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EDUCATION

Ph.D. Oceanography, University of Maine, ME, 2012; Advisor: Andrew J. Pershing
M.Sc. Physical Oceanography, Memorial University, NL, 2005; Advisor: Brad de Young
M.A. Mathematics, University of Rochester, NY, 2002
B.A. Mathematics, University of Rochester, NY 2001

APPOINTMENTS & PROFESSIONAL EXPERIENCE

2013-present Senior Research Scientist, Bigelow Laboratory for Ocean Sciences, East Boothbay ME, USA
2020 Otto Mønsted Fonden Visiting Professor, Denmark Technical University, Denmark
2013-present Research Scientist, Colby College, Waterville ME, USA
2010-2015 Board of Directors, Officer of Outreach and External Affairs, Gulf of Maine Marine Education Association, Portland ME, USA
2012-2013 Visiting Assistant Professor, Department of Earth and Oceanographic Science, Bowdoin College, Brunswick ME, USA
2006-2012 Research Associate, School of Marine Sciences, University of Maine, Orono, ME / Gulf of Maine Research Institute, Portland ME, USA
2006 Instructor, Adjunct Faculty, Mathematics Department, Southern Maine Community College, South Portland ME, USA
2005-2006 Physical Oceanography Research Technician, Bermuda Atlantic Time-Series Study, Bermuda Biological Station for Research, St. George's, Bermuda
2002-2003 Volunteer Instructor, Linda Learning Center and public schools, Phetchaburi, Thailand

PEER-REVIEWED PUBLICATIONS

* indicates undergraduate contributor, † indicates equal authorship

McClenachan L, Waller J, **Record NR** (2022) How do human actions affect fisheries? Differences in perceptions between fishers and scientists in the Maine lobster fishery. *FACETS*. 7: 174-193. <https://doi.org/10.1139/facets-2021-0030>

Record NR, Pershing AJ (2021) Facing the forecaster's dilemma: reflexivity in ocean ecosystem forecasting. *Oceans*. 2(4), 738-751.

Record NR (2021) The intertwined futures of whales and humans. *Oceanography*. 34 (3), 16-18.

Record NR, Vera LA (2021) Uncovering big data bias in sustainability science. *Spire: The Maine Journal of Conservation and Sustainability*. DOI:10.13140/RG.2.2.28533.65761

Pershing AJ, Alexander M, Brady D, Brickman D, Curchitser E, Diamond T, McClenachan L, Mills K, Nichols O, Pendleton DE, **Record NR**, Scott J, Staudinger M, Wang Y (2021) Climate impacts on the Gulf of Maine ecosystem: A review of observed and expected changes in 2050 from rising temperatures.

- Elementa Science of the Anthropocene*, 9(1): 00076.
- Stepanauskas R, Brown JM, Mai U, Bezuidt O, Pachiadaki M, Brown J, Biller SJ, Berube PM, **Record NR**, Mirarab S (2021) Gene exchange networks in marine planktonic bacteria.
- Ross* CH, Pendleton DE, Tupper B, Brickman D, Zani MA, Mayo CA, **Record NR**, (2021) Projecting regions of North Atlantic right whale, *Eubalaena glacialis*, habitat suitability in the Gulf of Maine for the year 2050. *Elementa Science of the Anthropocene*. 9 (1): 00058.
- Record NR**, Countway PD, Kanwit K, Fernández-Robledo JA (2021) Rise of the rare biosphere: Thinking beyond climate envelopes for forecasting harmful algal blooms. *Elementa*. 9 (1): 00056.
- McGinty N, Barton AD, **Record NR**, Finkel ZV, Johns DJ, Stock CA, Irwin AJ (2020) Anthropogenic climate change impacts on copepod trait biogeography. *Global Change Biology*.
<https://doi.org/10.1111/gcb.15499>
- Beam JP, George S, Countway PD, **Record NR**, Johnston DT, Girguis PR, Emerson D (2020) Mud, microbes, and macrofauna: seasonal dynamics of the iron biogeochemical cycle in an intertidal mudflat. *Frontiers*. 7:921.
- Brown JM, Brown J, Labonté J, **Record NR**, Poulton NJ, Sieracki ME, Logares R, Stepanauskas R (2020) Single Cell Genomics Reveals Viruses Consumed by Marine Protists. *Frontiers in Microbiology*. 11: 2317.
<https://doi.org/10.3389/fmicb.2020.524828>
- Grasso I*, Russell D, Matthews A, Matthews J, **Record NR** (2020) Applying Algorithmic Accountability Frameworks with Domain-specific Codes of Ethics: A Case Study in Ecosystem Forecasting for Shellfish Toxicity in the Gulf of Maine. In *Proceedings of the 2020 ACM-IMS on Foundations of Data Science Conference* (pp. 83-91). <https://doi.org/10.1145/>
- Record NR**, Pershing AJ (2020) A note on the effects of epidemic forecasts on epidemic dynamics. *PeerJ*. 8:e9649. <https://doi.org/10.7717/peerj.9649>
- Marquis ND, Bishop TJ, Countway PD, **Record NR**, Fernández-Robledo JA (2020) A qPCR-Based Survey of *Haplosporidium nelsoni* and *Perkinsus spp.* in the Eastern Oyster, *Crassostrea virginica* in Maine, USA. *Pathogens* 9(4):256.
- Grasso I*[†], Archer SD[†], Burnell C, Tupper B, Rauschenberg C, Kanwit K, **Record NR**[†] (2019) The hunt for red tides: Deep learning algorithm forecasts fine scale shellfish toxicity in coastal Maine. *Ecosphere*. 10(12): e02960.
- Maps F, **Record NR** (2019) Marine ecosystem models should be rooted in past experiences, not anchored in past habits. *ICES Journal of Marine Science*. 77.1: 46-57. doi:10.1093/icesjms/fsz218
- Marquis ND, **Record NR**, Countway PD, Bishop TJ, Fernández Robledo JA (2019) Molecular epizootiology of *Toxoplasma gondii* and *Cryptosporidium parvum* in the eastern oyster (*Crassostrea virginica*) from Maine (NE USA). *Pathogens*. 8: 125. doi:10.3390/pathogens8030125
- Pershing AJ, **Record NR**, Alexander MA, Franklin BS, Kennedy BT, McClenachan L, Mills KE, Thomas AC, Scott JD, Wolff NH (2019) Challenges to natural and human communities from surprising ocean temperatures. *Proceedings of the National Academy of Sciences*. doi: 10.1073/pnas.1901084116.
- McClenachan L, Marra M*, **Record NR**, Grabowski J, Neal B, Scyphers S (2019) Shifting perceptions of rapid temperature changes' effects on marine fisheries, 1945-2017. *Fish and fisheries*. In press.

- Record NR**, Runge JA, Pendleton DE, Balch WM, Davies KTA, Pershing AJ, Johnson CL, Stamieszkin K, Ji R, Feng Z, Kraus SD, Kenney RD, Hudak C, Mayo CA, Chen C, Salisbury J, Thompson CRS (2019) Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. *Oceanography*. 32(2).
- Record NR**, Balch WM, Stamieszkin K (2019) Century-scale changes in phytoplankton phenology in the Gulf of Maine. *PeerJ*. 7:e6735.
- Staudinger MD, Mills KE, Stamieszkin K, **Record NR**, Hudak CA, Allyn A, Diamond A, Friedland K, Golet W, Henderson ME, Hernandez CM, Huntington TG, Ji R, Johnson CL, Johnson DS, Jordan A, Kocik J, Li Y, Liebman M, Nichols OC, Pendleton DE, Richards RA, Robben T, Thomas AC, Walsh HJ, Yakola K (2019) It's about time: A synthesis of changing phenology in the Gulf of Maine ecosystem. *Fisheries Oceanography*. DOI: 10.1111/fog.12429
- Record NR**, Ji R, Maps F, Varpe Ø, Runge JA, Petrik CM, Johns DA (2018) Copepod diapause and the biogeography of the marine lipidscape. *Journal of Biogeography* 45(10):2238-2251.
- McGinty N, Barton AD, **Record NR**, Finkel Z, Irwin A (2018) Traits structure copepod niches in the North Atlantic and Southern Ocean. *Marine Ecology Progress Series*. 610:109-126.
- Record NR**, Tupper B, Pershing AJ (2018) The jelly report: Forecasting jellyfish using email and social media. *Anthropocene Coasts*. 1: 34-43.
- Fernández-Robledo JA, Marquis ND, Countway PD, **Record NR**, Irish EL*, Schuldt MM, Kingston SE, Bishop TJ, Messerman NA, Bowden TJ (2018) Pathogens of marine bivalves in Maine (USA): a historical perspective. *Aquaculture*. 493: 9-17.
- Wang L, Kerr LA, Bridger E, **Record NR**, Tupper B (2018) Modeling marine pelagic fish species spatiotemporal distributions utilizing a maximum entropy approach. *Fisheries Oceanography*. 27(6):571-586.
- Krumhansl KA, Head E, Pepin P, Plourde S, **Record NR**, Runge JA, Johnson C (2018) Environmental drivers of vertical distribution in diapausing *Calanus* copepods in the northwest Atlantic. *Progress in Oceanography*. 162:202-222.
- Pachiadaki MG, Sintés E, Bergauer K, Brown J, **Record NR**, Swan B, Mathyer ME, Hallam S, Lopez-Garcia P, Takaki Y, Nunoura T, Woyke T, Herndl G, Stepanauskas R (2017) Major role of nitrite-oxidizing bacteria in dark ocean carbon fixation. *Science*. 358(6366): 1046-1051.
- Thomas AC, Pershing AJ, Friedland KD, Nye JA, Mills K, Alexander MA, Weatherbee R, Henderson ME, **Record NR** (2017) Seasonal trends and phenology shifts in sea surface temperature on the North American northeast shelf. *Elementa: Science of the Anthropocene*. 5: 48.
- Record NR** (2017) A people's science. *Limnology & Oceanography Bulletin*. 26(2), 36-37.
- Ji R, Feng Z, Jones BT, Thompson C, Chen C, **Record NR**, Runge JA (2017) Coastal Amplification of Supply and Transport (CAST): A new hypothesis about the persistence of *Calanus finmarchicus* in the Gulf of Maine. *ICES Journal of Marine Science*. 74(7):1865-1874.
- Record NR**, O'Brien JD, Stamieszkin K, Runge JA (2017) Omic-style statistical clustering reveals old and new patterns in the Gulf of Maine ecosystem. *Canadian Journal of Fisheries and Aquatic Sciences*. 74(7):973-979.

- Record NR**[†], Talmy D[†], Våge S[†] (2016) Quantifying tradeoffs for marine viruses. *Frontiers Marine Science*. 3: 251.
- Middleton J*[†], Martínez Martínez J, Wilson WH, **Record NR**[†] (2016) The functional dynamics of *Emiliania huxleyi* virus-host interactions across multiple scales. *Limnology & Oceanography*. 62(3):922-933.
- Friedland KD, **Record NR**, Asch RG, Kristiansen T, Saba VS, Drinkwater K, Henson S, Leaf RT, Morse RE, Johns D, Large SI, Hjøllø SS, Nye JA, Alexander MA (2016) Seasonal plankton blooms in the North Atlantic linked to the distribution of diapausing zooplankton. *Elementa: Science of the Anthropocene*. 4:000099.
- Pershing AJ, Hernandez CM, Kerr LA, LeBris A, Mills KE, Nye JA, **Record NR**, Scannell HA, Sherwood GD, Thomas AC (2016) Response to Comment on "Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery." *Science*. 352 (6284): 423.
- O'Brien JD, **Record NR**, Countway PD (2016) The power and pitfalls of Dirichlet-multinomial mixture models for ecological count data. *BioRxiv*. 045468.
- Pershing AJ, Hernandez CM, Kerr LA, LeBris A, Mills KE, Nye JA, **Record NR**, Scannell HA, Sherwood GD, Thomas AC (2015) Slow adaptation in the face of rapid warming leads to the collapse of an iconic fishery. *Science*. 350 (6262): 809-812.
- Stamieszkin K, Pershing AJ, **Record NR**, Pilskalns CH, Dam HG, Feinberg LR (2015) Size as the master trait in modeled copepod fecal pellet carbon flux. *Limnology & Oceanography*. 60(6):2090-2107.
- Golet WJ[†], **Record NR**[†], Lehuta S, Lutcavage M, Galuardi B, Cooper AB, Pershing AJ[†] (2015) The paradox of the pelagics: Why bluefin tuna can go hungry in a sea of plenty. *Marine Ecology Progress Series*. 527: 181-192.
- Marquis N*, **Record NR**, Fernández-Robledo JA (2015) Survey for protozoan parasites in eastern oysters (*Crassostrea virginica*) from the Gulf of Maine using PCR-based assays. *Parasitology International*. 64(5): 299-302.
- Pershing AJ, Mills KE, **Record NR**, Stamieszkin K, Wurtzell KV, Byron CJ, Fitzpatrick D, Golet WJ, Koob E (2015) Evaluating trophic cascades as drivers of regime shifts in different ocean ecosystems. *Philosophical Transactions of the Royal Society B*. 370: 20130265.
- Runge JA, Ji R, Thompson C, **Record NR**, Maps F, Chen C, Salisbury J, Vandemark D (2014) Persistence of *Calanus finmarchicus* in the western Gulf of Maine during recent extreme warming. *Journal of Plankton Research*. 37(1):221-232.
- Fernández-Robledo JA, Vasta GR, **Record NR** (2014) Protozoan parasites of bivalve molluscs: literature follows culture. *PLoS ONE*. 9(6): e100872.
- Record NR**, Pershing AJ, Maps F (2014) Plankton post-paradox. *ICES Journal of Marine Science*. 71(2): 296-298.
- Maps F, **Record NR**, Pershing AJ (2014) A metabolic approach to dormancy in pelagic copepods helps explaining inter- and intra-specific variability in life-history strategies. *Journal of Plankton Research*. 36 (1), 18-30.
- Record NR**, Pershing AJ, Maps F (2013) Emergent copepod communities in an adaptive trait-structured model. *Ecological Modelling*. 260: 11-24.
- Record NR**, Pershing AJ, Maps F (2013) The paradox of "the paradox of the plankton". *ICES Journal of*

- Marine Sciences*. 71(2):236-240.
- Lehuta S, Petitgas P, Mahévas S, Huret M, Vermard Y, Uriarte A, **Record NR** (2013) Selection and validation of a complex fishery model using an uncertainty hierarchy. *Fisheries Research*. 143: 57-66.
- Barton AD, Pershing AJ, Litchman E, **Record NR**, Edwards KF, Finkel ZV, Kiørboe T, Ward BA. (2013) The biogeography of marine plankton traits. *Ecology Letters*. 16: 522–534.
- Record NR**, Pershing AJ, Maps F (2012) First principles of copepod development help explain global marine diversity patterns. *Oecologia*. 170(2): 289-295.
- Pendleton DE, Sullivan PJ, Brown MW, Cole TVN, Good CP, Mayo CA, Monger BC, Phillips S, **Record NR**, Pershing AJ (2012) Weekly predictions of North Atlantic right whale *Eubalaena glacialis* habitat reveal influence of prey abundance and seasonality of habitat preferences. *Endangered Species Research*. 18: 147-161.
- Maps F, Pershing AJ, **Record NR** (2012) A generalized approach for simulating growth and development in diverse marine copepod species. *ICES Journal of Marine Science*. 69(3): 370-379.
- Maps F, Runge JA, Leising A, Pershing AJ, **Record NR**, Plourde S, Pierson JJ (2012) Modeling the timing and duration of dormancy in populations of *Calanus finmarchicus* from the northwest Atlantic shelf. *Journal of Plankton Research*. 34(1): 36-54.
- Record NR**, Pershing AJ, Jossi JW (2010) Biodiversity as a dynamic variable in the Gulf of Maine continuous plankton recorder transect. *Journal of Plankton Research*. 32(12): 1675-1684.
- Record NR**, Pershing AJ, Runge JA, Mayo CA, Monger BC, Chen C (2010) Improving ecological forecasts of copepod community dynamics using genetic algorithms. *Journal of Marine Systems*. 82(3): 96-110.
- Pershing AJ, Christensen LB, **Record NR**, Sherwood GD, Stetson PB (2010) The Impact of Whaling on the Ocean Carbon Cycle: Why Bigger Was Better. *PLoS ONE*. 5(8): e12444.
- Runge JA, 19 others, **Record NR** (2010) Understanding climate impacts on recruitment and spatial dynamics of Atlantic cod in the Gulf of Maine: Integration of observations and modeling. *Progress in Oceanography*. 87: 251–263.
- Pershing AJ, **Record NR**, Monger BC, Pendleton DE, Woodard LA (2009) Model-based estimates of *Calanus finmarchicus* abundance in the Gulf of Maine. *Marine Ecology Progress Series*. 378: 227-243.
- Pershing AJ, **Record NR**, Monger BC, Mayo CA, Brown MW, Cole TVN, Kenney RD, Pendleton DE, Woodard LA (2009) Model-based estimates of right whale habitat use. *Marine Ecology Progress Series*. 378: 245-257.
- Pendleton DE, Pershing AJ, Brown MW, Mayo CA, Kenney RD, **Record NR**, Cole TVN (2009) Regional scale mean matters: mean copepod concentration indicates relative abundance of North Atlantic right whales. *Marine Ecology Progress Series*. 378:211-225.
- Record NR**, Pershing AJ (2008) Modeling zooplankton development using the monotonic upstream scheme for conservation laws. *Limnology & Oceanography: Methods*. 6: 364-372.
- Roth V, Ivanchenko V, **Record NR** (2007) Evaluating student response to WeBWoRK, a Web-Based Homework Delivery and Grading System. *Computers & Education*. 50:1462-1482.
- Davoren GK, May C, Penton P, Reinfort B, Buren A, Burke C, Andrews D, Montevecchi WA, **Record NR**, de Young B, Rose-Taylor C, Bell T, Anderson JT, Koen-Alonso M, Garthe S (2007) An Ecosystem-Based

Research Program for Capelin (*Mallotus villosus*) in the Northwest Atlantic: Overview and Results. *Journal of Northwest Atlantic Fisheries Science*. 39: 35–48.

Record NR, de Young B (2006) Patterns of diel vertical migration of zooplankton in historical acoustic Doppler velocity and backscatter data on the Newfoundland Shelf. *Canadian Journal of Fisheries & Aquatic Sciences*. 63: 2708-2721.

SCIENCE WRITING

Record NR (2021) Ocean Viruses Contain Keys to Life: The ocean is awash in viruses, many of which are essential to life as we know it. *Maine Boats Homes & Harbors*. Issue 172
<https://maineboats.com/print/issue-172/ocean-viruses-contain-keys-life>

Record NR (2020) Maine Voices: To change our state's forecast for COVID-19, we cannot afford half measures. *Portland Press Herald*. 25 March 2020. <https://www.pressherald.com/2020/03/25/maine-voices-changing-our-states-forecast-for-covid-19/>

Record NR, Ashander J, Adler P, Dietze M (2020) Ecological forecasting ethics: lessons for COVID-19. *Dynamic Ecology*. 8 June 2020. <https://dynamicecology.wordpress.com/2020/06/08/ecological-forecasting-ethics-lessons-for-covid-19/>

Record NR (2019) Algorithms in the Wild. *The Brooklyn Rail*.
https://brooklynrail.org/special/River_Rail_Colby/river-rail/Algorithms-in-the-Wild

Record NR (2019) Environmental DNA: Seeing the ocean in a bottle. *Maine Boats Homes & Harbors*. Issue 161: 57.

Record NR (2019) Environmental DNA: The next map of the ocean. *Landings – News and Views from Maine's Lobstering Community*. 27(12): 6.

Record NR (2018) The Uncertain Future of Right Whales: Saving endangered whales means crucial compromises. *Maine Boats Homes & Harbors*. Issue 153: 46. (*National award finalist: Folio Eddie Award, Essays & Criticism.*)

Record NR (2018) The hunt for red tides: The biology of toxic algal blooms. *Maine Boats Homes & Harbors*. Issue 150: 43. (*National award winner: Folio Eddie Award, Analysis, 2018; National award winner: International Regional Magazine Association, Gold in Nature & Environment, 2019*)

Record NR (2016) Unearthly Floating Objects: The weird and wonderful jellyfish. *Maine Boats Homes & Harbors*. Issue 141: 68. (*Award nomination: International Regional Magazine Association, Nature and Environment Feature.*)

Record NR (2016) Maine has a front-row seat for climate change. *The Working Waterfront*. 20 May 2016.
<http://www.islandinstitute.org/working-waterfront/maine-has-front-row-seat-climate-change>

Record NR (2015) Be on the lookout for 'oceans of jelly'. *The Working Waterfront*. 16 June 2015.
<http://www.islandinstitute.org/working-waterfront/be-lookout-oceans-jelly>

Record NR (2014) Dockside oceanography: taking the pulse of the ocean. *The Working Waterfront*. 18 June 2014. <http://www.workingwaterfrontarchives.org/2014/06/18/dockside-oceanography-taking-the-pulse-of-the-ocean/>

GRANTS AND CONTRACTS

- National Oceanic and Atmospheric Association. 1/1/2022-12/31/2022. Improving prey covariates for right whale density models and management. (subaward: **Record NR**, \$76,955).
- National Science Foundation. 8/14/2020-8/13/2023. Collaborative Research: Sources and transformations of export production: A novel 50-year record of pelagic-benthic coupling from coral and plankton bioarchives. \$189,353. McMahon K, **Record NR**, Jaacks J, Phillips B, Stamieszkin K.
- National Science Foundation. 8/1/2020-8/30/2021. Collaborative Conference: OceanHackWeek: A Workshop to Explore Data Science in Oceanography. \$7,423. **Record NR**, Mitchell C, Mayorga E, Lee W.
- National Oceanic and Atmospheric Association. 10/1/2020-9/30/2021. Zooplankton covariates for right whale density models and management. (subaward: **Record NR**, \$89,781).
- Maine Community Foundation. 6/1/2020-10/1/2020. \$21,434. Mapping and modeling right whale prey to inform management decisions. **Record NR**.
- National Oceanic and Atmospheric Association, Bureau of Ocean Energy Management, Integrated Ocean Observing System. 9/1/2019-8/31/2022. \$1,050,000. MBON expansion into the Gulf of Maine: the NERACOOS/NROC Integrated Sentinel Monitoring Network (ISMN). (subaward: **Record NR**, \$45,000) NA19NOS0120197.
- National Oceanic and Atmospheric Association. 9/1/2019-8/31/2022. \$521,000. Developing a machine learning-based, high resolution, predictive capacity for monitoring paralytic shellfish toxins along the Gulf of Maine coastline. Archer S, **Record NR**, Kanwit K, MacLeod J. NA19NOS4780187
- National Science Foundation. 5/1/2019-4/30/2022. \$646,687. Collaborative Research: Individual based approaches to understanding krill distributions and aggregations. Fields D, **Record NR**, Weissburg MJ, Murphy D. OPP-1840941.
- National Aeronautics and Space Administration. 5/1/2019-9/1/2019. \$14,652. Improving climate readiness of Gulf of Maine fisheries through ecosystem forecasting. Kerr L, **Record NR**.
- Otto Mønsted Fond. 1/1/2020-12/31/2020. DKK210.000,00. Visiting fellowship to Denmark Technical University. **Record NR**, Payne M.
- National Science Foundation. 10/1/2018-9/30/2021. \$771,641. Collaborative Research: Interactions of the Microbial Iron and Methane Cycles in the Tundra Ecosystem. Emerson D, **Record NR**, Bowden W. DEB-1754358.
- National Aeronautics and Space Administration. 9/1/2017-8/31/2020. \$1,427,294. GNATS: An experimental observatory documenting the Gulf of Maine carbon cycle. Balch WM, **Record NR**.
- National Science Foundation. 10/1/2016-9/30/2019. \$754,600. BD Spokes: SPOKE: SOUTH: Collaborative: Using Big Data for Environmental Sustainability: Big Data + AI Technology = Accessible, Usable, Useful Knowledge! Goel A. (subaward: **Record NR**, \$37,941)
- Commercial contract. 11/21/2016-3/1/2017. \$5,400. Nowcasting technology for marine debris. **Record NR**.
- National Institutes of Health. 9/20/2016-8/31/2017. \$750,063. Novel Use of Emergent Technologies to Improve Efficiency of Animal Model Research. (subaward: **Record NR**, \$19,345)
- National Aeronautics and Space Administration. 4/1/2016-3/31/2019. \$598,289. Incorporating Marine and Coastal Phenology Into The National Climate Assessment. **Record NR**, Mills K, Kerr L, Young Morse R,

- Armstrong E, Thomas A. NNX16AG59G.
- National Oceanic and Atmospheric Administration, Saltonstall-Kennedy. 9/1/2015-8/31/2017. \$394,694. Forecasting Protozoan Parasites in the Gulf of Maine and the Risk of Bioaccumulation of Human Waterborne Pathogens in Oysters. Fernández Robledo JA, Countway PD, **Record NR**.
- National Science Foundation. 4/1/2015-3/31/2018. \$1,150,334. Collaborative Research: Mechanisms supporting persistence of a key plankton species during climate change on the Northwest Atlantic continental shelf. Runge JA, **Record NR**, Ji R, Salisbury JE, Chen C.
- National Aeronautics and Space Administration. 9/1/2014-8/31/2017. \$743,652. Earth System Data Solutions for Detecting and Adapting to Climate Change in the Gulf of Maine. Shehata T, Pershing AJ, **Record NR**, Kerr L, Mills K, Young Morse R.
- National Oceanic and Atmospheric Administration, Cooperative Institute for the North Atlantic Region. 9/1/2014-8/31/2019. \$842,555. Impacts of a changing ecosystem on Atlantic salmon marine productivity. Mills KE. (subaward: **Record NR**)
- National Aeronautics and Space Administration. 9/1/2014-8/31/2017. \$1,299,051. Combining satellite-, AUV-, and ship-based measurements from the multi-decadal time series - GNATS - to Model the Carbon Cycle in the Gulf of Maine. Balch WM, **Record NR**. NNX16AG59G.
- National Science Foundation. 3/1/2010-2/28/2012. \$490,670. Understanding copepod life-history and diversity using a next-generation zooplankton model. Pershing AJ, Maps F. (subaward: **Record NR**)
- Maine Oil Spill Advisory Committee. 1/1/2008-1/31/2010. \$85,197. Shore-based Photogrammetry of Surface Oceanography for Oil Spill Mitigation. Pershing AJ, **Record NR**, Thomas A.

TECHNICAL REPORTS

* indicates undergraduate student

- Barton AD, Dutkiewicz S, Andersen KH, Fiksen Ø, Follows M, Mouw C, **Record NR**, Rynearson T (2016) Report on the "Trait-based approaches to ocean life" scoping workshop, October 5-8, 2015, U.S. Ocean Carbon and Biogeochemistry Program, 35 pp., DOI: 10.1575/1912/8017.
- McKnight M*, **Record NR**, Runge JA (2013) Development of the deep diapause *Calanus finmarchicus* layer in Wilkinson Basin, Gulf of Maine. Report.
- Runge JA, Jones RA, **Record NR**, Pershing AJ (2012) Summer distribution of the planktonic copepod, *Calanus finmarchicus*, along the coast of the Gulf of Maine. Report to the Maine Department of Marine Resources.
- Record NR** (2012) Linking ecological first principles with biodiversity patterns of marine copepods. Ph.D. Dissertation, University of Maine School of Marine Sciences.
- Record NR** (2010) Ocean ecosystem through the eyes of a continuous plankton recorder. *J. Plank. Res.* 32(12):Cover.
- Wilson C, 19 others, **Record NR**. Remote sensing applications to marine resource management. In: *IOCCG (2009). Remote Sensing in Fisheries and Aquaculture. Forget, M.-H., Stuart, V. and Platt, T. (eds.), Reports of the International Ocean-Colour Coordinating Group, No. 8, IOCCG, Dartmouth, Canada.*
- Record NR**, Pershing AJ, Kingsley G, Higgins K (2009) Shore-based photogrammetry of surface

- oceanography for oil spill mitigation. Data Report, University of Maine School of Marine Sciences.
- Whitefield JD, **Record NR**, Pershing AJ (2010) Shore-based photogrammetry of surface oceanography for oil spill mitigation. Data Report, University of Maine School of Marine Sciences.
- Record NR** (2005) Acoustic imaging of diel vertical migration of zooplankton on the Newfoundland Shelf. M.Sc. Thesis, Memorial University of Newfoundland.
- Record NR**, de Young B, Foley J (2004) Physics and Physical Oceanography Data Report 2004-2: Analysis of Physical Oceanographic Data from Funk Island Bank, August 2004. Department of Physics and Physical Oceanography, Memorial University of Newfoundland.
- Record NR** (2003) Introduction to Lorenz's System of Equations. DOI: 10.13140/RG.2.1.1623.1842

TALKS

* indicates undergraduate student

- Record NR** (2021) HAB EWS technical guidance: Concept overview. 19th International Conference on Harmful Algae. (virtual)
- Record NR (invited)** (2021) Seeing the ocean's future with big data and AI. Colby College Davis Institute for Artificial Intelligence. (virtual)
- Record NR** (2021) Solving the forecaster's dilemma: reflexivity in ocean ecosystem forecasting. Association for the Science of Limnology and Oceanography, Aquatic Sciences Meeting (virtual)
- Record NR (invited)** (2021) Climate change in the Gulf of Maine. Maine Island Trails Association public seminar series.
- Record NR**, Ross C (2020) Zooplankton covariates for right whale density models, forecasting, and management. Northeast Fisheries Science Center Zooplankton Workshop. Virtual meeting.
- Record NR (invited)** (2020) Climate change in Maine. Maine College of Art: Ecologies of the Local. Virtual talk.
- Record NR** (2020) New Developments in Forecasting Harmful and Toxic Algae. ICES Working Group on Phytoplankton and Microbial Ecology. Virtual meeting.
- Record NR (invited)** (2020) Algorithms in the Wild: Ecosystem Forecasting in a Changing Climate. DTU Aqua, Technical University of Denmark. Copenhagen, Denmark.
- Record NR (invited)** (2020) Machines learning marine ecology: Adventures in the noosphere. Centre for Ocean Life, Technical University of Denmark. Copenhagen, Denmark.
- Record NR**, Runge JA, Pendleton DE, Balch WM, Davies KTA, Pershing AJ, Johnson C, Stamieszkin K, Ji R, Feng Z, Kraus SD, Kenney RD, Hudak CA, Mayo CA, Chen C, Salisbury J, Thompson C, Ross, C (2019) Predicting right whale responses to rapid oceanographic changes. Right whale consortium meeting. Portland ME.
- Record NR (invited)** (2019) Algorithms in the Wild: Ecosystem Forecasting in a Changing Climate. Bowdoin Mathematics Seminar Series, Brunswick ME.
- Record NR** (2019) Whales and Warming: How Climate Change is Shaping the Future of Right Whales. Café Scientifique, Bigelow Laboratory for Ocean Sciences, East Boothbay ME.
- Record NR (invited)** (2019) The Human Element. Public Q&A, Boothbay ME.

- Record NR (invited)** (2019) Lobster Wars. Public Q&A, Boothbay ME.
- Record NR**, Runge JA, Pendleton DE, Balch WM, Davies KTA, Pershing AJ, Johnson CL, Stamieszkin K, Ji R, Feng Z, Kraus SD, Kenney RD, Hudak C, Mayo CA, Chen C, Thompson CRS (2019) Climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. Association for the Study of Limnology and Oceanography annual meeting, San Juan PR.
- Record NR (invited)** (2019) Climate Change: Wiscasset. First Congregational Church Wiscasset.
- Record NR**, Runge JA, Pendleton DE, Balch WM, Davies KTA, Pershing AJ, Johnson CL, Stamieszkin K, Ji R, Feng Z, Kraus SD, Kenney RD, Hudak C, Mayo CA, Chen C, Thompson CRS (2018) Climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. Regional Association for Research on the Gulf of Maine annual meeting, Portland ME.
- Record NR (invited)**, Runge JA (2018) Connecting Oceanography, *Calanus*, and Whales. Atlantic Large Whale Take Reduction Team.
- Record NR (invited)** (2018) Climate change in the Gulf of Maine. Boothbay Region Land Trust, Boothbay ME.
- Record NR (invited)** (2018) Climate Change: Vinalhaven. Union Church of Vinalhaven.
- Record NR (invited)** (2018) Climate Change: Boothbay Peninsula. Boothbay Congregational Church.
- Record NR (invited)** (2018) Adapting to Climate Change in the Gulf of Maine. Tufts Environmental Studies Lunch & Learn Seminar Series. Medford MA.
- Record NR** (2017) Civic science: Science for the people, by the people. Café Scientifique, Bigelow Laboratory for Ocean Sciences, East Boothbay ME.
- Record NR (invited)** (2017) Climate Stewards: Ecosystem Forecasting in a Changing Climate. Wells Reserve at Laudholm, Wells ME.
- Record NR (invited)** (2016) Climate and the Gulf of Maine. New England Ocean Science Education Collaborative annual meeting, Portland ME.
- Record NR (invited)** (2016) Ecosystem mind-mapping. The University Centre in Svalbard, Longyearbyen, Norway.
- Record NR (invited)** (2016) Arctic Influences on Circulation in the North Atlantic. Arctic Council Science Symposium. Portland ME.
- Record NR (invited)** (2016) Modeling Ocean Resources. Mid-Maine Global Forum. Waterville ME.
- Record NR**, Ji R, Maps F, Varpe Ø, Runge JA (2016) Computing the biogeography of copepodid diapause. Ocean Sciences, New Orleans LA.
- Record NR (invited)** (2016) The mathematics of adapting to rapid climate change in the Gulf of Maine. Bates College, Lewiston ME.
- Record NR (invited)** (2016) Adapting to rapid climate change in the Gulf of Maine. Coalition for Expanding the Reach of Earth Sciences, Bowdoin College, Brunswick ME.
- Record NR (invited)** (2015) Ecosystem forecasting in a changing climate. NASA Space Day.
- Record NR (invited)** (2015) Ecosystem forecasting in the ocean. Colby College Environmental Studies evening lecture series.
- Record NR (invited)** (2015) Ecosystem forecasting in the ocean. University of New England seminar series.

- Record NR (invited)** (2014) 40 years of change in the Gulf of Maine ecosystem. Maine Audubon, Camden ME.
- Record NR (invited)** (2014) 40 years of change in the Gulf of Maine ecosystem. Café Scientifique, Boothbay ME.
- Record NR**, Seidman D* (2014) Gelatinous zooplankton trends, models, and information gaps in the Gulf of Maine. Regional Association for Research on the Gulf of Maine annual meeting, Boston MA.
- Record NR (invited)** (2014) Adaptive and machine learning algorithms in ocean ecosystem models. Université Laval, Quebec, Canada.
- Record NR (keynote)** (2014) Adaptive and machine learning algorithms in ocean ecosystem models. ICES Working Group in Integrative, Physical-biological and Ecosystem Modelling. Haarlem, Netherlands.
- Record NR (invited)** (2013) Acoustic zooplankton time series from the NERACOOS buoys. Northeastern Regional Association of Coastal and Ocean Observing Systems annual meeting.
- Record NR**, Pershing AJ, Maps F (2013) Emergent copepod communities in an adaptive trait-structured model. International workshop on Trait-based approaches to Ocean Life. Centre for Ocean Life, Copenhagen, Denmark.
- Record NR (invited)**, Pershing AJ (2012) Trends in biodiversity: 45 years of the Continuous Plankton Recorder. Workshop: The Gulf of Maine in a changing climate, Bowdoin College, Brunswick ME.
- Record NR**, Pershing AJ, Maps F (2012) Emergent copepod communities in an adaptive trait-based model. Ocean Sciences Meeting, Salt Lake City UT.
- Record NR (invited)**, Pershing AJ, Pendleton DE, Runge JA, Jones R (2011) Adaptive computing in ecosystem forecasting: Copepods and whales in the Gulf of Maine. Vermont Experimental Program to Stimulate Competitive Research, University of Vermont, Burlington VT.
- Record NR (invited)**, Pershing AJ, Maps F (2011) Toward a Grand Unified Theory of Copepods. Mathematical Biosciences Institute, The Ohio State University, Columbus OH.
- Record NR (moderator)**, Pershing AJ (2010) A Low-Cost System for Environmental Monitoring, Deployed in Portland Harbor. The Working Waterways & Waterfronts National Symposium on Water Access, Portland ME.
- Record NR**, Pershing AJ (2009) The structure and function of pelagic zooplankton biodiversity in the Gulf of Maine. Gulf of Maine Symposium. St. Andrews NB, Canada.
- Record NR**, Pershing AJ, Pendleton DE, Mayo CA, Stamieszkin K, Monger BC, Runge JA, Jones R, Chen C (2009) Operational Ecosystem Forecasting to Inform Right Whale Habitat Assessment in Cape Cod Bay. Society for Marine Mammalogy Biennial Conference, Quebec City, Canada.
- Record NR**, Pershing AJ, Monger B, Mayo CA, Chen C (2008) Operational forecasts of right whale distributions from satellite and oceanographic data using dynamical models. Ocean Sciences Meeting, Orlando FL.
- Record NR**, Pershing AJ, Monger B, Mayo C, Chen C, Brown M, Kenney R (2007) Forecasting right whale distributions from satellite and oceanographic data using dynamical models. Society for Marine Mammalogy Biennial Conference, Cape Town, South Africa.
- Record NR***, Pennings T (2000) Don't Kill the Goose: Using Dynamical Systems to Outsmart the European

Corn Borer. Michigan Mathematics REU Mini-Conference.

SELECTED POSTERS

* indicates undergraduate student

Record NR, Pershing AJ, Tupper B (2018) The Jelly Report: Forecasting jellyfish using email and social media. Ocean Sciences, New Orleans LA.

Stamieszkin K, Thomas AC, Weatherbee R, Kerr LA, Mills KE, **Record NR** (2017) Seasons in the ocean: Developing phenological indicators for climate assessment. Ocean Carbon Biogeochemistry meeting, Woods Hole MA.

Record NR (2015) Mapping the jelly and fat of the world's oceans. Trait-based Approaches to Ocean Life workshop, Waterville Valley NH.

Record NR, Ji R, Maps F, Varpe Ø, Runge JA (2014) Predicting the biogeography of copepodid diapause. Forum for Arctic Modeling & Observational Synthesis, Workshop #3, Woods Hole MA.

Seidman D*, **Record NR** (2014) A model of population dynamics for the life stages of *Salpa fusiformis* in the Gulf of Maine. Regional Association for Research on the Gulf of Maine annual meeting, Boston MA.

Record NR, Wurtzell KV (2013) Acoustically-derived zooplankton time series from the NERACOOS buoys. Regional Association for Research on the Gulf of Maine, Annual Meeting, Portsmouth NH.

Checkley DM Jr, Jackson GA, McKinnon DA, Pedersen O-P, **Record NR**, Tande KS, Trudnowska E (2012) Size spectrum parameters as essential ocean variables. Ocean Sciences Meeting, B1100. Salt Lake City UT.

Record NR, Pershing AJ, Runge JA, Mayo C, Monger BC (2010) Improving ecological forecasts with genetic algorithms: application to a biological-physical copepod community model. Ocean Sciences Meeting, IT45D-06. Portland OR.

Record NR, de Young B (2005) Diel Vertical Migration: Zooplankton on the Newfoundland Shelf. Ecosystem Studies of Sub-Arctic Seas symposium. Victoria BC, Canada.

Record NR, de Young B (2005) Diel Vertical Migration: Zooplankton on the Newfoundland Shelf. Canadian Meteorological and Oceanographic Society congress. Vancouver BC, Canada.

TEACHING AND STUDENT ADVISING

2017-2022	Program Director, <i>Changing Oceans</i> semester in residence program
2022	<i>JP297Dj Ocean Forecasting: AI, Ecology, and Data Justice on the Seas</i> , Colby College
2016-2021	<i>ES383 The Ocean Environment</i> , Colby College
2019	<i>The Gulf of Maine: Signals of Change</i> , Maine School of Science and Math
2016-2017	<i>BI297B Climate Change in the Gulf of Maine</i> , Colby College
2015	<i>BI297B Modeling Ocean Ecosystems</i> , Colby College
2012-2013	<i>EOS105 Oceanography of the Gulf of Maine</i> , <i>EOS352 Biodiversity in the Open Ocean</i> , <i>EOS255 Numerical Modeling of Ocean Ecosystems</i> , Bowdoin College
2006	<i>MATH110 Contemporary Mathematics</i> (3 sections), Southern ME Community College
2002-2003	English Instructor and Tutor, Linda Learning Center, Petchaburi, Thailand
2000-2002	Teaching / WeBWork Assistant, <i>Calculus I & II</i> , University of Rochester

MENTORED UNDERGRADUATE PROJECTS

- 2021 Douyon K. Extending the spatial coverage of HAB occurrence forecasting through the development of a more comprehensive global model. Colby College. *Independent research project*.
- 2021 Innis J. Automating A Visual Screening Task Using Deep Learning. *Summer internship* (NSF REU)
- 2021 Johnson T. A Novel Low-Cost Design for a Water Sampling Ocean Drifter. *Summer internship*
- 2020 Johnson T. Forecasting Whale Populations in the Northwest Atlantic with Machine Learning and Big Data. *Summer internship* (NSF REU).
- 2019-2020 Cobb C. Phenological linkages in the Gulf of Maine. *Honors Thesis*.
- 2018-2020 Ross C. The physical factors that affect baleen whale habitat preferences in the Gulf of Maine. Colby College / Bigelow Laboratory. *Independent research project / Honors Thesis*.
- 2018-2019 Yu A. Forecasting moose-vehicle collisions. Colby College. *Honors Thesis*.
- 2018-2019 Grasso I. Shellfish Toxicity Forecast in the Gulf of Maine using Neural Networks. *Summer internship* (NSF REU).
- 2017 Chistolini V. Species Distribution Model Development and Validation. Colby College. *Honors Thesis*.
- 2017 Young D. Finding dominant modes in ocean precipitation phenology. Bigelow Laboratory. *Summer internship* (NSF REU).
- 2016 Kronauer AB. Modeling ocean ecosystem: Forecasting the abundance of gelatinous zooplankton in the Gulf of Maine. Colby College. *Honors thesis*.
- 2016 Posega Rappeleye E. Operational forecasting of jellyfish in the Gulf of Maine using citizen reports. Bigelow Laboratory. *Summer internship* (NSF REU).
- 2015 Kronauer AB. Machine learning: Forecasting the abundance of gelatinous zooplankton in the Gulf of Maine. Bigelow Laboratory. *Summer internship* (NSF REU).
- 2015 Keady CA. Investigating chlorophyll-*a* anomalies in the Southern Ocean and the Tasman Sea. Bigelow Laboratory. *Summer internship*.
- 2014 Seidman DN. A model of population dynamics for the life stages of *Salpa fusiforma* in the Gulf of Maine. Bigelow Laboratory. *Summer internship* (NSF REU).
- 2014 Middleton J. Mathematical modeling of *Emiliana huxleyi* and a host-specific virus. Colby College. *Honors thesis*.
- 2013 Middleton J. Marine viral interactions and the effect of bacterial colloid debris on populations in a model system. Colby College / Bigelow Laboratory. *Independent research project*.
- 2012 McKnight M. Development of the deep diapausal *Calanus* layer in the Gulf of Maine. Bowdoin College. *Summer internship*.

FIELD EXPERIENCE

2019	Two-week survey Arctic tundra for iron/methane cycle dynamics, Toolik Field Station
2014-present	One-day surveys for the Gulf of Maine North Atlantic Time Series and other projects
2012-present	One-day instructional research cruises and other instructional surveys for undergraduates
2008-2013	One-to-ten-day surveys, coastal Maine: ring nets, CTD, LOPC
2008-2009	Designed, constructed, and deployed a photogrammetric system for detecting, mapping, and tracking sea-surface microlayers in Portland Harbor, Maine
2005-2006	Monthly one-week surveys for the Bermuda Atlantic Time-series Study: CTD, Niskin bottles, ring nets, sediment traps
2005	Two-week survey of the Funk Island Bank, Newfoundland: seabird and marine mammal identification and counts. Two-week study at a puffin colony
2004	Two surveys in Newfoundland—Funk Island Bank, two weeks; Bonne Bay, one week: CTD, thermistor, ADCP, bio-acoustics, and bongo nets. Preparation and two-week installation of the Bonne Bay Ocean Observatory

PROGRAMMING EXPERIENCE

Languages:	Matlab, C, R, Python, Fortran, Perl, HTML
Ocean models:	ROMS, Aestus, FVCOM, MITGCM

HONORS AND AWARDS

2019	International Regional Magazine Association, Gold in Nature & Environment, "The hunt for red tides: The biology of toxic algal blooms." <i>Maine Boats Homes & Harbors</i> . Issue 150: 43.
2018	Eddie Award: Analysis, "The hunt for red tides: The biology of toxic algal blooms." <i>Maine Boats Homes & Harbors</i> . Issue 150: 43.
2005	Gordon Mertz Fellowship in Physical Oceanography, Memorial Univ. of Newfoundland
2005	Fellow of the School of Graduate Studies, Memorial Univ. of Newfoundland
2001	Highest Distinction, Mathematics Department, Univ. of Rochester
1996-2000	Bausch and Lomb Scholarship for Academic Achievement in Science, Univ. of Rochester

SERVICE AND OTHER ACTIVITIES

2021-present	Director, Tandy Center for Ocean Forecasting
2017-present	Director, Sea Change Semester Program
2017-present	Atlantic Large Whale Take Reduction Team member (National Marine Fisheries Service)
2018-2020	Lobster Research Collaborative (Maine Department of Marine Resources)
2014-2019	Chair, Bigelow Laboratory Education Committee
2015, 2018	National Science Foundation panel review

2010-2015 Board of directors, Gulf of Maine Marine Education Association

2008-2010 Winter park maintenance and construction, Baxter State Park, ME USA

2006-2009 Seabird colony work, Project Puffin / Maine Audubon, ME USA

2003-2005 Trail design and maintenance, East Coast Trail Association, NL Canada

Journal Review: *American Fisheries Society, Canadian Journal of Fisheries and Aquatic Sciences, Computers & Education, Ecological Applications, Ecological Complexity, Ecological Modelling, Elementa: Journal of the Anthropocene, Fisheries Oceanography, Frontiers in Marine Science, Global Change Biology, ISME Journal, Journal of Marine Systems, Journal of Plankton Research, Limnology and Oceanography, Marine Ecology Progress Series, PLOS ONE, Progress in Oceanography, Theoretical Ecology, Zoology*