Jessica C. Garwood

Dept. of Marine and Coastal Sciences,
Rutgers, The State University of New Jersey
71 Dudley Road
New Brunswick, NJ 08901

Website JessCG.github.io
Email jgarwood@marine.rutgers.edu
Languages English, French (fluent)
Italian (conversational)

Research Interests

My research interests focus on elucidating the fundamental dynamics that govern small-scale physical-biological interactions in the coastal ocean. By combining *in situ* measurements with numerical models and theory, I seek to interpret the ocean as it relates to plankton. At the core of my research is a desire to develop and employ underwater robotic plankton swarms to capture these dynamics.

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

2014 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, First Class Honours - Dalhousie University

Appointments

2020 - Postdoctoral Associate, Dept. of Marine and Coastal Sciences, Rutgers University
Linking behavior and transport of larvae using waves and turbulence as cues
Principal investigators: Heidi Fuchs, Greg Gerbi, Bob Chant

2013-2019 Graduate Student Researcher, Scripps Institution of Oceanography, UCSD
2017 Teaching Assistant, Scripps Institution of Oceanography, UCSD
2011-2013 Graduate Student Researcher, Dept. of Oceanography, Dalhousie University
2011-2012 Teaching Assistant, Dept. of Oceanography, Dalhousie University
2009-2011 Undergraduate Student Researcher, Dept. of Oceanography, Dalhousie University

Peer-Reviewed Publications

McCormick, L.R., S. Gangrade, **J.C. Garwood**, N.W. Oesch, and L.A. Levin. Defining a visual luminoxyscape to describe oxygen and irradiance constraints on larval habitat in a changing ocean. *Submitted to Limnol. Oceanogr. Lett.*

Garwood, J.C., A.J. Lucas, P. Naughton, P.L.D. Roberts, J.S. Jaffe, L. deGelleke, and P.J.S. Franks. 2021. Larval cross-shore transport estimated from internal waves with a background flow: The effects of larval vertical position and depth regulation. Limnol. Oceanogr. 66(3):678-693. doi:10.1002/lno.11632

Garwood, J.C., R.C. Musgrave, and A.J. Lucas. 2020. Life in Internal Waves. Oceanography. 33(3): 38-49. doi:10.5670/oceanog.2020.313

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. doi:10.1002/lno.11400

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. doi:10.1002/lno.11389

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. doi:10.1016/j.csr.2015.05.004

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. doi:10.1007/s12237-013-9618-z

In-Preparation Publications

Garwood, J.C., H.L. Fuchs, G.P. Gerbi, E.J. Hunter, and R.J. Chant. Estuarine larval retention enhanced by tuning into turbulence and tuning out waves. *In preparation.*

Moulton, M., S.H. Suanda, **J.C. Garwood**, N. Kumar, M.R. Fewings, J.M. Pringle. 2023. Mechanisms for the transport of nutrients, plankton, and pollutants across the nearshore region. Ann. Rev. Mar. Sci. *In preparation.*

Grants & Fellowships

2014-2016	Alexander Graham Bell Canada Graduate Scholarship - PhD
2013-2014	Regents Fellowship
2011-2012	Alexander Graham Bell Canada Graduate Scholarship - MSc
2007-2011	Chancellor's Scholarship
2007-2011	Provincial Millennium Excellence Award
2011	NSERC Undergraduate Student Research Award
2010	NSERC Undergraduate Student Research Award
2009	NSERC Undergraduate Student Research Award
2007-2008	Residence Scholarship
2004-2006	Full scholarship - United World College of the Adriatic

Honors

2015 Fager Award - *recognizes excellence in quantitative training of peers*
2014 Canada Governor General's Academic Medal - Gold
2007-2011 Dean's list
2011 Hugh P. Bell Scholarship
2011 J. G. Ogden Memorial Prize
2011 Vemco Scholarship
2010 David Durward Memorial Prize
2009 Shao Hua and Wen Hsiang Yoh Prize in Biology
2004 Canada Governor General's Academic Medal - Bronze

Presentations

Invited

2021 Gordon Research Conference speaker invitation. Session: Novel approaches to observing in coastal systems. Postponed to 2023. *Coastal Ocean Dynamics Gordon Research Conference.*

2021 Estuarine and nearshore larval retention enhanced by sinking in turbulence and depth-keeping in internal waves. March 2021. *Department of Marine Sciences, University of Connecticut.*

2020 Cross-shore transport in internal waves: Lessons learned from robotic larval mimics. Nov. 2020. *Department of Oceanography, Dalhousie University.*

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

2020 Transport in coastal internal waves: Lessons learned from robotic larval mimics. Jan. 2020. *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. Feb. 2020. *Ocean Sciences Meeting, San Diego, CA, USA.*

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. Sept. 2018. *Eastern Pacific Ocean Conference, Mount Hood, OR, USA.*

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. Feb. 2018. *Ocean Sciences Meeting, Portland, OR, USA.*

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. Sept. 2017. *Scripps Student Symposium, San Diego, CA, USA.*

2016 Law, B.A., T.G. Milligan, P.S. Hill, **J.C. Garwood**, V. Zions. Temporal and spatial changes in grain size on a macro-tidal channel-flat complex: Results from Kingsport, Nova Scotia, Bay of Fundy. Feb. 2016. *Ocean Sciences Meeting, New Orleans, LA, USA.*

2013 Law, B.A., P.S. Hill, T.G. Milligan, P.L. Wiberg, **J.C. Garwood**, V. Zions. Temporal and spatial change in grain size and erodibility on a macro-tidal channel-flat complex in Kingsport, N.S., Canada, versus a mesa-tidal channel-flat complex in Willapa Bay, Washington, USA. Nov. 2013. *Conference of the Coastal & Estuarine Research Federation, San Diego, CA, USA.*

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. Dec. 2012. *AGU Fall Meeting, San Francisco, CA, USA.*

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. March 2012. *Conference of Dalhousie Oceanography Graduate Students, Halifax, NS, Canada.*

2012 **Garwood, J.C.**, P.S. Hill, and B.A. Law. Biofilms and size sorting of intertidal sediment during erosion. Feb. 2012. *Ocean Sciences Meeting, Salt Lake City, UT, USA.*

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

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. Feb. 2016. *Ocean Sciences Meeting, New Orleans, LA, USA.*

2016 Jaffe, J.S., B. Laxton, **J.C. Garwood**, P.J.S. Franks, P.L. Roberts. A micro-fluidic treadmill for observing suspended plankton in the lab. Feb. 2016. *Ocean Sciences Meeting, New Orleans, LA, USA.*

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. Feb. 2014. *Ocean Sciences Meeting, Honolulu, HI, USA.*

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. Nov. 2013. *Conference of the Coastal & Estuarine Research Federation, San Diego, CA, USA.*

2013 **Garwood, J.C.**, P.S. Hill, and B.A. Law. Mudflat biofilms coarsen suspended sediment in the Minas Basin. May 2013. *Nova Scotia Tidal Energy Research Symposium and Forum, Acadia University, Wolfville, NS, Canada.*

2011 **Garwood, J.C.**, and P.S. Hill. Effects of biofilms on sediment sortability. Feb. 2011. *Cameron Conference, Halifax, NS, Canada.*

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

2021 11:628:410: Biophysical interactions: from barnacles to jellyfish - Rutgers University
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, Inner-Shelf Dynamics Experiment, 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

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

2017-2019 Diversity Advisory Committee - SIO

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

2017 Discussion leader, Munk Centennial Symposium on Internal waves, turbulence, and the overturning circulation of the ocean, May 2017, San Diego, CA, USA

2017 Organizer, Scripps Student Symposium - SIO

2014-2015 Organizer, Ecology Seminars - SIO

2011-2012 Organizer, Oceanography Seminars - Dalhousie University

2011-2012 Student recruitment volunteer, Oceanography - Dalhousie University

2011-2012 Treasurer, Dalhousie Oceanography Student Association

2012 Organizer, Conference of Dalhousie Oceanography Graduate Students

Outreach

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.

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

Manuscript reviews

2020 *Coral Reefs* (1)
2020 *Frontiers in Marine Science* (1)
2020 *Journal of Marine Research* (1)
2020 *Marine Ecology Progress Series* (1)
2019-2020 *Estuarine, Coastal and Shelf Science* (2)

Broader community experience

2014-2019 Climbing gym instructor, Outback Climbing Center, UCSD
2016-2018 Volunteer shift leader, Banff Centre Mountain Film and Book Festival, Banff, Canada
2014-2015 Volunteer, Banff Centre Mountain Film and Book Festival, Banff, Canada
2006-2007 Volunteer recreation program coordinator, Fort Good Hope, Northwest Territories, Canada