

## Justin L. Penn

Postdoctoral Research Associate

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### EDUCATION

2020 **PhD**, Oceanography

University of Washington, Seattle

Dissertation title: “Biosphere Impacts of Ocean Hypoxia in Warming Climate”

2016 **MS**, Oceanography

University of Washington, Seattle

2012 **BS**, Environmental Science, Conservation Biology Minor

University of California, Los Angeles

Magna Cum Laude

### RESEARCH INTERESTS

Climate change, ocean biogeochemistry, marine ecosystems, biodiversity, Earth system/ecosystem modeling, extinction, ocean deoxygenation, nitrogen cycle, O<sub>2</sub> minimum zones, paleoclimate, paleo/geobiology, ecophysiology, biogeography, metabolic theory, carbon cycle, tropical oceanography, fisheries, coral reefs.

### PROFESSIONAL EXPERIENCE

2025 **Instructor**, Department of Ecology and Evolutionary Biology, Princeton University and Smithsonian Tropical Research Institute, Panama

2021 – **Postdoctoral Research Associate**, Department of Geosciences, Princeton University

2021 **Postdoctoral Scholar**, School of Oceanography, University of Washington, Seattle

2014 – 2020 **Graduate Research Assistant**, School of Oceanography University of Washington, Seattle

2015, 2017 **Teaching Assistant**, School of Oceanography University of Washington, Seattle

2013 – 2014 **Research Scientist & Engineer**, School of Oceanography University of Washington, Seattle

2012 – 2013 **Research Assistant**, Department of Atmospheric and Oceanic Science University of California, Los Angeles

2012 **Research Intern**, Institute of the Environment and Sustainability, Institute of Geophysics & Planetary Physics, University of California, Los Angeles

## PUBLICATIONS

Al Aswad J.A., **Penn J. L.**, Monarrez P., Deutsch C., Payne. J. L., Physiology and climate change explain unusually high similarity across marine communities after end-Permian mass extinction *Science Advances*. (2025) 11, DOI: 10.1126/sciadv.adr4199

**Penn. J. L.**, Deutsch C., Geographic and taxonomic patterns in aerobic traits of marine ectotherms. *Phil. Trans. R. Soc. B* (2024) 379 (1896), 20220487. <https://doi.org/10.1098/rstb.2022.0487>

Endress M. A., **Penn J. L.**, Boag T. H., Burford B. P., Sperling E. A., Deutsch C. Thermal optima in the hypoxia tolerance of marine ectotherms: physiological causes and biogeographic consequences. *PLOS Biology* (2024) 22 (1), e3002443. <https://doi.org/10.1371/journal.pbio.3002443>

Deutsch C., **Penn J. L.**, Lucey N. Climate, oxygen, and the future of marine biodiversity. *Annual Review of Marine Science* (2024) 16, 217-245. <https://doi.org/10.1146/annurev-marine-040323-095231>

Payne J. L., Al Aswad J. A., Deutsch C. A., Monarrez P. M., **Penn J. L.**, Singh P., Selectivity of mass extinctions: patterns, processes, and future directions. *Cambridge Prisms: Extinction* (2023).1,e12,1–11 <https://doi.org/10.1017/ext.2023.10>

Deutsch C., **Penn J. L.**, Verbek W. C. E. P., Inomura K., Endress M., Payne J. L. Impact of warming on aquatic body sizes explained by metabolic scaling from microbes to macrofauna. *Proceedings of the National Academy of Sciences*. 119(2022). <https://doi.org/10.1073/pnas.2201345119>

**Penn J. L.**, Deutsch C., Avoiding ocean mass extinction from climate warming. *Science*. 526, 524-526 (2022). DOI: 10.1126/science.abe903

C. Deutsch, **Penn J. L.**, Seibel B., Metabolic trait diversity shapes marine biogeography. *Nature*. 585 (2020), <https://doi.org/10.1038/s41586-020-2721-y>

Howard E. M., **Penn J. L.**, Frenzel H., Seibel B. A., Bianchi D., Renault L., Kessouri F., Sutula M. A., McWilliams J. C., Deutsch C., Climate-driven aerobic habitat loss in the California Current System, *Science Advances*. 6 (2020), DOI: 10.1126/sciadv.aay3188

**Penn J. L.**, Weber T., Chang, B. X., Deutsch C., Microbial ecosystem dynamics drive fluctuating nitrogen loss in marine anoxic zones. *Proceedings of the National Academy of Sciences*. 16 (2019), <https://doi.org/10.1073/pnas.1818014116>

**Penn J. L.**, Global warming blamed for Earth’s largest mass extinction. *The Science Breaker*. (2019). <https://doi.org/10.25250/thescbr.brk277>

**Penn J. L.**, Deutsch C., Payne. J. L., Sperling E.A., Temperature-dependent hypoxia explains biogeography and severity of end-Permian marine mass extinction. *Science*. 362 (2018), <https://doi.org/10.1126/science.aat1327>

**Penn J. L.**, Weber T., Deutsch C., Microbial functional diversity alters the structure and function of oxygen deficient zones. *Geophysical Research Letters*. 43 (2016),

<https://doi.org/10.1002/2016GL070438>

## GRANTS AND FELLOWSHIPS

- 2022–2025    Geophysical Fluid Dynamics Laboratory (GFDL) & Cooperative Institute for Modeling the Earth System (CIMES) Task III project; “Development and parametrization of a trait-based model of zooplankton diversity for marine food web and climate feedback studies”, Co-PI.
- 2018            Program on Climate Change Fellowship, UW

## HIGHLIGHTS, HONORS, AND AWARDS

- 2024 – 2026, 2015 – 2019    National Center for Atmospheric Research (NCAR) Computing Allocation
- 2022    *Science* Perspective by Malin Pinsky and Alexa Fredston on “Avoiding ocean mass extinction from climate warming.”
- 2019    Ocean Carbon and Biogeochemistry Science Highlights: “Microbial ecosystem dynamics drive fluctuating nitrogen loss in marine anoxic zones”
- 2018    *Science* Perspective by Lee Kump on “Temperature-dependent hypoxia explains biogeography and severity of end-Permian marine mass extinction”
- 2016    Modeling a Living Planet Travel Scholarship, Princeton University
- 2013    Phi Beta Kappa, UCLA
- 2012    California Sea Grant Isaacs Scholarship
- 2012    Departmental Academic Achievement Award, Institute of the Environment and Sustainability, UCLA
- 2012    Departmental Highest Honors, Institute of the Environment and Sustainability, UCLA

## INVITED TALKS

- 2025    Program on Climate Change Summer Institute: Paleoclimate Constraints on Future Climate University of Washington; “Modeling Biodiversity Dynamics under Climate Change.”
- 2025    AIMEC Science Salon, Tohoku University, Japan; “Extinctions from Hypoxia in a Warming Ocean: Ancient Lessons for the Future.”
- 2025    Scripps Ecology Seminar at UCSD; “Extinctions from Hypoxia in a Warming Ocean: Ancient Lessons for the Future.”

- 2025 Seminar in the Department of Earth and Atmospheric Science, Cornell University; “Extinctions from Hypoxia in a Warming Ocean: Ancient Lessons for the Future.”
- 2025 Earth, Atmospheric, and Planetary Sciences Department Lecture Series at MIT; “Extinctions from Hypoxia in a Warming Ocean: Ancient Lessons for the Future.”
- 2025 Seminar at the School of Biological Sciences at Hong Kong University; “Hypoxia drove depth selectivity of marine extinction during the Paleocene-Eocene Thermal Maximum (PETM).”
- 2024 Seminar in Earth and Planetary Sciences at Stanford University; “Hypoxia drove depth selectivity of marine extinction during the Paleocene-Eocene Thermal Maximum (PETM).”
- 2024 School of Earth Sciences and Engineering, Nanjing University, China. “Climate warming and ocean hypoxia as drivers of end-Permian marine mass extinction: Implications for the future of biodiversity.”
- 2024 Workshop on Earth’s Evolution and Global Carbon Cycle, School of Earth Sciences and Engineering, Nanjing University, China; “Climate warming and ocean hypoxia as drivers of end-Permian marine mass extinction: Implications for the future of biodiversity.”
- 2024 Bianchi Lab Group, Department of Oceanic and Atmospheric Science, University of California, Los Angeles, “Climate warming and ocean hypoxia as drivers of end-Permian marine mass extinction: Implications for the future of biodiversity.”
- 2019 Chemical Oceanography seminar: University of Washington, Seattle. “Temperature-dependent hypoxia explains end-Permian extinction in the oceans.”
- 2018 Paleobiology seminar: University of Washington, Seattle. “Temperature-dependent hypoxia explains end-Permian extinction in the oceans.”

## CONFERENCES

- 2024 Geological Society of America Connects, Anaheim, CA; “Climate, trait adaptation, and marine extinction patterns of the Paleocene-Eocene Thermal Maximum” (Talk).
- 2024 ESA Annual Meeting, Long Beach, CA; “Hypoxic storms promote species coexistence through competition on a tropical reef” (Talk).
- 2024 Ocean Sciences Meeting, New Orleans, LA; “Geographic and taxonomic patterns in aerobic traits of marine species” (Talk).
- 2022 Geological Society of America Connects, Denver, CO; “Avoiding ocean mass extinction from climate warming” (Invited).
- 2022 GENIE Symposium: Applications of the cGENIE (muffin) Earth System Model. University of California, Riverside (Attendee).

- 2020 Program on Climate Change Winter Symposium, University of Washington, Seattle. “Marine Extinction Risk from Climate Warming” (Talk).
- 2020 AAAS Annual Meeting, Seattle. “Marine Extinction Risk from Climate Warming” (Talk).
- 2019 Oceanography graduate and postdoc symposium: University of Washington, Seattle. “Temperature-dependent hypoxia explains end-Permian extinction in the oceans” (Poster).
- 2018 Gordon Research Conference: Global Change Biology, NH: “Temperature-dependent hypoxia explains end-Permian extinction in the oceans” (Poster).
- 2018 Gordon Research Seminar: Global Change Biology, NH: “Temperature-dependent hypoxia explains end-Permian extinction in the oceans” (Talk).
- 2017 Geological Society of America, Seattle, WA: “Temperature-dependent hypoxia explains end-Permian extinction in the oceans” (Talk).
- 2017 Ocean Science Meeting, Portland, OR: “Temperature-dependent hypoxia explains end-Permian extinction in the oceans” (Talk).
- 2016 American Geophysical Union Fall Meeting, San Francisco, CA: “Aerobic marine habitat loss during the Late Permian extinction” (Poster).
- 2016 Modeling a Living Planet: Princeton University, NJ: “Microbial ecosystem dynamics in marine O<sub>2</sub> minimum zones” (Poster).
- 2016 Program on Climate Change Summer Institute: The Climate of Antarctica and the Southern Ocean, Friday Harbor, WA. (Attendee).
- 2014 American Geophysical Union Fall Meeting, San Francisco, CA: “Microbial competition for N intermediates drives oscillating N loss from marine oxygen deficient zones” (Talk).
- 2014 Gordon Research Conference: Marine Microbes, Boston, MA: “Modeling microbial ecosystem dynamics in marine anoxic zones” (Poster).

## **MEDIA COVERAGE**

Communicating research findings to the public is a key part of increasing science accessibility and spreading awareness about climate change impacts. For my work on extinction, I’ve had the opportunity to convey my results to a broad audience by speaking with reporters, which led to coverage in >340 news outlets, including [\*National Geographic\*](#), [\*New York Times\* 1, 2](#), [\*The Atlantic\*](#), [\*The Guardian\* 1, 2](#), [\*Scientific American\*](#), [\*The Independent\*](#), [\*Business Insider\*](#), [\*Forbes\*](#), [\*Seattle Times\*](#), [\*Smithsonian\*](#), [\*Newsweek\*](#), [\*Washington Post\*](#), [\*GeekWire\*](#), [\*Science News\*](#), [\*The Scientist\*](#), [\*Grist\*](#), [\*Mother Jones\*](#), [\*The Stranger\*](#), [\*My Northwest\*](#), [\*Futurity\*](#), [\*Seattle Met\*](#), [\*Yahoo!\*](#), [\*MSN\*](#), [\*NBC\*](#), [\*Gizmodo\*](#), [\*Bloomberg\*](#), [\*Wired\*](#), [\*USA today\*](#).

2018, 2022 Radio Guest:

*CBS News Radio L.A.*

[Radio Ecoshock with Alex Smith](#) (106 stations)

[“The Record” with Bill Radke, KUOW \(NPR\), Seattle, WA](#)

[BBC Radio 5 Live “Up All Night”](#)

[The “Texas Standard”, KUT \(NPR\)](#)

[The Paper Boys Podcast, UW, Seattle](#)

2018 [Video Interview](#) with Andrew Buncombe for The Independent

## SERVICE ACTIVITIES

2024- PAGES PO<sub>2</sub> Early Career Network Representative

2024 *Session Moderator* for “Marine ecosystems across scales of space, time, and biology”, Ocean Science Meeting, New Orleans, LA

2024 *Guest lecturer*, School of Earth Sciences and Engineering, Nanjing University, China (Feifei Zhang)

2018 [Climate consultation](#) with Governor Jay Inslee, Washington State Capitol, WA

2017 *Guest Lecturer*, Seattle University, Seattle, WA, ATM S220: Mass Extinctions (Doug Faust)

2010-2012 Volunteer Docent, Project 23, La Brea Tar Pits Page Museum, Los Angeles, CA.

## TEACHING

2025 Princeton University, EEB 349: Semester in the Field Program, Tropical Biology in Panama: Tropical Marine Biodiversity in a Changing Ocean

2015, 2017 University of Washington, Ocean 215: Methods of Oceanographic Data Analysis in Python (Steve Riser)

## FIELDWORK

2025 Smithsonian Tropical Research Institute, Bocas Del Toro, Panama: Zooplankton biodiversity, bacteria and nutrient surveys, and respirometry experiments

12/2016–  
01/2017 R/V Sikuliaq, Eastern Tropical North Pacific: ARGO float deployment, zooplankton and nutrient sampling, algorithm development for CTD O<sub>2</sub> sensor

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|-----------|---|
| 2012      | R/V Yellowfin, San Pedro Ocean Time-series (SPOT): Phytoplankton and nutrient sampling                |
| 2012      | California Sea Grant Vessel, Santa Monica Bay Observatory (SMBO): Phytoplankton and nutrient sampling |
| 2011      | Monteverde Research Station, Costa Rica: Nutrient sampling of forest canopy throughflow               |
| 2010-2012 | Excavator, Project 23, La Brea Tar Pits Page Museum, Los Angeles, CA.                                 |

*Reviewer* of journal articles in: Nature Communications, Geophysical Research Letters, Marine Chemistry, Environmental Research Letters.