

JESSICA Y. LUO

201 Forrestal Road
Princeton, New Jersey, 08540
Phone: (609)-452-5313 (o)
Email: jessica.luo@noaa.gov
Citizenship: U.S.A.

EDUCATION

- Ph.D. **University of Miami**, Miami, FL 2015
Rosenstiel School of Marine & Atmospheric Sciences
Division of Marine Biology and Fisheries
Dissertation: *Gelatinous zooplankton in marine communities and ecosystems: fine-scale horizontal and vertical distribution, trophic drivers, and contributions to global carbon cycling*
Major Professor: Robert K. Cowen
- M.S. **Stanford University**, Stanford, CA 2007
Department of Geological and Environmental Sciences
Major Professor: Adina Paytan
- B.A. **Stanford University**, Stanford, CA 2007
Program in Human Biology

PROFESSIONAL EXPERIENCE

Research Oceanographer (ZP-03)

Geophysical Fluid Dynamics Laboratory (GFDL)
National Oceanic and Atmospheric Administration 2019 - present

- Studying the impacts of climate variability and change on plankton dynamics.
- Improving the representation of marine ecosystems in the GFDL Earth System Model to better understand marine ecosystem tipping points.

Postdoctoral Fellow

National Center for Atmospheric Research (NCAR)
Climate and Global Dynamics Division, Oceanography Section 2016 – 2019
Postdoctoral supervisor: Matthew Long

- Leading efforts for the development of a global size-based ecosystem model for the Community Earth System Model (CESM).

Postdoctoral Scholar

Oregon State University, Hatfield Marine Science Center, Plankton Ecology Lab 2016
Postdoctoral supervisors: Robert K. Cowen and Su Sponaugle

- Investigating larval fish predator-prey dynamics using the *In Situ* Ichthyoplankton Imaging System.

Graduate Research Assistant

University of Miami, Rosenstiel School of Marine and Atmospheric Sciences 2010 – 2015

- Studied the sub-mesoscale distribution and dynamics of gelatinous zooplankton and mesozooplankton using the *In Situ* Ichthyoplankton Imaging System.
- Led development of crowdsourcing websites and competitions for manual and machine-learning based plankton identification.
- Participated in six oceanographic research cruises (~80 days at sea).

Ocean Education and Outreach Coordinator National Park Service, Point Reyes National Seashore	2008 – 2010
Research Assistant Stanford University, Department of Geological and Environmental Sciences	2005 – 2007

HONORS AND AWARDS

- Eco-DAS XII (Ecological Dissertations in the Aquatic Sciences), invited participant
- Best Oral Presentation by an Early Career Scientist
International Council for the Exploration of the Seas (ICES) 2014 Annual Science Meeting
- National Science Foundation (NSF) Graduate Research Fellowship
- University of Miami Robert C. Maytag Fellowship

PUBLICATIONS

Manuscripts in preparation or in review

1. **Luo JY**, Stock CA, Henschke N, Dunne JP. Global ecological and biogeochemical impacts of pelagic tunicates: a modeling study. *Progress in Oceanography*, **in prep.**
2. Negrete-Garcia G*, **Luo JY***, Long MC, Lindsay K, Levy MN, Barton AG. Global scale ecosystem dynamics in a size-structured and trait-based model. *Progress in Oceanography*, **in prep.**
*authors contributed equally to this manuscript.
3. Petrik CM, Heneghan RF, **Luo JY**, Everett JD, Harrison CS, Richardson AJ. Assessment of mesozooplankton in CMIP6 Earth system models and implications for modeling higher trophic levels and carbon sequestration. *Journal of Geophysical Research - Biogeosciences*, **in prep.**
4. Stamieszkin K, **Luo JY**, Millette NC, Follett EM, Record NR, Johns DG. Conditions for Mixotrophy in the North Atlantic Ocean. *Limnology and Oceanography*, **in prep.**

Peer-reviewed publications

1. Long MC, Moore JK, Lindsay K, Levy M, Doney SC, **Luo JY**, Krumhardt KM, Letscher RT, Grover M, and Sylvester ZT. (2021) Simulations with the Marine Biogeochemistry Library (MARBL). *Journal of Advances in Modeling Earth Systems*, <https://doi.org/10.1029/2021MS002647>
2. Robinson KL, Sponaugle S, **Luo JY**, Gleiber M, and Cowen RK. (2021) Fine- to coarse- scale patches are more frequent and larger in continental than oceanic waters across plankton phyla. *Science Advances*, 7(47), eabk2904, <https://doi.org/10.1126/sciadv.abk2904>
3. Kearney KA, Bograd S, Drenkard E, Gomez F, Haltuch M, Hermann A, Holsman K, Jacox M, Kaplan I, Koenigstein S, **Luo JY**, Masi M, Muhling B, Pozo Buil M, and Woodworth-Jefcoats PA. (2021) Using global-scale earth system models for regional fisheries applications. *Frontiers in Marine Science*, 8:622206. <https://doi.org/10.3389/fmars.2021.622206>
4. Harrison CS, **Luo JY**, Putman N, Li Q, Sheevam P, Krumhardt K, Stevens J, and Long MC. (2021) Identifying global favorable habitat for early juvenile loggerhead sea turtles. *Journal of the Royal Society Interface*, 18: 20200799. <https://doi.org/10.1098/rsif.2020.0799>
5. **Luo JY**, Condon RH, Stock CA, Duarte CM, Lucas CH, Pitt KA, and Cowen RK. (2020) Gelatinous zooplankton facilitate substantial carbon export in the global oceans: a modeling

- study. *Global Biogeochemical Cycles*, 34, e2020GB006704.
<https://doi.org/10.1029/2020GB006704> *Journal cover
6. Séférian, R, Berthet S, Yool A, Palmiéri J, Bopp L, Tagliabue A, Kwiatkowski L, Aumont O, Christian J, Dunne J, Gehlen M, Ilyina T, John JG, Li H, Long MC, **Luo JY**, Nakano H, Romanou A, Schwinger J, Stock C, Santana-Falcón Y, Takano Y, Tjiputra J, Tsujino H, Watanabe M, Wu T, Wu F, and Yamamoto A. (2020) Tracking improvement in simulated marine biogeochemistry between CMIP5 and CMIP6. *Current Climate Change Reports*. 6:95-119.
<https://doi.org/10.1007/s40641-020-00160-0>
 7. Krumhardt, KM, Lovenduski NS, Long MC, **Luo JY**, Lindsay K, Yeager S, and Harrison C. (2020) Potential predictability of net primary productivity in the ocean. *Global Biogeochemical Cycles*, 34, e2020GB006531. <https://doi.org/10.1029/2020GB006531> *Journal cover
 8. Schimd MS, Cowen RK, Robinson K, **Luo JY**, Briseño-Avena C, and Sponaugle S. (2020) Prey and predator overlap at the edge of a mesoscale eddy: fine-scale, in-situ distributions to inform our understanding of oceanographic processes. *Scientific Reports*, 10:921,
<https://doi.org/10.1038/s41598-020-57879-x>
 9. Cordero-Quirós N, Miller A, Subramanian AC, **Luo JY**, and Capotondi A. (2019) Composite physical-biological El Niño and La Niña conditions in the California Current System in CESM1-POP2-BEC. *Ocean Modelling*, 142:101439, <https://doi.org/10.1016/j.ocemod.2019.101439>
 10. **Luo JY**, Irisson J-O, Graham B, Guigand C, Sarafraz A, Mader C, and Cowen RK. (2018) Automated plankton image analysis using convolutional neural networks. *Limnology and Oceanography: Methods*, <https://doi.org/10.1002/lom3.10285>
 11. Durden J, **Luo JY**, Alexander H, Grossman L, and Flanagan A. (2017) Integrating Big Data into aquatic ecology: Challenges and opportunities. *Limnology and Oceanography Bulletin*, <https://doi.org/10.1002/lob.10213>
 12. Greer AT, Chiaverano L, **Luo JY**, Cowen RK, and Graham M. (2017) Scyphozoan ecology, behavior, and interactions with larval fishes described with in situ imaging in the northern Gulf of Mexico. *ICES Journal of Marine Science*, <https://doi.org/10.1093/icesjms/tsx168>
 13. Robinson KL, **Luo JY**, Sponaugle S, Guigand C, and Cowen RK. (2017) A tale of two crowds: Public engagement in plankton classification. *Frontiers in Marine Science*, 4:82.
<https://doi.org/10.3389/fmars.2017.00082>
 14. Faillettaz R, Picheral M, **Luo JY**, Guigand C, Cowen RK, and Irisson J-O. (2016) Imperfect automatic image classification successfully describes plankton distribution patterns. *Methods in Oceanography*, 15-16:60-77.
 15. **Luo JY**, Grassian B, Tang D, Irisson J-O, Greer AT, Guigand CG, and Cowen RK. (2014) Environmental drivers of fine-scale distributions of the gelatinous zooplankton community across a mesoscale front. *Marine Ecology Progress Series*, 510:129-149.
<https://doi.org/10.3354/meps10908>.
 16. McClatchie S, Cowen R, Nieto K, Greer A, **Luo JY**, Guigand C, Demer D, Griffith D, and Rudnick D. (2012) Resolution of fine biological structure including small narcomedusae across a front in the Southern California Bight. *Journal of Geophysical Research*, 117, C04020,
<https://doi.org/10.1029/2011JC007565>.

Datasets, Software, and Non-referred publications

1. Schmid MS, Daprano D, Jacobson KM, Sullivan C, Briseño-Avena C, **Luo JY**, and Cowen RK. (2021). A Convolutional Neural Network based high-throughput image classification pipeline - code and documentation to process plankton underwater imagery using local HPC infrastructure and NSF's XSEDE (1.0.0). *Zenodo*. <https://doi.org/10.5281/zenodo.4641158>

2. Kelly PT, Bell T, and others (2017) Ecological Dissertations in the Aquatic Sciences (Eco-DAS): An effective networking and professional development opportunity for early career aquatic sciences. *Limnology and Oceanography Bulletin*, 26: 25–30. <https://doi.org/10.1002/lob.10180>
3. Cowen RK, Sponaugle S, Robinson KL, **Luo JY**. (2015) PlanktonSet 1.0: Plankton imagery data collected from F.G. Walton Smith in Straits of Florida from 2014-06-03 to 2014-06-06 and used in the 2015 National Data Science Bowl (NCEI Accession 0127422). NOAA National Centers for Environmental Information. Dataset. <https://doi.org/10.7289/v5d21vjd>

INVITED TALKS

1. Developing PSSdb: a Pelagic Size Structure database to support biogeochemical modeling. ASLO Aquatic Sciences Meeting. 2021
2. Plankton dynamics across scales in observations and models. Princeton University, Department of Geosciences, Climate Seminar Series. 2019
3. Integrating plankton observations and models: implications for ecological forecasting. U.S. CLIVAR Summit, 2019.
4. Zooplankton in marine ecosystems and biogeochemical cycles: a critical but under-represented link in global models. NOAA Geophysical Fluid Dynamics Laboratory. 2018.
5. Dynamics of zooplankton in marine communities and ecosystems: insights from high-resolution imaging and models. University of Colorado - Boulder, 2016
6. Gelatinous zooplankton: fine-scale distributions, trophic drivers, and contribution to global carbon cycling. Oregon State University, Integrative Biology Fall Seminar Series, 2015
7. Imaging Jellyfish in the Oceans. Sharing the Coast conference. Oregon Sea Grant. 2015.

CONTRIBUTED TALKS

1. **Luo JY**, Stock CA, Dunne JP. Global ecological and biogeochemical impacts of pelagic tunicates: a modeling study. *Ocean Sciences Meeting*. San Diego, CA. 2020.
2. **Luo JY**, Long MC, Lindsay K, Levy MN. Investigating marine food-web dynamics in the Community Earth System Model (CESM). *4th International Symposium on the Effects of Climate Change on the World's Oceans*. Washington, D.C. 2018.
3. **Luo JY**, Long MC, Lindsay K, Levy MN. Size-structured and trait-based plankton modeling in the Community Earth System Model (CESM). *Ocean Sciences Meeting*. Portland, OR. 2018.
4. **Luo JY**, Grassian B, Tang D, Irisson J-O, Greer AT, Guigand CM, McClatchie S, Cowen RK. Environmental drivers of the fine-scale distribution of a gelatinous zooplankton community across a mesoscale front. *International Council for the Exploration of the Seas (ICES) Annual Science Meeting*. A Coruña, Spain. 2014. ****Won Best Oral Presentation by an Early Career Scientist**
5. **Luo JY**, Grassian B, Greer AT, Guigand C, Irisson J-O, McClatchie S, Cowen RK. Fine scale distribution of gelatinous zooplankton across a front in the Southern California Bight. *4th International Jellyfish Blooms Symposium*. Hiroshima, Japan. 2013.
6. **Luo JY**, Greer AT, Guigand C, McClatchie S, Cowen, RK. The fine scale distribution of siphonophores and a narcomedusae bloom across a front in the Southern California Bight. *Ocean Sciences Meeting*. Salt Lake City, UT. 2012.

SELECTED POSTERS

1. **Luo JY**, Robinson KL, Sponaugle S, Cowen RK. Development of a mesozooplankton community along a dynamic current: insights from a Lagrangian towed plankton imager. *Ocean Sciences Meeting*. 2018.
2. **Luo JY** and Long MC. Modeling oxygen-driven shifts in ecosystem composition. *Trait-based approaches to marine life*. 2017.
3. **Luo JY**, Condon RH, Cowen RK. Gelatinous animals facilitate carbon export in the global oceans. *Ocean Sciences Meeting*. 2016.
4. **Luo, JY**, Grassian B, Tang D, Irisson J-O, Greer AT, Guigand CM, McClatchie S, Cowen RK. Environmental drivers of the fine-scale distribution of a gelatinous zooplankton community across a small-scale front. *Ocean Sciences Meeting*. 2014.
5. **Luo J**, Paytan A, Al-Najjar, T. Using Carbon and Nitrogen Stable Isotopes and Trace Metal Concentrations in Zooplankton to Determine Seasonal and Anthropogenic Influences in the Gulf of Aqaba, Red Sea. *AGU Fall Meeting*. 2007.

GRANTS, PROPOSALS, and FELLOWSHIPS

(Total: \$1.642M)

1. "Developing PSSdb: a Pelagic Size Structure database to support biogeochemical modeling," NOAA Climate Program Office, 2021-2024, Lead PI: Luo
2. "Dynamic Elemental Stoichiometry in COBALT," Cooperative Institute for Modeling the Earth System, Princeton University, 2020-2021, PI George Hagstrom (Luo: Co-PI)
3. "Eddy effects on the ocean biological pump," National Science Foundation, 2020-2023, PI Laure Resplandy. (Luo: Collaborator and Proposal Co-writer)
4. "Dynamic Nutrient Stoichiometry in COBALT," Cooperative Institute for Modeling the Earth System, Princeton University, 2019-2020, PI George Hagstrom (Luo: Co-PI)
5. National Science Foundation (NSF) Graduate Research Fellowship. 2010-2015.
6. Robert E. Maytag Fellowship, University of Miami. 2010-2015.
7. Data Science for Social Good: 1st Annual National Data Science Bowl. Prize sponsorship and competition support. Booz Allen Hamilton. 2014-2015.
8. International Council for the Exploration of the Seas (ICES) Annual Science Meeting, Conference Travel and Best Oral Presentation Award. 2014.
9. Partner University Fund, coursework and research support at the University of Pierre and Marie Curie (UPMC), Villefranche-sur-Mer, France. 2013.
10. Ten grants funding aquatic sciences education and outreach at Point Reyes National Seashore, National Park Service, 2008 – 2010. (\$310,000)
11. "Assessing Anthropogenic Influences on Phytoplankton Nutrient Dynamics using Zooplankton Tows in the Gulf of Aqaba, Red Sea." Stanford University McGee grant. 2006.
12. Five research grants / fellowships, Stanford University. 2004-2006.

PROFESSIONAL ACTIVITIES

Conference session convening:

- *Advances in Coupled Physical-Biogeochemical Modeling: Regional to Global Scales* (Primary chair)
2020 Ocean Sciences Meeting, San Diego CA. 2020
- *(Sub)mesoscale Physical/Biogeochemical Interactions*
2020 Ocean Sciences Meeting, San Diego CA. 2020

- *Physical-biogeochemical interactions across scales: From microscale to mesoscale.* 2018 Ocean Sciences Meeting, Portland OR. 2018
- *Machine learning in biological oceanography.* 2018 Ocean Sciences Meeting, Portland OR. 2018
- *Big data in marine ecology* (Primary chair). 2016 Ocean Sciences Meeting, New Orleans LA. 2016

Steering Committee, 37th Annual Larval Fish Conference, Miami, FL. 2013.

Reviewer for Nature, Limnology & Oceanography, Limnology & Oceanography Methods, ICES Journal of Marine Science, Journal of Marine Systems, Marine Ecology Progress Series, Atmosphere, Hydrobiologica, Scientia Marina, NOAA Bay Watershed Education and Training (B-WET) Program, and NSF Biological Oceanography.

Review panelist member for NASA FINESST Program.

EDUCATION AND OUTREACH

Plankton Portal 2012 – present

- Co-developed online citizen science website (www.planktonportal.org) through Zooniverse.org for crowd-sourcing plankton image identification. Organized volunteer communication and outreach.

Undergraduate Students

- Isabela Rios, Hollings Scholar, NOAA 2020
- Quiana Berry, CIMES summer intern, Princeton University 2020
- Jamin Rader, SOARS internship, UCAR 2017 – 2018
- Chase Cobb, Summer REU internship, Oregon State University 2014
- Ben Grassian, Senior Thesis, University of Miami 2012 – 2014
- Jenna Binstein, Senior Thesis, University of Miami 2012 – 2013

Mentorship and Supervision (16 total) 2011 – present

- Interns and research techs, Oregon State University and University of Miami
- Employees and science communication interns, National Park Service

Guest Lectures and Labs

- Primary productivity in the ocean, University of Colorado Boulder 2018
- Plankton ecology and biological oceanography, Oregon State University 2014 – 2016
- Larval fish ecology and identification, University of Miami 2012
- Marine mammal conservation and management, University of Miami 2011

Aquatic & Marine Sciences Field Seminar, Point Reyes National Seashore, CA 2008 - 2010

- Developed and taught five field-seminars of varying lengths (2 weeks intensive, 1 week intensive, 6 week) for high school students on field techniques in the marine and aquatic sciences.

Teachers Professional Development Seminars, 2013-2015

Numerous public articles and newsletters, 2008-2016

SKILLS AND CERTIFICATIONS

AAUS Science Diver, NAUI advanced open water, EANx