JEFFREY J. HARD

Curriculum Vitae

CONTACT INFORMATION

National Marine Fisheries Service
Northwest Fisheries Science Center
Conservation Biology Division
2725 Montlake Boulevard East
Seattle, Washington 98112 USA
Tel: (206) 860-3275
Fax: (206) 860-3335
E-mail: jeff.hard@noaa.gov
Website: http://www.nwfsc.noaa.gov

RESEARCH INTERESTS

Evolution of life histories
Quantitative genetics
Conservation biology
Genetic and ecological consequences of harvest and propagation
Experimental design and statistical analysis

EDUCATION

1991	Ph.D. Ecology and Evolutionary Biology, University of Oregon, Eugene
1984	M.S. Fisheries, University of Alaska, Juneau
1979	B.S. Biology, Oregon State University, Corvallis (with high honors; Chemistry minor)

EXPERIENCE

1997-	Population Biology Program Manager and Supervisory Research Fishery Biologist, Conservation Biology Division, U.S. Department of Commerce, NMFS, Northwest Fisheries Science Center, Seattle, Washington
2002	Supervisory Research Fishery Biologist and Acting Director, Conservation Biology Division, U.S. Department of Commerce, NMFS, Northwest Fisheries Science Center, Seattle, Washington
1992-97	Research Fishery Biologist, U.S. Department of Commerce, NMFS, Northwest Fisheries Science Center, Seattle, Washington
1986-91	Graduate Research Fellow, Department of Biology, University of Oregon, Eugene
1982-86	Fishery Research Biologist, U.S. Department of Commerce, NMFS, Auke Bay Laboratory and Little Port Walter Field Station, Alaska
1978-82	Fishery Technician, U.S. Department of Commerce, NMFS, Auke Bay Laboratory and Little Port Walter Field Station, Alaska
1977	Biological Technician, U.S. Department of Commerce, NMFS, Auke Bay Laboratory, Alaska
1975-76	Research Assistant, Institute of Marine Science, University of Alaska, Fairbanks, Alaska, and CEPEX (Controlled Ecosystem Pollution EXperiment) Project, Patricia Bay Laboratory, Sidney, B.C., Canada
1975	Biological Technician, U.S. Department of Commerce, NMFS, Auke Bay Laboratory, Alaska

AWARDS, FELLOWSHIPS, AND HONORS

2000-05	U.S. Department of Commerce Special Act Awards (5 total)
1996	U.S. Department of Commerce Group Bronze Medal, Endangered Species Act Coastwide Status Reviews for Pacific Salmon

1996 U.S. Department of Commerce Group Bronze Medal, Genetics Project
1994-95 U.S. Department of Commerce Certificate of Recognition
1993 Finalist, Young Investigator's Prize, Society of American Naturalists
1992 National Research Council Post-doctoral Fellowship (award offered)
1990-91 National Institutes of Health Genetics Training Grant (pre-doctoral fellowship)
1989 Elected to Sigma Xi
1988-91 Graduate Research Fellowship, University of Oregon
1987-88 Coca-Cola Scholarship, University of Oregon
1986-88 Graduate Teaching Fellowship, University of Oregon
1986 Finalist, American Fisheries Society Publications Awards for Best Publication in the Transactions of the American Fisheries Society
1985-86 U.S. Department of Commerce Sustained Superior Performance Award
1981-84 U.S. Department of Commerce Advanced Studies Program
1974-76 Alaska Stateroom Scholarship, University of Alaska

PROFESSIONAL AFFILIATIONS AND CERTIFICATIONS

2008- Affiliate Associate Professor of Fisheries, University of Washington, School of Aquatic and Fishery Sciences
2005- Mentor, NMFS - Sea Grant Joint Graduate Fellowship Program in Population Dynamics and Marine Resource Economics
2000- National Research Council Post-doctoral Research Advisor
1998- Affiliate Associate Professor of Fisheries, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
1996- American Association for the Advancement of Science, Member
1989- Sigma Xi: The Scientific Research Society, Member
1984- American Institute of Fishery Research Biologists, Member
1982- American Fisheries Society (Certified Fisheries Scientist, 1986; President, Genetics Section, 2004-2006)

FUNDED RESEARCH PROPOSALS

2007- What is the relative importance of evolutionary vs. plastic responses of Pacific salmon to climate change? Gordon and Betty Moore Foundation (R. Waples, NWFSC, and N. Mantua and D. Schindler, University of Washington, P.I.s). Funding support limited to workshop travel, coordinated through the National Center for Ecological Analysis and Synthesis, Santa Barbara, CA.
2007- Heritability of Traits in Wild Kuskokwim R. Chinook, Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative, $224,261 awarded (J. Olsen, J. Wenburg, and K. Harper, USFWS, co-P.I.s)
2006- Determine how hatchery domestication reduces fitness of naturally spawning salmon and identify ways to reduce these harmful effects (BiOp: Strategies and Substrategies; Hatchery Strategy 2), NMFS Biological Opinion Remand funding, $1,477,500 awarded (K. A. Naish, University of Washington, co-P.I.)
2006- Selective Fishery Impacts on Yukon R. Chinook, Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative, $183,005 awarded (J.F. Bromaghin, USFWS, R. Nielson and L. McDonald, Western EcoSystems Technology, Inc., co-P.I.s)
2000-03 Heritability of Disease Resistance and Immune Function in Chinook Salmon, Bonneville Power Administration FY-2000 Initiative, $200,000 awarded (D. E. Campton, USFWS; D. G. Elliott and R. J. Pascho, USGS, co-P.I.s)
2000-03 Differences in Natural Production Between Hatchery and Wild Coho: Reproductive Competence as Influenced by Degree of Hatchery Ancestry, Hatchery Scientific Review Group, Interagency Committee for Outdoor Recreation, $340,000 awarded (H. J. Fuss, P. L. Hulett, and C. S. Sharpe, WDFW; K. P. Currens, NWIFC; and M. J. Ford, NWFSC, co-P.I.s)
1996-05 Outbreeding Depression in Pacific Salmon, NOAA/NMFS Recover Protected Species Initiative, Project NWC-P18, $1,250,000 awarded

1993-06 Quantitative Genetic Consequences of Captive Broodstock Programs for Pacific Salmon, Bonneville Power Administration, Project 93-56, $1,800,000 awarded (K. A. Naish, University of Washington, co-P.I.)

PUBLICATIONS

Refereed Research Papers

1. Hard, J. J., W. H. Eldridge, and K. A. Naish. *In press.* Genetic consequences of size-selective fishing: implications for viability of Chinook salmon from the Arctic-Yukon-Kuskokwim region of Alaska. Submitted to the proceedings of the symposium on Sustainability of the Arctic-Yukon-Kuskokwim Salmon Fisheries: What Do We Know About Salmon Ecology, Management, and Fisheries? Alaska Sea Grant & American Fisheries Society.

2. Neely, K. G., J. M. Myers, J. J. Hard, and K. D. Shearer. *In press*. Comparison of growth, feed intake, and nutrient efficiency in a selected strain of coho salmon (*Oncorhynchus kisutch*) and its source stock. Aquaculture.

3. Thrower, F. P., and J. J. Hard. *In press.* Effects of a single event of close inbreeding on growth and survival in steelhead. Conservation Genetics.

4. Johnson, O. W., M. H. Ruckelshaus, W. S. Grant, F. W. Waknitz, A. M. Garrett, G. J. Bryant, K. Neely, and J. J. Hard. *In press*. Coastwide status review of coastal cutthroat trout (*Oncorhynchus clarki clarki*) by the National Marine Fisheries Service for listing under the Endangered Species Act. North American Journal of Fisheries Management.

5. Ford, M. J., J. J. Hard, B. Boelts, E. LaHood, and J. M. Miller. 2008. Estimates of natural selection in a salmon population in captive and natural environments. Conservation Biology 22:783-794.

6. Gustafson, R. G., R. S. Waples, J. M. Myers, L. Weitkamp, G. J. Bryant, O. W. Johnson, and J. J. Hard. 2007. Pacific salmon extinctions: quantifying lost and remaining diversity. Conservation Biology 21:1009-1020.

7. Hard, J. J., D. G. Elliott, R. G. Pascho, D. M. Chase, L. K. Park, J. R. Winton, and D. E. Campton. 2006. Genetic effects of ELISA-based segregation for control of bacterial kidney disease in Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 63:2793-2808.

8. Hard, J. J., L. S. Mills, and J. M. Peek. 2006. Genetic implications of reduced survival of male red deer *Cervus elaphus* under harvest. Wildlife Biology 12:427-441.

9. Ford, M. J., H. Fuss, B. Boelts, E. LaHood, J. Hard, and J. Miller. 2006. Changes in run timing and natural smolt production in a naturally spawning coho salmon (*Oncorhynchus kisutch*) population after 60 years of intensive hatchery supplementation. Canadian Journal of Fisheries and Aquatic Sciences 63:2343-2355.

10. McClelland, E. K., J. M. Myers, J. J. Hard, L. K. Park, and K. A. Naish. 2005. Two generations of outbreeding in coho salmon (*Oncorhynchus kisutch*): effects on size and growth. Canadian Journal of Fisheries and Aquatic Sciences 62:2538-2547.

11. Smoker, W. W., I. A. Wang, A. J. Gharrett, and J. J. Hard. 2004. Embryo survival and smolt to adult survival in second-generation outbred coho salmon. Journal of Fish Biology 65 (Suppl. A):254-262.

12. Thrower, F. P., J. J. Hard, and J. E. Joyce. 2004. Genetic architecture of growth and early life history transitions in anadromous and derived freshwater populations of steelhead (*Oncorhynchus mykiss*). Journal of Fish Biology 65 (Suppl. A):286-307.

13. Granath, K. L., W. W. Smoker, A. J. Gharrett, and J. J. Hard. 2004. Effects on embryo development time

and survival of intercrossing three geographically separate populations of southeast Alaska coho salmon (*Oncorhynchus kisutch*). Environmental Biology of Fishes 69:299-306.

14. Waples, R. S., R. G. Gustafson, L. A. Weitkamp, J. M. Myers, O. W. Johnson, P. J. Busby, J. J. Hard, G. J. Bryant, F. W. Waknitz, K. Neely, D. Teel, W. S. Grant, G. A. Winans, S. Phelps, A. Marshall, and B. M. Baker. 2001. Characterizing diversity in Pacific salmon from the Pacific Northwest. Journal of Fish Biology 59(a):1-41.

15. Hard, J. J., L. Connell, W. K. Hershberger, and L. W. Harrell. 2000. Genetic variation in mortality of chinook salmon (*Oncorhynchus tshawytscha*) during a bloom of the marine alga *Heterosigma akashiwo.* Journal of Fish Biology 56:1387-1397.

16. Hard, J. J., B. A. Berejikian, E. P. Tezak, S. L. Schroder, C. M. Knudsen, and L. T. Parker. 2000. Evidence for morphometric differentiation of wild and captively reared coho salmon: a geometric analysis. Environmental Biology of Fishes 58(1):61-73.

17. Hard, J. J., G. A. Winans, and J. C. Richardson. 1999. Phenotypic and genetic architecture of juvenile morphometry in chinook salmon. Journal of Heredity 90(6):597-606.

18. Hard, J. J., and W. R. Heard. 1999. Analysis of straying variation in Alaskan hatchery chinook salmon following transplantation. Canadian Journal of Fisheries and Aquatic Sciences 56:578-589.

19. Berejikian, B. A., E. P. Tezak, S. L. Schroder, C. M. Knudsen, and J. J. Hard. 1997. Reproductive behavioral interactions between wild and captively reared coho salmon (*Oncorhynchus kisutch*). ICES Journal of Marine Science 54:1040-1050.

20. Bradshaw, W. E., C. M. Holzapfel, C. A. Kleckner, and J. J. Hard. 1997. Heritability of development time and protandry in the pitcher-plant mosquito, *Wyeomyia smithii*. Ecology 78:969-976.

21. Hard, J. J., W. E. Bradshaw, and C. M. Holzapfel. 1993. Genetic coordination of demography and phenology in the pitcher-plant mosquito, *Wyeomyia smithii*. Journal of Evolutionary Biology 6:707-723.

22. Hard, J. J., W. E. Bradshaw, and C. M. Holzapfel. 1993. The genetic basis of photoperiodism and its divergence among populations of the pitcher-plant mosquito, *Wyeomyia smithii*. The American Naturalist 142(3):457-473.

23. Hard, J. J., and W. E. Bradshaw. 1993. Reproductive allocation in the western tree-hole mosquito, *Aedes sierrensis*. Oikos 66(1):55-65.

24. Hard, J. J., W. E. Bradshaw, and C. M. Holzapfel. 1992. Epistasis and the divergence of photoperiodism between populations of the pitcher-plant mosquito, *Wyeomyia smithii*. Genetics 131:389-396.

25. Courtney, S. P., and J. J. Hard. 1990. Host acceptance and life-history traits in *Drosophila busckii*: tests of the hierarchy-threshold model. Heredity 64(1990):371-375.

26. Hard, J. J., W. E. Bradshaw, and D. J. Malarkey. 1989. Resource- and density-dependent development in tree-hole mosquitoes. Oikos 54(2):137-144.

27. Hard, J. J., A. C. Wertheimer, and W. F. Johnson. 1989. Geographic variation in the occurrence of red- and white-fleshed chinook salmon (*Oncorhynchus tshawytscha*) in western North America. Canadian Journal of Fisheries and Aquatic Sciences 46(7):1107-1113.

28. Hard, J. J. 1986. Production and yield of juvenile chinook salmon in two Alaskan lakes. Transactions of the American Fisheries Society 115(2):305-313.

29. Hard, J. J., A. C. Wertheimer, W. R. Heard, and R. M. Martin. 1985. Early male maturity in two stocks of chinook salmon (*Oncorhynchus tshawytscha*) transplanted to an experimental hatchery in southeastern Alaska. Aquaculture 48(1985):351-359.

Refereed Review Papers, Syntheses, and Book Chapters

1. Hard, J. J. *In press.* Case study of Pacific salmon. *In* U. Dieckmann, O. R. Godø, M. Heino, and J. Mork (editors), Fisheries-Induced Adaptive Change. Cambridge Studies in Adaptive Dynamics, Cambridge University Press, UK.

2. Hard, J. J., M. R. Gross, M. Heino, R. Hilborn, R. G. Kope, R. Law, and J. D. Reynolds. 2008. Evolutionary consequences of fishing and their implications for salmon. Evolutionary Applications 1:388-408. *Invited review.*

3. Kapuscinski, A. R., J. J. Hard, R. Neira, K. M. Paulson, A. Ponniah, W. Kamonrat, W. Mwanja, I. A. Fleming, J. Gallardo, R. H. Devlin, and J. Trisak. 2007. Approaches to assessing gene flow. *In* A. R. Kapuscinski, S. Li, K. R. Hayes, and G. Dana (editors), Environmental Risk Assessment of Genetically Modified Organisms, Vol 3: Methodologies for Transgenic Fish, p. 112-150. CABI International, Wallingford, Oxfordshire, UK.

4. Senanan, W., J. J. Hard, A. Alcivar-Warren, J. Trisak, M. Zakaraia-Ismail, and M. L. Hernandez. 2007. Risk management: post-approval monitoring and remediation. *In* A. R. Kapuscinski, S. Li, K. R. Hayes, and G. Dana (editors), Environmental Risk Assessment of Genetically Modified Organisms, Vol 3: Methodologies for Transgenic Fish, p. 272-290. CABI International, Wallingford, Oxfordshire, UK.

5. Hard, J. J. 2004. Evolution of chinook salmon life history under size-selective harvest. *In* A. Hendry and S. Stearns (editors), Evolution Illuminated: Salmon and Their Relatives, p. 315-337, Oxford University Press.

6. Wang, S., J. J. Hard, and F. Utter. 2002. Salmonid inbreeding: a review. Reviews in Fish Biology and Fisheries 11:301-319.

7. Wang, S., J. J. Hard, and F. Utter. 2002. Genetic variation and fitness in salmonids. Conservation Genetics 3:321-333.

8. Hard, J. J., R. G. Kope, and W. S. Grant. 2000. Endangered Species Act review of the status of pink salmon from Washington, Oregon, and California. *In* E. E. Knudsen, C. R. Steward, D. D. MacDonald, J. E. Williams, and D. W. Reiser (editors), Sustainable Fisheries Management: Pacific Salmon, p. 103-110, Lewis Publishers, Boca Raton, FL.

9. Hard, J. J. 1995. A quantitative genetic perspective on the conservation of intraspecific diversity. American Fisheries Society Symposium 17:304-326. *Invited review.*

10. Hard, J. J. 1995. Genetic monitoring of life-history characters in salmon supplementation: problems and opportunities. American Fisheries Society Symposium 15:212-225.

11. Hard, J. J. 1995. Science, education, and the fisheries scientist. Fisheries 20(3):10-16.

12. Hard, J. J. 1987. All the kings' colors. Alaska Fish & Game 19(4):4-5.

Conference Proceedings

1. Gustafson, R., J. Myers, L. Weitkamp, O. Johnson, and J. Hard. Pacific salmon extinctions: quantifying lost and remaining diversity. 2007. Proceedings of the First Annual Northwest Fisheries Science Center Symposium, "Looking to the Past to Envision the Future," 12-13 December 2006, Seattle, Washington.

2. Hard, J. J. 2002. Genetic risks of hatchery salmon production to wild salmon. *In* C. Orr, P. Gallaugher, and J. Penikett (editors), Hatcheries and the protection of wild salmon, p. 72-85. Speaking for the Salmon workshop proceedings, Centre for Coastal Studies and Continuing Studies in Science at Simon Fraser University, Burnaby, B.C.

3. Hard, J. J. 2002. Update on the status of pink salmon in the Pacific Northwest. *In* K. Neely, O. W. Johnson, K. W. Myers, and J. J. Hard (rapporteurs), Proceedings 20th Northeast Pacific Pink and Chum Workshop, Seattle, Washington.

4. Neely, K., O. W. Johnson, K. W. Myers, and J. J. Hard (rapporteurs). 2002. Proceedings 20th Northeast Pacific Pink and Chum Workshop, Seattle, Washington.

5. Johnson, O. W., A. M. Garrett, W. S. Grant, K. Neely, M. H. Ruckelshaus, F. W. Waknitz, and J. J. Hard. 2001. Summary of status review of coastal cutthroat trout from the Pacific northwest. Pages 255-257 in Brewin, M. K., A. J. Paul, and M. Monita (editors). Bull trout II conference proceedings. Trout Unlimited Canada, Calgary, Alberta. *Peer reviewed.*

6. Hard, J. J. 2000. Genetic interactions between wild and cultured salmon. *In* P. Gallaugher and C. Orr (editors), Aquaculture and the protection of wild salmon, p. 8-18. Speaking for the Salmon workshop proceedings, Continuing Studies in Science at Simon Fraser University, Burnaby, B.C.

7. Hard, J. J. 1999. Status review of pink salmon in the Pacific Northwest. *In* S. Hawkins (rapporteur), Proceedings of the 19th Northeast Pacific Pink and Chum Salmon Workshop, p. 166-173, Juneau, Alaska.

Technical Reports

1. Hard, J. J., J. M. Myers, M. J. Ford, R. G. Kope, G. R. Pess, R. S. Waples, G. A. Winans, B. A. Berejikian, F. W. Waknitz, P. B. Adams, P. A. Bisson, D. E. Campton, and R. R. Reisenbichler. 2007. Status Review of Puget Sound Steelhead (*Oncorhynchus mykiss*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC 81: 117 p. *Peer reviewed*.

2. Hard, J.J., and K.A. Naish. 2007. Evaluate effects of inbreeding and inbreeding depression. In B.A. Berejikian (editor), Research on captive broodstock programs for Pacific salmon, 2006-2007 Annual report, Project No. 199305600, p. xxx-xxx. Available Bonneville Power Administration (BPA Report DOE/BP-xx-x, xx electronic pages), Environment Fish and Wildlife, P.O. Box 3621, Portland, OR 97208.

3. Hard, J.J., and K.A. Naish. 2006. Evaluate effects of inbreeding and inbreeding depression. In B.A. Berejikian (editor), Research on captive broodstock programs for Pacific salmon, 2005-2006 Annual report, Project No. 199305600, p. 100-125. Available Bonneville Power Administration (BPA Report DOE/BP-xx-x, xx electronic pages), Environment Fish and Wildlife, P.O. Box 3621, Portland, OR 97208.

4. Hard, J. J., J. M. Myers, F. W. Waknitz, and the members of the Biological Review Team. 2005. Status review update for Puget Sound steelhead. Report submitted to NOAA/NMFS Northwest Regional Office, Seattle, Washington, 26 July 2005, 70 p. + 4 appendices.

5. Hard, J.J., and K.A. Naish. 2005. Evaluate effects of inbreeding and inbreeding depression. In B.A. Berejikian (editor), Research on captive broodstock programs for Pacific salmon, 2004-2005 Annual report, Project No. 199305600, p. 138-160. Available Bonneville Power Administration (BPA Report DOE/BP-00017690-1, 162 electronic pages), Environment Fish and Wildlife, P.O. Box 3621, Portland, OR 97208.

6. Hard, J.J., and K.A. Naish. 2004. Evaluate effects of inbreeding and inbreeding depression. In B.A. Berejikian (editor), Research on captive broodstock programs for Pacific salmon, 2003-2004 Annual report, Project No. 199305600, p.164-189. Available Bonneville Power Administration (BPA Report DOE/BP-00005227-4, 190 electronic pages), Environment Fish and Wildlife, P.O. Box 3621, Portland, OR 97208.

7. Peek, J. M., M. S. Boyce, E. O. Garton, J. J. Hard, and L. S. Mills. 2002. Risks involved in current management of elk in Washington. Final report to Washington Department of Fish and Wildlife and Washington Wildlife Commission, Olympia, WA, 99 p. October 2002.

8. Hard, J. J. 2002. Inbreeding. In B. A. Berejikian (editor), Research on captive broodstock programs for Pacific salmon, p. 96-110. Annual Report to Bonneville Power Administration, Project No. 93-056-00 (Contract No. 00005227).

9. Fuss, H. J., C. Sharpe, M. J. Ford, J. J. Hard, and E. LaHood. 2001. Differences in natural production between hatchery and wild coho salmon in Minter Creek, Washington. Annual Report to the Hatchery Scientific Research Group, Seattle, WA, June 2001.

10. Hard, J. J. 2001. Inbreeding. In B. Berejikian and C. Nash (editors), Research on captive broodstock programs for Pacific salmon, p. 86-94. Annual Report to Bonneville Power Administration, Project No. 93-056-00 (Contract No. 00005227).

11. Hard, J. J. 2000. Inbreeding. Pages 111-116 *In* B. Berejikian (editor), Research on captive broodstock programs for Pacific salmon. Report to Bonneville Power Administration, Contract No. 1999A117859, Project No. 199305600, 124 electronic pages (BPA Report DOE/BP-17859-1), June 2000. (Available http://www.efw.bpa.gov/Environment/EW/EWP/DOCS/REPORTS/HATCHERY/A17859-1.pdf)

12. Ford, M. J., and J. J. Hard. 2000. Does traditional hatchery production help conserve wild salmon – a comment on the Fall Creek coho hatchery controversy. Unpubl. manuscript, 9 p., available as an Adobe Acrobat file from http://www.nwfsc.noaa.gov/cbd/LannanResponse.pdf.

13. Johnson, O. J., M. H. Ruckelshaus, W. S. Grant, F. W. Waknitz, A. M. Garrett, G. J. Bryant, K. M. Neely, and J. J. Hard. 1999. Status review of coastal cutthroat trout from Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-37, 292 p. *Peer reviewed.*

14. Hard, J. J. 1997. Genetic effects of salmon hatcheries: outbreeding depression, artificial selection, and fitness. *In* Proceedings of Outbreeding Depression: A Research Planning Workshop. University of Alaska, Juneau, 2-5 March.

15. Hard, J. J., R. G. Kope, W. S. Grant, F. W. Waknitz, L. T. Parker, and R. S. Waples. 1996. Status review of pink salmon from Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-25, 131 p. *Peer reviewed.*

16. Hard, J. J., and W. K. Hershberger. 1996. Research on quantitative genetic consequences of captive broodstock programs for Pacific salmon populations. In P. Swanson and 8 coauthors: Research on captive broodstock programs for Pacific salmon, Part VIII, p. 8-1 to 8-28. Annual report to Bonneville Power Administration, Contract No. AI79-93BP55064, Proj. No. 93-56.

17. Hard, J. J., and W. K. Hershberger. 1995. Quantitative genetic consequences of captive broodstock programs for anadromous Pacific salmon (*Oncorhynchus* spp.). *In* T. A. Flagg and C. V. W. Mahnken (editors), An assessment of the status of captive broodstock technology for Pacific salmon, p. 2-1 to 2-75. Final Report to Bonneville Power Administration, Project No. 93-56 (Contract No. DE-AI79-93BP55064), June 1995.

18. Hard, J. J. 1994. Genetics and salmon management: expanded summary of a panel discussion. *In* L. K. Park, P. Moran, and R. S. Waples (editors), Applications of DNA technology to the management of Pacific salmon: proceedings of the workshop, p. 151-163. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-17, 178 p. *Peer reviewed.*

19. Hard, J. J. 1994. Density dependence, ecological carrying capacity, and Pacific salmon: a summary report. Memorandum to NMFS Northwest Regional Office from NMFS Northwest Fisheries Science Center, Seattle, Washington.

20. National Marine Fisheries Service (NMFS). 1993. Interim policy on artificial propagation of Pacific salmon under the Endangered Species Act. Federal Register [Docket No. 921186-2286; April 5, 1993] 58(63): 17573-17576

21. Hard, J. J., R. P. Jones, Jr., M. R. Delarm, and R. S. Waples. 1992. Pacific salmon and artificial propagation under the Endangered Species Act. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-2, 56 p. *Peer reviewed.*

22. Hard, J. J. 1991. Life-history evolution in the pitcher-plant mosquito, *Wyeomyia smithii*. Doctoral dissertation, University of Oregon, Eugene, 100 p.

23. Hard, J. J. 1986. Flesh color variation in chinook salmon (*Oncorhynchus tshawytscha*) at Little Port Walter, southeastern Alaska. U.S. Department of Commerce, NOAA Technical Memorandum NMFS F/NWC-109, 30 p.

Manuscripts in preparation or review

1. Bromaghin, J. F., R. M. Nielson, and J. J. Hard. Genetic responses in size and age of Yukon River Chinook salmon to size-selective fishing. Transactions of the American Fisheries Society. *In preparation.*

2. Naish, K. A., and J. J. Hard. Bridging the gap: molecular genetics, adaptive variation and phenotypic traits. In: Hauser, L., R. S. Waples, and G. R. Carvalho (editors), Advances in Marine Fish and Fisheries Genetics. Special Issue of Fish and Fisheries. *Invited review, in preparation.*

3. Eldridge, W. H., J. J. Hard, and K. A. Naish. Harvest strategies and fisheries-induced evolution in Chinook salmon: the role of genetic correlations among life history traits. Submitted to Ecological Applications. *In review.*

4. Kendall, N., J. J. Hard, and T. P. Quinn. Quantifying six decades of fishery selection for size and age at maturity in sockeye salmon. Submitted to Ecological Applications. *In review.*

5. Bromaghin, J. F., R. M. Nielson, and J. J. Hard. Transforming between multivariate normal densities. Submitted to American Statistician. *In review.*

CONFERENCE AND SYMPOSIA PAPERS

Invited

1. 2008 What we know--and need to know--about fisheries-induced evolution in salmonids. Symposium on "Evolving fish, changing fisheries," Annual meeting of the American Fisheries Society, Ottawa, ON, Canada, 17-21 August (with M. R. Gross, M. Heino, R. Hilborn, R. G. Kope, R. Law, and J. D. Reynolds)
2. 2008 Is size-selective fishing responsible for the declining size of Yukon River chinook salmon? Symposium on "Contributions of genetic principles and technology to sustainable fisheries: concepts, challenges, and case studies," Annual meeting of the American Fisheries Society, Ottawa, ON, Canada, 17-21 August (with J. F. Bromaghin and R. M. Nielson)
3. 2008 Why both within- and between-population diversity are essential to conserve fitness in the wild: a lesson from Alaskan steelhead. Symposium on "Contributions of genetic principles and technology to sustainable fisheries: concepts, challenges, and case studies," Annual meeting of the American Fisheries Society, Ottawa, ON, Canada, 17-21 August (with F. P. Thrower)
4. 2008 Evolution of growth, precocious maturation, and smoltification in anadromous and derived freshwater forms of southeast Alaskan steelhead. 11th West Coast Steelhead Meeting, Boise, Idaho, 3-5 March

5. 2007 An evolutionary approach to evaluating the consequences of selective harvest for salmon life history. Sustainability of the Arctic-Yukon-Kuskokwim Salmon Fisheries: What Do We Know About Salmon Ecology, Management, and Fisheries? Anchorage, Alaska, 6-9 February
6. 2006 Variation in growth, precocious maturation, smoltification, and marine survival in anadromous and derived freshwater forms of southeast Alaskan *Oncorhynchus mykiss*: implications for conservation of steelhead. 10th West Coast Steelhead Meeting, Port Townsend, Washington, 7-9 March
7. 2005 Genetic variation in disease resistance of chinook salmon (*Oncorhynchus tshawytscha*) exposed to two bacterial pathogens. Symposium on Bacterial Kidney Disease - Challenge for the 21st Century, Seattle, Washington, 15-17 November
8. 2005 Differentiation of wild Alaskan anadromous and derived freshwater populations of *Oncorhynchus mykiss* in neutral and adaptive traits: implications for conservation and recovery of steelhead. Annual meeting of the American Fisheries Society, Anchorage, Alaska, 11-15 September
9. 2004 Evaluating the potential for fisheries-induced evolutionary change in salmonids. Annual meeting of the American Fisheries Society, Madison, Wisconsin, 21-26 August
10. 2004 Potential outbreeding depression between an anadromous population of steelhead (*Oncorhynchus mykiss*) and an outplanted population partially isolated for 70 years and subjected to founder effects. Annual meeting of the American Fisheries Society, Madison, Wisconsin, 21-26 August (with F. P. Thrower and J. E. Joyce)
11. 2004 Quantitative genetics and conservation: applying a proven tool to emerging problems. Plenary address, workshop on Conservation Genetics Workshop on Imperiled Freshwater Molluscs and Fishes, Freshwater Mollusc Conservation Society, Shepherdstown, West Virginia, June
12. 2002 Constraint and opportunity: the complex role genetic architecture plays in adaptation. Keynote address, symposium on Genetic Basis, Architecture, and Determinants of Fitness-related Traits in Fishes, Congress on Ecological and Evolutionary Ethology of Fishes, Quebec City, Quebec, Canada, 16-19 August
13. 2002 Inbreeding and its consequences: what do we know and need to know? Workshop on Captive Broodstocks for Recovery of Imperiled Salmonid Populations, Gig Harbor, Washington, 25-26 June
14. 2002 Evaluating benefits and risks of hatchery salmon production: why the controversy? Salmonid Restoration Conference, Ukiah, California, 2-3 March
15. 2001 Some current issues related to the culture of Pacific salmon for enhancement. Cultivation of Salmon II Symposium, Bergen, Norway, 6-10 May (with K. D. Shearer, M. Strom, and W. Fairgreave)
16. 2001 Update on the status of pink salmon in the Pacific Northwest. 20th Northeast Pacific Pink and Chum Workshop, Seattle, Washington, 21-23 March
17. 2001 Evolution of salmon life history under size-selective harvest. Symposium on Fisheries-Induced Adaptive Change, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, 14-17 March
18. 2000 Defining units of salmon conservation: the challenge of interpreting biological diversity. Symposium on Evolutionary Ecology of Pacific Salmon (S-8), Society for Conservation Biology, Missoula, Montana, 5-9 June (with P. J. Busby, R. G. Gustafson, O. W. Johnson, J. M. Myers, and L. A. Weitkamp)
19. 2000 Consequences of inbreeding for survival and growth of captively reared chinook salmon: preliminary results. Fish and Fisheries in the Columbia River Basin: The Science Behind the Decisions, Annual Meeting of Oregon Chapter, American Fisheries Society, Eugene, Oregon, 16-18 February
20. 1999 Status of pink salmon in the Pacific Northwest. 19th Pink and Chum Salmon Workshop, Juneau, Alaska
21. 1996 Review of the status of pink salmon from Washington, Oregon, California, and Idaho. Conference on Towards Sustainable Fisheries: Balancing Conservation and Use of Salmon and Steelhead in the Pacific Northwest, Victoria, British Columbia (with R. G. Kope and W. S. Grant)
22. 1994 Artificial propagation of Pacific salmon under the Endangered Species Act: constraints and opportunities. Northwest Fish Culture Conference, Sunriver, Oregon (with R. S. Waples)
23. 1994 A quantitative genetic perspective on the conservation of intraspecific diversity. American Fisheries Society Symposium on Evolution and the Aquatic Ecosystem, Monterey, California
24. 1993 Life-history characteristics as a genetic concern in the use of artificial propagation for management of natural fish populations. Symposium on Problem-Solving Research for Management: Shared Responsibilities, 123rd annual meeting of the American Fisheries Society, Portland, Oregon

25. 1984 Precocious male maturity in two stocks of chinook salmon transplanted to an experimental hatchery in southeastern Alaska. IV International Conference on the Biology of Pacific Salmon, Victoria and Agassiz, B.C., Canada

Contributed

1. 2007 Implications of size-selective mortality for viability in an exploited salmon population. American Fisheries Society Annual Conference, San Francisco, CA, 2-6 September (with W. H. Eldridge and K. A. Naish)
2. 2006 Potential trade-offs in resistance of chinook salmon (*Oncorhynchus tshawytscha*) to two bacterial pathogens resulting from selection of broodstock based on antigen level. International Association for Genetics in Aquaculture, Montpellier, France, 26-30 June
3. 2006 It's up to the girls…. or is it? Genetic analysis of maternal and parental contributions to early development in Chinook salmon. Coastwide Salmonid Genetics Meeting, Santa Cruz, California, 22-24 June (with K. A. Naish)
4. 2004 Heritability of precocious maturation, smolting and growth in anadromous and derived freshwater populations of steelhead (*Oncorhynchus mykiss*). Annual international conference of the Fisheries Society of the British Isles, London, 19-23 July (with F. P. Thrower and J. E. Joyce)
5. 2004 No effect on embryo survival or smolt to adult survival at sea in second generation of outbreeding of coho salmon. Annual international conference of the Fisheries Society of the British Isles, London, 19-23 July (with W. W. Smoker, I. A. Wang, and A. J. Gharrett)
6. 2004 Quantitative genetic analysis of chinook salmon resistance to two bacterial pathogens. Coastwide Genetics Workshop, Newport, Oregon, 17-18 June (poster with L. Park, R. Pascho, D. Elliott, D. Chase, and D. Campton)
7. 2003 Inheritance of age at maturity in Alaskan chinook salmon under size-selective harvest. Annual meeting of the American Fisheries Society, Quebec City, Quebec, Canada, 10-14 August
8. 2002 Consequences of size-selective fishing for evolution of chinook salmon life history. 20th Lowell Wakefield Fisheries Symposium on Genetics of Subpolar fish and Invertebrates, Juneau, Alaska, 29-31 May
9. 2002 Effects on embryo development time and survival of intercrossing three geographically separate stocks of southeast Alaska coho salmon (*Oncorhynchus kisutch*). 20th Lowell Wakefield Fisheries Symposium on Genetics of Subpolar fish and Invertebrates, Juneau, Alaska, 29-31 May (with K. L. Granath, W. W. Smoker, and A. J. Gharrett)
10. 2002 Relative fitness of hatchery and natural coho salmon spawning in Minter Creek, Washington. 20th Lowell Wakefield Fisheries Symposium on Genetics of Subpolar fish and Invertebrates, Juneau, Alaska, 29-31 May (with M. Ford, E. LaHood, B. Berejikian, H. Fuss, C. Sharpe, and P. Hulett)
11. 1999 Reproductive success in naturally spawning wild and captively-reared coho salmon (*Oncorhynchus kisutch*). 1999 Joint Meeting of the American Society of Ichthyologists and Herpetologists and the American Ecological Society, Pennsylvania State University, June (with L. Park, B. Berejikian, and E. LaHood)
12. 1999 Phenotypic and genetic architecture of body size and shape in juvenile chinook salmon. Coastwide Genetics Workshop, Missoula, Montana (poster with G. A. Winans)
13. 1997 Phenotypic and genetic architecture of body shape in juvenile chinook salmon. 127th annual meeting of the American Fisheries Society, Monterey, California (with G. A. Winans)
14. 1997 Genetic variation in body size and shape of juvenile chinook salmon. 77th annual meeting of the American Society of Ichthyologists and Herpetologists, Seattle, Washington (poster with G. A. Winans and J. C. Richardson)
15. 1997 Genetic variation in multivariate morphometry of juvenile chinook salmon (*Oncorhynchus tshawytscha*). American Association for the Advancement of Science Annual Meeting and Science Innovation Exposition, Seattle, Washington (poster with G. A. Winans and J. C. Richardson)
16. 1997 The use of microsatellite markers to assess reproductive success in naturally spawning wild and captively-reared coho salmon (*Oncorhynchus kisutch*). American Association for the Advancement of Science Annual Meeting and Science Innovation Exposition, Seattle, Washington (poster with L. Park, B. Berejikian, E. Tezak, S. Schroder, and C. Knudsen)

17. 1995 To propagate or not to propagate: toward a risk/benefit analysis for threatened salmon populations. Conference on Propagation and Recovery of Threatened and Endangered Species, Newport, Oregon (with R. S. Waples)
18. 1994 Genetic monitoring of life-history characters in supplementation of salmon populations: problems and opportunities. American Fisheries Society Symposium on Uses and Effects of Cultured Fishes in Aquatic Ecosystems, Albuquerque, New Mexico
19. 1991 Homing and straying in two stocks of transplanted chinook salmon. International Symposium on Biological Interactions of Enhanced and Wild Salmonids, Nanaimo, B.C., Canada (with W. R. Heard)
20. 1991 Genetic coordination of life-history tactics in the pitcher-plant mosquito, *Wyeomyia smithii*. Twelfth Annual Pacific Ecology Conference, Oregon Institute of Marine Biology, Charleston
21. 1989 Geographic variation in the occurrence of red- and white-fleshed chinook salmon: Genetic drift or natural selection? 1989 Joint Conference of the Western Association of Fish and Wildlife Agencies and Western Division of American Fisheries Society, Seattle, Washington
22. 1989 Variation in clutch and egg size in a mosquito. Tenth Annual Pacific Ecology Conference, Oregon Institute of Marine Biology, Charleston
23. 1988 Reproductive allocation in the western tree-hole mosquito, *Aedes sierrensis.* XVIII International Congress of Entomology, University of British Columbia, Vancouver, B.C., Canada
24. 1985 Effect of cestode parasitism on yield of chinook salmon from Osprey Lake, Alaska. Annual Meeting of Alaska Chapter, American Fisheries Society, Kodiak
25. 1983 Suitability of fishless lakes in southeastern Alaska as rearing habitat for chinook salmon. Annual Meeting of Alaska Chapter, American Fisheries Society, Soldotna

SEMINARS AND WORKSHOPS

Invited

1. 2007 Life history variation in anadromous and resident wild Alaskan *Oncorhynchus mykiss*: implications for conservation of steelhead. Grey Wolf Fly Fishing Club, Port Townsend, Washington, 9 May
2. 2006 Size-selective fishing and its implications for salmon. Yukon River Drainage Fisheries Association meeting, Anchorage, Alaska, 30 October
3. 2004 Genetic variation in life history in anadromous and derived freshwater forms of *Oncorhynchus mykiss*, Independent Scientific Advisory Board, Seattle, Washington, 8 December
4. 2004 Genetic variation in life history in anadromous and derived freshwater forms of *Oncorhynchus mykiss*, Recovery Science Review Panel, Santa Cruz, California, 1 December
5. 2004 An evolutionary look at size-selective harvest of chinook salmon, Independent Scientific Advisory Board Seattle, Washington, 25 February
6. 2004 Consequences of interbreeding among coho salmon populations: preliminary results, Hatchery Scientific Research Group, Seattle, Washington, 9 February
7. 2004 An evolutionary look at size-selective harvest of chinook salmon, University of Washington, School of Fishery and Aquatic Sciences, Seattle, Washington, 5 February
8. 2003 Genetics issues in hatcheries and captive breeding programs, University of Washington, School of Fishery and Aquatic Sciences, Seattle, Washington, 26 November
9. 2003 Collaborative development of a CALFED proposal to reprogram California salmon production hatcheries for research, Sacramento, California, 27 March
10. 2002 Hatchery Research in Conservation Biology Division. Presentation to NWFSC Accreditation Panel, Northwest Fisheries Science Center, Seattle, Washington, 16 September
11. 2002 Genetics issues in hatcheries and captive breeding programs, University of Washington, School of Fishery and Aquatic Sciences, Conservation Genetics 510 lecture, Seattle, Washington, 27 November
12. 2001 Genetic consequences of elk harvest. Elk Risk Assessment Panel - Progress Report. Washington Fish and Wildlife Commission Workshop, Olympia, Washington, 6 October
13. 2001 Genetic risks of hatchery salmon production to wild salmon, Hatcheries and the Protection of Wild Salmon , Simon Fraser University Centre for Coastal Studies, Burnaby, B.C., Canada, 6-8 June
14. 2001 Quantitative genetics of salmon harvest, University of Washington, School of Fishery and Aquatic Sciences, Conservation Genetics 510 lecture, Seattle, Washington, 21 May
15. 2001 Evolutionary consequences of size-selective harvest for chinook salmon, University of Alaska Fairbanks, School of Fishery and Ocean Sciences, Juneau, Alaska, April

16. 2001 Defining units of salmon conservation: the challenge of interpreting biological diversity, University of Alaska Fairbanks, School of Fishery and Ocean Sciences, Juneau, Alaska, April
17. 2000 Workshop for Recovery and Restoration of East Coast Sturgeons in the Neuse and St. John's River Systems, National Ocean Service Charleston Laboratory, Ft. Johnson, South Carolina, 26-27 July
18. 2000 Sturgeon Culture Risk Assessment Workshop, Mote Marine Laboratory, Sarasota, Florida, 6-7 April
19. 2000 Genetic interactions between wild and cultured salmon, Aquaculture and the Protection of Wild Salmon , Simon Fraser University Continuing Studies in Science, Burnaby, B.C., Canada, 1-3 March
20. 1997 Genetic and phenotypic variation in body morphology of juvenile chinook salmon. University of Washington School of Fisheries, Seattle
21. 1997 Genetic effects of salmon hatcheries: outbreeding depression, artificial selection, and fitness. A research planning workshop. University of Alaska, Juneau
22. 1993 Artificial propagation and conservation of salmonids. University of Washington School of Fisheries, Seattle
23. 1993 Life history evolution in the pitcher-plant mosquito. University of Washington Department of Genetics, Seattle
24. 1993 The National Marine Fisheries Service' approach to salmon conservation. Special Ecology Seminar, University of Oregon, Eugene
25. 1992 Pacific salmon, artificial propagation, and the Endangered Species Act. University of Washington School of Fisheries Seminar, Seattle
26. 1991 Genetic mechanisms of population divergence. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington
27. 1991 Flesh-color variation and life history in chinook salmon. Population Biology Seminar, University of Oregon, Eugene

Contributed

1. 2006 Genetic variation in resistance of chinook salmon to two bacterial pathogens. NWFSC Brown Bag Lunch Seminar, 24 January
2. 2002 Relative fitness of hatchery and natural coho salmon in Minter Creek - Progress report. Hatchery Scientific Research Group, Northwest Fisheries Science Center, Seattle, Washington, 16 January
3. 1990 Genetic correlation and population divergence. Genetics Seminar, University of Oregon, Eugene
4. 1990 Tests of the trade-off between egg size and number. Population Biology Seminar, University of Oregon, Eugene
5. 1988 Evolution of life-history traits: genetic polymorphism or developmental homeostasis? Genetics Seminar, University of Oregon, Eugene
6. 1985 Utility of chilled incubation to delay development of chinook salmon embryos. Southeastern Alaska Chinook Salmon Workshop, University of Alaska, Juneau
7. 1985 Age, sex and size distribution of chinook salmon returning to Little Port Walter, Alaska. Southeastern Alaska Chinook Salmon Workshop, University of Alaska, Juneau
8. 1983 First-season performance of chinook salmon reared in two fishless lakes in southeastern Alaska. Southeastern Alaska Chinook Salmon Workshop, University of Alaska, Juneau

PROFESSIONAL ACTIVITIES

2008- Organized and served as teaching assistant for two courses on Model-oriented Experimental Design taught by Dr. Juhani Kettunen, Finnish Game and Fisheries Research Institute and University of Helsinki (two 6-day courses offered at the NWFSC, Seattle in January and in May 2008)

2008- Chair, Puget Sound Steelhead Technical Recovery Team

2007- Steering Committee (with R. Waples, M. Ford, and L. Park), Workshop on Six Decades of Genetic Research at the Northwest Fisheries Science Center, Seattle, Washington (September 2007)

2006- Steering Committee (with R. Waples, R. Huey, J. Travis), Workshop on Evolutionary consequences of anthropogenic changes on long-term viability of Pacific salmon and steelhead, Seattle, Washington (December 2006)

2006- Co-chair (with O. Johnson, K. Neely, L. Weitkamp), 23rd Northeast Pacific Pink and Chum Salmon Workshop, Seattle, Washington (planned, February 2008)

2006 Member, Board of Examiners for P.V. Kalavathy, Ph.D. candidate at Manonmaniam Sundaranar University, India (Dissertation entitled "Trophic polymorphism and adaptive plasticity in selected threatened cyprinid fishes in streams and rivers of south India")

2005 Invited participant, United Nations Environment Program Global Environmental Facility, Scientific & Technical Advisory Panel Workshop on the Environmental Risk Assessment of Transgenic Fish, October 2005, Penang, Malaysia

2005 Co-lead Researcher (with J. Myers), Endangered Species Act status review for Puget Sound steelhead (steelhead listed as a Threatened Species under the U.S. Endangered Species Act, May 2007)

2004-06 President, Genetics Section, American Fisheries Society

2004 Member, Scientific Panel, Battle Creek Steelhead Supplementation Plan

2004 Advisory Group, Risk Assessment Modeling Project for Salmon Hatcheries

2003-06 Associate Editor, *Transactions of the American Fisheries Society*

2003- Member, Oregon Hatchery Research Center Science Team and Advisory Board

2001-02 Member, Review Panel for Elk Harvest Strategies, Washington Department of Fish and Wildlife and Washington Wildlife Commission

2001 Co-chair, 20th Northeast Pacific Pink and Chum Salmon Workshop, Seattle, Washington

2000 Panelist, Aquaculture and the Protection of Wild Salmon 'Think Tank,' Simon Fraser University Continuing Studies in Science, Burnaby, B.C., Canada

1997- Coordinate NWFSC's Conservation Biology Division review of ESA documents: Biological Opinions, Section 7 and Section 10 Direct and Indirect Take Permit Applications, Habitat Conservation Plans, hatchery program evaluations, and related documents

1997 Provided technical advice to NMFS Northeast Region on artificial propagation of Atlantic salmon

1997 Alaska Sea Grant Annual Review Panelist

1995 Genetics Panelist, Wild Salmon Supplementation Workshop, *Exxon Valdez* Oil Spill Restoration Program

1994-96 Lead Researcher, Endangered Species Act status review for pink salmon

1994- Chinook Salmon Captive Propagation Technical Oversight Committee

1994 Expert Panelist, Canadian Salmonid Enhancement Program Evaluation

1991 Steering Committee, Twelfth Pacific Ecology Conference

1990-91 President's Task Force on Research and Graduate Education, University of Oregon

STUDENT ADVISING

2008- Jocelyn Lin, University of Washington School of Aquatic and Fishery Sciences (member, Ph.D. Advisory committee)

2007- Dr. Kathleen O'Malley (Ph.D. Oregon State University, Corvallis), National Research Council Postdoctoral Associate

2005- Neala Kendall, University of Washington School of Aquatic and Fishery Sciences (member, M.S and Ph.D. Advisory committees)

2005-06 Jessica Dales, Santa Clara University NOAA undergraduate intern, Environmental Sciences major

2005- Tyler Dann, University of Alaska School of Fisheries and Ocean Sciences (member, M.S. Advisory committee)

2005-08 Jonathan Drake, University of Washington School of Forest Sciences (member, Ph.D. Advisory committee, Advanced Studies Program)

2004-07 Willy Eldridge, University of Washington School of Aquatic and Fishery Sciences (member, Ph.D. Advisory committee); NMFS - Sea Grant Joint Graduate Fellow in Population Dynamics and Marine Resource Economics

2003-05 Dr. Shaun Roark (Ph.D. Miami University, Ohio), National Research Council Postdoctoral Associate

2002-06 Kathleen Neely, University of Washington School of Aquatic and Fishery Sciences (member, M.S. Advisory committee, Advanced Studies Program)

2002-06 Stephanie Walden, University of Alaska School of Fisheries and Ocean Sciences (member, M.S. Advisory committee)

2001-05 Todd Seamons, University of Washington School of Fisheries (member, Ph.D. Advisory committee)

1999-02 Brian Beckman, University of Washington School of Fisheries (member, Ph.D. Advisory committee)

1998-99 Dan Andrews, University of Washington-Tacoma (undergraduate student; mentoring)
1998-02 Karla Granath, University of Alaska School of Fisheries and Ocean Sciences (member, M.S. Advisory committee)
1998-01 Dr. Kerry Naish (Ph.D. University of Wales, Swansea), National Research Council Senior Postdoctoral Associate
1998-01 Shizhen Wang, University of Washington School of Fisheries (member, Ph.D. Advisory committee)
1996-97 Chris Richardson, University of Washington School of Fisheries (undergraduate student; mentoring)

OUTREACH

2009- Graduate course led: Topics in Phenotypic Evolution (FISH 510), University of Washington School of Aquatic and Fishery Sciences, Seattle, Winter Quarter, January-March (*planned*)
2005 Classroom presentation on Pacific salmon conservation, Glacier Park Elementary School, Tahoma School District, 4th and 5th-grade classes, October
2004 Graduate course led: Quantitative Genetics (FISH 510), University of Washington School of Aquatic and Fishery Sciences, Seattle, Spring Quarter, March-June
2002 Classroom presentation on Pacific salmon biology, Glacier Park Elementary School, Tahoma School District, 5th-grade classes, November
2001 Classroom presentation on Pacific salmon biology, Cedar River Elementary School, Tahoma School District, 5th-grade classes, November
2000 Cedar River Field Trip, Tahoma Junior High School 9th Grade Science Class, April
1999 Science Judge, Cedar River Elementary School Science Fair, Tahoma School District, May
1998 Classroom presentation on Pacific salmon conservation, Rock Creek Elementary School, Tahoma School District, 4th- and 5th-grade classes, October
1997 Classroom presentation on Pacific salmon conservation, Rock Creek Elementary School, Tahoma School District, 3rd- and 4th-grade classes, November
1997 Classroom presentation on Pacific salmon conservation, Issaquah High School Career Fair, April
1995 Classroom presentation on Pacific salmon, Rock Creek Elementary School, Tahoma School District, 1st grade classes, October
1994- University of Oregon Mentor Program
1987-88 Scientist-In-Residence, Eugene 4J School District, Oregon

COMMITTEE SERVICE

2006- Environmental Conservation Division Promotion Committee
2005-08 Northwest Fisheries Science Center Research Planning Team
2002- Northwest Fisheries Science Center OMI Promotion Management Advisory Committee
2002-03 Northwest Fisheries Science Center Safety Committee
2001-04 Northwest Fisheries Science Center Internal Grants Program Review Panel (co-chair, 2003-04)
2001 Combined Federal Campaign keyworker
1998 Conservation Biology Division Coordinator Search Committee
1998- Conservation Biology Division Promotion Committee
1998-01 NWFSC Promotion Criteria Development Committee

REVIEWS

Journals

American Fisheries Society Special Symposia, American Naturalist, Canadian Journal of Fisheries and Aquatic Sciences, Canadian Journal of Zoology, Conservation Biology, Conservation Genetics, Copeia, Ecological Applications, Ecology, Ecology of Freshwater Fish, Environmental Biology of Fishes, Evolution, Evolutionary Applications, Functional Ecology, Genetics, Heredity, Journal of Fish Biology, Journal of Heredity, North American Journal of Fisheries Management, Progressive Fish-Culturist, Transactions of the American Fisheries Society

Grant proposals and other documents

Florida Fish and Wildlife Commission Finfish Genetics Policy, Washington Sea Grant and Alaska Sea Grant research proposals, Hatchery Scientific Research Group Operational Guidelines, Aquaculture Collaborative Research and Development Program (Canada), U.S. Department of Agriculture Small Business Innovation Research Program, Saltonstall-Kennedy Grant research proposals, Aquanet (Canada), Natural Sciences and Engineering Research Council of Canada (NSERC), USGS Gila Trout Broodstock Management Plan, NWFSC Internal Grants Program

COLLABORATORS

Dr. J. Bromaghin, U.S. Fish and Wildlife Service
R. Nielson, WEST, Inc. (Laramie, Wyoming)
Dr. J. Olsen, U.S. Fish and Wildlife Service
Dr. D. Campton, U.S. Fish and Wildlife Service
Dr. C. Busack, Washington Department of Fish and Wildlife
Prof. A. Gharrett, University of Alaska
Prof. M. Gross, University of Toronto
Dr. L. Hauser, University of Washington
Dr. M. Heino, Institute of Marine Research, Bergen, Norway
Prof. R. Hilborn, University of Washington
J. Joyce, NMFS Auke Bay Laboratory
Prof. R. Law, University of York
Prof. S. Mills, University of Montana
Dr. K. Naish, University of Washington
Prof. J. Peek, University of Idaho (emeritus)
Prof. J. Reynolds, Simon Fraser University
Prof. W. Smoker, University of Alaska
F. Thrower, NMFS Auke Bay Laboratory
Dr. F. Utter, University of Washington
A. Wertheimer, NMFS Auke Bay Laboratory
Dr. Maureen Purcell, U.S. Geological Survey
Dr. J. Winton, U.S. Geological Survey

REFERENCES

Available upon request