letters*, 16, 1-5.
- (18) Romain, J.J.*., Exton, D.A., Smith, D.J., Rose, A.*., Vondriska, C.V.*., **Titus, B.M.** (2020) Fine-scale patterns of cleaning activity by Pederson's cleaner shrimp, *Ancylomenes pedersoni* across ecologically disjunct reef habitats. *Journal of the Marine Biological Association of the United Kingdom*, <https://doi.org/10.1017/S0025315420000958>
- (17) Riginos, CR, Crandall, ED, Liggans, L, Gaither, MR, Ewing, RB, Meyer, C, Andres, KR, Euclide, PR, **Titus, BM**, Therkildsen, NO, Salces-Castellano, A, Stewart, LC, Toonen, RJ, Deck, J (2020) Building a Global Genomics Observatory: using GEOME (the Genomic Observatories Metadatabase) to expedite and improve deposition and retrieval of genetic data and metadata for biodiversity research. *Molecular Ecology Resources*. <https://doi.org/10.1111/1755-0998.13269> From the Cover
- (16) **Titus, BM**, Laroche, R*., Rodriguez, E., Wirshing, H., Meyer, C.P. (2020) Host identity and symbiotic association affects the taxonomic and functional diversity of the clownfish-hosting sea anemone microbiome. *Biology Letters* 16, 1-8. <https://doi.org/10.1098/rsbl.2019.0738>
- (15) **Titus, B.M.**, Blishak, P., Daly, M (2019). Genomic signatures of sympatric speciation with historical and contemporary gene flow in a tropical anthozoan (Hexacorallia: Actiniaria). *Molecular Ecology*, <https://doi.org/10.1111/mec.15157>.
- (14) **Titus, BM**, Benedict, C.*., Laroche, R.* Gusmao, LC, Van Deusen, V.,* Chiodo, T., Meyer, CP, Berumen, ML, Bartholomew, A., Yanagi, K., Reimer, JD, Fujii, T., Daly, M., Rodriguez, E. (2019) Phylogenetic relationships of the clownfish-hosting sea anemones. *Molecular Phylogenetics & Evolution* doi:10.1016/j.ympev.2019.106526
- (13) **Titus, B.M.**, Daly, M., Vondriska, C.* Hamilton, I., Exton D.A. (2019) Lack of strategic service provisioning by Pederson's cleaner shrimp (*Ancylomenes pedersoni*) highlights independent evolution of cleaning behaviors between ocean basins. *Scientific Reports*. 9:629, doi:10.1038/s41598-018-37418-5
- (12) O'Reilly, E. †, **Titus, B.M.** †, Nelsen, M.W., Ratchford, S., Chadwick, N.E. (2018) Giant ephemeral anemones? Rapid growth and high mortality in the corkscrew sea anemone *Bartholomea annulata* under variable conditions. *Journal of Experimental Marine Biology and Ecology*, 509: 44-53.
- (11) **Titus, B.M.**, Daly, M, Hamilton, N*., Berumen, M., Baeza, J.A. (2018) Global species delimitation and phylogeography of the circumtropical "sexy shrimp" *Thor amboinensis* reveals a cryptic

species complex and secondary contact in the Indo-West Pacific. *Journal of Biogeography* 45, 1275-1287.

- (10) **Titus, B.M.**, Daly, M. (2017) Phylogeographic reconstruction reveals extensive cryptic diversity in a common symbiosis from the Tropical Western Atlantic. *Reef Encounter* 32: 20-24.
- (09) **Titus, B.M.**, Palombit, S*, Daly, M. (2017) Endemic diversification in an isolated archipelago with few endemics: an example from a cleaner shrimp species complex in the Tropical Western Atlantic. *Biological Journal of the Linnaean Society* 122: 98-112.
- (08) **Titus, B.M.**, Vondriska, C*, Daly, M. (2017) Comparative behavioral observations demonstrate the spotted “cleaner” shrimp *Periclimenes yucatanicus* engages in true symbiotic cleaning interactions. *Royal Society Open Science*, 4:170078
- (07) **Titus, B.M.**, Daly, M, Macrander, J., Del Rio, A*, Santos, S.R., Chadwick, N.E. (2017) Contrasting abundance and contribution of clonal proliferation to the population structure of the corkscrew sea anemone *Bartholomea annulata* in the tropical Western Atlantic. *Invertebrate Biology*. 136: 62-74.
- (06) **Titus, B.M.**, Daly M. (2017) Specialist and generalist symbionts show counterintuitive levels of genetic diversity and discordant demographic histories along the Florida Reef Tract. *Coral Reefs*. 36: 339-354.
- (05) **Titus, B.M.** Daly, M., Exton, DA. (2015) Temporal patterns of Pederson shrimp (*Ancylomenes pedersoni* Chace 1958) cleaning interactions on Caribbean coral reefs. *Marine Biology*. 162: 1651-1664
- (04) **Titus, B.M.** Daly, M., Exton, DA. (2015) Do reef fish habituate to diver presence? Evidence from two reef sites with contrasting historical levels of SCUBA intensity in the Bay Islands, Honduras. *PLOS ONE*. 10(3): e0119645.
- (03) **Titus, B.M.**, Daly, M. (2015) Fine-scale phylogeography reveals cryptic biodiversity in Pederson’s cleaner shrimp, *Ancylomenes pedersoni* (Crustacea: Caridea: Palaemonidae), along the Florida Reef Tract. *Marine Ecology*. 36: 1379-1390.
- (02) Huebner, L.K., Dailey, B., **Titus, B.M.**, Khalaf, M., Chadwick, N.E. (2012). Host preference and habitat segregation among Red Sea anemonefish: effects of sea anemone traits and fish life stages. *Marine Ecology Progress Series* 464: 1-15. **Feature cover article**
- (01) Lescinsky, H., **Titus, B.M.**, Hubbard, D. (2012). Live coral cover in the fossil record: an example from Holocene reefs of the Dominican Republic. *Coral Reefs*. 31 (2): 335-346.

MANUSCRIPTS IN REVIEW

Bennet-Smith, M.F., Majoris, J.E., **Titus, B.M.**, Berumen, M.L. (In Review). Clownfish-hosting sea anemones (Anthozoa: Actiniaria) of the Red Sea: notes on new associations and distributions, historical misidentifications, and morphological variability.

Glon, H., Quattrini, A., Rodriguez, E., **Titus, B.M.**, Daly, M. (In Review). Sequence-capture methods outperform Sanger and RADseq approaches in resolving species and population boundaries in hexacorallian anthozoans

RECENT PRESENTATIONS (last 5 years)

*Presenting author ^Undergraduate advisee

INVITED SEMINARS

- 2021 **Titus, B.M.** *Invited speaker, Arkansas State University (Feb 2021)*
- 2020 **Titus, B.M.** *Invited speaker, Marine Aquarium Conference of North America, Online conference*
- 2020 **Titus, B.M.** *Invited Seminar, University of Tampa, FL, USA*
- 2020 **Titus, B.M.** *Invited Seminar, Stetson University, FL, USA*
- 2019 **Titus, B.M.** *Invited Seminar, Fairfield University, CT, USA*
- 2019 **Titus, B.M.** *Invited Seminar, Fordham University, NY, USA*
- 2019 **Titus, B.M.** *Invited Speaker, Marine Aquarium Conference of North America, Orlando, FL, USA*
- 2019 **Titus, B.M.** *Invited Seminar, American Museum of Natural History, NY, USA*
- 2018 **Titus, B.M.** *Invited seminar. National Museum of Natural History, Smithsonian Institution, Washington D.C., USA*
- 2013 **Titus, B.M.** *Invited seminar Otterbein University, OH, USA*
- 2013 **Titus, B.M.** *Invited seminar Operation Wallacea, Honduras*

CONFERENCE PRESENTATIONS

- 2019 **Titus, B.M.**, Rodriguez, E. Molecular species delimitation of the clownfish hosting sea anemones: are there really only 10 host species? *Society for Integrative and Comparative Biology (SICB) Meeting, Tampa, FL.*
- 2018 **Titus, B.M.**, Daly, M. Gulf Stream formation drives allopatric speciation, secondary contact, and hybrid speciation in a cleaner shrimp species complex. *Society of Systematic Biologists (SSB) Standalone Meeting, The Ohio State University, Columbus, OH, USA*
- 2016 **Titus, B.M.**, Daly, M. Comparative phylogeography in a multi-level sea anemone symbiosis: effects of host specificity on patterns of co-diversification and genetic biodiversity. *13th International Coral Reef Symposium, Honolulu, HI, USA*
- 2015 **Titus, B.M.**, Daly, M. Comparative phylogeography in a multi-level sea anemone symbiosis: effects of host specificity on patterns of co-diversification and genetic biodiversity. *44th Benthic Ecology Meeting, Quebec, Canada.*

POSTER PRESENTATIONS

- 2019 Benedict, C., **Titus, B.M.**, Laroche, R., Gusmao, LC, Van Deusen, V., Chiodo, T., Meyer, CP, Berumen, ML, Bartholomew, A., Yanagi, K., Reimer, JD, Fujii, T., Daly, M., Rodriguez, E. Phylogenetic relationships among the clownfish hosting sea anemones. *Evolution*, Providence, RI

- 2019** Benedict, C., **Titus, B.M.**, Laroche, R., Gusmao, LC, Van Deusen, V., Chiodo, T., Meyer, CP, Berumen, ML, Bartholomew, A., Yanagi, K., Reimer, JD, Fujii, T., Daly, M., Rodriguez, E. Phylogenetic relationships among the clownfish hosting sea anemones. Society for Integrative and Comparative Biology (SICB) Meeting, Tampa, FL. Poster presentation
- 2019** Laroche, R., **Titus, B.M.**, Benedict C., Meyer, C., Rodriguez, E. Exploring the clownfish sea anemone microbiome across host and habitat. Society for 5 Integrative and Comparative Biology (SICB) Meeting, Tampa, FL. Poster presentation
- 2018** **Titus, B.M.**, Daly, M. Reduced representation sequencing for symbiotic anthozoans: are reference genomes necessary to eliminate endosymbiont contamination and make robust phylogeographic inference? Global Invertebrate Genomics Alliance Research Conference III (GIGAll), Curacao, NetherlandsAntilles. Poster presentation
- 2018** Quattrini, A.M., Faircloth, B.C., **Titus, B.M.**, Rodriguez, E., McFadden, C.S. Phylogenomics of class Anthozoa (Cnidaria) using universal target-enrichment baits. Global Invertebrate Genomics Alliance Research Conference III (GIGAll), Curacao, Netherlands-Antilles. Poster presentation
- 2018** Sheridan, N., Seyoum, S., Sharp, W., **Titus, B.M.**, Daly, M., Schrey, A., Richards, C. Population genomics of a monitored sea anemone (*Condylactis gigantea*) in Florida, U.S. Population, Evolutionary, and Quantitative Genomics Conference, University of Wisconsin.

PROFESSIONAL EXPERIENCE

American Academy of Underwater Science (AAUS) Scientific Research SCUBA diver (2018-present).
400+ logged scientific research dives

RESEARCH EXPEDITIONS (*planned and led, ^undergraduate participation)

- 2019 Utila, Honduras^
- 2019 Moorea, French Polynesia*
- 2018 Faresmaathoda, Huvadhu Atoll, Republic of the Maldives*
- 2018 Gulf of Oman, United Arab Emirates*
- 2017 San Salvador, Bahamas*
- 2016 Flower Garden Banks, Gulf of Mexico, Texas, USA*
- 2015 Eleuthera, Bahamas**^
- 2015 Bocas del Toro, Panama*
- 2015 Barbados**^
- 2015 Curacao, Netherlands Antilles**^
- 2014 Bermuda**^
- 2014 Cuba*
- 2014 Mahahual, Mexico*
- 2014 St. Thomas, US Virgin Islands*
- 2013 Bay Islands, Honduras**^
- 2013 Florida Keys, USA*
- 2012 Florida Keys, USA*
- 2010 Red Sea, Gulf of Aqaba, Jordan^
- 2010 St. Thomas, US Virgin Islands*
- 2009 St. Thomas, US Virgin Islands
- 2009 Belize^

2008 St. Thomas, US Virgin Islands
2007 Enriquillo Valley, Dominican Republic
2006 Belize

OUTREACH

2019 Family Night, American Museum of Natural History
2019 Millstein Ocean Science Series: Ocean Parenting, American Museum of Natural History
2019 Meet the Scientist, Education Department, American Museum of Natural History
2019 Millstein Ocean Science Series: Layers of the Ocean, American Museum of Natural History
2019 Meet the Scientist, Discovery Room, American Museum of Natural History
2013-2017 Volunteer, Museum of Biological Diversity Open House, The Ohio State University
2011 Reef Systems Coral Farm outreach, Boy Scouts of America
2009 Co-leader, National Oceanic & Atmospheric Administration SeaGrant Outreach, US Virgin Islands
2009 Co-author National Oceanic & Atmospheric Administration SeaGrant Activity Book
2008 Co-leader, National Oceanic & Atmospheric Administration SeaGrant Outreach, US Virgin Islands

SERVICE

PEER REVIEWS

Molecular Ecology, Molecular Ecology Resources, Molecular Phylogenetics and Evolution, BMC Evolutionary Biology, Journal of Evolutionary Biology, Biology Letters, Heredity, Biological Reviews, Coral Reefs, Marine Biology, Contributions to Zoology, European Journal of Taxonomy, Journal of the Marine Biological Association of the United Kingdom, Regional Studies in Marine Science, Biological Bulletin, PeerJ, Marine Environmental Research, Marine Biology Research, Journal of Crustacean Biology.

GRANT REVIEWER

2020 National Science Foundation- Biological Oceanography (BIO-OCE)
2019 National Science Foundation- Biological Oceanography (BIO-OCE)

EXTERNAL COMMITTEE MEMBER

2020 PhD Defense Committee Member, University of Bergen, Norway

UNDERGRADUATE MENTORSHIP (*current graduate school affiliation)

2018-2019 Charlotte Benedict, NSF REU-The American Museum of Natural History. (*MSc Student The Ohio State Univ.)
2018-2019 Robert Laroche, NSF REU- The American Museum of Natural History. (*PhD Student Rice University)
2018-2019 Amy Swift Oxford University, UK
2018-2019 Emily Bremer Univ. Southampton, UK
2018-2019 Chloe Boyd Univ. Sussex, UK
2016-2019 Joe Romain, Univ. of Essex, UK
2016-2019 Amelia Rose Oxford University, UK

2015-2016 Spencer Palombit The Ohio State University
 2014-2016 Clayton Vondriska The Ohio State University. (*PhD student Arkansas State University)
 2014-2016 Natalie Hamilton The Ohio State University *(PhD student Texas A&M University)
 2014 Anna Klompen. William & Mary Univ.. (*PhD student University of Kansas.)
 2014-2015 Eric Witt Otterbein Univ.
 2013-2015 Annelise del Rio. The Ohio State University. (*PhD student University of California-Davis)
 2013 Joseph Weethee, The Ohio State University. (Completed Medical School at Univ. of Cincinnati)

TEACHING EXPERIENCE & TRAINING

COURSES TAUGHT (*Lead Instructor)

2020 *Systematics of Symbiosis, Richard Guilder Graduate School, American Museum of Natural History. Winter Term 2020- Lead Instructor
 2018-2019 *First Year Graduate Student Seminar Series, Richard Guilder Graduate School, American Museum of Natural History. (2018-2019)- Lead Instructor
 2016 Organismal Biology (Lab) The Ohio State University
 2014 Integrative Biology (recitation) The Ohio State University
 2014-2015 Human Anatomy (Lab) The Ohio State University
 2013-2016 Evolution (recitation) The Ohio State University
 2012-2013 Biology for non-majors (Lab) The Ohio State University
 2010 Ecology (Lab) Auburn University
 2009-2011 Organismal Biology (Lab) Auburn University
 2008 Principles of Biology (Lab) Auburn University

CLASSROOM PROFESSIONAL DEVELOPMENT

2014 Teaching College Biology (BIOL 6001)- Center for Life Science Education, Ohio State Univ. *3 credit hr course for pedagogical training, scholarship of teaching & learning (SoTL), assessment,
 2012-2016 Professional development seminar (BIOL 5001)- Center for Life Science Education, Ohio State Univ. 1 credit hr seminar
 2012 University Center for the Advancement of Teaching (UCAT), GTA training- Ohio State University
 2009 Fundamentals of Teaching Biology 7010- Auburn University. 1 credit hr seminar
 2009 Professional Aspects of Biology 7540- Auburn University. 1 credit hr seminar
 2007 Study of the School-Introduction to Education- Otterbein University. 4 credit hr course

COLLABORATORS

Jorge Angulo University of Havana, Cuba
 J. Antonio Baeza Clemson University
 Aaron Bartholomew American University of Sharjah, United Arab Emirates

Michael Berumen	King Abdullah Univ. of Science & Technology, Saudi Arabia
Bryan Carstens	The Ohio State University
Jessy Castellanos Gell	University of Havana, Cuba
Eleanor Caves	University of California-Santa Barbara
Nanette Chadwick	Auburn University
Meg Daly	The Ohio State University
Dan A. Exton	Operation Wallacea, United Kingdom
Takuma Fuji	Natural History Museum-Chiba, Japan
Danwei Huang	National University of Singapore
Halard Lescinsky	Otterbein University
Chris Meyer	National Museum of Natural History, Smithsonian Institution
Andrea Quattrini	National Museum of Natural History, Smithsonian Institution
Stephen Ratchford	University of the Virgin Islands
James Reimer	University of the Ryukyus-Japan
Estefania Rodriguez	American Museum of Natural History
Nicolas Salamin	University of Lausanne-Switzerland
Scott Santos	Auburn University
Anna Scott	Southern Cross University- Australia
Nancy Sheridan	Florida Fish & Wildlife Conservation Commission
Nuno Simoes	Universidad Nacional Autonoma de Mexico
Kensuke Yanagi	Natural History Museum-Chiba, Japan

PROFESSIONAL REFERENCES

Dr. Marymegan Daly
Professor & Director of the Museum of Biological Diversity
Dept. of Evolution, Ecology, & Organismal Biology
The Ohio State University
1315 Kinnear Rd
Columbus, OH, USA 43212
Phone: 614-247-8412
Email: daly.66@osu.edu

Dr. Bryan C. Carstens
Associate Professor
Dept. of Evolution, Ecology, & Organismal Biology
The Ohio State University
300 Aronoff Laboratory
318 W. 12th Ave
Columbus, OH, 43210
Phone: 614-292-2030
Email: carstens.12@osu.edu

Dr. Estefania Rodriguez
Curator

Division of Invertebrate Zoology
American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024
Phone: 212-769-5244
Email: erodriguez@amnh.org

Dr. Christopher Meyer
Curator
Division of Invertebrate Zoology
National Museum of Natural History
Smithsonian Institution
Washington D.C.
Phone: 703-314-0434
Email: meyerc@si.edu

Dr. Nicolas Salamin
Professor
Dept. of Computational Biology
University of Lausanne
Genopode bureau
CH-1105 Lausanne, Switzerland
Phone: +41 021 692 53 90
Email: nicolas.salamin@unil.ch