BENJAMIN TOBEY SAENZ

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EDUCATIONAL BACKGROUND

Stanford University, Stanford, CA, Environmental Earth System Science, **Ph.D., 2011**
NSF Graduate Training Course in Antarctic Biology, McMurdo, Antarctica, **2006**
Stanford University, Stanford, CA, Biological Sciences – Honors, **B.S., 1999**
Stanford University, Stanford, CA, Electrical Engineering, **B.S., 1999**

APPOINTMENTS AND WORK EXPERIENCE

biota.earth | Berkeley, CA | 2007 – present
Principal Consultant

- Consultant & Grant Writer: Sovereign Environmental Aquaculture Solutions (SEAS) Program. Successfully funded seaweed aquaculture expansion in traditionally native waters in Southeast Alaska that includes carbon monitoring and lifecycle analysis, Native Conservancy, AK
- Co-PI: Farming for blue carbon: Assessing seaweed cultivation for CO2 removal, Stanford Sustainability Accelerator
- Biogeochemical Seaweed Modeling: Subcontractor on US Dept. of Energy Bioenergy Technology Office (BETO) sponsored project to improve seaweed productivity modeling in US waters using the MACMODS modeling system, Stanford University CA.
- Scientific Advisor, Ebb Carbon: A start-up company using ocean alkalinity enhancement for CDR
- Consultant, Coastal Dynamics Laboratory, UC Irvine: Seaweed modeling refinement, coupling seaweed growth to the CESM global climate model
- Advisor & Consultant: SEA MATE, a Grantham-funded program to investigate and scale electrochemical ocean-alkalinity-based carbon sequestration
- P.I. for Sustainable Seaweed Solutions, a ClimateWorks-funded investigation of global biophysical and economic seaweed cultivation potential (https://www.ess.uci.edu/~sjdavis/seaweed.html)
- Advisor & Consultant, Ocean Energy from Macroalgae with Fearless Fund: a DOE ARPA-e funded program investigating harvest of sargassum in the tropical Atlantic
- Science and strategy, AiiM Partners Fund (www.aiimpartners.com)

GEI Consultants (formerly RMA, Inc.) | Davis, CA | 2013 – present
Senior Water Resources Engineer

- Project scoping, development, and manager: Modeling CO_2 in the Sacramento-San Joaquin delta to characterize potential effects from subsurface CO_2 storage, US Department of Energy, Livermore, CA
- Construction, calibration and climate modeling of the Russian River watershed, Sonoma County Water, CA
- Calibration and construction of water quality models for northern and central California river systems, with a focus on temperature and dissolved oxygen management for USBR and other water managers
- Project management, authoring statistical and graphical data analytic routines, primary model development, data management, biological and water quality modeling, HPC optimization
- Utilized bioacoustics for non-take estimates of fish abundances and distribution in the SF Bay Estuary
- Developed open source data analysis tools for ADCP-measured water flow (Github: ADCPy)

Adecco for X, Inc. (Formerly Google X) | Mountain View, CA | 2018 – 2020
Marine Biologist

- Worked with a small team developing 'moonshots': rapid assessment, ecological ocean modeling, techno-economic & energy+carbon life cycle analyses, biogeochemical experimentation

University of South Florida | St. Petersburg, FL | 2013 – 2015
Research Scientist

- Primary data analyst on NSF/OPP Collaborative Project, Top-down food web processes in the Southern Ocean: Prey depletion by top predators in McMurdo Sound
- Responsible for field data collection in Antarctica, and analysis of physical oceanography (current and structure), phytoplankton dynamics, bioacoustics of krill and fish, and predator foraging and movements (penguins, whales)
- Three publications are completed and one more in development, addressing primary question of how upper trophic organisms can directly and indirectly structure the lower food web

University of California, Santa Cruz | Santa Cruz, CA |2011 – 2013
Postdoctoral Scholar

- Authored the KPP-Ecosystem-Ice (KEI) model, that couples a 1-dimensional ocean mixing model (KPP; Large *et al*., 1994), a sea ice model (SIESTA; Saenz and Arrigo, 2014) and a marine ecosystem model (CESM v1.0; Moore *et al*., 2002; 2004). (Github: KEIPY)
- Using KEI, investigated the influence of climate-related changes in deep-ocean heat and nutrients supply on sea ice, ocean physics, and primary production in the Antarctic Peninsula region

Stanford University | Stanford, CA | 2004–2011
PhD Candidate, Teaching Assistant

- Constructed the SIESTA 3D sea ice and ecosystem model for hemispheric investigation of primary production inside sea ice
- SIESTA incorporates brine fluid dynamics, 2-way spectral irradiance attenuation, conservative mass and thermodynamic physics, and a multi-nutrient NPZ model of algal population
- SIESTA has been used in 5 new-research publications with more in production

Point Blue Conservation Science (formerly PRBO) | Petaluma, CA | 2000 – 2007
Ecologist

- Designed the scientific sampling and oceanographic stations for Applied California Current Ecosystem Study (ACCESS) in the Gulf of the Farallones, CA
- Participated on over 20 research cruises in the Gulf of the Farallones
- Developed data analysis protocols for estimation of krill biomass from acoustic sampling
- Performed primary data collection and reporting of a several multi-year studies of seabird foraging, diet, and prey availability surrounding Alcatraz Island
- Managed 3 seasonal biologists

Monterey Bay Aquarium Research Institute | Moss Landing, CA | 2004
Biological Technician

- Constructed and tested autonomous buoys for measuring dissolved CO2 in seawater

TECHNICAL SKILLS & RESEARCH TOOLS

Programming: Python, FORTRAN, C#, MATLAB, Java, R, Perl, C, High-performance computing (OpenMP, MPI, CUDA)

Instrumentation & Methodology: BueROV and BlueBoat (Blue Robotics) setup and operation, CTD and related water quality devices (Seabird, YSI, others), scientific echosounders (BioSonics, SIMRAD), RDI/Teledyne ADCP, small boat operations, wildlife trackers (various), OpenROV, Fluorometers (Turner, various), satellite-based oceanography, GIS (ARC, QGIS).

OTHER RELEVANT EXPERIENCE

- Invited expert reviewer of the National Academy of Sciences Report: *A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration* (2021)
- Volunteer online editor, programmer, and webmaster for the peer-reviewed scientific journal *Marine Ornithology* (2006 – 2023), http://www.marineornithology.org
- Scientific Committee on Oceanographic Research (SCOR) Biogeochemical Exchange Processes at the Sea-Ice Interface (BEPSII) (2012-2021)

PUBLICATIONS (ORCID 0000-0003-3724-3033)

Saenz, BT, Rachiele, R, Uribe Robles, M, Schmidt, B, Harper, D., Mburu, E, Vaughn, L, Killam, D. In prep. CO2 sequestration well blowout impacts on surface water quality in the Sacramento-San Joaquin Delta. Submitting to *Scientific Reports*.

Saenz, B.T., M. Young, F. Feyrer, L. Grimaldo, S. Acuna, E. Gross, and W. Kimmerer. In prep. Acoustic estimation of small fish density and behavior in the northern San Francisco Estuary. Submitting to *PLoS One.*

Deas M, Sun Y-H, DeGeorge J, Saenz BT, Evans TA, et. al. (2025) Development of a Water Temperature Modeling Platform to Support Short- and Long-Term Water Temperature Management in Reservoir–River Systems. *Water* 17:2714.

Fahlbusch JA, Cade DE, Hazen EL, Elliott ML, Saenz BT, Goldbogen JA, Jahncke J. 2024. Submesoscale coupling of krill and whales revealed by aggregative Lagrangian coherent structures. *Proceedings of the Royal Society B: Biological Sciences* 291:20232461.

Roberson LM, Grebe GS, Arzeno-Soltero IB, Bailey D, Chan S, Davis K, Goudey CA, Kite-Powell H, Lindell S, Manganelli D, Marty-Rivera M, Ng C, Rollano FT, Saenz B, Van Cise AM, Waters T, Yang Z, Yarish C (2024) Developing Cultivation Systems and Better Management Practices for Caribbean Tropical Seaweeds in US Waters. In: *Tropical Phyconomy Coalition Development: Focus on Eucheumatoid Seaweeds*. Critchley AT, Hurtado AQ, Neish IC (eds) Springer International Publishing, Cham, p 121–141

Wongpan P, Meiners KM, Vancoppenolle M, Fraser AD, Moreau S, Saenz BT, Swadling KM, Lannuzel D (2024) Gross Primary Production of Antarctic Landfast Sea Ice: A Model-Based Estimate. *Journal of Geophysical Research: Oceans* 129:e2024JC021348.

Arzeno-Soltero IB, Saenz BT, Frieder CA, Long MC, DeAngelo J, Davis SJ, Davis KA. 2023. Large global variations in the carbon dioxide removal potential of seaweed farming due to biophysical constraints. *Commun Earth Environ* 4:1–12. https://www.nature.com/articles/s43247-023-00833-2

Saenz B.T., McKee D.C., Doney S.C., Martinson D.G., Stammerjohn S.E. 2023. Influence of seasonally varying sea-ice concentration and subsurface ocean heat on sea-ice thickness and sea-ice seasonality for a 'warm-shelf' region in Antarctica. *Journal of Glaciology* 69:1466–1482. DOI: 10.1017/jog.2023.36

DeAngelo, J., Saenz, B.T, Arenzo-Soltero, I.B., Frieder, C., Long, M.C, Hamman, J., Davis, K.A., and Davis, S.J. 2022. Economic and biophysical limits to seaweed farming for climate change mitigation. 2022 *Nature Plants*, 9:45-57. https://doi.org/10.1038/s41477-022-01305-9

Rockwood, R. Cotton, Meredith L. Elliott, Benjamin Saenz, Nadav Nur, and Jaime Jahncke. 2020. Modeling Predator and Prey Hotspots: Management Implications of Baleen Whale Co-Occurrence with Krill in Central California. *PLOS ONE* 15(7): e0235603. DOI: 10.1371/journal.pone.0235603.

Ainley, David G., Trevor W. Joyce, Ben Saenz, Robert L. Pitman, John W. Durban, Grant Ballard, Kendra Daly, and Stacy Kim. 2020. Foraging Patterns of Antarctic Minke Whales in McMurdo Sound, Ross Sea. *Antarctic Science* 1–12. DOI: 10.1017/S0954102020000310.

Saenz, B. T., D. G. Ainley, K. L. Daly, G. Ballard, E. Conlisk, M. L. Elrod, & S. L. Kim. 2020. Drivers of concentrated predation in an Antarctic marginal-ice-zone food web. *Scientific Reports.* DOI: 10.1038/s41598-020-63875-y

Kim, S. B, L. A. Gunther, S. H. Mahaffey, K. M. Qualls. M. Sugla, B. T. Saenz, et al. 2019. The contribution of ice algae to the winter energy budget of juvenile Antarctic krill in years with contrasting sea ice conditions. *ICES Journal of Marine Science.* https://doi.org/10.1093/icesjms/fsy145

Thayne, M. W., J. A. Santora, B. Saenz, P. Warzybok, & J. Jahncke. 2018. Combining seabird diet, acoustics and ecosystem surveys to assess temporal variability and occurrence of forage fish. *Journal of Marine Systems*, in press. doi: 10.1016/j.jmarsys.2018.08.006

Selz, V., Saenz, B. T., van Dijken, G. L., & Arrigo, K. R. 2018. Drivers of Ice Algal Bloom Variability between 1980 and 2015 in the Chukchi Sea. *Journal of Geophysical Research: Oceans*, 123. https://doi.org/10.1029/2018JC014123

Kim, S., Saenz, B., Scanniello, J., Daly, K., & Ainley, D. 2018. Local climatology of fast ice in McMurdo Sound, Antarctica. *Antarctic Science*, 30(2), 125-142. doi:10.1017/S0954102017000578

Manugian S., Elliott, M. L., Bradley, R., Howar, J., Karnovsky, N., Saenz, B., et al. 2015. Spatial Distribution and temporal patterns of Cassin's Auklet foraging and their euphausiid prey in a variable ocean environment. *PLoS ONE* 10(12): e0144232. doi:10.1371/journal.pone.0144232

Saenz, B. T., and K. R. Arrigo. 2014. Annual primary production in Antarctic sea ice during 2005-2006 from a sea ice state estimate. *Journal of Geophysical Research*, 119, 3645–3678, doi:10.1002/2013JC009677.

Palmer, M. A., B. T. Saenz, B. T., and K. R. Arrigo. 2014. Impacts of sea ice retreat, thinning, and melt-pond proliferation on the summer phytoplankton bloom in the Chukchi Sea, Arctic Ocean. *Deep Sea Research II*, http://dx.doi.org/10.1016/j.dsr2.2014.03.016

Saenz, B. T., and K. R. Arrigo. 2012. Simulation of a sea ice ecosystem using a hybrid model for slush layer desalination. *Journal of Geophysical Research*, 117: C05007, doi:10.1029/2011JC007544.