3 January 2019

Dear Search Committee:

I am writing to apply for the position of Assistant Unit Leader for the Washington Cooperative Fish and Wildlife Research Unit at the University of Washington. I am currently a Research Fisheries Biologist at NOAA's Northwest Fisheries Science Center, and I am also an Affiliate Associate Professor in the School of Aquatic and Fishery Sciences at the University of Washington. I have a strong history of mentoring students, post-docs, and peers, and working in interdisciplinary groups to answer research questions and solve management problems.

I work on a variety of problems related to the conservation and management of aquatic resources, particularly along the west coast of North America. I have a strong background in field research, studying trophic interactions in aquatic food webs and the roles of habitat coupling in structuring ecosystem dynamics. Much of my more recent work has focused on the development of statistical methods for analyzing temporal and spatial data, and their application to freshwater and marine ecosystems. The results of my research have formed the basis for fisheries and habitat management decisions in Puget Sound and the Columbia River Basin, and contributed to the natural resource damage assessment following the Deepwater Horizon oil spill in the Gulf of Mexico.

I have devoted much of my career to outreach and the transfer of knowledge to others. Through instruction in formal courses, smaller workshops, and one-on-one mentoring, I strive to help others understand both the underlying concepts and how to apply the appropriate tools to address their problems. I have formally mentored early career scientists locally at our science center and nationally through programs at the Ecological Society of America. I also embrace an open science philosophy whereby I develop reproducible workflows and make them publicly available, something I believe should be emphasized more in graduate education.

I have a proven ability to communicate results and collaborate effectively as evident from my CV. I have published papers with numerous co-authors in a wide variety of general ecology and fisheries journals, often alongside students and post-docs. I have participated in a number of working groups sponsored by NSF, NCEAS, and USGS. I have also served on expert panels tasked with identifying causes of declines of Pacific salmon in Alaska, British Columbia, and Oregon.

Please find attached to this letter copies of my CV, which includes contact information for three professional references, and statements about my research, teaching, and diversity philosophies. Thank you for taking the time to consider my application.

Mark Scheuerell, Ph.D.

Research Interests and Approach

I am motivated by questions related to how natural and anthropogenic forces interact to affect the structure of aquatic ecosystems and the services we derive from them. Increasing demands on our natural resources and a changing climate will interact in ways no one can knowingly predict. I see our greatest opportunities for successfully dealing with the uncertainties about the future as coming directly from our ability to (1) separate the signals from the noise in our contemporary and historical data, and (2) identify the underlying sources of the noise. Thus, much of my current research focuses largely on the development of quantitative methods and their application to issues concerning the conservation of at-risk species and the management of commercially important resources.

For the past decade I have been collaborating with government and academic scientists to develop statistical models and associated software for the analysis of multivariate time series and spatial data. The general idea is to use specific forms of hierarchical models to uniquely model the true states of nature, such as density or location, and our observations of those states. This allows us to answer questions related to (1) the number of unique environmental processes from which the observed data arise, (2) the extent to which the observed data map onto each process, and (3) the magnitude of process noise relative to observation noise. We have extended these methods to studies of the effects of hatchery supplementation on endangered Pacific salmon, large-scale patterns in the abundance of groundfishes, and climate-induced changes in marine and freshwater food web interactions. The associated packages we have developed for the `R` programming language have been widely used by the broader scientific community as well.

More recently my colleagues and I have been developing integrated population models (IPMs) for steelhead in Puget Sound, coho on the Oregon Coast, and Chinook salmon in the Columbia River basin. Although IPMs are relatively common in assessments of birds and marine fishes, they are relatively new to salmon research. IPMs use a joint likelihood based on all of the available data, such that model outputs match the data rather than first pre-processing the data to match the model. In contrast to other population models, IPMs use the same model for the fitting and projection phases of the analysis, which means they more accurately and precisely account for all of the process and observation components of variance. We have used our IPMs to answer questions related to the anticipated effects of changing harvest, hatchery and flow management policies in light of uncertainty about future environmental variability.

I have also become much more interested in the socio-economic side of fisheries management and conservation of at-risk species. For example, I am presently working with an economist at Oregon State University on a valuation for estuary restoration work to benefit coho salmon populations. Collaborations such as this one have helped me to appreciate the different insights to be gained when addressing problems from a non-ecological viewpoint.

Teaching and Mentoring Philosophy

My approach to teaching is guided by my philosophy that an education is the best investment someone could ever make – once earned it can never be taken away. Furthermore, the value of that investment is directly related to extent that students learn by doing. Too often knowledge obtained through rote memorization, or the one-way delivery of information from teacher to student, cannot be readily applied to real world problems. Rather, we must instead demonstrate concepts and allow students to share in the experience of trying something new, making mistakes, and learning from them. Thus, I feel strongly that courses with integrated field and lab studies are critical for not only effectively transferring knowledge, but also capturing the interest and attention of students for the natural environment around them.

I always enjoyed mathematics as a student, but a variety of challenging quantitative courses during my Ph.D. studies really opened my eyes to a whole new world of applied math and statistics. Notably, the common thread throughout those courses was the instructors' strong reliance on computer exercises for demonstrating concepts like simulating population dynamics or estimating parameters in statistical models. In addition to witnessing firsthand how changing parameters or model forms can affect outputs and inference, I also learned valuable programming skills. Thus, I have also come to rely heavily on hands-on, in-class computer exercises when teaching everything from small workshops to full courses.

We now have software and platforms, such as Markdown and GitHub, which allow us to follow best practices with respect to what many call "data science". That is, in an age of increasing journal retractions and scientists' inability to successfully reproduce previous findings, it is increasingly important that we document every step of our workflow as we move from raw data, to analyses, to figures and tables. I would impress upon my students the critical importance of this and teach them the necessary tools and protocols.

I have experienced a number of unique challenges and opportunities as a government scientist for more than 15 years, which afford me some insights that others may not share. Most students finish graduate school with a good understanding of how to write grants, do research, and present their work in oral or written form. Unfortunately, however, many do not receive information on alternative career options, how to manage people and money, and opportunities for public outreach and service. I am committed to training well-rounded scientists who possess a diverse set of skills and broad understanding of their field.

Approach to fostering a diverse professional community

As a white male I am regularly aware of the many biases that exist in our field, and I have come to appreciate some of the challenges faced by other groups trying to get a foothold in science. Therefore, I strive to use my position of relative privilege to better assist underrepresented students in achieving their academic and professional goals. For example, I am currently a mentor with EcologyPlus, which connects diverse students and early career scientists with a support community of peers and professionals, and is sponsored by NSF's INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) Program.

I am committed to increasing diversity by explicitly recruiting graduate students, post-docs, and staff from diverse backgrounds. One important way to increase diversity is to focus on inclusion. As the father of two children with developmental and physical disabilities, I work daily to insure that they can share the same experiences as everyone else. If we are to truly integrate everyone into our society, must move towards a position of recognizing people for their strengths rather than focusing on their weaknesses. I believe that when we create an open, welcoming space that explicitly acknowledges the differences among us, we can better engage with one another and create positive outcomes for all. As such, I am absolutely committed to a workplace free from any form of harassment or misconduct. Simply stated, I want my students to not only become good scientists, but good citizens as well.

Mark D. Scheuerell

Curriculum vitae

Contact

Fish Ecology Division
Northwest Fisheries Science Center
2725 Montlake Blvd E
Seattle WA 98112

206.302.2437 (tel)
206.860.3267 (fax)
mark.scheuerell@noaa.gov
https://faculty.washington.edu/scheuerl

Education

Ph.D., Zoology, University of Washington (2002)

M.S., Fishery and Aquatic Science, Cornell University (1995)

B.S., Zoology, University of Wisconsin (1991)

Professional experience

Research Fisheries Biologist
Northwest Fisheries Science Center, NOAA Fisheries   2003 - present

Affiliate Associate Professor
School of Aquatic and Fishery Sciences, University of Washington   2016 - present

Affiliate Assistant Professor
School of Aquatic and Fishery Sciences, University of Washington   2007 - 2016

Post-doctoral Fellow
National Research Council, National Academies of Sciences   2002 - 2003

Fellowships

National Research Council Postdoctoral Research Associateship (2003)

Ford Foundation Fellowship in Environmental Science (2002)

National Science Foundation Graduate Research Training Grant in Mathematical Biology (1999)

Electric Power Research Institute Fellowship in Fish Population Biology (1994)

Awards & Honors

Presidential Early Career Award for Scientists and Engineers, White House Office of Science and Technology Policy, Washington, District of Columbia (2006)

Selection to the American Society of Limnology and Oceanography DIALOG V Symposium, Bermuda Biological Station for Research, The Bermuda Islands (2003)

Best Student Presentation, American Fisheries Society, Alaska Chapter Annual Meeting, Girdwood, Alaska (2002)

Best Student Presentation, Ecological Society of America Annual Meeting, Aquatic Section, Madison, Wisconsin (2001)

Ingrith Deyrup-Olsen Award for Distinguished Teaching Assistant, Department of Zoology, University of Washington, Seattle, Washington (2000)

Richard C. Snyder Award for Vertebrate Zoology Research, Department of Zoology, University of Washington, Seattle, Washington (1999)

Publications[*]

[*In review*]

Scheuerell MD, Ruff CP, Anderson JH, Beamer EM. Estimating density-dependent population dynamics in a variable environment with imperfect data.

Smits AP, *Ruffing CM*, Royer TV, Appling AP, *Griffiths NA*, *Bellmore R*, **Scheuerell MD**, Harms TK, Jones J. Detecting signals of large-scale climate phenomena on river flows and nitrogen, phosphorus, and silica loads in the Mississippi-Atchafalaya River basin.

[*In press or published*]

60. Hampton SE, **Scheuerell MD**, Church MJ, Melack JM. *In press.* Long-term perspectives in aquatic research. Limnology and Oceanography

59. Thorson JT, **Scheuerell MD**, Olden JD, Schindler DE. 2018. Spatial heterogeneity contributes more to portfolio effects than species differences in bottom-associated marine fishes. Proceedings of the Royal Society B 285:20180915

58. Ward EJ, *Oken K*, Rose KA, Sable S, Watkins K, Holmes EE, **Scheuerell MD**. 2018. Applying spatiotemporal models to monitoring data to quantify fish responses to the Deepwater Horizon oil spill in the Gulf of Mexico. Environmental Monitoring and Assessment 190:530

57. *Bal G*, **Scheuerell MD**, Ward EJ. 2018. Characterizing the strength of density dependence in at-risk species through Bayesian model averaging. Ecological Modelling 381:1-9

56. *Freshwater C*, Burke BJ, **Scheuerell MD**, Grant SCH, Trudel M, Juanes F. 2018. Coherent population dynamics associated with sockeye salmon juvenile life history strategies. Canadian Journal of Fisheries and Aquatic Sciences 75:1346–1356

55. Ardón M, Helton AM, **Scheuerell MD**, Bernhardt ES. 2017. Fertilizer legacies meet saltwater incursion: challenges and constraints for coastal plain wetland restoration. Elementa: Science of the Anthropocene 5:41

54. *Honea JM*, McClure MM, Jorgensen JC, **Scheuerell MD**. 2016. Assessing the vulnerability of freshwater life stages of Chinook salmon to climate change. Climate Research 71:127-137

53. *Goertler PAL*, **Scheuerell MD**, Simenstad CA, Bottom DL. 2016. Estimating common growth patterns in juvenile Chinook salmon (Oncorhynchus tshawytscha) from diverse genetic stocks and a large spatial extent. PLoS ONE 11:e0162121

52. [†]Thorson JT, Ianelli JN, Larsen EA, Ries L **Scheuerell MD**, Szuwalski CS, Zipkin EF. 2016. Joint dynamic species distribution models: a tool for community ordination and spatiotemporal monitoring. Global Ecology and Biogeography 25:1144–1158

51. *Ohlberger J*, **Scheuerell MD**, Schindler DE. 2016. Population coherence and environmental impacts across spatial scales: a case study of Chinook salmon. Ecosphere 7:e01333

50. Jorgensen JC, Ward EJ, **Scheuerell MD**, Zabel RW. 2016. Assessing spatial covariance among time series of abundance. Ecology and Evolution 6:2472–2485

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[*]Authors in italics were students or post-docs at the time the research was completed.
[†]All junior authors listed in alphabetical order.

49. **Scheuerell MD**. 2016. An explicit solution for calculating optimum spawning stock size from Ricker's stock recruitment model. PeerJ 4:e1623

48. Thorson JT, **Scheuerell MD**, Shelton AO, See K, Skaug H, Kristensen K. 2015. Spatial factor analysis: a new tool for estimating joint species distributions and correlations in species range. Methods in Ecology and Evolution 6:627-637

47. **Scheuerell MD**, Buhle ER, Semmens BX, Ford MJ, Cooney T, Carmichael RW. 2015. Analyzing large-scale conservation interventions with Bayesian hierarchical models: A case study of supplementing threatened Pacific salmon. Ecology and Evolution 5:2115–2125

46. *Lisi PJ*, Schindler DE, *Cline TJ*, **Scheuerell MD**, Walsh PB. 2015. Topography and snowmelt control stream thermal sensitivity to air temperature. Geophysical Research Letters 42:3380-3388

45. Thorson JT, **Scheuerell MD**, Semmens BX, Pattengill-Semmens C. 2014. Demographic modeling of citizen science data informs habitat preferences and population dynamics of recovering fishes. Ecology 95:3251-3258

44. *Francis TB*, *Wolkovich EM*, **Scheuerell MD**, Katz SL, Holmes EE, Hampton SE. 2014. Shifting regimes and changing interactions in the Lake Washington, U.S.A., plankton community from 1962–1994. PLoS ONE 9(10):e110363

43. *Griffiths JR*, Schindler DE, *Armstrong JB*, **Scheuerell MD**, Whited DC, Clarke RA, Hilborn R, Holt CA, Lindley ST, Stanford JA, Volk EC. 2014. Performance of salmon fishery portfolios across western North America. Journal of Applied Ecology 51:1554–1563

42. Williams JG, Smith SG, Fryer J, **Scheuerell MD**, Muir WD, Flagg TA, Zabel RW, Ferguson JW, Casillas E. 2014. Influence of ocean and freshwater conditions on Columbia River sockeye salmon adult return rates. Fisheries Oceanography 23:210–224

41. *Stachura MM*, Mantua NJ, **Scheuerell MD**. 2014. Oceanographic influences on spatio-temporal patterns in North Pacific salmon abundance. Canadian Journal of Fisheries and Aquatic Sciences 71:226-235

40. *Thorson JT*, **Scheuerell MD**, Buhle ER, Copeland T. 2014. Spatial diversity buffers temporal variability in early juvenile survival for an endangered Pacific salmon. Journal of Animal Ecology 83:157–167

39. Hampton SE, Holmes EE, *Scheef LP*, **Scheuerell MD**, Katz SL, *Pendleton DE*, Ward EJ. 2013. Quantifying effects of abiotic and biotic drivers on community dynamics with multivariate autoregressive (MAR) models. Ecology 94:2663–2669

38. *Holsman KK*, **Scheuerell MD**, *Buhle ER*, Emmett R. 2012. Interacting effects of translocation, artificial propagation, and environmental conditions on the marine survival of Chinook salmon from the Columbia River, Washington, U.S.A. Conservation Biology 26:912-922

37. *Francis TB*, **Scheuerell MD**, Brodeur R, Levin PS, Ruzicka JJ, Tolimieri N, Peterson WT. 2012. Climate shifts the interaction web of a marine plankton community. Global Change Biology 18:2498–2508

36. *Scheef LP*, *Pendleton DE*, Hampton SE, Katz SL, Holmes EE, **Scheuerell MD**, Johns DG. 2012. Assessing marine plankton community structure from long-term monitoring data with multivariate autoregressive (MAR) models: a comparison of fixed station versus spatially distributed sampling data. Limnology and Oceanography: Methods 10:54-64

35. Crozier LG, **Scheuerell MD**, Zabel RW. 2011. Using time series analysis to characterize evolutionary and plastic responses to environmental change: a case study of a shift toward earlier migration date in sockeye salmon. The American Naturalist 178:755-773

34. *Francis TB*, Schindler DE, Holtgrieve G, *Larson E*, **Scheuerell MD**, Semmens BX, Ward EJ. 2011. Habitat structure and energetic support for zooplankton in temperate lakes. Ecology Letters 14:364-372

33. **Scheuerell MD**, Zabel RW, Sandford BP. 2009. Relating juvenile migration timing and survival to adulthood in two species of threatened Pacific salmon (Oncorhynchus spp.). Journal of Applied Ecology 46:983–990

32. *Buhle ER*, *Holsman KK*, **Scheuerell MD**, Albaugh A. 2009. Using an unplanned experiment to evaluate the effects of hatcheries and environmental variation on threatened populations of wild salmon. Biological Conservation 142:2449–2455

31. *Rich HB*, Quinn TP, **Scheuerell MD**, Schindler DE. 2009. Climate and intra-specific competition control the growth and life history of juvenile sockeye salmon (Oncorhynchus nerka) in Iliamna Lake, Alaska. Canadian Journal of Fisheries and Aquatic Sciences 66:238-246

30. Anguilletta MJ, Steel EA, Bartz KK, Kingsolver JG, **Scheuerell MD**, Beckman BR, Crozier LG. 2008. Big dams and salmon evolution: changes in thermal regimes and their potential evolutionary consequences. Evolutionary Applications 1:286-299

29. Waples RS, Zabel RW, **Scheuerell MD**, Sanderson BL. 2008. Evolutionary responses by native species to major anthropogenic changes to their ecosystems: Pacific salmon in the Columbia River hydropower system. Molecular Ecology 17:84-96

28. **Scheuerell MD**, *Moore JW*, Schindler DE, Harvey CJ. 2007. Varying effects of anadromous sockeye salmon on the trophic ecology of two species of resident salmonids in southwest Alaska. Freshwater Biology 52:1944-1956

27. Hampton SE, **Scheuerell MD**, Schindler DE. 2006. Coalescence in the Lake Washington story: interaction strengths in a planktonic food web. Limnology and Oceanography 51:2042-2051

26. **Scheuerell MD**, Hilborn R, Ruckelshaus MH, Bartz KK, Lagueux KM, Hass AD, Rawson K. 2006. The Shiraz model: a tool for incorporating anthropogenic effects and fish-habitat relationships in conservation planning. Canadian Journal of Fisheries and Aquatic Sciences 63:1596-1607

25. Bartz KK, Lagueux KM, **Scheuerell MD**, Beechie TJ, Ruckelshaus MH. 2006. Translating restoration scenarios into habitat conditions: an initial step in evaluating recovery strategies for Chinook salmon (Oncorhynchus tshawytscha). Canadian Journal of Fisheries and Aquatic Sciences 63:1578-1595

24. Zabel RW, **Scheuerell MD**, McClure MM, Williams JG. 2006. The interplay between climate variability and density dependence in the population viability of Chinook salmon. Conservation Biology 20:190-200

23. Scheuerell JM, Schindler DE, **Scheuerell MD**, Fresh KL, Litt AH, Shepherd JA, Sibley T. 2005. Temporal dynamics in foraging behavior of a pelagic predator. Canadian Journal of Fisheries and Aquatic Sciences 62:2494-2501

22. **Scheuerell MD**, Williams JG. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon. Fisheries Oceanography 14:448-457

21. **Scheuerell MD**. 2005. The influence of juvenile size on the age at maturity of individually-marked wild Chinook salmon. Transactions of the American Fisheries Society 134:999-1004

20. Romare P, Schindler DE, **Scheuerell MD**, Scheuerell JM, Litt AH, Shepherd JH. 2005. Variation in spatial and temporal gradients in zooplankton spring development: the effect of climatic factors. Freshwater Biology 50:1007-1021

19. **Scheuerell MD**, Levin PS, Zabel RW, Williams JG, Sanderson BL. 2005. A new perspective on the importance of marine-derived nutrients to threatened stocks of Pacific salmon (Oncorhynchus sp.). Canadian Journal of Fisheries and Aquatic Sciences 62:961-964

18. Schindler DE, Rogers DE, **Scheuerell MD**, Abrey CA. 2005. Effects of changing climate on zooplankton and juvenile sockeye salmon growth in southwestern Alaska. Ecology 86:198-209

17. **Scheuerell MD**. 2004. Quantifying aggregation and association in three dimensional landscapes. Ecology 85:2332-2340

16. Beauchamp DA, Sergeant CJ, Mazur MM, *Scheuerell JM*, Schindler DE, **Scheuerell MD**, Fresh KL, Seiler DE, Quinn TP. 2004. Spatial-temporal dynamics of early feeding demand and food supply by sockeye salmon fry in Lake Washington. Transactions of the American Fisheries Society 133:1014-1032

15. **Scheuerell MD**, Schindler DE. 2004. Changes in the spatial distribution of fishes in lakes along a residential development gradient. Ecosystems 7:98-106

14. *Moore JW*, Schindler DE, **Scheuerell MD**. 2004. Disturbance of freshwater habitats by anadromous salmon in Alaska. Oecologia 139:298-308

13. [‡]Hilborn R, *Branch TA*, *Ernst B*, *Magnusson A*, *Minte-Vera CV*, **Scheuerell MD**, Valero JL. 2003. State of the world's fisheries. Annual Review of Environment and Resources 23:359-399

12. **Scheuerell MD**, Schindler DE. 2003. Diel vertical migration by juvenile sockeye salmon: empirical evidence for the antipredation window. Ecology 84:1713-1720

11. Schindler DE, **Scheuerell MD**, *Moore JW*, Gende SM, *Francis TB*, *Palen WJ*. 2003. Pacific salmon and the ecology of coastal ecosystems. Frontiers in Ecology and the Environment 1:31-37

10. *Moore JW*, Schindler DE, **Scheuerell MD**, Smith D, Frodge J. 2003. Lake eutrophication at the urban fringe. Ambio 32:13-18

9. **Scheuerell MD**, Schindler DE, Litt AH, Edmondson WT. 2002. Environmental and algal forcing of Daphnia production dynamics. Limnology and Oceanography 47:1477-1485

8. Schindler DE, **Scheuerell MD**. 2002. Habitat coupling in lake ecosystems. Oikos 98:177-189

7. Rudstam LG, Van de Valk A, **Scheuerell MD**. 2002. Comparison of acoustic and standard estimates of larval fish abundance in Oneida Lake, New York. Fisheries Research 57:145-154

6. Delany MF, Lockley TC, Pranty B, **Scheuerell MD**. 2000. Stomach contents of two nestling Florida Grasshopper Sparrows. Florida Field Naturalist 28:75-77

5. Perkins DW, Vickery PD, Dean TF, **Scheuerell MD**. 1998. Nesting records and reproductive success of Florida Grasshopper Sparrows (Ammodramus savannarum floridanus). Florida Field Naturalist 26:7-17.

4. Pranty B, **Scheuerell MD**. 1997. First summer record of the Henslow's Sparrow in Florida. Florida Field Naturalist 25:64-66

3. Mills EL, **Scheuerell MD**, Carlton JT, Strayer DL. 1997. Biological invasions in the Hudson River: an inventory and historical analysis. Bulletin of the New York State Museum 57:1-51

2. Mills EL, Strayer DL, **Scheuerell MD**, Carlton JT. 1996. Exotic species in the Hudson River basin: a history of invasions and introductions. Estuaries 19:814-823

1. He X, [§]Scheurell MD, Soranno PA, Wright RA. 1994. Recurrent response patterns of a zooplankton community to whole-lake fish manipulation. Freshwater Biology 32:61-72

Book chapters

Scheuerell MD, Hilborn R. 2009. Estimating the freshwater component of essential fish habitat for Pacific salmon (*Oncorhynchus* spp.) with the Shiraz model. Pages 187-202 in Knudsen EE, Michael H (Eds.). *Pacific Salmon Environmental and Life History Models: Advancing Science for Sustainable Salmon in*

[‡]All junior authors listed in alphabetical order.

[§]"Scheuerell" misspelled in final printing.

the Future. American Fisheries Society Symposium 71. Bethesda, Maryland.

Fresh KL, Graeber W, Bartz KK, Davies JR, **Scheuerell MD**, Haas A, Ruckelshaus MH, Sanderson BL. 2009. Incorporating spatial structure and diversity into recovery planning for anadromous Pacific salmonids. Pages 403-428 in Knudsen EE, Michael H (Eds.). *Pacific Salmon Environmental and Life History Models: Advancing Science for Sustainable Salmon in the Future.* American Fisheries Society Symposium 71. Bethesda, Maryland.

Dini ML, Soranno PA, **Scheuerell MD**, Carpenter SR. 1993. Effects of predators and food supply on diel vertical migration of Daphnia. Pages 153-171 in Carpenter SR, Kitchell JF (Eds.) *The Trophic Cascade in Lakes.* Cambridge University Press, Cambridge, England.

Other publications

Buhle ER, **Scheuerell MD**, Cooney TD, Ford MJ, Zabel RW, Thorson JT. 2018. Using Integrated Population Models to Evaluate Fishery and Environmental Impacts on Pacific Salmon Viability. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-140.

Holmes EE, Ward EJ, **Scheuerell MD**. 2018. Analysis of multivariate time-series using the MARSS package, Version 3.10.8. http://cran.r-project.org/web/packages/MARSS/vignettes/UserGuide.pdf.

Schindler D, Krueger C, Bisson P, Bradford M, Clark B, Conitz J, Howard K, Jones M, Murphy J, Myers K, **Scheuerell M**, Volk E, Winton J. 2013. Arctic-Yukon-Kuskokwim Chinook Salmon Research Action Plan: Evidence of Decline of Chinook Salmon Populations and Recommendations for Future Research. Prepared for the AYK Sustainable Salmon Initiative, Anchorage, Alaska. v + 70 p.

Stout HA, Lawson PW, Bottom DL, Cooney TD, Ford MJ, Jordan CE, Kope RG, Kruzic LM, Pess GR, Reeves GH, **Scheuerell MD**, Wainwright TC, Waples RS, Ward E, Weitkamp LA, Williams JG, Williams TH. 2012. Scientific conclusions of the status review for Oregon coast coho salmon (*Oncorhynchus kisutch*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-118.

Peterman RM, Marmorek D, Beckman B, Bradford M, Mantua N, Riddell BE, **Scheuerell M**, Staley M, Wieckowski K, Winton JR, Wood CC. 2010. Synthesis of evidence from a workshop on the decline of Fraser River sockeye. June 15-17, 2010. Report to the Pacific Salmon Commission, Vancouver, British Columbia. 158 p.

Scheuerell MD. 2005. Mapping the status of Pacific salmon [book review]. Trends in Ecology & Evolution 20:290-291

Williams JG, Smith SG, Zabel RW, Muir WD, **Scheuerell MD**, Sandford BP, Marsh DM, McNatt R, Achord S. 2005. Effects of the Federal Columbia River Power System on salmonid populations. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-63.

Technical products

Holmes EE, Ward EJ, **Scheuerell MD**, Willis K. 2018. MARSS: Multivariate Autoregressive State-Space Modeling. R Package Version 3.10.8 https://cran.r-project.org/web/packages/MARSS/index.html

Ward EJ, **Scheuerell MD**, Holmes EE. 2018. atsar: Applied Time Series Analysis in R: an introduction to time series analysis for ecological and fisheries data with Stan. R Package Version 1.0.1 https://doi.org/10.5281/zenodo.1158021

Scheuerell MD. 2017. muti - An R package for computing mutual information. R Package Version 1.0.0 https://doi.org/10.5281/zenodo.439391

Invited presentations

Improved understanding of fisheries and ecosystems from noisy and disparate data. University of Alaska Fairbanks, College of Fisheries and Ocean Sciences, September 26, 2018, Fairbanks, Alaska

The development and application of new tools in quantitative ecology. Western Society of Naturalists Meeting, November 17, 2017, Pasadena, California

Estimating density-dependent population dynamics in a variable environment with imperfect data. Department of Fisheries and Wildlife, Oregon State University, May 1, 2017, Corvallis, Oregon

Analyzing large-scale conservation interventions with Bayesian hierarchical models: A case study of supplementing threatened Pacific salmon. American Fisheries Society Meeting, August 19, 2015, Portland, Oregon

Analyzing temporal dynamics of Pacific salmon and their ecosystems. Simon Fraser University, October 27, 2011, Burnaby, British Columbia

Great minds do not think alike: a diversity of collaborators aids in analyses of marine communities. Salish Sea Ecosystem Conference, October 25, 2011, Vancouver, British Columbia

Analyzing large-scale ecosystem experiments with Bayesian state-space models: a case study of hatcheries and Pacific salmon. American Society of Limnology and Oceanography Meeting, June 10, 2010, Santa Fe, New Mexico

An integrated approach to assessing vulnerability of Pacific salmon stocks to climate change. American Fisheries Society Annual Meeting, September 13, 2010, Pittsburgh, Pennsylvania

Evaluating large-scale effects of hatchery supplementation on threatened spring/summer Chinook salmon from the Snake River basin, USA. State of the Salmon 2010 Conference on Ecological Interactions between Wild and Hatchery Salmon, May 5, 2010, Portland, Oregon

Using stable isotopes to inform river restoration science. Western Division of the American Fisheries Society Annual Meeting, May 7, 2008, Portland, Oregon

Forecasting climate-induced shifts in the marine survival of salmon. P/ICES Conference on New Frontiers in Marine Science, June 28, 2007, Baltimore, Maryland

A sea change in the conservation of Pacific salmon: addressing climate variation and human impacts in an uncertain future. School of Aquatic and Fisheries Sciences, University of Washington, November 30, 2006, Seattle, Washington

Potential impacts of agriculture and habitat modification on Pacific Salmon. Environmental Studies Planning Unit, The Evergreen State College, November 17, 2005, Olympia, Washington

Interactive effects of climate change and human activities on the population dynamics of Pacific salmon. Department of Fisheries and Wildlife, University of Idaho, October 11, 2005, Moscow, Idaho

Estimating essential fish habitat for Pacific salmon with the Shiraz model. American Fisheries Society Annual Meeting, September 14, 2005, Anchorage, Alaska

Anthropogenic causes of a state shift in a large river ecosystem: Chinook salmon and the Snake River basin Department of Watershed Sciences, Utah State University, February 2, 2005, Logan, Utah

Tipping the scales: balancing natural and human impacts on lakes. American Society of Limnology and Oceanography DIALOG V Symposium, October 20, 2003, Bermuda Biological Station for Research

A model framework for relating life-history, freshwater habitat, and the ocean environment to Pacific salmon production and capacity. American Fisheries Society Alaska Chapter Annual Meeting, October 22, 2002, Girdwood, Alaska

Impacts of lakeshore residential development on the spatial distribution and energy sources of fishes. American Society of Limnology and Oceanography Aquatic Sciences Meeting, June 13, 2002, Victoria, British Columbia

External support

North Pacific Research Board ($82k) 2017-2018. Retrospective analysis of long-term census data to identify factors affecting survival and life history strategies of coho salmon (Collaborator with Tallmon, Vulstek)

NOAA Fisheries And The Environment (FATE) Program ($147k) 2015-2016. Improving salmon population forecasts by combining environmental drivers, variable age composition, and spatial structure into hierarchical models (PI with Thorson)

Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative ($340k) 2013-2014. Multivariate analysis of factors affecting AYK Chinook salmon (co-PI with Hilborn, Schindler, Mantua)

NSF-NOAA Comparative Analysis of Marine Ecosystem Organization (CAMEO) Program ($347k) 2009-2010. New statistical tools for analyzing community dynamics with applications to marine zooplankton (co-PI with Hampton, Holmes, Ward, Katz)

BPA FCRPS Biological Implementation Program ($299k) 2007-2009. Evaluating density-dependent effects of hatchery production on wild salmon (sole PI)

BPA FCRPS Biological Implementation Program ($297k) 2007-2009. Evaluating the effects of estuarine and ocean arrival timing on salmon survival from an ecosystem perspective (sole PI)

NOAA Fisheries And The Environment (FATE) Program ($118k) 2006-2007. Developing quantitative tools to forecast the effects of climate variability on the population dynamics of Pacific salmon (PI with Zabel, Mantua)

Society membership

Ecological Society of America

> *Secretary*, Aquatic Ecology Section (2008-2009)

Association for the Sciences of Limnology and Oceanography

American Fisheries Society

> *Chair*, Committee for the Mercer Patriarche *N Am J Fish Manag* Best Paper Award (2006)

Editorial responsibilities

Associate Editor, *Limnology and Oceanography Letters* (2016-present)

Guest Editor, *Ecological Applications* (2009-present)

Special Issue Editor, *Limnology and Oceanography* (2017-2018)

Associate Editor, *Ecological Research* (2007-2017)

Outstanding Reviewer, *Canadian Journal of Fisheries and Aquatic Sciences* (2017)

Manuscript reviewer for

> *Behavioural Ecology · Canadian Journal of Fisheries and Aquatic Sciences · Canadian Journal of Zoology · Conservation Biology · Ecography · Ecological Applications · Ecological Modelling · Ecology · Ecology and Society · Ecology Letters · Ecosphere · Ecosystems · Environmental Biology of Fishes · Fisheries Oceanography · Freshwater Biology · Frontiers in Ecology and the Environment · Global Change Biol-*

ogy · Journal of Animal Ecology · Journal of Applied Ecology · Journal of Bioeconomics · Limnology and Oceanography · North American Journal of Fisheries Management · Oecologia · Oikos · PLoS Biology · PLoS ONE · Proceedings of the National Academy of Sciences · Transactions of the American Fisheries Society · Trends in Ecology and Evolution

National & international service

Mentor, EcologyPlus Program from NSF INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) (2018-present)

Mentor, Ecological Society of America Early Career Ecologist Mentorship Program (2017)

Mentor, Stream Resilience Research Coordination Network, Working Group 2 - Time Series Analysis (2015-2016)

Analyst, U.S. Departments of Commerce and Justice, Deepwater Horizon National Resource Damage Assessment (2014-2015)

Member, Chinook Salmon Expert Panel, Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative (2011-2012)

Member, Expert Advisory Panel, Pacific Salmon Commission Bilateral Scientific Workshop to Examine the Decline in Fraser River Sockeye (2010)

Member, Biological Review Team, National Marine Fisheries Service Risk Assessment of Oregon Coast Coho Salmon (2009-2010)

Teaching experience

Applied Time Series Analysis in Fisheries and Environmental Sciences
Visiting Instructor, University of Washington   2013 - present

Limnology; *Fisheries Stock Assessment*; *Water & Society*
Guest Lecturer, University of Washington   1999 - present

Applied Time Series Analyses for Ecologists
Visiting Instructor, Stockholm University   2014

Theory and Application of Stable Isotopes in Ecology
Visiting Instructor, University of Washington   2005 - 2007

Limnology; *Vertebrate Zoology*; *Comparative Vertebrate Anatomy*
Teaching Assistant, University of Washington   1997 - 2000

Trainees

Post-doctoral

Guillaume Bal (co-advised with EJ Ward)

Eric Buhle

Kirstin Holsman

Daniel Pendleton (co-advised with EE Holmes)

Jim Thorson (co-advised with EE Holmes & EJ Ward)

Ph.D. students

Caitlin Magel, Oregon St Univ (ad-hoc committee member)

Tessa Francis, Univ Washington (committee member)

M.S. students

Jessica Beetz, Univ Washington (committee member)

Pascale Goertler, Univ Washington (ad hoc committee member)

Casey Ralston, Univ Washington (committee member)

Harry Rich, Univ Washington (ad-hoc committee member)

Megan Stachura, Univ Washington (ad-hoc committee member)

Undergraduate students

Christina Murphy, Oregon St Univ (NOAA Ernest F. Hollings Undergraduate Scholarship Program)

Professional references

Dr. Daniel Schindler
School of Aquatic and Fishery Sciences
University of Washington
PO Box 355020
Seattle, WA 98195
(206) 616-6724
deschind@uw.edu

Dr. Ray Hilborn
School of Aquatic and Fishery Sciences
University of Washington
PO Box 355020
Seattle, WA 98195
(206) 543-3587
rayh@uw.edu

Dr. Eric Ward
Conservation Biology Division
Northwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Blvd E
Seattle, WA 98112
(206) 302-1745
eric.ward@noaa.gov