

MATTHEW THOMAS COSTA

*Curriculum Vitae*

Postdoctoral Research Associate  
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*Education:*

Princeton University Princeton, NJ Ecology and Evolutionary Biology B.A., 2011  
Certificates: Environmental Studies, Language and Culture of Ancient Rome  
UC San Diego-SIO La Jolla, CA Marine Biology M.S., 2016  
UC San Diego-SIO La Jolla, CA Oceanography Ph.D., 2019

*Publications:*

Research Articles:

- Allard, S. M., M. T. Costa, A. N. Bulseco, V. Helfer, L. G. E. Wilkins, C. Hassenrück, K. Zengler, M. Zimmer, N. Erazo, J. L. M. Rodrigues, *et al.* Accepted for publication. Introducing the Mangrove Microbiome Initiative: Setting microbial research priorities and approaches to better understand, protect, and rehabilitate mangrove ecosystems.
- Costa, M. T., E. Ezcurra, O. Aburto-Oropeza, M. Maltz, K. Arogyaswamy, J. Botthoff, and E. Aronson. 2022. Baja California Sur mangrove deep peat microbial communities cycle nitrogen but do not affect old carbon pool. *Marine Ecology Progress Series* 695:15–31. doi: 10.3354/meps14117.
- Costa, M. T., E. Ezcurra, P. Ezcurra, P. Salinas-de-León, B. Turner, J. Kumagai, J. J. Leichter, and O. Aburto-Oropeza. Sediment depth and accumulation shape belowground carbon stocks across northern New World mangroves. *Limnology & Oceanography* (In Press).
- Costa, M. T., P. Salinas-de-León, and O. Aburto-Oropeza. 2019. Storage of blue carbon in isolated mangrove forests of the Galapagos' rocky coast. *Wetlands Ecology and Management*. doi.org/10.1007/s11273-019-09653-8.
- de Putron, S. J., J. M. Lawson, K. White, M. T. Costa, M. V. B. Geronimus, and A. MacCarthy. 2016. Brooded larvae of the Atlantic coral *Porites astreoides* vary in size within and between different reef sites in Bermuda. *Coral Reefs*. doi: 10.1007/s00338-016-1527-8.
- Ezcurra, P., E. Ezcurra, P. P. Garcillán, M. T. Costa, and O. Aburto-Oropeza. Coastal landforms and accumulation of mangrove peat increase carbon sequestration and storage. *PNAS* 113(16): 4404–4409.
- Hutchison, J., D. P. Philipp, J. E. Claussen, O. Aburto-Oropeza, M. Carrasquilla-Henao, G. A. Castellanos-Galindo, M. T. Costa, P. D. Daneshar, H. J. Hartmann, F. Juanes, *et al.* Building an expert-judgement-based model of mangrove fisheries. *American Fisheries Society Symposium* 83:17–42.
- Kumagai, J. A., M. T. Costa, E. Ezcurra, and O. Aburto-Oropeza. 2020. Prioritizing mangrove conservation across Mexico to facilitate 2020 NDC ambition. *Ambio*. doi.org/10.1007/s13280-020-01334-8.

Tanner, M. K., N. Moity, M. T. Costa, J. R. M. Jarrin, O. Aburto-Oropeza, and P. Salinas-de-León. 2019. Mangroves in the Galapagos: ecosystem services and their valuation. *Ecological Economics* 160: 12–24.

Commentary:

Bauman, S. J., M. T. Costa, M. B. Fong, B. M. House, E. M. Perez, M. H. Tan, A. E. Thornton, and P. J. S. Franks. 2014. Augmenting the Biological Pump: the Shortcomings of Geoengineered Upwelling. *Oceanography* 27(3):17–23.

Costa, M. T., E. M. Ferrer, and L. A. Levin. 2018. “Why De Anza Cove wetland restoration would help protect us against sea-level rise.” *San Diego Union-Tribune*, December 5 2018.

Online Documents:

Aburto-Oropeza, O., J. Cota-Nieto, I. Dominguez-Guerrero, A. Giron-Nava. and M. Costa. 2015. How distance between mangroves and reefs could affect snapper populations. *DataMares. InteractiveResource*. <http://dx.doi.org/10.13022/M3Z303>.

Cota-Nieto, J., T. Plomozo, I. Dominguez-Guerrero, M. Costa, and O. Aburto-Oropeza. 2014. Snapper Habitat in Gulf of California Mangrove Forests. *DataMares. InteractiveResource*. <http://dx.doi.org/10.13022/M3CC77>.

Costa, M. 2014. Sampling Mangrove Peat in the Southern Gulf of California. *DataMares. InteractiveResource*. <http://dx.doi.org/10.13022/M3Z596>.

Costa, M. T., I. Dominguez-Guerrero, J. Cota-Nieto, E. Ezcurra, and O. Aburto-Oropeza. 2015. Mangroves are snapper generators. *DataMares. InteractiveResource*. <http://dx.doi.org/10.13022/M3JS3D>.

Costa, M. T., P. Ezcurra, and O. Aburto-Oropeza. 2015. Gulf Mangroves Store Carbon by the Ton. *DataMares. InteractiveResource*. <http://dx.doi.org/10.13022/M3V305>.

Costa M. T., P. Salinas-de-León, E. Rastoin, J. Cota-Nieto, I. Mascareñas, L. Cavole, A. Ramírez Valdez, and O. Aburto-Oropeza. 2017. Distant mangroves share similar fish communities, while neighbors can be different. *DataMares. InteractiveResource*. <https://doi.org/10.13022/M3C015>.

Doctoral Dissertation:

Costa, M. T. 2019. Mangroves in depth: long-term carbon burial across spatial scales. University of California, San Diego Ph.D. Dissertation. 142 pp.

Bachelor’s Thesis:

Costa, M. T. 2011. Mangrove Species Zonation in a Bermudan Tidal Pond. Princeton University B.A. Thesis. 129 pp.

*Conference Presentations:*

Contributed Presentations:

Costa, M. T. 2015. Sampling mangrove peat in the Gulf of California. Poster presented at: the Ecological Society of America Annual Meeting, August 2015, Baltimore, MD.

Ezcurra, P., E. Ezcurra, P. P. Garcillán, M. T. Costa, and O. Aburto-Oropeza. Coastal landforms and accumulation of mangrove peat increase carbon sequestration and storage. Talk presented at: the Ocean Sciences Meeting, February 2016, New Orleans, LA.

- Costa, M. T., O. Aburto-Oropeza, E. Aronson, J. Botthoff, and E. Ezcurra. 2017. ESA. Deep peat deposits in Baja California Sur mangroves record slow rate of organic matter decomposition. Talk presented at: the Ecological Society of America Annual Meeting, August 2017, Portland, OR.
- Costa, M. T., P. Salinas-de-León, and O. Aburto-Oropeza. 2018. Mangrove blue carbon on the rocky coast of the Galapagos Archipelago. Poster presented at: the Annual Meeting of the Association for the Sciences of Limnology and Oceanography, June 2018, Victoria, Canada.
- Costa, M. T. and B. J. Pan. 2018. “Blue Carbon” or “Marine Ecosystem Regeneration”? Press conference presented at the 24<sup>th</sup> Conference of the Parties to the United Nations Framework Convention on Climate Change, Katowice, Poland.
- Costa, M. T., E. Ezcurra, P. Ezcurra, P. Salinas-de-León, B. Turner, J. J. Leichter, and O. Aburto-Oropeza. 2019. Sediment depth and accumulation age constrain mangrove carbon stocks, depending on forest type. Talk presented at: the Annual Meeting of the Association for the Sciences of Limnology and Oceanography, February, San Juan, PR.
- Costa, M. T., E. Ezcurra, P. Ezcurra, P. Salinas-de-León, B. Turner, J. Kumagai, J. J. Leichter, and O. Aburto-Oropeza. 2020. Sediment depth and accumulation constrain belowground carbon stocks across northern New World mangroves. Poster presented at: the Ocean Sciences Meeting, February, San Diego, CA.
- Costa, M. T., Z. Plopper, A. Meyer, R. D. Norris, P. Lieberg-Clark, A. Lupo, O. Aburto-Oropeza, and M. A. Merrifield. 2021. Can humble urban wetlands help transform climate change mitigation and adaptation in coastal cities? Digital poster presented at: the Ocean Visions Summit, May 2021.

Invited Talks:

- Costa, M. T. 2018. Research career perspectives. Presented in a panel discussion at the UCSD Biological Sciences Student Organization. April 4, 2018.
- Costa, M. T. 2020. Mangrove Deforestation. Virtual presentation at the 2020 American Geographical Society GEO2050 Conference. November 16, 2020.
- Costa, M. T. 2021. Postdoc Panel. Presented in a panel discussion at the Scripps Institution of Oceanography Women and Minorities in Science. June 2, 2021.
- Costa, M. T. 2022. Can coastal wetlands help mitigate climate change? Virtual presentation at the Pacific Climate Form of the Americas, hosted by the University of California San Diego on June 1, 2022.

Other Conferences:

Youth delegate at the March 28-29 United Nations High-Level Meeting on Climate Change and Sustainable Development for All. U.N.H.Q., NY.

*Undergraduate Research Experience:*

**Junior Independent Work** (6/2009 part-time, 7-8/2009 full-time): I conducted a research project on the release of larvae by the reef-building coral species *Porites astreoides* in Bermuda. The research involved a combination of field and lab work. I worked closely with Dr. Samantha de Putron (the principle investigator) and Ms. Julia Lawson (another research intern) over two months in the summer of 2009 at the Bermuda Institute of Ocean Sciences.

**Senior Thesis** (6/2010 part-time, 7-8 2011 full-time): I conducted an observational study on the distribution of mangrove tree species in a tidal pond in Bermuda. I also measured a set of biotic and abiotic factors that vary in the environment along with the distribution of trees. I used these data to generate a multiple regression model to explain the zonation pattern of trees. This research culminated in an in-depth thesis paper (129 pages), in which I reviewed the literature on mangrove species zonation, presented my data and analysis, discussed the limitations of my statistical approach and the role of observational studies in ecology, and explored the connections between mangrove ecosystem models and the future of mangrove conservation.

*Graduate Research Experience:*

**Sedimentary Carbon Stocks in the Mangroves of Latin America** (7/2014 – 9/2019): I sampled mangrove sediment deposits in mangrove forests of the Baja and Yucatan Peninsulas of Mexico, the Galapagos Islands in Ecuador, and throughout the coastal areas of Panama. I collected whole sediment cores (for x-ray fluorescence analysis) and subsamples (for bulk content and stable isotope ratios of C and N), coring in a manner that spans the mangrove zonation of each forest. These samples allowed me to probe the history of C storage and decomposition in mangrove sediments in recent centuries and to predict future C cycling as these forests face environmental challenges and changing global conditions.

In addition to my doctoral work, I conducted fieldwork in collaboration with projects in the areas of coastal biological oceanography, benthic monitoring and species mapping, and coral reef field experimentation, most of which required the skills of an advanced scientific diver.

*Teaching Experience:*

**Teaching Assistant** (5 – 6/2009 part-time, 5 – 6/2010 full-time): For two summers, I worked as a TA for the month-long Princeton University Marine Biology summer course, taught at the Bermuda Institute of Ocean Sciences (BIOS). I led labs and field trips, taught precepts (short class meetings) on lab and field work, or on the data analysis for the labs, and gave one course lecture. Many of the field projects were conducted on SCUBA, and I helped lead these dives. I coordinated learning materials, set up the lab before use, collected specimens when necessary, helped keep student data organized. I graded lab reports and exam questions. I worked closely with the students on the lecture material as well as the lab work, and acted as an adviser for some of the student groups on their final projects.

**Teaching Fellow** (2012 – 3 part-time): I worked as an instructor in the Education Department of the New York Aquarium for Wildlife Conservation. I taught a wide range of student age groups, from pre-kindergarten through high school. Focusing on marine zoology, the programs offered emphasize hands-on learning, individual and group investigation, and the wonder of discovery. When not teaching, I worked on developing our curricula and educational materials. I also assisted with teacher workshops administered by the Education Department, aimed to help outside educators bring the aquarium back to their classrooms.

**Assistant Instructor** (9 – 12/2018 part-time): I worked as the assistant instructor for Introduction to California Coastal Oceanography, an upper-level undergraduate course at Scripps Institution of Oceanography. I conducted office hours with students, lead and helped coordinate lab sessions, and graded lab reports and final exam answers.

**Assistant Instructor** (3 – 6/2019 part-time): I worked as the assistant instructor for Natural History below the Tides, a graduate-level field ecology course at Scripps Institution of Oceanography. I helped organize and lead field and classroom sessions observing and

identifying marine organisms. This position required ability, organization, and leadership in scientific SCUBA and small boats operations.

**Instructor** (12/2019): I was one of two instructors for a field and lecture course entitled “Oceanography and Coastal Processes” for the 3 Seas Program at Northeastern University. The course was held at Coiba National Park in Panama and included a heavy fieldwork component, diving or snorkeling at field sites every day. In addition to leading daily discussions and giving nightly lectures, we designed and led field education experiences for a group of undergraduate scientific divers, overcoming logistic and pedagogical challenges.

**Faculty Advisor/Committee Member** (2020-2022): I served as a faculty adviser for a senior undergraduate student at UCSD majoring in environmental systems for two masters’ of advanced studies students. I guided them as they designed and implemented their independent research projects, done in collaboration with me on coastal blue carbon.

**Co-instructor** (Spring 3 – 6/2021): I co-instructed a graduate course entitled, “Blue Carbon, Carbon Sequestration, and Ecosystem Management of Climate Change” at SIO, UCSD. Professor James L. Leichter was the instructor of record, but in fact he and I agreed to share teaching responsibilities evenly (he can provide verification of this fact on request). The course explored the foundational ecology and geology of coastal ecosystem carbon cycling as well as multidisciplinary elements of coastal ecosystem management, including restoration implementation, international policy, and carbon finance.

#### *Employment:*

**Lab Assistant** (9/2008 – 5/2009 part-time): I worked for a year as a lab assistant in the lab of David Stern, a member of the Princeton University Ecology and Evolutionary Biology faculty studying developmental biology in *Drosophila*. This active lab included about five graduate students and post-docs. My tasks were to keep the lab organized and well-stocked. My responsibilities included cleaning and organizing glassware, operating the autoclave, preparing agar plates, and making frequently used stock solutions.

**Entomological Apprentice** (2 – 8/2013): I prepared, pinned, and framed insects for sale at *Evolution*, a business in New York, NY, that sells a range of biological curiosities. Skill in handling and pinning delicate insects and a wide-ranging working knowledge of arthropod taxonomy was required.

**Graduate Student Researcher** (9/2013 – 9/2019): I worked to conduct field sampling, to analyze samples and data, and to synthesize and to communicate the research as a graduate student in the Aburto Lab at Scripps Institution of Oceanography.

#### *Academic Service:*

**Princeton University Ecology and Evolutionary Biology Department Undergraduate Committee Co-Chair** (2010 – 2011): I volunteered to coordinate and organize a number of student-based activities within the department.

**Scripps Institution of Oceanography Ecology Seminar Committee** (2014 – 2015): I organized and invited speakers for a weekly science seminar at SIO.

**Graduate Student Representative** (2016): I have served as a representative of the graduate student body of SIO on a year-long university committee dedicated to forming a long-term plan for the SIO campus, a search committee for new biological oceanography faculty, the library committee, and other institutional efforts.

**Peer Mentor Program Leadership** (2015 – present): I served as a peer mentor for an incoming graduate student at SIO during the 2015-6 academic year, and, during 2016-7, am mentoring another new student, as well as helping to lead the program as a member of the student leadership committee for the program.

**Mentor/Adviser for Undergraduate Researchers** (2016 – present): I have mentored six undergraduates at UCSD pursuing independent study research for credit, helping them design, carry out, and present their research. In all, I have trained 13 students and collaborators on field and lab methods for blue carbon research.

**ASLO Mentor** (2020): At the Ocean Sciences Meeting co-hosted by the Association for the Sciences of Limnology and Oceanography in San Diego in February 2020, I volunteered to serve as a mentor for two events. I spent the first morning of the conference on a ship in San Diego Harbor discussing graduate school and research with undergraduates who came to the conference as part of the ASLO Multicultural Program. I also spent 2 hours on the fourth day of the conference helping high school and younger students prepare for presenting their research in a poster session at the conference.

*Outreach:*

**Ocean Discovery Institute** (2014 – 8): I volunteered to engage with middle-school students from underserved areas of San Diego in immersive underwater science experiences.

**Birch Aquarium Volunteer** (2014 – present): I have volunteered to interpret exhibits, engage visitors, and communicate science at the Birch Aquarium at Scripps Institution of Oceanography.

**Scripps Community Outreach Program for Education** (2014 – present): I volunteer to engage with members of the public—schools groups, professional organizations, and others—to introduce them to the science that is being done at Scripps Institution of Oceanography, and other scientific topics related to the ocean.

**UC Natural Reserve System** (2015 – present): I have volunteered at and helped to lead in several events focused on restoration, outreach, and education at two of UCSD's Natural Reserves (the Scripps Coastal Reserve and Kendall-Frost Marsh), from teaching children about wetland organisms to engaging elected officials on the topic of wetland ecosystem services.

Numerous other outreach activities, from communicating online with the general public to interfacing with individual adults and children.

*Funding History:*

Regents Fellowship (University of California, San Diego) (2013 – 2014)

Mia Tegner Memorial Fellowship (UC San Diego) (2014)

SIO Department Graduate Student Excellence Travel/Research Award (2014 – 2016)

National Science Foundation Graduate Research Fellowship (2014 – 2019)

National Science Foundation Graduate Research Internship (2015)

UC-MEXUS Dissertation Research Grant (2016 – 2019)

ASLO Student Travel Grant (2016)

UCSD Graduate Student Association Travel Grant (2019)

*Honors:*

Behrman Society of Undergraduate Fellows (2009 – 2011)

Member of Sigma Xi Scientific Society (2011)

*Other Skills:*

CPR/First Aid

Intermediate fluency in Spanish

Open water, scientific, and rescue SCUBA certifications (as well as O<sub>2</sub> administration certification), with experience in a range of underwater data collection techniques

Several years of small boat operation for science, and a CA boating license

Experience with statistical theory and application and proficiency using R statistical software