

NATIONAL MARINE FISHERIES SERVICE REPORT 2
FISHERIES SCIENCE CENTER ACTIVITIES
SALMON-RELATED PUBLICATIONS OF THE NORTHWEST AND SOUTHWEST
FISHERIES SCIENCE CENTER IN 2020 - PRESENT:

In press

Anderson, Eric C.

In press. CKMRpop: Forward-in-time simulation and tabulation of pairwise kin relationships in age-structured populations. *Molecular Ecology Resources*.
<https://doi.org/10.1111/1755-0998.13513>

Barros, Arthur, James A. Hobbs, Malte Willmes, Christina M. Parker, Micah Bisson, Nann A. Fangue, Andrew L. Rypel, and Levi S. Lewis.

In press. Spatial heterogeneity in prey availability, feeding success, and dietary selectivity for the threatened longfin smelt. *Estuaries and Coasts*.
<https://doi.org/10.1007/s12237-021-01024-y>

Bond, Rosealea M., Joseph D. Kiernan, Ann-Marie K. Osterback, Cynthia H. Kern, Alexander E. Hay, Joshua M. Meko, Miles E. Daniels, and Jeffrey M. Perez.

In press. Spatiotemporal variability in environmental conditions influences the performance and behavior of juvenile steelhead in a coastal California lagoon. *Estuaries and Coasts*.
<https://doi.org/10.1007/s12237-021-01019-9>

FitzGerald, Alyssa M., David Boughton, Joshua Fuller, Sara N. John, Benjamin T. Martin, Lee R. Harrison, and Nathan J. Mantua.

In press. Physical and biological constraints on the capacity for life-history expression of anadromous salmonids: an Eel River, California, case study. *Canadian Journal of Fisheries and Aquatic Sciences*.
<https://doi.org/10.1139/cjfas-2021-0229>

Hance, Dalton J., Russell W. Perry, Adam C. Pope, Arnold J. Ammann, Jason L. Hassrick, and Gabriel Hansen.

In press. From drought to deluge: spatiotemporal variation in migration routing, survival, travel time and floodplain use of an endangered migratory fish. *Canadian Journal of Fisheries and Aquatic Sciences*.
<https://doi.org/10.1139/cjfas-2021-0042>

Hassrick, Jason L., Arnold J. Ammann, Russell W. Perry, Sara N. John, and Miles E. Daniels.

In press. Factors affecting spatiotemporal variation in survival of endangered winter-run Chinook Salmon outmigrating from the Sacramento River. *North American Journal of Fisheries Management*.
<https://doi.org/10.1002/nafm.10748>

Martin, Benjamin T., Michael A. Gil, Ashkaan K. Fahimipour, and Andrew M. Hein.
In press. Informational constraints on predator-prey interactions. *Oikos*.
<https://doi.org/10.1111/oik.08143>

Munsch, Stuart H., Correigh M. Greene, Nathan J. Mantua, and William H. Satterthwaite.
In press. One hundred-seventy years of stressors erode salmon fishery climate resilience
in California's warming landscape. *Global Change Biology*.
<https://doi.org/10.1111/gcb.16029>

2022

Boughton, David A., Lee R. Harrison, Sara N. John, Rosealea M. Bond, Colin L. Nicol, Carl J.
Legleiter, and Ryan T. Richardson.
2022. Capacity of two Sierra Nevada rivers for reintroduction of anadromous salmonids:
insights from a high-resolution view. *Transactions of the American Fisheries Society*
151(1):13-41.
<https://doi.org/10.1002/tafs.10334>

Cimino, Megan A., Scott A. Shaffer, Heather Welch, Jarrod A. Santora, Pete Warzybok, Jaime
Jahncke, Isaac Schroeder, Elliott L. Hazen, and Steven J. Bograd.
2022. Western gull foraging behavior as an ecosystem state indicator in coastal
California. *Frontiers in Marine Science* 8:790559 (14 p.).
<https://doi.org/10.3389/fmars.2021.790559>

Dudley, Peter N., Sara N. John, Miles E. Daniels, and Eric M. Danner
2022. Using decades of spawning data and hydraulic models to construct a temperature-
dependent resource selection function for management of an endangered salmonid.
Canadian Journal of Fisheries and Aquatic Science 79(1):73-81.
<https://doi.org/10.1139/cjfas-2021-0022>

Young, Matthew, Frederick Feyrer, Darren Fong, Rachel Johnson, Tamara Kraus, Veronica
Larwood, Elizabeth Stumpner, and Megan Young.
2022. Ocean connectivity drives trophic support for consumers in an intermittently closed
coastal lagoon. *Estuarine, Coastal and Shelf Science* 264:107665 (12 p.).
<https://doi.org/10.1016/j.ecss.2021.107665>

2021

Abadia-Cardoso, A., R. Hernandez-Guzman, A. Varela-Romero, J.C. Garza, and F.J. Garcia-De
Leon.
2021. Population genetics and species distribution modeling highlight conservation needs
of the endemic trout from the Northern Sierra Madre Occidental. *Conservation Genetics*
22:629-643.
<https://doi.org/10.1007/s10592-021-01388-5>

- Amaya, Dillon J., Michael A. Alexander, Antonietta Capotondi, Clara Deser, Kristopher B. Karnauskas, Arthur J. Miller, and Nathan J. Mantua.
2021. Are long-term changes in mixed layer depth influencing North Pacific marine heatwaves? *Bulletin of the American Meteorological Society* 102(1):S59-S66.
<https://doi.org/10.1175/BAMS-D-20-0144.1>
- Apgar, Travis M., Joseph E. Merz, Benjamin T. Martin, and Eric P. Palkovacs.
2021. Alternative migratory strategies are widespread in subyearling Chinook salmon. *Ecology of Freshwater Fish* 30(1):125-139.
<https://doi.org/10.1111/eff.12570>
- Atencio, Benjamin J., Eva B. Thorstad, Augun H. Rikardsen, and Jenny L.A. Jensen.
2021. Keeping close to the river, shore and surface: the first marine migration of brown trout (*Salmo trutta*) and Arctic charr (*Salvelinus alpinus*) post-smolts. *Journal of Fish Biology* 99(2):462-471.
<https://doi.org/10.1111/jfb.14737>
- Bellanger, Manuel, Robert Fonner, Daniel S. Holland, Gary D. Libecap, Douglas W. Lipton, Pierre Scemama, Cameron Speir, and Olivier Thebaud.
2021. Cross-sectoral externalities related to natural resources and ecosystem services. *Ecological Economics* 184:106990 (10 p.).
<https://doi.org/10.1016/j.ecolecon.2021.106990>
- Bell-Tilcock, Miranda, Carson A. Jeffres, Andrew L. Rypel, Malte Willmes, Richard A. Armstrong, Peter Holden, Peter B. Moyle, Nann A. Fanguie, Jacob V.E. Katz, Ted R. Sommer, J. Louise Conrad, and Rachel C. Johnson.
2021. Biogeochemical processes create distinct isotopic fingerprints to track floodplain rearing of juvenile salmon. *PLoS ONE* 16(10):e0257444 (23 p.).
<https://doi.org/10.1371/journal.pone.0257444>
- Bell-Tilcock, Miranda, Carson A. Jeffres, Andrew L. Rypel, Ted R. Sommer, Jacob V.E. Katz, George Whitman, and Rachel C. Johnson.
2021. Advancing diet reconstruction in fish eye lenses. *Methods in Ecology and Evolution* 12(3):449-457.
<https://doi.org/10.1111/2041-210X.13543>
- Brias, Antoine, and Stephan B. Munch.
2021. Ecosystem based multi-species management using Empirical Dynamic Programming. *Ecological Modelling* 441:109423 (11 p.).
<https://doi.org/10.1016/j.ecolmodel.2020.109423>
- Campbell, Matthew A., Eric C. Anderson, John Carlos Garza, and Devon E. Pearse.
2021. Polygenic basis and the role of genome duplication in adaptation to similar selective environments. *Journal of Heredity* 112(7):614-625.
<https://doi.org/10.1093/jhered/esab049>
- Cordoleani, F., C.C. Phillis, A.M. Sturrock, A.M. FitzGerald, A. Malkassian, G.E. Whitman, P.K. Weber, and R.C. Johnson.

2021. Threatened salmon rely on a rare life history strategy in a warming landscape. *Nature Climate Change* 11:982-988.
<https://doi.org/10.1038/s41558-021-01186-4>
- Del Rio, Annelise M., Gabriella N. Mukai, Benjamin T. Martin, Rachel C. Johnson, Nann A. Fangue, Joshua A. Israel, and Anne E. Todgham.
2021. Differential sensitivity to warming and hypoxia during development and long-term effects of developmental exposure in early life stage Chinook salmon. *Conservation Physiology* 9(1):coab054 (17 p.).
<https://doi.org/10.1093/conphys/coab054>
- Donohoe, Christopher J., David E. Rundio, Devon E. Pearse, and Thomas H. Williams.
2021. Straying and life history of adult steelhead in a small California coastal stream revealed by otolith natural tags and genetic stock identification. *North American Journal of Fisheries Management* 41(3):711-723.
<https://doi.org/10.1002/nafm.10577>
- FitzGerald, Alyssa M., Sara N. John, Travis M. Apgar, Nathan J. Mantua, and Benjamin T. Martin.
2021. Quantifying thermal exposure for migratory riverine species: Phenology of Chinook salmon populations predicts thermal stress. *Global Change Biology* 27(3):536-549.
<https://doi.org/10.1111/gcb.15450>
- Guldin, Marie, Leif Anderson, James Hilger, Rosemary Kosaka, Jerry Leonard, Cameron Speir, Dale Squires, Erin Steiner, Stephen Stohs, and Ashley Vizek.
2021. West Coast fisheries impacts from COVID-19. In: U.S. seafood industry and for-hire sector impacts from COVID-19: 2020 in perspective, p. 25-35. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-221.
<https://spo.nmfs.noaa.gov/content/tech-memo/us-seafood-industry-and-hire-impacts-covid-19-2020-perspective>
- Harding, Jeffrey, Edward Dick, Nathan Mantua, Brian Wells, Arnold Ammann, and Sean Hayes.
2021. Distribution patterns of fish and invertebrates from summer salmon surveys in the central California Current System 2010–2015. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-645. 72 p.
<https://doi.org/10.25923/44n2-7964>
- Jardim, Ernesto, Manuela Azevedo, Jon Brodziak, Elizabeth N. Brooks, Kelli F. Johnson, Nikolai Klibansky, Colin P. Millar, Coilin Minto, Iago Mosqueira, Richard D.M. Nash, Paraskevas Vasilakopoulos, and Brian K. Wells.
2021. Operationalizing ensemble models for scientific advice to fisheries management. *ICES Journal of Marine Science* 78(4):1209-1216.
<https://doi.org/10.1093/icesjms/fsab010>
- Johnson, Bethany, Marcella Gomez, and Stephan B. Munch.
2021. Leveraging spatial information to forecast nonlinear ecological dynamics. *Methods*

in Ecology and Evolution 12(2):266-279.
<https://doi.org/10.1111/2041-210X.13511>

Kasperski, Stephen, Geret S. DePiper, Alan C. Haynie, Suzana Blake, Lisa L. Colburn, Amy Freitag, Michael Jepson, Mandy Karnauskas, Kirsten M. Leong, Douglas Lipton, Michelle Masi, Cameron Speir, Howard Townsend, and Mariska Weijerman.
2021. Assessing the state of coupled social-ecological modeling in support of ecosystem based fisheries management in the United States. *Frontiers in Marine Science* 8:631400 (13 p.).
<https://doi.org/10.3389/fmars.2021.631400>

Klamath River Technical Team.

2021. Klamath River fall Chinook salmon age-specific escapement, river harvest, and run size estimates, 2020 run. Klamath River Technical Team. 21 p.
<https://www.pcouncil.org/documents/2021/02/klamath-river-fall-chinook-salmon-age-specific-escapement-river-harvest-and-run-size-estimates-2020-run-krtt-feb-15-2020.pdf/>

Klamath River Technical Team.

2021. Ocean abundance projections and prospective harvest levels for Klamath River fall Chinook, 2021 season. Klamath River Technical Team. 31 p.
<https://www.pcouncil.org/documents/2021/03/ocean-abundance-projections-and-prospective-harvest-levels-for-klamath-river-fall-chinook-2021-season-krtt-march-18-2021.pdf/>

Lewis, Levi S., Christian Denney, Malte Willmes, Wilson Xieu, Rachel A. Fichman, Feng Zhao, Bruce G. Hammock, Andrew Schultz, Nann Fangue, and James A. Hobbs.
2021. Otolith-based approaches indicate strong effects of environmental variation on growth of a Critically Endangered estuarine fish. *Marine Ecology Progress Series* 676:37-56.
<https://doi.org/10.3354/meps13848>

Lindley, Steven T., Nathan J. Mantua, Tanya L. Rogers, and Stephan B. Munch.

2021. Recent changes in the spatial and temporal distribution of salmon habitat in the North Pacific. In: Jeongseok Park, William Stanbury, and MacKenzie Kermoade (eds.), *Third NPAFC-IYS Virtual Workshop on Linkages between Pacific Salmon Production and Environmental Changes (May 25-28, 2021)*. North Pacific Anadromous Fish Commission, NPAFC Technical Report 17:108-112.
<https://doi.org/10.23849/npafctr17/108.112>

Mantua, Nate, Rachel Johnson, John Field, Steve Lindley, Tommy Williams, Anne Todgham, Nanne Fangue, Carson Jeffres, Heather Bell, Dennis Cocherell, Jacques Rinchar, Donald Tillitt, Bruce Finney, Dale Honeyfield, Taylor Lipscomb, Scott Foott, Kevin Kwak, Mark Adkison, Brett Kormos, Steve Litvin, and Iliana Ruiz-Cooley.
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(May 25-28, 2021). North Pacific Anadromous Fish Commission, NPAFC Technical Report 17:92-93.
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Michel, Cyril J., Jeremy J. Notch, Flora Cordoleani, Arnold J. Ammann, and Eric M. Danner. 2021. Nonlinear survival of imperiled fish informs managed flows in a highly modified river. *Ecosphere* 12(5):e03498 (20 p.).
<https://doi.org/10.1002/ecs2.3498>

Nelson, Thomas Reid, Cyril J. Michel, Meagan P. Gary, Brendan M. Lehman, and Nicholas J. Demetras. 2021. Effects of artificial lighting at night on predator density and salmonid predation. *Transactions of the American Fisheries Society* 150(2):147-159.
<https://doi.org/10.1002/tafs.10286>

Ng, Thomas. 2021. Probabilistic graphical inference of pedigrees. Ph.D. dissertation, University of California, Santa Cruz.
<https://escholarship.org/uc/item/8cw1r5j5> (under embargo until May 11, 2023)

Nobriga, Matthew L., Cyril J. Michel, Rachel C. Johnson, and John D. Wikert. 2021. Coldwater fish in a warm water world: Implications for predation of salmon smolts during estuary transit. *Ecology and Evolution* 11(15):10381-10395.
<https://doi.org/10.1002/ece3.7840>

O'Farrell, Michael R., and William H. Satterthwaite. 2021. A rebuilding time model for Pacific salmon. *Fisheries Research* 238:105900 (9 p.).
<https://doi.org/10.1016/j.fishres.2021.105900>

Ohms, Haley, David Boughton, Dereka Chargualaf, and Karlee Liddy. 2021. Carmel River fisheries report 2021. U.S. Department of Commerce, NOAA Southwest Fisheries Science Center, Santa Cruz, California. 89 p.
<https://www.carmelsteelhead.org/carmel-river-fisheries-report-2021/>

Olivetti, Simone, Michael A. Gil, Vamsi K. Sridharan, and Andrew M. Hein. 2021. Merging computational fluid dynamics and machine learning to reveal animal migration strategies. *Methods in Ecology and Evolution* 12(7):1186-1200.
<https://doi.org/10.1111/2041-210X.13604>

Pacific Fishery Management Council (Salmon Technical Team). 2021. Review of 2020 ocean salmon fisheries: Stock assessment and fishery evaluation document for the Pacific Coast Salmon Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon. 340 p.
<https://www.pcouncil.org/documents/2021/02/review-of-2020-ocean-salmon-fisheries.pdf>

Pacific Fishery Management Council (Salmon Technical Team). 2021. Preseason report I: Stock abundance analysis and environmental assessment Part 1

for 2021 ocean salmon fishery regulations. Pacific Fishery Management Council, Portland, Oregon. 132 p.
<https://www.pcouncil.org/documents/2021/03/2021-preseason-report-i.pdf>

Pacific Fishery Management Council (Salmon Technical Team).
2021. Preseason report II: Proposed alternatives and environmental assessment Part 2 for 2021 ocean salmon fishery regulations. Pacific Fishery Management Council, Portland, Oregon. 94 p.
<https://www.pcouncil.org/documents/2021/03/2021-preseason-report-ii.pdf>

Pacific Fishery Management Council (Salmon Technical Team).
2021. Preseason report III: Council adopted management measures and environmental assessment Part 3 for 2021 ocean salmon fishery regulations. Pacific Fishery Management Council, Portland, Oregon. 51 p.
<https://www.pcouncil.org/documents/2021/04/2021-preseason-report-iii.pdf/>

Robinson, Rebecca R., Jeremy Notch, Alex McHuron, Renae Logston, Tom Pham, and Arnold J. Ammann.
2021. The effects of water temperature, acoustic tag type, size at tagging, and surgeon experience on juvenile Chinook salmon (*Oncorhynchus tshawytscha*) tag retention and growth. *Animal Biotelemetry* 9:22 (10 p.).
<https://doi.org/10.1186/s40317-021-00246-y>

Rundio, David E., and Steven T. Lindley.
2021. Importance of non-native isopods and other terrestrial prey resources to steelhead/rainbow trout *Oncorhynchus mykiss* in coastal streams in Big Sur, California. *Ecology of Freshwater Fish* 30(4):419-432.
<https://doi.org/10.1111/eff.12594>

Rundio, David E., John Carlos Garza, Steven T. Lindley, Thomas H. Williams, and Devon E. Pearse.
2021. Differences in growth and condition of juvenile *Oncorhynchus mykiss* related to sex and a migration-associated genomic region. *Canadian Journal of Fisheries and Aquatic Sciences* 78(3):322-331.
<https://doi.org/10.1139/cjfas-2020-0073>

Santora, Jarrod A., Isaac D. Schroeder, Steven J. Bograd, Francisco P. Chavez, Megan A. Cimino, Jerome Fiechter, Elliott L. Hazen, Maria T. Kavanaugh, Monique Messie, Rebecca R. Miller, Keith M. Sakuma, William J. Sydeman, Brian K. Wells, and John C. Field.
2021. Pelagic biodiversity, ecosystem function, and services: an integrated observing and modeling approach. *Oceanography* 34(2):16-37.
<https://doi.org/10.5670/oceanog.2021.212>

Shelton, Andrew Olaf, Genoa H. Sullaway, Eric J. Ward, Blake E. Feist, Kayleigh A. Somers, Vanessa J. Tuttle, Jordan T. Watson, and William H. Satterthwaite.
2021. Redistribution of salmon populations in the northeast Pacific Ocean in response to

- climate. *Fish and Fisheries* 22(3):503-517.
<https://doi.org/10.1111/faf.12530>
- Spence, Brian C., David E. Rundio, Nicholas J. Demetras, and Maryna Sedoryk.
2021. Efficacy of environmental DNA sampling to detect the occurrence of endangered coho salmon (*Oncorhynchus kisutch*) in Mediterranean-climate streams of California's central coast. *Environmental DNA* 3(4):727-744.
<https://doi.org/10.1002/edn3.175>
- Thayer, J.A., Z. Burr, J.C. Field, R.D. Carle, and P. Warzybok.
2021. Inter-annual variability in forage fish population size structure: Comparison of selectivity of traditional vs. non-traditional sampling devices. *Fisheries Research* 234:105801 (8 p.).
<https://doi.org/10.1016/j.fishres.2020.105801>
- Tommasi, Desiree, Yvonne deReynier, Howard Townsend, Chris J. Harvey, William H. Satterthwaite, Kristin N. Marshall, Isaac C. Kaplan, Stephanie Brodie, John C. Field, Elliott L. Hazen, Stefan Koenigstein, Joshua Lindsay, Kathleen Moore, Barbara Muhling, Lisa Pfeiffer, James A. Smith, Jonathan Sweeney, Brian Wells, and Michael G. Jacox.
2021. A case study in connecting fisheries management challenges with models and analysis to support ecosystem-based management in the California Current Ecosystem. *Frontiers in Marine Science* 8:624161 (23 p.).
<https://doi.org/10.3389/fmars.2021.624161>
- Waters, Charles D., Anthony Clemento, Tutku Aykanat, John Carlos Garza, Kerry A. Naish, Shawn Narum, and Craig R. Primmer.
2021. Heterogeneous genetic basis of age at maturity in salmonid fishes. *Molecular Ecology* 30(6):1435-1456.
<https://doi.org/10.1111/mec.15822>
- Weber, Edward D., Toby D. Auth, Simone Baumann-Pickering, Timothy R. Baumgartner, Eric P. Bjorkstedt, Steven J. Bograd, Brian J. Burke, Jose L. Cadena-Ramirez, Elizabeth A. Daly, Martin de la Cruz, Heidi Dewar, John C. Field, Jennifer L. Fisher, Ashlyn Giddings, Ralf Goericke, Eliana Gomez-Ocampo, Jose Gomez-Valdes, Elliott L. Hazen, John Hildebrand, Cheryl A. Horton, Kym C. Jacobson, Michael G. Jacox, Jaime Jahncke, Mati Kahru, Raphe M. Kudela, Bertha E. Lavaniegos, Andrew Leising, Sharon R. Melin, Luis Erasmo Miranda-Bojorquez, Cheryl A. Morgan, Catherine F. Nickels, Rachael A. Orben, Jessica M. Porquez, Elan J. Portner, Roxanne R. Robertson, Daniel L. Rudnick, Keith M. Sakuma, Jarrod A. Santora, Isaac D. Schroeder, Owyn E. Snodgrass, William J. Sydeman, Andrew R. Thompson, Sarah Ann Thompson, Jennifer S. Trickey, Josue Villegas-Mendoza, Pete Warzybok, William Watson, and Samantha M. Zeman.
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- Willmes, Malte, Emily E. Jacinto, Levi S. Lewis, Rachel A. Fichman, Zachary Bess, Gabriel Singer, Anna Steel, Peter Moyle, Andrew L. Rypel, Nann Fanguie, Justin J.G. Glessner,

James A. Hobbs, and Eric D. Chapman.
2021. Geochemical tools identify the origins of Chinook salmon returning to a restored creek. *Fisheries* 46(1):22-32.
<https://doi.org/10.1002/fsh.10516>

Xieu, Wilson, Levi S. Lewis, Feng Zhao, Rachel A. Fichman, Malte Willmes, Tien-Chieh Hung, Luke Ellison, Troy Stevenson, Galen Tigan, Andrew A. Schultz, and James A. Hobbs. 2021. Experimental validation of otolith-based age and growth reconstructions across multiple life stages of a critically endangered estuarine fish. *PeerJ* 9:e12280 (22 p.).
<https://doi.org/10.7717/peerj.12280>

Northwest Fisheries Science Center Salmon-related publications

In press

Ebel, JD, DA Larsen, KR Conely, and MA Middleton. A fish out of basin: Increased stress physiology and reduced performance of Salmon River hatchery Chinook Salmon. *North American Journal of Fisheries Management*.

Francis, TB, GH Sullaway, BE Feist, AO Shelton, E Chui, C Daley, KE Frick, N Tolimieri, GD Williams & JF Samhour. Equivocal associations between small-scale shoreline restoration and subtidal fishes in an urban estuary *Restoration Ecology*

Good, T.P., L.A. Weitkamp, D.E. Lyons, D.D. Roby, K.S. Andrews, and P.J. Bentley. Availability of alternative prey influences avian predation on salmonids in the Columbia River estuary. *Estuaries and Coasts*.

Gosselin, J.L., J. J. Anderson, B. Sanderson, M. Middleton, B.P. Sanford, and L.A. Weitkamp. In press. Assessing seasonal and biological indices of juvenile Chinook salmon for freshwater decision triggers that increase ocean survival. *Freshwater Science*

Peter, KT, JI Lundin, C Wu, BE Feist, Z Tian, J Cameron, NL Scholz & EP Kolodziej. Characterizing the chemical profile of biological decline in stormwater impacted urban watersheds. *Environmental Science & Technology*

Waples RS, Ford MJ, Nichols K, Kardos M, Myers J, Thompson TQ, Anderson EC, Koch IJ, McKinney G, Miller MR, Naish K, Narum SR, O'Malley KG, Pearse D, Pess GR, Quinn TP, Seamons TR, Spidle A, Warheit K, Willis SC. 2022. Implications of large-effect loci for conservation: a review and case study with Pacific Salmon. *Journal of Heredity*.

2022

Ford, M. J., editor. 2022. Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-171.
<https://doi.org/10.25923/kq2n-ke70>

Pearse, D, E Anderson, G Pess, J Myers, K Nichols, M Kardos, M Ford, & R Waples. 2022. Implications of large-effect loci for conservation: a review and case study with Pacific salmon. *Journal of Heredity*.

Munsch, S. H., C. M. Greene, N. J. Mantua, W. H. Satterthwaite. 2022. One hundred-seventy years of stressors erode salmon fishery climate resilience in California's warming landscape. *Global Change Biology*.

Rougemont, Q., A. Xuereb, X. Dallaire, J-S. Moore, E. Normandeau, E.B. Rondeau, R.E. Withler, D.M. Van Doornik, P.A. Crane, K.A. Naish, J.C. Garza, T.D. Beacham, B.F. Koop, and L. Bernatchez. 2022. Long distance migration is a major factor driving local adaptation at continental scale in a Pacific Salmon. *Molecular Ecology*.
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Van Doornik, D.M., B.A. Berejikian, M. Moore, M. Downen, A. Clairborne, K. Doctor, J. Waltermier, R. Endicott. 2022. The influence of captive rearing environments and individual traits on the reproductive success of naturally spawning steelhead (*Oncorhynchus mykiss*). *Canadian Journal of Fisheries and Aquatic Sciences*.
<https://doi.org/10.1139/cjfas-2021-0028>

2021

Armstrong, J. B., A. H. Fullerton, C. E. Jordan, J. L. Ebersole, J. R. Bellmore, I. Arismendi, B. Penaluna, G. H. Reeves. 2021. The importance of warm habitat to the growth regime of cold-water fishes. *Nature Climate Change*. doi:<https://dx.doi.org/10.1038/s41558-021-00994-y>

Armstrong, M, D Minkoff, AH Dittman, D May, E Moody, TP Quinn, and WR Ardren. 2021. Evidence of an olfactory imprinting window in embryonic Atlantic salmon. *Ecology of Freshwater Fish*. DOI: 10.1111/eff.12628

Beechie, T. J., C. Fogel, C. Nicol, B. Timpane-Padgham. 2021. A process-based assessment of landscape change and salmon habitat losses in the Chehalis River basin, USA. *PLoS ONE* , 16 (11) : e0258251.

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Bottom, D. L., S. A. Hinton, D. J. Teel, G. C. Roegner, L. L. Johnson, B. P. Sandford. 2021. The Abundance and Distribution of Hatchery and Naturally Produced Chinook Salmon in Columbia River Estuary Nearshore Habitat. *North American Journal of Fisheries Management*.

Crozier, L. G., L. E. Wiesebron, B. J. Burke, D. Widener, and T. Marsh. 2021. Reframing Steelhead Migration Behavior: A Population Perspective on Migration Rate and Survival Through the Columbia and Snake Rivers. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-164. <https://doi.org/10.25923/dds5-jg64>

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