Jessica C. Garwood

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Research Interests

My research interests focus on elucidating fundamental physical-biological interactions that govern larval and sediment transport in the coastal ocean. For my PhD research, I used theoretical and numerical models to better understand internal-wave-induced transport measured *in situ* by a swarm of small, subsurface robots. My current postdoctoral work investigates the effects of vertical swimming on larval transport and retention in the Delaware Bay and the Mid-Atlantic Bight, using a regional model.

Education

2019 PhD Oceanography - Scripps Institution of Oceanography, UCSD
Transport in internal waves with a background flow: Lessons learned from robotic larval mimics
Advisors: Peter J. S. Franks & Andrew J. Lucas

2013 MSc Oceanography - Dalhousie University
Seasonal variation and biological effects on mudflat erodibility in the Minas Basin, Bay of Fundy.
Advisor: Paul S. Hill

2011 BSc Marine Biology & Oceanography - Dalhousie University
First Class Honours

Appointments

2020 - present Postdoctoral Associate - Rutgers University

Publications

Garwood, J.C., R.C. Musgrave, and A.J. Lucas. Life in Internal Waves. *Under review.*

Garwood, J.C., A.J. Lucas, P. Naughton, P.L.D. Roberts, J.S. Jaffe, L. deGelleke, and P.J.S. Franks. 2020. Larval cross-shore transport estimated from internal waves with a background flow: The effects of larval vertical position and depth regulation. Limnol. Oceanogr. *Published online.*

Garwood, J.C., A.J. Lucas, P. Naughton, M.H. Alford, P.L.D. Roberts, J.S. Jaffe, L. deGelleke, and P.J.S. Franks. 2020. A novel cross-shore transport mechanism revealed by subsurface, robotic larval mimics:

Internal wave deformation of the background velocity field. Limnol. Oceanogr. 65(7):1456-1470.

Franks, P.J.S., **J.C. Garwood**, M. Ouimet, J. Cortes, R. Musgrave, and A.J. Lucas. 2020. Stokes drift of plankton in linear internal waves: Cross-shore transport of neutrally buoyant and depth-keeping organisms. Limnol. Oceanogr. 65(6):1286-1296.

Garwood, J.C., P.S. Hill, H.L. MacIntyre, and B.A. Law. 2015. Grain sizes retained by diatom biofilms during erosion on tidal flats linked to bed sediment texture. Cont. Shelf Res. 104:37-44.

Garwood, J.C., P.S. Hill, and B.A. Law. 2013. Biofilms and size sorting of fine sediment during erosion in intertidal sands. Estuar. Coasts. 36:1024-1036.

Awards

Scripps Institution of Oceanography

Alexander Graham Bell Canada Graduate Scholarship (3 years)
Fager Award (recognizes excellence in quantitative training of peers)
Regents Fellowship

Dalhousie University

Canada Governor General's Academic Medal - Gold
Alexander Graham Bell Canada Graduate Scholarship (1 year)
NSERC Undergraduate Summer Research Grant (3 summers)
Chancellor's Scholarship (4 years)
Provincial Millennium Excellence Award (4 years)
Dean's list (4 years)
Hugh P. Bell Scholarship
Vemco Scholarship
David Durward Memorial Prize
Shao Hua and Wen Hsiang Yoh Prize in Biology

Other

United World College of the Adriatic (full scholarship, 2 years)
Canada Governor General's Academic Medal - Bronze

Presentations

Seminars

2020 Cross-shore transport in internal waves: Lessons learned from robotic larval mimics. *Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution.*

2020 Transport in coastal internal waves: Lessons learned from robotic larval mimics. *Department of Marine and Coastal Sciences, Rutgers University.*

Oral presentations

2020 **Garwood, J.C.**, A.J. Lucas, P. Naughton, M.H. Alford, P.L.D. Roberts, J.S. Jaffe, L. deGelleke, and P.J.S. Franks. Three-way interaction between larval swimming behavior, internal waves, and the mean flow enhances cross-shore transport. *Ocean Sciences Meeting*.

2018 **Garwood, J.C.**, P.J.S. Franks, P. Naughton, P.L.D. Roberts, A.J. Lucas, J.S. Jaffe. A ratchet to shore: How background flow and nonlinear internal waves can interact to enhance transport of quasi-Lagrangian plankton mimics. *Eastern Pacific Ocean Conference*.

2018 **Garwood, J.C.**, P.J.S. Franks, P. Naughton, P.L.D. Roberts, A.J. Lucas, J.S. Jaffe. A ratchet to shore: transport of quasi-Lagrangian plankton mimics by nonlinear internal waves. *Ocean Sciences Meeting*.

2017 **Garwood, J.C.**, P.J.S. Franks, P. Naughton, P.L.D. Roberts, A.J. Lucas, J.S. Jaffe. A ratchet to shore: transport of quasi-Lagrangian plankton mimics by nonlinear internal waves. *Scripps Student Symposium*.

2012 **Garwood, J.C.**, S.S. Kienast, and P.S. Hill. Evidence of dust deposition in a core from the Eastern Equatorial Pacific on glacial-interglacial timescales. *AGU Fall Meeting*.

2012 **Garwood, J.C.**, S.S. Kienast, and P.S. Hill. Evidence of dust deposition in a core from the Eastern Equatorial Pacific on glacial-interglacial timescales. *Conference of Dalhousie Oceanography Graduate Students*.

2012 **Garwood, J.C.**, and P.S. Hill. Biofilms and size sorting of intertidal sediment during erosion. *Ocean Sciences Meeting*.

2011 **Garwood, J.C.**, and P.S. Hill. Effects of biofilms on sediment sortability. *Conference of Dalhousie Oceanography Graduate Students*.

Poster presentations

2016 **Garwood, J.C.**, R.C. Musgrave, R.C., P.J.S. Franks. Modeling plankton aggregation and transport by nonlinear internal waves propagating onshore. *Ocean Sciences Meeting*.

2014 **Garwood, J.C.**, K. Devitt, R. Cox, and P.S. Hill. Comparison of biofilm effects on sediment erosion at two intertidal sites with distinct surface sediment grain size. *Ocean Sciences Meeting*.

2013 **Garwood, J.C.**, and P.S. Hill. Seasonal and biofilm effects on sediment erosion and sorting in an intertidal mudflat in the Bay of Fundy, Canada. *Conference of the Coastal & Estuarine Research Federation*.

2011 **Garwood, J.C.**, and P.S. Hill. Effects of biofilms on sediment sortability. *Cameron Conference, Dalhousie University*.

Student mentorship

2020 **Samikshya Poudel**
RIOS undergraduate summer intern - Rutgers

Samikshya investigated the likelihood of larvae spawned near Cape Hatteras to be transported North and back to the shelfbreak via the Gulf Stream. Analyses were conducted using virtual larval tracks generated with ROMSPath and ROMS output. My role was to supervise the project.

2018 **Shailja Gangrade**
Scripps Undergraduate Research Fellow

Shailja compiled CTD data to map ocean depths with optimal light and oxygen levels based on larval visual system requirements. My role was to provide programming mentorship, and co-advise with Lillian McCormick, under the supervision of Lisa Levin and Peter Franks.

2012 - 2013 **Rachel Cox**
Dalhousie Undergraduate Honours Research Project

Rachel investigated the effects of benthic fauna on sediment resuspension on an intertidal flat in the Bay of Fundy. I helped frame her research project, and provided input on the experimental design and data interpretation. Advisor: Paul S. Hill.

2011 - 2012 **Karen Devitt**
Dalhousie Undergraduate Honours Research Project

Karen investigated sediment retention by benthic biofilms grown in the lab. I helped frame her research project, and provided input on the experimental design. Advisor: Paul S. Hill.

Teaching

Co-instructor

2015 SIO 278: Introduction to R for Oceanographers - SIO

Guest lecturer

2020 11:628:410: Biophysical interactions: from barnacles to jellyfish - Rutgers University

2018 SIO 90: Perspectives on Ocean Sciences - SIO

2017 SIO 285: Physical-Biological Interactions - SIO

Teaching assistant

2017 SIO 134: Introduction to Biological Oceanography - SIO
Instructor: Mike Landry

2012 OCEA 3004: The Last Billion Years - Dalhousie University
Instructor: Paul S. Hill

2011 OCEA 2002: The Blue Planet - Dalhousie University
Instructor: Paul S. Hill

Field work

Deployment of robotic swarm & moorings, small boat operations

2016 Principal investigator, PhD research - 2 weeks, Mission Beach, CA, USA

Research cruises

2018 Introduction to at-sea sampling for summer interns, R/V Robert Gordon Sproul - 1 day, San Diego, CA, USA

2017 Night shift leader, SCoNE student cruise, R/V Robert Gordon Sproul - 10 days, Point Sal, CA, USA

2016 Chief scientist, class project, R/V Robert Gordon Sproul - 3 cruises totaling 5 days, San Diego, CA, USA

2013 Class cruises, R/V Robert Gordon Sproul - 2 cruises totaling 2 days, San Diego, CA, USA

2013 Research assistant, S0-228, R/V Sonne - 25 days, Jayapura, Indonesia to Townsville, Australia

Sediment collection on intertidal flats

2011-2012 Principal investigator, MSc research - twice monthly for 8 months, Bay of Fundy, NS, Canada

2010 Principal investigator, BSc research - twice monthly in summer, Cole Harbour, NS, Canada

2010 Research assistant - 3 weeks, Willapa Bay, WA, USA

Service & Outreach

Rutgers University

2020 Moderator and organizer, Panel on Diversity in STEM and screening of *Picture a Scientist*

Scripps Institution of Oceanography

2017 - 2019 Diversity Advisory Committee

2017 Organizer, Scripps Student Symposium

2014 - 2015 Organizer, Ecology Seminars

Dalhousie University

2011 - 2012 Organizer, Oceanography Seminars

2011 - 2012 Student recruitment volunteer, Oceanography

2011 - 2012 Treasurer, Dalhousie Oceanography Student Association

2012 Organizer, Conference of Dalhousie Oceanography Graduate Students

Other

2020 Scientific adviser, United World Challenge
Designed coding activities introducing ocean concepts, and participated in a podcast (Episode 9) available on Spotify, Apple Podcasts, and others.

2018 Session co-chair, Eastern Pacific Ocean Conference
Session: Interdisciplinary studies examining transport and mixing from the shelf to the shoreline.

2016 - 2018 Outreach, Ocean Discovery Institute
Developed two year-long research projects for low income, middle school students

Manuscript reviews

Coral Reefs
Estuarine, Coastal and Shelf Science
Frontiers in Marine Science
Journal of Marine Research
Marine Ecology Progress Series

Additional skills

Programming languages

Matlab, R, TEX - *proficient*
Python, Fortran - *familiar*

Modeling

MITgcm, ROMS, ROMSPath

Language

French, English - *fluent*
Italian - *conversational*