Sunny Jardine

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Education

Ph.D., Agricultural and Resource Economics, University of California at Davis, 2013

M.A., International Development Economics, University of San Francisco, 2008

B.S., Environmental Studies, SUNY College of Environmental Science and Forestry, 2002

Employment

Associate Professor, School of Marine and Environmental Affairs, University of Washington, September 2021-Present

> Rae S. and Bell M. Shimada Endowed Faculty Fellow in Memory of Warren S. Wooster, 2022-Present
>
> Faculty member, Quantitative Ecology and Resource Management Interdisciplinary Graduate Program, 2018-Present

Assistant Professor, School of Marine and Environmental Affairs, University of Washington, September 2016-Present

Assistant Professor, School of Marine Science and Policy, University of Delaware, September 2013-August 2016

> Faculty member, Department of Applied Economics and Statistics, University of Delaware, April 2014-August 2016

Journal Articles[1]

Van Deynze, B., Fonner, R., Feist, B. **Jardine, S.L.**, Holland, D.S. (*forthcoming*). Daniel S. Holland What influences spatial variability in restoration costs? Econometric cost models for inference and prediction in restoration planning. *Biological Conservation*.

Ziegler, J.P.*, **Jardine, S.L.**, Jones, S.E., van Poorten, B.T., Janssen, M.A., Solomon, C.T. (2021). Investing in the commons: transient welfare creates incentives despite open access. *Ecology and Society*, 26(2).

Fisher, M.C., Moore, S.K., **Jardine, S.L.**, Watson, J.R., Samhouri, J.F. (2021). Climate shock effects and mediation in fisheries. *Proceedings of the National Academy of Sciences*, 118(2).

Kroetz, K., Luque, G.M., Gephart, J.A., **Jardine, S.L.**, Lee, P., Moore, K.C., Cole, C., Steinkruger, A. and Donlan, C.J., (2020). Consequences of seafood mislabeling for marine populations and fisheries management. *Proceedings of the National Academy of Sciences*, 117(48), 30318-30323.

Jardine, S.L., Fisher, M.*, Moore, S., Samhouri, J. (2020). Inequality in the economic impacts from climate shocks in fisheries: the case of harmful algal blooms. *Ecological Economics*, 176, 106691.

Moore, S., Dreyer, S.J.*, Ekstrom, J.A., Moore, K., Norman, K., Klinger, T., Allison, E.H. and **Jardine, S.L.** (2020). Harmful algal blooms and coastal communities: socioeconomic impacts and actions taken to cope with the 2015 U.S. West Coast domoic acid event. *Harmful Algae*, 96, p.101799.

Mao, J.*, and **Jardine, S.L.** (2020). Market Impacts of a Toxic Algae Event: The Case of California Dungeness Crab, *Marine Resource Economics*, 35(1), 1-20.

Moore, K.M.*, Allison, E.H., Dreyer, S.J., Ekstrom, J.A., **Jardine, S.L.**, Klinger, T., Moore, S.K. and Norman, K.C. (2020). Harmful algal blooms: identifying effective adaptive actions used in fishery-dependent communities in response to a protracted event. *Frontiers in Marine Science*, 6, 1-12.

Sanderman, J., Hengl, T., Fiske, G., Solvik, K., Adame, M., Benson, L., Bukoski, J., Carnell, P., Cifuentes-Jara, M. , Donato, D., Duncan, C., Eid, E., zu Ermgassen, P., Ewers, C., Glass, L., Gress, S., **Jardine, S.L.**, Jones, T. , Macreadie, P., Nsombo, E., Rahman, M., Sanders, C., Spalding, M., Landis, E. (2018). Global mangrove forest soil carbon mapping at 30 m spatial resolution, *Environmental Research Letters*, 13(5), 055002.

[1]Postdoctoral and graduate student co-authors are indicated with an asterisk (∗).

Tan, Y.* and **Jardine, S.L.** (2018). Considering economic efficiency in ecosystem-based management: The case of horseshoe crabs in Delaware Bay, *Environmental and Resource Economics*, 72(2), 511-538.

Jardine, S.L., and Sanchirico, J.N. (2017). Estimating the cost of invasive species control, *Journal of Environmental Economics and Management*, 87, 242-257.

Jardine, S.L., and Sanchirico, J.N. (2015). Fishermen, markets, and population diversity. *Journal of Environmental Economics and Management*, 74, 37-54.

Jardine, S.L., and Siikamäki, J. (2014). A global predictive model of carbon in mangrove soils. *Environmental Research Letters* 9(10), 104013.

Jardine, S.L., C.-Y. C. Lin, and Sanchirico, J.N. (2014). Measuring the benefits from a marketing cooperative in the Copper River fishery. *American Journal of Agricultural Economics*, 96(4), 1084-1101.

Lampert, A., A. Hastings, E.D. Grosholz, **Jardine, S.L.**, and Sanchirico, J.N. (2014). Optimal approaches for balancing invasive species eradication and endangered species management. *Science* 344(6187), 1028-1031.

Siikamäki, J., J.N. Sanchirico, **S.L. Jardine**, D. McLaughlin, and Morris, D. (2013). Blue carbon: Coastal ecosystems, carbon storage, and potential for reducing emissions. *Environment: Science and Policy for Sustainable Development* 55(6), 14-29.

Siikamäki, J., Sanchirico, J.N., and **Jardine, S.L.** (2012). †Global economic potential for reducing carbon dioxide emissions from mangrove loss. *Proceedings of the National Academy of Sciences* 109(36), 14369-14374.

Jardine, S.L., and Sanchirico, J.N. (2012). Catch share programs in developing countries: A survey of the literature. *Marine Policy* 36(6), 1242-1254.

Other Publications

Jardine, S.L. 2019. Comments on the economic analysis in the Pebble Project Draft Environmental Impact Statement. Prepared for the Bristol Bay Regional Seafood Development Association. Submitted to the U.S. Army Corps of Engineers.

Siikamäki, J., Sanchirico, J.N., **Jardine, S.L.**, McLaughlin, D., and Morris, D. 2012. Blue carbon: Global options for reducing emissions from the degradation and development of coastal ecosystems.

Resources for the Future Report.

Jardine, S.L., and Sanchirico, J.N. 2012. 'Ecological economics'. In *Encyclopedia of Theoretical Ecology*, eds. A. Hastings and L. Gross. Berkeley: University of California Press., 213-218

Doerr, A., Cardenas, S., **Jardine, S.L.**, Yoon, H., Bucaram, S., and Sanchirico, J.N. 2013. Territorial use rights in fisheries (TURFs). In *Encyclopedia of Energy, Natural Resource, and Environmental Economics*, eds. J. Shogren. Newnes.

Research Grants

2022-2024: Integrating Economics and Ecology to Inform Climate-Ready Aquatic Invasive Species Management for Vulnerable Willamette Basin Communities, Northwest Climate Adaptation Science Center, US Geological Survey, Northwest, $346,791. B. Van Deynze and **S.L. Jardine** (PIs), Rebecca Flitcroft, Samuel Chan (co-PIs).

2022-2024: Maximizing returns on investing in barrier culvert removal in Washington state, Washington Sea Grant, National Oceanic and Atmospheric Administration, $255,592. **S.L. Jardine** (PI), B. Van Deynze, D.S. Holland, R. Fonner, M.D. Scheuerell (co-PIs).

2022: Assessing Marine Industry Compliance in the Crabber-Towboat Lane Agreement, National Working Waterfront Network, $5,000. **S.L. Jardine** (PI) and J. Keeton (co-PI).

2020-2024: HAB Socioeconomics - Evaluation of mitigation strategies for harmful algal blooms in the West Coast Dungeness crab fishery, National Ocean Service, National Oceanic and Atmospheric Administration, $1,097,739 ($320,926 to UW). D. Kling (PI), D. Holland, **S.L. Jardine**, J. Sanchirico, G. Sylvia (co-PIs).

2019: Columbia Basin salmon conservation planning, National Oceanic and Atmospheric Administration, $113,456. **S.L. Jardine** (PI).

2017-2021: CNH-L: Social-ecological dynamics of recreational fishery landscapes, National Science Foundation, Coupled Natural-Human Systems, $1,500,000 ($237,806 to UW). C.T. Solomon (PI), M.A. Janssen, **S.L. Jardine**, O.P. Jensen, S.E. Jones, and B.T. Van Poorten (co-PIs).

2016-2017: Identifying community needs and developing emergency response strategies for coastal fishing communities impacted by harmful algal blooms, The JPB Foundation, $500,000. T. Klinger (PI), E.H. Allison, S.J. Dreyer, **S.L. Jardine**, S. Moore (co-PIs).

2015-2016: Matching funds for the NOAA funded project: The economics of ecosystem services from oyster aquaculture, State of Delaware's Federal Research and Development Matching Grant

Program, $99,979. **S.L. Jardine** (PI), T. Li, K.D. Messer, G. Ozbay (co-PIs).

2016-2018: Managing for biodiversity and blue carbon in the face of sea-level rise and barrier-island migration, National Oceanic and Atmospheric Administration, Sea Grant, $527,888. C.J. Hein (PI), **S.L. Jardine**, K. Gedan, J.L. Trueba (co-PIs).

2014-2016: The economics of ecosystem services from oyster aquaculture, National Oceanic and Atmospheric Administration, Sea Grant, Aquaculture Research Program, $317,215. **S.L. Jardine** (PI), J.W. Ewart, M. Kecinski, K.D. Messer, G.R. Parsons, J.K. York (co-PIs).

2014-2016: A bioeconomic analysis of ecosystem-based horseshoe crab fishery management, National Oceanic and Atmospheric Administration, Delaware Sea Grant, $52,819. **S.L. Jardine** (PI).

2014-2016: Price seasonality and stock evolution, University of Delaware Research Foundation, $6,000. **S.L. Jardine** (PI).

Presentations

Invited Presentations

University of California, Davis, Eyes on the Ocean Seminar Series, Actively Managing Fishing Portfolios in Response to a Climate Shock, October 2022.

Workshop: Economic Research for Management of West Coast Salmon and Steelhead: Status, Needs, and Directions, Incorporating cost information and portfolio optimization methods into fish passage planning across Western Washington (presented with B. Van Deynze), June 2022.

University of Delaware, APEC Seminar, Endogenous Diversification in Fisheries, May 2021.

University of Stavanger, Business School Wednesday Webinar, The Market and Distributional Impacts of a HAB Event, September 2020.

Northwest Fisheries Science Center, Monster Jam Seminar Series, Considering economic efficiency in ecosystem-based management: The case of horseshoe crabs in Delaware Bay, December 2017.

University of Delaware, School of Marine Science and Policy, Global economic potential for reducing carbon dioxide emissions from mangrove loss, Guest Lecture, September 2017.

Workshop: Seafood a Global Commodity, Cocoa Beach, Florida, The distribution of benefits from MSC certification, November 2016.

Gulf of Maine Research Institute, Fishermen, markets, and population diversity, October 2014.

Colby College, Economics Department and the Environmental Studies Department, Fishermen, markets, and population diversity, Guest Lecture, October 2014.

Woods Hole Oceanographic Institute, Seminar Series, Fishermen, markets, and population diversity, March 2014.

Workshop: Salmon Markets and Aquaculture Production, The Norwegian University of Life Sciences, Fishermen, markets, and population diversity, August 2013.

Environmental Defense Fund, Catch share programs in developing countries: A survey of the literature, September 2012.

Conference Presentations

20^{th} Biennial Conference of the International Institute of Fisheries Economics and Trade, Investing in the commons: Transient welfare creates incentives despite open access, July 2022.

20^{th} Biennial Conference of the International Institute of Fisheries Economics and Trade, Investing in the commons: The spatial dynamics of renewable resource use, July 2022.

Association of Environmental and Resource Economists Annual Summer Conference, The spatial dynamics of renewable resource use, June 2020.

149^{th} annual meeting of the American Fisheries Society, Considering economic efficiency in ecosystem-based management: The case of horseshoe crabs in Delaware Bay, August 2018.

International Institution of Fisheries Economics and Trade, Considering economic efficiency in ecosystem-based management: The case of horseshoe crabs in Delaware Bay, July 2018. International scholarly meeting.

6^{th} World Congress of Environmental and Resource Economists, Estimating the cost of invasive species control, June 2018. International scholarly meeting.

Association of Environmental and Resource Economists Annual Summer Conference, Estimating the cost of invasive species control, June 2016. National scholarly meeting.

Northeastern Agricultural Economics Association Meeting, Estimating the cost of invasive species control, June 2015.

North American Association of Fisheries Economists Meeting, Fishermen, markets, and population diversity, May 2015.

North American Association of Fisheries Economists Meeting, Parameter estimation in bioeconomic systems, May 2015.

2014 World Congress of Environmental and Resource Economists, Fishermen, markets, and population diversity, June 2014.

2013 North American Association of Fisheries Economists Biennial Forum, Measuring benefits from a marketing cooperative in the Copper River fishery, May 2013.

2012 Agricultural and Applied Economics Association Annual Meeting, Measuring benefits from a marketing cooperative in the Copper River fishery, August 2012.

Presentations to a Nonprofessional or Public Audience

Annual Meeting of the North Pacific Marine Science Organization (PICES), GlobalHAB: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms: a Compendium of Case Studies, October 2019. Invited presentation to natural and physical scientists, resource managers, and the public.

Society for Freshwater Science, Making Waves podcast, Episode 40, May 2019.

Integration of Economics into Implementation Strategies for the Puget Sound Partnership, April 2019. Presentation to resource managers.

Professional Appointments

Associate Editor, *Marine Resource Economics*, July 2015-Present

Associate Editor, *Frontiers in Marine Science: Marine Affairs and Policy*, August 2020-2022

Scientific and Statistical Committee, Mid-Atlantic Fisheries Management Council, 2013 - 2016

Teaching

Spatial Data Workshop — Spring quarters: 2019, 2020, 2021

(Master's, University of Washington)

Applied Microeconomics for Marine Affairs — Winter quarters: 2017, 2018, 2019, 2020, 2021
(Master's, University of Washington)

Statistics for Marine and Environmental Policy — Fall quarters: 2016, 2017, 2018, 2019, 2020
(Master's, University of Washington)

Economics of Natural Resources — Fall semesters: 2014, 2015
(Master's, University of Delaware)

Environmental Policy Analysis — Spring 2015
(Undergraduate, University of Delaware)

Graduate Students and Post-doctoral Scholars

M.M.A., University of Washington, School of Marine and Environmental Affairs

Graduated in 2021: Kathryn Bland (thesis chair, topic: impacts of harmful algal blooms on Dungeness crab harvesters); Stuart Jones (thesis chair, topic: fisheries improvement programs)

Graduated in 2020: Louis Forristall (capstone advisor, topic: halibut bycatch in the Gulf of Alaska); Brittany Hoedemaker (courses only advisor); Elise Lasky (courses only advisor); Jon McVeigh (courses only advisor); Angela Moran (capstone advisor, topic: halibut bycatch in the Gulf of Alaska); Nicholas Nagengast (thesis chair, topic: recreational fisheries effort); Stephanie Wolek (courses only advisor)

Graduated in 2019: Katie Chicojay (capstone advisor, topic: groundfish individual fishing quota program); Emilie Franke (capstone advisor, topic: west coast groundfish individual fishing quota program); Kelly Martin (capstone advisor, topic: west coast groundfish individual fishing quota program); Priscilla Rivas (capstone advisor, topic: west coast groundfish individual fishing quota program); Alexandra Stote (thesis chair, topic: oyster restoration)

Graduated in 2018: Diana Perry (thesis chair, topic: impacts of harmful algal blooms on Dungeness crab harvesters); (Chair) Lange Solberg (thesis chair, topic: dual permits in the Bristol Bay salmon fishery)

M.A., University of Delaware, School of Marine Science and Policy

Graduated in 2017: Meredith Kurz (thesis co-chair, topic: marsh loss in barrier island systems)

Graduated in 2016: Jefferson Flood (thesis co-chair, topic: oyster restoration)

Ph.D., University of Delaware, School of Marine Science and Policy

Graduated in 2019: Lingxiao Yan (thesis co-chair, topic: marine natural resources and environmental economics)

Post-doctoral Scholars

2019 - Present: Braeden VanDeynze (research topic: cost effective salmon conservation)

2019 - 2021: Adam L. Hayes (research topic: coupled dynamics of recreational fishery landscapes)