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Education

University of Washington, Ph.D. Aquatic and Fishery Sciences 2003-2006
- Committee: Ray Hilborn (advisor), Andre Punt, Tim Essington
Montana State University, MSc Biology 2000-2003
- Advisor: Dan Goodman
University of California San Diego, BSc Ecology and Evolution 1995-1999

Employment

Statistician Northwest Fisheries Science Center, NMFS (NOAA) 2009 - present
Affiliate Professor University of Washington (SAFS) 2013 - present
Post-doctoral researcher National Research Council 2007 - 2008
Stock assessment scientist Wellington, New Zealand Spring 2005
Graduate research assistant University of Washington 2003 - 2006

Journal Articles (peer - reviewed)

146. Jarvis-Mason, E.T., W. Watson, **E.J. Ward**, A.R. Thompson, and B.X. Semmens. 2025. Environment-driven trends in larval abundance predict fishery recruitment in two saltwater basses. *ICES Journal of Marine Science*, 82:fsae196. [link](#)
145. Oken, K.L., S.D. Groth, D.S. Holland, A.E. Punt, and **E.J. Ward**. 2025. Variability in somatic growth over time and space determines optimal season-opening date in the oregon ocean shrimp (*pandalus jordani*) fishery. *Canadian Journal of Fisheries and Aquatic Sciences*, 82:1-13. [link](#)
144. Samhouri, J.F., B.E. Feist, M. Jacox, O.R. Liu, K. Richerson, E. Steiner, J. Wallace, K. Andrews, L. Barnett, A.H. Beaudreau, L. Bellquist, M.P. Buil, M.A. Haltuch, A. Harley, C.J. Harvey, I.C. Kaplan, K. Norman, A. Phillips, L.K. Rasmuson, **E.J. Ward**, C. Whitmire, and R.L. Selden. 2024. Stay or go? geographic variation in risks due to climate change for fishing fleets that adapt in-place or adapt on-the-move. *PLOS Climate*, 3:1-28. [link](#)
143. May, S.A., K.R. Shedd, K.M. Gruenthal, J.J. Hard, W.D. Templin, C.D. Waters, M.D. Adkison, **E.J. Ward**, C. Habicht, L.I. Wilson, A.C. Wertheimer, and P.A.H. Westley. 2024. Salmon hatchery strays can demographically boost wild populations at the cost of diversity: quantitative genetic modelling of alaska pink salmon. *Royal Society Open Science*, 11:240455. [link](#)
142. Riekkola, L., O.R. Liu, **E.J. Ward**, D.S. Holland, B.E. Feist, and J.F. Samhouri. 2024. Modeling the spatiotemporal patterns and drivers of dungeness crab fishing effort to inform whale entanglement risk mitigation on the u.s. west coast. *Journal of Environmental Management*, 351:119735. [link](#)

141. **Ward, E.J.**, and R.S. Waples. 2024. Potential benefits and challenges of quantifying pseudoreplication in genomic data with entropy statistics. *Entropy*, 26:. [link](#)
140. Nelson, B.W., **E.J. Ward**, D.W. Linden, E. Ashe, and R. Williams. 2024. Identifying drivers of demographic rates in an at-risk population of marine mammals using integrated population models. *Ecosphere*, 15:e4773. [link](#)
139. **Ward, E.J.**, M.E. Hunsicker, K.N. Marshall, K.L. Oken, B.X. Semmens, J.C. Field, M.A. Haltuch, K.F. Johnson, I.G. Taylor, A.R. Thompson, and N. Tolimieri. 2024. Leveraging ecological indicators to improve short term forecasts of fish recruitment. *Fish and Fisheries*, 25:895-909. [link](#)
138. Rand, Z.R., **E.J. Ward**, J.E. Zamon, T.P. Good, and C.J. Harvey. 2024. Using hidden markov models to develop ecosystem indicators from non-stationary time series. *Ecological Modelling*, 495:110800. [link](#)
137. Samhoury, J.F., B.E. Feist, M. Jacox, O.R. Liu, K. Richerson, E. Steiner, J. Wallace, K. Andrews, L. Barnett, A.H. Beaudreau, L. Bellquist, M.P. Buil, M.A. Haltuch, A. Harley, C.J. Harvey, I.C. Kaplan, K. Norman, A. Phillips, L.K. Rasmuson, **E.J. Ward**, C. Whitmire, and R.L. Selden. 2024. Stay or go? geographic variation in risks due to climate change for fishing fleets that adapt in-place or adapt on-the-move. *PLOS Climate*, 3:1-28. [link](#)
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135. Davies, S.C., P.L. Thompson, C. Gomez, J. Nephin, A. Knudby, A.E. Park, S.K. Friesen, L.J. Pollock, E.M. Rubidge, S.C. Anderson, J.C. Iacarella, D.A. Lyons, A. MacDonald, A. McMillan, **E.J. Ward**, A.M. Holdsworth, N. Swart, J. Price, and K.L. Hunter. 2023. Addressing uncertainty when projecting marine species distributions under climate change. *Ecography*, :e06731. [link](#)
134. Jensen, A.J., R.P. Kelly, W.H. Satterthwaite, **E.J. Ward**, P. Moran, and A.O. Shelton. 2023. Modeling ocean distributions and abundances of natural- and hatchery-origin chinook salmon stocks with integrated genetic and tagging data. *PeerJ*, 11:e16487. [link](#)
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129. Gaydos, J.K., J.S. Leger, S. Raverty, H. Nollens, M. Haulena, **E.J. Ward**, C.K. Emmons, M.B. Hanson, K. Balcomb, D. Ellifrit, M.N. Weiss, and D. Giles. 2023. Epidemiology of skin changes in endangered southern resident killer whales (*Orcinus orca*). *PLOS ONE*, 18:e0286551. [link](#)
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127. Buckner, J.H., W.H. Satterthwaite, B.W. Nelson, and **E.J. Ward**. 2023. Interactions between life history and the environment on changing growth rates of chinook salmon. *Canadian Journal of Fisheries and Aquatic Sciences*, 80:648–662. [link](#)
126. Kardos, M., Y. Zhang, K.M. Parsons, Y. A. H. Kang, X. Xu, X. Liu, C.O. Matkin, P. Zhang, **E.J. Ward**, M.B. Hanson, C. Emmons, M.J. Ford, G. Fan, and S. Li. 2023. Inbreeding depression explains killer whale population dynamics. *Nature Ecology & Evolution*, :1–12. [link](#)
125. May, S.A., J.J. Hard, M.J. Ford, K.A. Naish, and **E.J. Ward**. 2023. Assortative mating for reproductive timing affects population recruitment and resilience in a quantitative genetic model. *Evolutionary Applications*, 16:657–672. [link](#)
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120. Brodie, S., J.A. Smith, B.A. Muhling, L.A.K. Barnett, G. Carroll, P. Fiedler, S.J. Bograd, E.L. Hazen, M.G. Jacox, K.S. Andrews, C.L. Barnes, L.G. Crozier, J. Fiechter, A. Fredston, M.A. Haltuch, C.J. Harvey, E. Holmes, M.A. Karp, O.R. Liu, M.J. Malick, M.P. Buil, K. Richerson, C.N. Rooper, J. Samhoury, R. Seary, R.L. Selden, A.R. Thompson, D. Tommasi, **E.J. Ward**, and I.C. Kaplan. 2022. Recommendations for quantifying and reducing uncertainty in climate projections of species distributions. *Global Change Biology*, 28:6586–6601. [link](#)

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117. English, P., **E.J. Ward**, C.N. Rooper, R.E. Forrest, L.A. Rogers, K.L. Hunter, A.M. Edwards, B.M. Connors, and S.C. Anderson. 2022. Contrasting climate velocity impacts in warm and cool locations show that effects of marine warming are worse in already warmer temperate waters. *Fish and Fisheries*, 23:239-255. [link](#)
116. Essington, T.E., S.C. Anderson, L.A. Barnett, H.M. Berger, S.A. Siedlecki, and **E.J. Ward**. 2022. Advancing statistical models to reveal the effect of dissolved oxygen on the spatial distribution of marine taxa using thresholds and a physiologically based index. *Ecography*, e06249:. [link](#)
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112. Hunsicker, M., **E.J. Ward**, M. Litzow, S. Anderson, C. Harvey, J. Field, J. Gao, M. Jacox, S. Melin, A. Thompson, and P. Warzybok. 2022. Tracking and forecasting community responses to climate perturbations in the california current ecosystem. *PLOS Climate*, 1:e0000014. [link](#)
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107. Jannot, J.E., **E.J. Ward**, K.A. Somers, B.E. Feist, T.P. Good, D. Lawson, and J.V. Carretta. 2021. Using Bayesian models to estimate humpback whale entanglements

in the United States west coast sablefish pot fishery. *Frontiers in Marine Science*, 8:1595. [link](#)

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105. Waples, R.S., R.K. Waples, and **E.J. Ward**. 2021. Pseudoreplication in genomics-scale datasets. *Molecular Ecology Resources*, 22:503–518. [link](#)
104. Stewart, J.D., J.W. Durban, H. Fearnbach, L.G. Barrett-Lennard, P.K. Casler, **E.J. Ward**, and D.R. Dapp. 2021. Survival of the fattest: linking body condition to prey availability and survivorship of killer whales. *Ecosphere*, 12:e03660. [link](#)
103. Jefferson, T.A., M.A. Smultea, **E.J. Ward**, and B. Berejikian. 2021. Harbor seals (*Phoca vitulina richardii*) in the inland waters of Washington State: a novel approach to stock size estimation. *PLOS ONE*, 16:e0241254. [link](#)
102. Shelton, A.O., G.H. Sullaway, B.E. Feist, **E.J. Ward**, K.A. Somers, V.J. Tuttle, J.T. Watson, and W.H. Satterthwaite. 2021. Redistribution of salmon populations in the Northeast Pacific Ocean in response to climate. *Fish and Fisheries*, 22:503–517. [link](#)
101. Barnett, L.A., S. Anderson, and **E.J. Ward**. 2021. Improving estimates of species distribution change by incorporating local trends. *Ecography*, 44:427–439. [link](#)
100. Feddern, M.L., G.W. Holtgrieve, and **E.J. Ward**. 2021. Stable isotope signatures in historic harbor seal bone link food web-assimilated carbon and nitrogen resources to a century of environmental change. *Global Change Biology*, 27:2328–2342. [link](#)
99. Essington, T., **E.J. Ward**, T.B. Francis, C. Greene, L. Kuehne, and D. Lowry. 2021. Historical reconstruction of the Puget Sound (Usa) groundfish community. *Marine Ecology Progress Series*, 657:173–189. [link](#)
98. Holt, M.M., J.B. Tennessen, **E.J. Ward**, M.B. Hanson, C.E. Emmons, D.A. Giles, and J.T. Hogan. 2021. Effects of vessel distance and sex on the behavior of endangered killer whales. *Frontiers in Marine Science*, 7:1211. [link](#)
97. Hodgson, E.E., R.A. Hovel, **E.J. Ward**, S. Lord, and J.W. Moore. 2020. Migratory diversity in an arctic fish supporting subsistence harvest. *Biological Conservation*, 248:108685. [link](#)
96. Litzow, M.A., M.J. Malick, N.A. Bond, C.J. Cunningham, J.L. Gosselin, and **E.J. Ward**. 2020. Quantifying a novel climate through changes in Pdo-climate and Pdo-salmon relationships. *Geophysical Research Letters*, 47:e2020GL087972. [link](#)
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94. Warlick, A.J., G.M. Ylitalo, S.M. O'Neill, M.B. Hanson, C. Emmons, and **E.J. Ward**. 2020. Using Bayesian stable isotope mixing models and generalized additive

- models to resolve diet changes for fish eating killer whales (*Orcinus orca*). *Marine Ecology Progress Series*, 649:189-200. [link](#)
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80. Shelton, A.O., W.H. Satterthwaite, **E.J. Ward**, B.E. Feist, and B.J. Burke. 2019. Using hierarchical models to estimate stock-specific and seasonal variation in ocean distribution, survivorship, and aggregate abundance of fall run Chinook salmon.. *Canadian Journal of Fisheries and Aquatic Sciences*, 76:95–108. [link](#)
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Book Chapters

E.J. Ward 2012. Population Dynamics. In *Grzimek's Animal Life Encyclopedia*. pp. 195-208.

Teaching Experience

FISH 507: Applied Time Series Analysis, University of Washington 2012 - present
Co-taught course with Eli Holmes and Mark Scheuerell [webpage](#)

Ecological Society of America (ESA) 2008 - 2011
Co-taught Analysis of Multivariate Time-Series Data Using State-Space Models, and Introduction to MARSS

NWFSC R workshop (organized & taught) 2010 - 2011

Visiting lecturer University of Washington 2007 - 2009
Taught FSH 497 Introductory modeling and programming course

External Funding

2023 E.J. Ward, K.N. Marshall. Developing multispecies models to improve forecasts and identify robust ecosystem management strategies under climate change. NMFS international fellowship to collaborate with Norway's Institute of Marine Research. \$36K

2022-2023 E.J. Ward, M. Hunsicker, B. Burke, W. Satterthwaite, M. Jacox, M. Litzow, M. Malick. *Non-stationary relationships between climate and fisheries in the California Current*. NWFSC grant, \$118K

2022-2024 T. Essington, M.E. Hunsicker, S.C. Anderson, E.J. Ward, J.T. Thorson, S. Siedlecki, L. Barnett, R. Forrest. *Climate change, distribution shifts, and choke species: A threat assessment to advance fishery ecosystem planning*. Washington Sea Grant, \$250K

2021 E.J. Ward. *Characterizing range shifts in groundfish species in response to local climate velocities*. NMFS Office of Science and Technology, \$40K.

2021-2023 C.E. Jordan, M.E. Hunsicker, and E.J. Ward. *Developing a dashboard for salmon data and ecosystem indicators*. NOAA Protected Species Toolbox, \$150K

2019-2021 E.J. Ward, A.O. Shelton, R. Sharma, B. Nelson. *A spatially explicit model for evaluating threats to coho salmon in freshwater and marine life stages in the Northeast Pacific Ocean*. Pacific Salmon Commission, \$229K

2019-2021 D. Finnoff, E.J. Ward, T. Miller, T. Schwoerer, M. Horning, D. Dugan. *Thresholds in a changing ocean environment: bioeconomic implications to inform adaptation decisions for Alaska's salmon fisheries*. NOAA Ocean Acidification Program, \$1,050,000.

2018-2020 A.O. Shelton, J. Watson, C. Cunningham, E.J. Ward, A. Grey, M.J. Ford, K. Sommers. *Integrating Chinook Catches from Directed Fisheries and Trawl Bycatch to Improve Distribution Information for Bycatch Avoidance and Impacts On Predators in a Changing Environment*. NOAA Protected Species, \$200K.

2018-2020 E.J. Ward, C. Harvey, J. Samhuri, etc. *Spatial ecosystem state and pressure indicators and scale-dependence of temporal indicator performance*. FATE (Fisheries And The Environment), \$192K.

2018-2020 M. Hunsicker, M. Litzow, E.J. Ward, B. Burke, S. Zador, C. Cunningham, and N. Bond. *Measuring the strength of ocean-atmosphere coupling to predict climate forcing of northeast Pacific ecosystems*. FATE (Fisheries And The Environment), \$198K.

2018-2020 G. Holtgrieve, C. Harvey, and E.J. Ward. *Reconstructing a Century of Coastal Productivity and Predator Trophic Dynamics using Compound-specific Stable Isotopes from Archival Bone Specimens*. Washington Sea Grant, \$192K.

2018-2020 L. Hauser, B. Vadopalas, R. Childer, B. Hudson, B. Eudeline, and E.J. Ward. *Development of genetic risk assessment tools and Management Strategy Evaluation for Aquaculture of Native Shellfish*. Saltonstall-Kennedy Grant, \$299K.

2017-2018 E.J. Ward, G. Holtgrieve, C. Harvey. *Reconstructing a ecosystem productivity and marine mammal trophic dynamics using compound-specific stable isotopes from bone specimens*. NWFSC Internal Grants Program

2016-2018 T.E. Essington, T.B. Francis, C. Greene, L. Kuehne, D. Lowry, E.J. Ward. *Recovering historical baselines in Puget Sound*. Washington Sea Grant, \$243K.

2016 E.J. Ward *Improving bycatch estimation through spatial statistics* \$100K.

2015 E.J. Ward, A.O. Shelton and M.J. Ford. *Portfolio Effects in Historic Chinook Hatchery Practices on Prey Availability for Southern Resident Killer Whales* National Fish and Wildlife Foundation, \$110K.

2014 - 2016 *Applying portfolio effects to the Gulf of Alaska ecosystem: Did multi-scale diversity buffer against the Exxon Valdez oil spill?* NCEAS working group, \$150K

2014-2015 I. Kaplan, E.J. Ward, et al. *A spatially explicit ecosystem model for quantifying marine mammal impacts on Chinook salmon* Pacific Salmon Commission Southern Fund, \$206K.

2013-2014 T. Eguchi, E.J. Ward, and E.E. Holmes. *Developing risk assessment tools for marine sea turtles* \$100K.

2013-2014 Holmes, E.E. and E.J. Ward. *Developing web based computing tools for protected species.* \$200K.

2013 M.B. Hanson, E.J. Ward. et al. *Modeling the distribution of endangered killer whales in Pacific Northwest Navy ranges using acoustic recorder detections and satellite tagged whales*, US Navy.

2013 Shelton, A.O., E.J. Ward, J.T. Thorson, M. Bellman, B. Feist. *Integrating spatial habitat and fisheries effort data to improve abundance estimates of west coast groundfish.* \$56K.

2011 E.J. Ward et al., *Incorporating multiple data sources into a unified framework to improve estimates of adult salmon returns and population productivity.* \$33K.

2009 NSF *Comparative Analysis of Marine Ecosystem Organization: New statistical tools for analyzing community dynamics with applications to marine zooplankton*, \$347K (141K from NCEAS). Associate Investigator (Principal Investigator - E.E. Holmes)

Fellowships and Awards

2022 NOAA Bronze Medal Award, Pacific Fisheries Management Council working group: "For leadership and problem-solving to develop innovative protections for Southern Resident killer whales and provide important fishing opportunities."

2006 *Cumulative Risk Assessment for Endangered Species* 2 year NRC post-doc awarded \$92K.

2003 *National Marine Fisheries Service / Washington Sea Grant Fellowship in Population Dynamics: Incorporating model selection and decision analysis into population dynamics modeling.* Grant awarded for \$120K.

Post-docs

2023-2024 Megan Feddern (UAF) Co-supervised with Curry Cunningham, Mary Hunsicker, Will Satterthwaite

2021-2023 Alex Jensen (UW) Co-supervised with Ryan Kelly, Ole Shelton, Will Satterthwaite

2019-2021 Christian Commander (NWFSC) Co-supervised with Lewis Barnett and Tim Essington

2017-2021 Ben Nelson (NWFSC) Co-supervised with Ole Shelton

2017-2019 Lewis Barnett (NWFSC)

2015-2017 Sean Anderson (Smith Fellow). Co-supervised with Trevor Branch

2012-2013 Guillaume Bal (NRC Research Post-doc). Co-supervised with Eli Holmes and Mark Scheuerell

2012 Jim Thorson (NRC Research Post-doc). With Michelle McClure, Eli Holmes, and Mark Scheuerell

Supervised Graduate Students or Committees

2021–2025 Sierra Gilman (B. Gardner), SEFS, University of Washington

2019–2022 Sam May (K. Naish), SAFS, University of Washington

2017–2021 Natalie Lowell (L. Hauser), SAFS, University of Washington (NMFS Population Dynamics Fellowship)

2017–2021 Megan Feddern (G. Holtgrieve), SAFS, University of Washington

2017–2020 Elizabeth Ng (T. Essington), SAFS, University of Washington (NMFS Population Dynamics Fellowship)

2012–2018 Pam Moriarty (T. Essington), SAFS, University of Washington

2013–2016 Brandon Chasco (S. Heppell) Oregon State University (NMFS Population Dynamics Fellowship)

2014–2015 Brian Stock (B. Semmens) SIO, with Tomo Eguchi

2015–2016 Hannah Linder (J. Horne) UW

Service and Outreach

Subject Editor, Ecological Applications 2013 - 2025

Subject Editor, PeerJ 2020 - present

Subject Editor, Methods in Ecology and Evolution 2022 - present

DFO - NOAA climate change working group 2021 - present

NOAA Fisheries Integrated Toolbox co-lead 2021 - present

Puget Sound Seabird Survey 2005-2021

Developed survey methodology for Puget Sound's first land-based citizen science seabird survey and oversaw data analysis

Orca Bowl Washington State Sea Grant / University of Washington

Secretary & Treasurer, Statistical Ecology Section, Ecological Society of America 2010-2012