

Molly E. Grear

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Marine Sciences Laboratory
Pacific Northwest National Laboratory
www.mollygrear.com

Ocean engineer and marine biologist researching the environmental impacts of marine renewable energy devices, with expertise in marine mammals, fluid mechanics, numerical modeling, structural mechanics, and a dedication to science communication and outreach.

Education

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| 2018 | Ph.D. in Civil and Environmental Engineering
<i>University of Washington</i>
Dissertation: Characterization of Marine Mammal Soft Tissue Biomechanics to Evaluate Tidal Turbine Collision
Advisor: Dr. Michael Motley |
| 2016 | M.S. in Civil and Environmental Engineering
<i>University of Washington</i> |
| 2012 | B.E. in Engineering Sciences
<i>Thayer School of Engineering, Dartmouth College</i>
Capstone project: Optimization of a diffuser-augmented hydrokinetic turbine |
| 2011 | A.B. in Engineering Sciences
<i>Dartmouth College</i> |

Research and Work Positions

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| 2018 – present | <i>Postdoctoral Research Assistant</i> , Coastal Sciences
Pacific Northwest National Laboratory
Development of hydrodynamic models for offshore macroalgae cultivation, as well as better stakeholder communication and outreach around ocean energy projects. |
| 2014 – 2018 | <i>Graduate Research Assistant</i> , Department of Civil and Environmental Engineering
University of Washington
Laboratory material testing, data analysis, and numerical modeling to quantify the risk tidal turbines pose to marine mammals. |
| 2014 – 2018 | <i>PhD Intern</i>
Pacific Northwest National Laboratory
Modeling and data analysis around projects involving human impact on the marine environment. |
| Mar–Aug 2017 | <i>Marine Renewable Energy Outreach Coordinator</i>
Washington Sea Grant and Northwest National Marine Renewable Energy Center
Designed and organized a speaker series at three locations across the Puget Sound; created curriculum around marine energy for use in local schools. |
| 2012 – 2014 | <i>Post-Bachelor's Research Assistant</i>
Pacific Northwest National Laboratory
Investigated potential environmental impacts of installing various ocean energy devices through predictive modeling, marine mammal science, and collaboration with stakeholders, developers and governmental agencies. |
| May–Nov 2011 | <i>Environmental Engineer</i>
United State Forest Service
Monitored the remediation of the coastal Salt Chuck Mine site on Prince of Wales Island, Alaska. |

- Jan–March 2011 | *Research Assistant*
University of Arkansas Agricultural Engineering Lab
 Prepared and analyzed sweetgum samples for making cellulosic ethanol from Southern Arkansas undergrowth biomass.
- Jan–Mar 2010 | *Research in Marine Ecology*
Dartmouth College Study Abroad Program
 Independent research at various Costa Rican and Little Cayman research stations in ecology, marine biology, and environmental science.

Peer-Reviewed Papers

- 2017 paper | M. Grear, M. Motley, S. Crofts, A. Witt, A. Summers, and P. Ditsche. Mechanical properties of harbor seal skin and blubber - a test of anisotropy. *Zoology*, 126:137–144, 2018
- 2017 paper | A. Copping, M. Grear, R. Jepsen, C. Chartrand, and A. Gorton. Understanding the potential risk to marine mammals from collision with tidal turbines. *International Journal of Marine Energy*, 19:110 – 123, 2017
- 2016 paper | Z. Yang, S. Taraphdar, T. Wang, R. Leung, and M. Grear. Uncertainty and feasibility of dynamical downscaling for modeling tropical cyclones for storm surge simulation. *Natural Hazards*, 84(2):1161–1184, 2016
- 2016 paper | A. Copping, S. Breithaupt, J. Whiting, M. Grear, J. Tagestad, and G. Shelton. Likelihood of a marine vessel accident from wind energy development in the atlantic. *Wind Energy*, 19(9):1557–1566, 2016

Conference Papers

- 2017 paper & talk | M. Grear and M. Motley. Tidal turbine collision assessment using the bulk and shear modulus of marine mammals’ soft tissue. In *European Wave and Tidal Energy Conference*, Cork, Ireland, 2017
- 2017 paper | A. Copping and M. Grear. Applying a simple model for estimating likelihood of collision of marine mammals with tidal turbines. In *European Wave and Tidal Energy Conference*, Cork, Ireland, 2017
- 2015 paper & talk | M. Grear and M. Motley. Numerical Modeling of the Impact Response of Tidal Devices and Marine Mammals. In *European Wave and Tidal Energy Conference*, Nantes, France, 2015
- 2015 paper & talk | M. Grear, A Copping, R. Jepsen, A. Gorton, and C. Chartrand. Understanding the Risk to Marine Mammals from Collision with a Tidal Turbine. In *Marine Energy Technology Symposium*, Washington, DC, 2015

Technical Reports

- 2014 report | T. Carlson, M. Grear, A. Copping, M. Halvorsen, R. Jepsen, and K. Metzinger. Assessment of strike of adult killer whales by an OpenHydro tidal turbine blade. *Report by Pacific Northwest National Laboratory*, 2014
- 2013 report | T. Carlson, M. Grear, M. Halvorsen, and A. Copping. Monitoring and Mitigation Alternatives for Protection of North Atlantic Right Whales during Offshore Wind Farm Installation. *Report by Pacific Northwest National Laboratory*, 2013
- 2013 report | A. Copping, S. Breithaupt, J. Tagestad, J. Whiting, M. Grear, and G. Shelton. Risk Assessment for Marine Vessel Traffic and Wind Energy Development in the Atlantic. *Report by Pacific Northwest National Laboratory*, 2013
- 2013 report | A. Copping, L. Hanna, J. Whiting, S. Geerlofs, M. Grear, K. Blake, A. Coffey, M. Massaua, J. Brown-Saracino, and H. Battey. Environmental effects of marine energy development around the world for the OES Annex IV. *Pacific Northwest National Laboratory for the Ocean Energy Systems Initiative*, page pp 97, 2013

Work in Progress

M. Grear, M. Motley, P. Ditsche, and A. Summers. Comparative material properties of marine mammals skin and blubber. submitted

M. Grear and M. Motley. Development of a material constitutive model for toothed whales. in prep

Conference Presentations, Public Talks, and Workshops

- 2018 talk | **M. Grear**, A. Copping, and G. Shelton. Visual simulation of whales and offshore renewable energy mooring lines and electrical cables. In *Marine Energy Technology Symposium*, Washington, DC, 2018
- 2018 talk | M. Fore, R. McLachlan, E. Bonnin, A. Weber, and **M. Grear**. Graduate students closing the gap in science communication training. In *AAAS Annual Meeting*, Austin, TX, 2018
- 2018 talk | **M. Grear** and M. Motley. Testing marine mammal soft tissue to understand injury risk from tidal turbine collision. In *Ocean Sciences Meeting*, Portland, OR, 2018
- 2018 talk | **M. Grear**, M. Motley, and A. Summers. Nonlinear mechanics of marine mammal skin. In *Society for Integrative and Comparative Biology Annual Meeting*, San Francisco, CA, 2018
- 2017 public talk | **M. Grear**. Overview of environmental impacts of marine renewable energy. Northwest Maritime Center. Port Townsend, WA, 2017
- 2017 public talk | **M. Grear**. State of the science: Environmental impacts of marine renewable energy. Olympic Natural Resource Center. Forks, WA, 2017
- 2017 public talk | **M. Grear**. Understanding the impact of tidal turbines on marine mammals. Seattle Town Hall. Seattle, WA, 2017. Video available at <https://www.youtube.com/watch?v=uCVDhcyTAes>
- 2017 talk | **M. Grear**, M. Motley, and P. Ditsche. Development of a material constitutive model for killer whale and harbor porpoise. In *Society for Integrative and Comparative Biology Annual Meeting*, New Orleans, LA, 2017
- 2016 poster | **M. Grear** and M. Motley. Modeling marine mammal tissue to understand tidal turbine collision. In *Northwest National Marine Renewable Energy Center Annual Meeting*, Portland, OR, 2016
- 2016 talk | **M. Grear** and M. Motley. Experimental and numerical development of material constitutive properties for marine mammals. In *Engineering Mechanics Institute*, Nashville, TN, 2016
- 2016 talk | **M. Grear**, S. Crofts, A. Copping, M. Motley, A. Summers, and P. Ditsche. Finite element material model of harbor seals' (*Phoca vitulina*) skin and blubber. In *Society for Integrative and Comparative Biology Annual Meeting*, Portland, OR, 2016
- 2015 talk | Z. Yang, S. Taraphda, T. Wang, R. Leung, and **M. Grear**. Uncertainty and feasibility of a dynamical downscaling climate model for coastal storm surge modeling. In *Coastal and Estuarine Research Federation*, Portland, OR, 2015
- 2015 invited speaker | **M. Grear** and A. Copping. Workshop examining marine energy's impacts on marine mammals. In *International Network on Offshore Renewable Energy Symposium*, Friday Harbor, WA, 2015
- 2015 poster | **M. Grear** and M. Motley. Marine Mammal and Tidal Turbine Collision. In *International Network on Offshore Renewable Energy Symposium*, Friday Harbor, WA, 2015
- 2014 poster | A. Copping, **M. Grear**, and T. Carlson. Acoustic Impacts of Offshore Wind Development on North Atlantic Right Whales. In *American Wind Energy Association*, Atlantic City, NJ, 2014

Teaching and Mentoring Experience

- Summer 2018 | **Research Mentor** *Civil and Environmental Engineering, University of Washington*: Mentored undergraduate student in a project about structural analysis of sculpin preopercle bones.
- Spring 2017 | **Finite Element Methods in Structural Mechanics** *Civil and Environmental Engineering, University of Washington*: Teaching assistant for graduate level finite element analysis.

Fall 2016, Winter 2017	Introduction Fluid Mechanics <i>Civil and Environmental Engineering, University of Washington</i> : Taught workshops, classes, and labs for junior engineering students.
Fall 2015	Research Mentor <i>Friday Harbor Laboratories, University of Washington</i> : Mentored undergraduate biology students through designing projects about marine mammals' biomechanical tissue properties
Summer 2012	Tutor <i>Studypoint Tutoring</i> : Instructed high school seniors on SAT preparation, as well as science and math topics, primarily calculus.
2011 – 2012	Introduction to Scientific Computing <i>Thayer School of Engineering, Dartmouth College</i> : Instructed small group sessions, designed homework projects, ran office hours, graded assignments and exams for introductory programming class for all engineering majors.
Summer 2010	Science Educator <i>Montshire Museum of Science</i> : Designed and taught curriculum for science summer camps for 4th-8th graders, including 'Kinetic Art', 'Environmental Science', and 'Inventors Camp'.
Summer 2010	Introduction to Engineering <i>Thayer School of Engineering, Dartmouth College</i> : Instructed engineering students through a complete design project, from fabrication to economic feasibility.

Service

July 2017	Puget Sound Renewable Energy Leadership Institute <i>Bonneville Environmental Foundation</i> . Taught 11 K-12 teachers about marine energy, relating marine energy curriculum to the Next Generation Science Standards
April 2017 – present	Engage Board of Directors Engage is a science speaker series and seminar program promoting science communication. www.engage-science.com
March 2017 – present	San Juan Island Marine Mammal Stranding Network Volunteer <i>The Whale Museum</i> .
Sept 2016 – Sept 2017	Campus Sustainability Fund Committee Member <i>University of Washington</i> , member of the committee allocating \$400,000 per year to projects fostering sustainability on campus.
June 2016 – June 2018	Graduate and Professional Student Senate <i>University of Washington</i> , senator representing Civil and Environmental Engineering
2014 – 2018	Engineering Discovery Days <i>University of Washington</i> Engineering demonstrations to schools grades 4-12 for hands on learning about research and classes on campus

Fellowships and Awards

2018	Forbes 30 Under 30 in Energy
2017	Three Minute Thesis first place in the University of Washington's competition to describe research to a public audience in less than three minutes.
2017	Friday Harbor Laboratories Fellowship funding to conduct research at the University of Washington's marine laboratory at Friday Harbor.
2017	Civil and Environmental Engineering Film Festival award for the best cinematography in the 2017 short film festival. Video available at https://www.youtube.com/watch?v=ij_PyfWynkM
2017	Graduate & Professional Student Senate Travel Grant travel award from the University of Washington to attend the Society of Integrative and Comparative Biology conference
2016	Graduate School Fund for Excellence and Innovation Award , travel award from the University of Washington to attend Engineering Mechanics Institute conference
2016, 2017, 2018	Society of Integrative and Comparative Biology Student Support , provided by the Society of Integrative and Comparative biology to attend the 2016 and 2017 annual meeting.
2015	EWTEC Travel Stipend , provided by Ocean Energy System's Annex IV as one of the top papers in the environmental track at the European Wave and Tidal Energy Conference.
2014	National Science Foundation Graduate Research Fellowship

- 2012 | **The John C. Woodhouse Environmental Engineering Prize**, *Thayer School of Engineering at Dartmouth* Awarded annually to a student in recognition of outstanding work in the field of environmental study or research at Thayer School.
- 2012 | **Citation for Excellence in Teaching**, Thayer School of Engineering at Dartmouth. Received a citation for both Winter and Spring terms of teaching 'Introduction to Scientific Computing'.

Skills and Certifications

Certifications	AAUS Scientific Diver in Training, PADI SCUBA Open Water, Engineer-in-Training (EIT)
Computing	Python, Matlab, R, ABAQUS, SQL, C, C++, AutoCAD, Solidworks, Blender, Maya, ANSYS Fluent