

# Eric J. Ward

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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)

154. Indivero, J., S.C. Anderson, L.A.K. Barnett, T.E. Essington, and **E.J. Ward**. 2025. Estimating a physiological threshold to oxygen and temperature from marine monitoring data reveals challenges and opportunities for forecasting distribution shifts. *Ecography*, 2025:e07413. [link](#)
153. Odell, A.N., K.N. Marshall, **E.J. Ward**, K.F. Johnson, and M.L. Baskett. 2025. Spatiotemporal models reveal dynamic growth patterns in u.s. west coast groundfish. *bioRxiv*, .: [link](#)
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151. 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](#)
150. **Ward, E.J.**, P.A. English, C.N. Rooper, B.E. Ferriss, C.E. Whitmire, C.R. Wetzel, L.A.K. Barnett, S.C. Anderson, J.T. Thorson, K.F. Johnson, J. Indivero, and E.H. Markowitz. 2025. surveyjoin: a standardized database of scientific trawl surveys in the northeast pacific ocean. *PeerJ*, 13:e19964. [link](#)
149. Indivero, J., S.C. Anderson, L.A.K. Barnett, T.E. Essington, and **E.J. Ward**. 2025. Estimating a physiological threshold to oxygen and temperature from marine monitoring data reveals challenges and opportunities for forecasting distribution shifts. *Ecography*, 2025:e07413. [link](#)

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147. 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](#)
146. 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](#)
145. 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](#)
144. 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](#)
143. 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](#)
142. **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](#)
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](#)
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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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- salmon. *Canadian Journal of Fisheries and Aquatic Sciences*, 80:648-662. [link](#)
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  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](#)
  124. Davis, M.J., J. Anthony, **E.J. Ward**, J. Firman, and C. Lorion. 2023. Coherence among Oregon Coast coho salmon populations highlights increasing relative importance of marine conditions for productivity. *Fisheries Oceanography*, 32:293-310. [link](#)
  123. Good, T.P., J.E. Jannot, K.A. Somers, and **E.J. Ward**. 2022. Using Bayesian time series models to estimate bycatch of an endangered albatross. *Fisheries Research*, 256:106492. [link](#)
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  119. Ettinger, A., C. Harvey, J. Samhour, C. Emmons, M. Hanson, **E.J. Ward**, and J. Olson. 2022. Shifting phenology of an endangered apex predator tracks changes in its favored prey. *Endangered Species Research*, 48:211-223. [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](#)
111. Anderson, S.C., **E.J. Ward**, P.A. English, and L.A.K. Barnett. 2022. sdmTMB: an R package for fast, flexible, and user-friendly generalized linear mixed effects models with spatial and spatiotemporal random fields. *bioRxiv*, :. [link](#)
110. Commander, C., L.B. Barnett, **E.J. Ward**, S.C. Anderson, and T.E. Essington. 2022. The shadow model: how and why small choices in dynamic species distribution models affect predictions. *PeerJ*, :PeerJ 10:e12783. [link](#)
109. Schwoerer, T., R. Dial, J. Little, A. Martin, J. Morton, J. Schmidt, and **E.J. Ward**. 2022. Flight plan for the future: floatplane pilots and researchers team up to predict invasive species dispersal in Alaska. *Biological Invasions*, 24:1229–1245. [link](#)
108. Scheuerell, M., **E.J. Ward**, and S.L. Katz. 2021. Using replicate sampling and informative priors to improve estimates of species interaction strengths from time series data. *Limnology and Oceanography Letters*, :.
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](#)
106. Ohlberger, J., **E.J. Ward**, R. Brenner, M. Hunsicker, S. Haught, D. Finnoff, M. Litzow, T. Schwoerer, G. Ruggerone, and C. Hauri. 2021. Non-stationary and interactive effects of climate and competition on pink salmon productivity. *Global Change Biology*, 28:2026–2040. [link](#)
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](#)



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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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91. ICES, I. . . 2020. ICES workshop on unavoidable survey effort reduction (wkuser). *ICES Scientific Reports*, 2:72. [link](#)
90. Barnett, L., **E.J. Ward**, J.E. Jannot, and A.O. Shelton. 2019. Dynamic spatial heterogeneity reveals interdependence of marine faunal density and fishery

- removals. *Ecological Indicators*, 107:105585. [link](#)
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6. Lee, Y.-W., R. Gustafson, J. Jannot, J. McVeigh, N. Riley, K. Somers, V. Tuttle, S. Wang, **E. Ward**. 2015. The next link/button will exit from NWFSC web site Observed and Estimated Bycatch of Green Sturgeon in 2002–2013 US West Coast Groundfish Fisheries. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. [link](#)
5. Denton, K., M. McHenry, R. Moses, **E.J. Ward**, M. Liermann, O. Stefankiv, W. Wells and G. Pess. 2014 Elwha River Steelhead Escapement Estimate Based on DIDSON/ARIS Multi-Beam SONAR Data. Lower Elwha Tribe, Port Angeles, Washington.
4. Denton, K., M. McHenry, R. Moses, **E.J. Ward**, M. Liermann, O. Stefankiv, W. Wells and G. Pess. 2014 Elwha River Chinook Escapement Estimate Based on DIDSON/ARIS Multi-Beam SONAR Data. Lower Elwha Tribe, Port Angeles, Washington.
3. **E.J. Ward**, M.J. Ford, R.G. Kope, J.K.B. Ford, A. Velez-Espino, C.K. Parken, L. LaVoy, M.B. Hanson, K.C. Balcomb. Estimating the impacts of Chinook salmon abundance and prey removal by ocean fishing on Southern Resident killer whale

- population dynamics. 2013. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-123, 71 p. [link](#)
2. Stout, H.A., P.W. Lawson, D.L. Bottom, T.D. Cooney, M.J. Ford, C.E. Jordan, R.G. Kope, L.M. Kruzic, G.R. Pess, G.H. Reeves, M.D. Scheuerell, T.C. Wainwright, R.S. Waples, **E.J. Ward**, L.A. Weitkamp, J.G. Williams, and T.H. Williams. 2012. Scientific conclusions of the status review for Oregon coast coho salmon (*Oncorhynchus kisutch*). U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-118, 242 p. [link](#)
  1. Northwest Fisheries Science Center. 2011. Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species. NWFSC, NMFS. 2725 Montlake Blvd E, Seattle, WA. [link](#)

## 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. Samhour, 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