John R. Casey

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Education

Ph.D. Oceanography (May 2017). Dept. of Oceanography, School of Ocean and Earth Science and Technology, University of Hawai'i, Mānoa.

B.S. Marine Biology, B.A. Spanish Language (May 2007). College of Charleston, Charleston, SC.

Research Experience and Positions Held

Postdoctoral Researcher (June 2020 – present). Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA.

Simons Postdoctoral Scholar (May 2019 – May 2020). Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA.

Research Affiliate (August 2018 – present). School of Ocean and Earth Science and Technology, University of Hawai'i, Mānoa, HI.

Simons Postdoctoral Scholar (July 2017 – May 2019). Center for Microbial Oceanography: Research and Education, University of Hawai'i, Mānoa, HI.

Research Technician II, III (May 2007 – July 2010). Core Flow Cytometry Facility, Marine Particle Imaging Lab, Bermuda Institute of Ocean Sciences, St. Georges, Bermuda.

Intern (August 2005 – January 2006). Research Experience for Undergraduates, Bermuda Biological Station for Research, St. Georges, Bermuda.

Intern (June 2004 – July 2004). Transects Program, Skidaway Institute of Oceanography/College of Charleston, Charleston, SC.

Research Assistant I (October 2003- March 2004). Dept. of Microbiology, College of Charleston, Charleston, SC.

Research Interests

Microbial oceanography, biogeochemical cycles, ecological stoichiometry, biological thermodynamics, modeling microbial metabolism and physiology.

I am interested in the coordination and optimization of cellular scale processes, how objectives - like fitness or entropy production - are influenced by the streams of information between tiers of biological organization, and how all this

complexity is imprinted in the genetic code. I enjoy thinking about these layers of biological complexity as they relate to the ecology and biogeochemistry of the oceans.

Refereed Scientific Publications

1. Casey, J.R., Lomas, M.W., Mandecki, J., Walker, D.E., 2007. *Prochlorococcus* contributes to new production in the Sargasso Sea deep chlorophyll maximum. *Geophysical Research Letters* 34, L10604.

2. Casey, J.R., Lomas, M.W., Michelou, V.K., Dyhrman, S.T., Ammerman, J.W., Sylvan, J.B., 2009. Taxon-specific orthophosphate and ATP utilization in the western Sargasso Sea. *Aquatic Microbial Ecology* 58, 31-44.

3. Fawcett, S.E., Lomas, M.W., Casey, J.R., Ward, B.B., Sigman, D.M., 2011. Assimilation of upwelled nitrate by small eukaryotes in the Sargasso Sea. *Nature Geoscience* 4, 1–6.

4. Lomas, M.W., Moran, S.B., Casey, J.R., Bell, D.W., Tiahlo, M., Whitefield, J., Kelly, R.P., Mathis, J.T., Cokelet, E.D., 2012. Spatial and seasonal variability of primary production on the Eastern Bering Sea shelf. *Deep Sea Research Part II: Topical Studies in Oceanography* 1–15.

5. Mackey, K., Buck, K.N., Casey, J.R., Cid, A., Lomas, M.W., Sohrin, Y., Paytan, A., 2012. Phytoplankton responses to atmospheric metal deposition in the coastal and open-ocean Sargasso Sea. *Frontiers in Microbiology* 3, 1–15.

6. Casey, J.R., Aucan, J.P., Goldberg, S.R., Lomas, M.W., 2013. Changes in partitioning of carbon among photosynthetic pico- and nanoplankton in the Sargasso Sea in response to changes in the North Atlantic Oscillation. *Deep Sea Research II: Topical Studies in Oceanography* 93, 58-70.

7. Wallhead, P.J., Garçon, V.C., Casey, J.R., Lomas, M.W., 2014. Long-term variability of phytoplankton carbon biomass in the Sargasso Sea. *Global Biogeochemical Cycles* 28, 825-841.

8. Durham, B.P., Grote, J., Whittaker, K.A., Bender, S.J., Luo, H., Grim, S.L., Brown, J.M., Casey, J.R., Dron, A., Florez-Leiva, L., Krupke, A., Luria, C.M., Mine, A.H., Nigro, O.D., Pather, S., Talarmin, A., Wear, E.K., Weber, T.S., 4. Wilson, J.M., Church, M.J., DeLong, E.F., Karl, D.M., Steward, G.F., Eppley, J.M., Krypides, N.C., Schuster, S., Rappé, M.S., 2014. Draft genome sequence of marine alphaproteobacterial strain HIMB11, the first cultivated representative of a unique lineage within the *Roseobacter* clade possessing an unusually small genome. *Standards in Genomic Sciences* 9, 632.

9. Casey, J.R., Falkowski, P.G., Karl, D.M., 2015. Substrate selection for heterotrophic bacterial growth in the sea. *Marine Chemistry* 177, 349-356.

10. Casey, J.R., Mardinoglu, A., Nielsen, J., Karl, D.M., 2016. Adaptive evolution of phosphorus metabolism in *Prochlorococcus*. *mSystems* 1, e00065–16.

11. Wilson, S.T., Aylward, F.O., Ribalet, F., Barone, B., Casey, J.R., Connell, P.E., Eppley, J.A., Ferrón, S., Romano, A.E., Turk-Kubo, K.A., Vislova, A., Armbrust,

V., Caron, D.A., Church, M.J., Zehr, J.P., Karl, D.M., DeLong, E.F., 2017. Coordinated regulation of growth, activity, and transcription in natural populations of the unicellular nitrogen-fixing cyanobacterium *Crocosphaera*. *Nature Microbiology* 2, 17118.

12. Casey, J.R., Ferrón, S., Karl, D.M., 2017. Light-enhanced microbial organic carbon yield. *Frontiers in Microbiology* 8, 2157.

13. Casey, J.R., Björkman, K.M., Ferrón, S., Karl, D.M., 2019. Size-dependence of metabolism within marine picoplankton populations. *Limnology and Oceanography* 64, 1819-1827.

14. Sosa, O.A., Casey, J.R., Karl, D.M., 2019. Methylphosphonate oxidation in *Prochlorococcus* supports phosphate acquisition, formate secretion, and carbon assimilation into purine nucleotides. *Applied and Environmental Microbiology* 85, e000289-19.

15. Wilson, S.T., Hawko, N.J., Armbrust, E.V., Barone, B., Björkman, K.M., Boysen, A.K., Burgos, M., Burrell, T.J., Casey, J.R., DeLong, E.F., Dugenne, M., Dutkiewicz, S., Dyhrman, S.T., Ferrón, S., Follows, M.J., Foreman, R.K., Funkey, C.P., Harke, M.J., Henke, B.A., Hill, C.N., Hynes, A.M., Ingalls, A.E., Jahn, O., Kelly, R.L., Knapp, A.N., Letelier, R.M., Ribalet, F., Shimabukuro E.M., Tabata, R.K.S., Turk-Kubo, K.A., White, A.E., Zehr, J.P., John, S., Karl, D.M., 2019 Kilauea lava fuels phytoplankton bloom in the North Pacific Ocean. *Science* 365, 1040-1044.

16. Casey, J.R., Follows, M.J., 2020. A steady-state model of microbial acclimation to substrate limitation. *PLoS Computational Biology* 16(8), e1008140.

17. Beckett, S.J., Demory, D., Coenen, A.R., Casey, J.R., Dugenne, M., Follett, C.L., Connell P., Carlson, M.C.G., Hu, S.K., Wilson, S.T., Muratore, D., Rodriguez-Gonzalez, R.A., Peng, S., Becker, K., Mende, D.R., Armbrust, E.V., Caron, D.A., Lindell, D., Follows, M.J., White, A.E., Ribalet, F., Weitz, J.S., 2021. Diel population dynamics and mortality of *Prochlorococcus* in the North Pacific Subtropical Gyre. *bioRxiv* doi:10.1101/2021.06.15.448546.

18. Mattern, J.P., Glauninger, K., Britten, G.L., Casey, J.R., Hyun, S., Wu, Z., Armbrust, E.V., Harchaoui, Z., Ribalet, F., 2022. A Bayesian approach to modeling phytoplankton population dynamics from size distribution time series. *PLoS Computational Biology* 18:e1009733.

19. Muratore, D., Boysen, A.K., Harke, M.J., Becker, K.W., Casey, J.R., Coesel, S.N., Mende, D.R., Wilson, S.T., Aylward, F.O., Eppley, J.M., Vislova, A., Peng, S., Rodriguez-Gonzalez, R. A., Beckett, S.J., Armbrust, E.V., DeLong, E.F., Karl, D.M., White, A.E., Zehr, J.P., Van Mooy, B.A.S., Dyhrman, S.T., Ingalls, A.E., Weitz, J.S., 2022. Complex marine microbial communities partition metabolism of scarce resources over the diel cycle. *Nature Ecology and Evolution* doi:10.1038/s41559-021-01606-w.

20. Casey, J.R., Boiteau, R.M., Engqvist, M.K.M., Finkel, Z.V., Li, G., Liefer, J., Müller, C.L., Muñoz, N., Follows, M.J., 2022. Basin-scale biogeography of marine

phytoplankton reflects cellular-scale optimization of metabolism and physiology. *Science Advances* 8:eabl4930.

Seminars, Symposia, Workshops, and Abstracts

1. Casey, J.R., Sancho, G., Zooplankton distribution across the South Atlantic Bight. (College of Charleston, Research Poster Session, 2006)

2. Casey, J.R., Lomas, M.W., Mandecki, J., Walker, D.E., Nitrate uptake by an uncultured *Prochlorococcus* population from the deep chlorophyll maximum in the Sargasso Sea. (College of Charleston, Research Poster Session, 2006)

3. Casey, J.R., Lomas, M.W., Walker, D.E., Taxon-specific nitrogen and carbon uptake rates in marine cyanobacteria. (ASLO/AGU Ocean Science Meeting 2006, Honolulu, Hawaii)

4. Lomas, M.W., Casey, J.R., Mandecki, J., and Walker, D.E., Taxon-specific carbon and nitrogen uptake rates in natural populations of *Prochlorococcus* and *Synechococcus*. (ASLO Summer Meeting 2006, Victoria, BC.)

5. Lomas, M.W., Sedwick, P.N., Casey, J.R., Does iron availability control new production by *Prochlorococcus* in subsurface waters in the Sargasso Sea? (ASLO Aquatic Sciences Meeting 2007, Santa Fe, NM)

6. Casey, J.R., Lomas, MW., Michelou, V., Dyhrman, S., Ammerman, J., Sylvan, J., Taxon-specific orthophosphate and ATP uptake in the Western Sargasso Sea. (ASLO/AGU Ocean Science Meeting 2008, Orlando, Florida)

7. Lomas, M.W., Ward, B., Casey, J.R., Eukaryotes dominate new production in the Sargasso Sea. (AGU Fall Meeting 2010, San Francisco, CA)

8. Casey, J.R., Lomas, M.W., Aucan, J.P., Interannual dynamics of carbon partitioning within the Sargasso Sea picoplankton assemblage. (ASLO/AGU Ocean Sciences Meeting 2010, San Juan, Puerto Rico) * ***Poster Award***

9. Casey, J.R., Björkman, K.M., Karl, D.M., Grabowski, E.M., Karl, D.M., Hot-PIE! A new look at primary productivity size spectra. (ASLO/AGU Ocean Sciences Meeting 2014, Honolulu, HI)

10. Casey, J.R., Bidigare, R.R., Karl, D.M., Photorespiration and LMW organic acid cycling at Station ALOHA. (ASLO/AGU Ocean Sciences Meeting 2014, Honolulu, HI)

11. Lomas, M.W., Bell, D.W., Casey, J.R., Terpis, K.X., Martiny, A.C., Controls on cell quota and elemental ratio variability in natural marine phytoplankton populations. (ASLO/AGU Ocean Sciences Meeting 2014, Honolulu, HI)

12. Casey, J.R., Ecological applications of flux balance analysis. (Society for Biological Engineering 2014, Göteborg, Sweden)

13. Casey, J.R., Follows, M.J., Jahn, O., Ji, B., Shaoie, S., Mardinoglu, A., Sarathi Sen, P., Nielsen, J., Karl, D.M., A *Prochlorococcus* proving ground for constraint-

based metabolic modeling and multi-'omics data integration. (ASLO/AGU Ocean Sciences Meeting 2016, New Orleans, LA)

14. Casey, J.R., Falkowski, P.J., Karl, D.M., Substrate selection for heterotrophic growth. (The Ocean and the Evolution of Earth's Biogeochemical Cycles 2016, Rutgers University, New Brunswick, NJ) **Invited*

15. Casey, J.R., Karl, D.M., Collimation of transcriptional noise by a cyanobacterial metabolic network. (Simons Collaboration on Ocean Processes and Ecology 2016, New York, NY)

16. Casey, J.R., Mardinoglu, A., Nielsen, J., Karl, D.M., Towards metabolic flux models of marine microbial communities. (Modeling Marine Microbial Communities and Biogeochemical Cycles 2017, New York, NY)

17. Casey, J.R., Müller, C.R., Pangenome-scale metabolic network reconstruction of *Prochlorococcus*. (ASLO/AGU Ocean Sciences Meeting 2018, Portland, OR)

18. Casey, J.R., Towards a mechanistic model of marine microbial community metabolism. (SOEST Department of Oceanography Seminar, 2018, Honolulu, HI) **Invited*

19. Casey, J.R., Müller, C.R., Follows, M.J., Simulations of *Prochlorococcus* growth and metabolism in the North Pacific Subtropical Gyre. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2018, New York, NY)

20. Casey, J.R., Follows, M.J., Towards physiological adaptations in Flux Balance Analysis. (Macromolecular Modeling Workshop, 2019, Boston, MA)

21. Casey, J.R., Müller, C.L., Bien, J., Nielsen, J., Karl, D.M., Follows, M.J., Simulating marine microbial growth and metabolism. (Biofuels Scientific Focus Area Meeting, Lawrence Livermore National Laboratory, 2019, Livermore, CA) ***Invited***

22. Vallino, J.J., Casey, J.R., Symposium: Cellular-scale Processes. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2019, New York, NY)

23. Casey, J.R., Follows, M.J., A model of adaptive nutrient transport. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2019, New York, NY)

24. Casey, J.R., Metabolic and Physiological Modeling. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2020, remote)

25. Casey, J.R., Boiteau, R.M., Engqvist, M.K.M., Finkel, Z.V., Li, G., Liefer, J., Müller, C.L., Muñoz, N., Follows, M.J., Pangenome-scale simulation of growth, metabolism and physiological acclimation of *Prochlorococcus* strainss across a meridional transect. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2020, remote)

26. Casey, J.R., Boiteau, R.M., Engqvist, M.K.M., Finkel, Z.V., Li, G., Liefer, J., Müller, C.L., Muñoz, N., Follows, M.J., Simulating microbial growth, metabolism and physiology. (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems Annual Meeting, 2021, remote)

27. Casey, J.R., Genome-scale constraint-based simulations of microbial metabolism and physiology. (Ocean Carbon Biogeochemistry Scoping Workshop: Laying the foundation for a potential future BioGeoSCAPES program, 2021, remote) **Invited*

Research Grants
Scholar – Simons Foundation (#549894): Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems (2017-2020). 341,521 USD

Fellow – Swedish Research Council/National Science Foundation: Graduate Research Opportunities Worldwide (2013-2014). 21,000 USD

Fellow – National Science Foundation: Graduate Research Fellowship Program (2010-2013). 134,000 USD

Fellow – National Science Foundation: Research Experience for Undergraduates (2005).

Reviewer for
Applied and Environmental Microbiology
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Continental Shelf Research
Deep Sea Research
eLife
Environmental Monitoring and Assessment
Flanders Research Foundation (Fonds Wetenschappelijk Onderzoek)
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