
CURRICULUM VITAE
COLE C. MONNAHAN

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EDUCATION

University of Washington, Ph.D., <i>Quantitative Ecology and Resource Management</i> Advancing Bayesian methods for fisheries stock assessment	Seattle, WA 2013–2017
University of Washington, M.S., <i>Quantitative Ecology and Resource Management</i> Population trends of the eastern North Pacific blue whale	Seattle, WA 2010–2013
Western Washington University, B.S., <i>Mathematics & B.A., German Language</i>	Bellingham, WA 2001–2006

EMPLOYMENT

Alaska Fisheries Science Center, NOAA Fisheries <i>Research Mathematical Statistician</i>	Seattle, WA 2019–present
School of Aquatic and Fishery Sciences, University of Washington <i>Research Scientist</i>	Seattle, WA 2017–2019
Department of Oceanography, University of Concepción <i>Research Scientist</i>	Concepción, Chile 2017–2018
Quantitative Ecology and Resource Management, University of Washington <i>Research Assistant</i>	Seattle, WA 2010–2017
U.S. Department of Agriculture <i>Agricultural Statistician</i>	Bothell, WA 2006–2010

CORE RESEARCH INTERESTS

Marine resource management, quantitative fisheries science, Bayesian statistics, population dynamics, spatial statistics, computer programming

PEER-REVIEWED PUBLICATIONS

Summary: 404 citations | h-index 11 | [Google Scholar](#)

In review/preparation

16. **Monnanhan, C. C.**, Thorson, J. T., Kotwicki, S., Ianelli, J., Lauffenburger, N, Punt, A. E. **In prep.** Combining bottom trawl and acoustic survey data to explicitly model vertical fish distribution and estimate spatio-temporal availability and an improved index of abundance.

Published and in press

15. **Monnanhan, C. C.**, Branch, T. A., Thorson, J. T., Stewart, I. J., and Szuwalski, C. S. 2019. Overcoming long Bayesian run times in integrated fisheries stock assessments. *ICES Journal of Marine Science*. 10.1093/icesjms/fsz059.
14. **Monnanhan, C. C.**, Acevedo, J., Noble Hendrix, A., Gende, S., Aguayo-Lobo, A., and Martinez, F. 2019. Population trends for humpback whales (*Megaptera novaeangliae*) foraging in the Francisco Coloane Coastal-Marine Protected Area, Magellan Strait, Chile. *Marine Mammal Science*, doi:10.1111/mms.12582.
13. **Monnanhan, C. C.** and K. Kristensen. 2018. No-U-turn sampling for fast Bayesian inference in ADMB and TMB: Introducing the adnuts and tmbstan R packages. *PLOS One* 13:e0197954.

12. **Monnahan**, C. C. and I. J. Stewart. 2018. The effect of hook spacing on longline catch rates: Implications for catch rate standardization. *Fisheries Research* 198:150-158.
11. **Monnahan**, C. C., J. T. Thorson, and T. A. Branch. 2017. Faster estimation of Bayesian models in ecology using Hamiltonian Monte Carlo. *Methods in Ecology and Evolution* 8:339-348.
10. Stewart, I. J. and C. C. **Monnahan**. 2017. Implications of process error in selectivity for approaches to weighting compositional data in fisheries stock assessments. *Fisheries Research* 192:126-134.
9. Kuriyama, P. T., K. Ono, F. Hurtado-Ferro, A. C. Hicks, I. G. Taylor, R. R. Licandeo, K. F. Johnson, S. C. Anderson, C. C. **Monnahan**, M. B. Rudd, C. C. Stawitz, and J. L. Valero. 2016. An empirical weight-at-age approach reduces estimation bias compared to modeling parametric growth in integrated, statistical stock assessment models when growth is time varying. *Fisheries Research* 180:119-127.
8. **Monnahan**, C. C., K. Ono, S. C. Anderson, M. B. Rudd, A. C. Hicks, F. Hurtado-Ferro, K. F. Johnson, P. T. Kuriyama, R. R. Licandeo, C. C. Stawitz, I. G. Taylor, and J. L. Valero. 2016. The effect of length bin width on growth estimation in integrated age-structured stock assessments. *Fisheries Research* 180:103-112.
7. **Monnahan**, C. C., T. A. Branch, and A. E. Punt. 2015. Do ship strikes threaten the recovery of endangered eastern North Pacific blue whales? *Marine Mammal Science* 31:279-297.
6. Thorson, J. T., C. C. **Monnahan**, and J. M. Cope. 2015. The potential impact of time-variation in vital rates on fisheries management targets for marine fishes. *Fisheries Research* 169:8-17.
5. Anderson, S. C., C. C. **Monnahan**, K. F. Johnson, K. Ono, and J. L. Valero. 2014. ss3sim: an R package for fisheries Stock Assessment simulation with stock synthesis. *PLOS One* 9:e92725.
4. Hurtado-Ferro, F., C. S. Szuwalski, J. L. Valero, S. C. Anderson, C. J. Cunningham, K. F. Johnson, R. Licandeo, C. R. McGilliard, C. C. **Monnahan**, M. L. Muradian, K. Ono, K. A. Vert-Pre, A. R. Whitten, and A. E. Punt. 2014. Looking in the rear-view mirror: bias and retrospective patterns in integrated, age-structured stock assessment models. *ICES Journal of Marine Science* 72:99-110.
3. Johnson, K. F., C. C. **Monnahan**, C. R. McGilliard, K. A. Vert-pre, S. C. Anderson, C. J. Cunningham, F. Hurtado-Ferro, R. R. Licandeo, M. L. Muradian, K. Ono, C. S. Szuwalski, J. L. Valero, A. R. Whitten, and A. E. Punt. 2014. Time-varying natural mortality in fisheries stock assessment models: identifying a default approach. *ICES Journal of Marine Science* 72:137-150.
2. **Monnahan**, C. C., T. A. Branch, K. M. Stafford, Y. V. Ivashchenko, and E. M. Oleson. 2014. Estimating historical eastern North Pacific blue whale catches using spatial calling patterns. *PLOS One* 9:e98974.
1. Ono, K., R. Licandeo, M. L. Muradian, C. J. Cunningham, S. C. Anderson, F. Hurtado-Ferro, K. F. Johnson, C. R. McGilliard, C. C. **Monnahan**, C. S. Szuwalski, J. L. Valero, K. A. Vert-Pre, A. R. Whitten, and A. E. Punt. 2014. The importance of length and age composition data in statistical age-structured models for marine species. *ICES Journal of Marine Science* 72:31-43.

Technical Reports (n=8):

- Branch, T. A., **Monnahan**, C. C., and Sirovic, A. 2018. Separating pygmy blue whale catches by population. Scientific Committee of the International Whaling Commission, SC/67b/SH/23.
- Branch, T. A., D. M. Palacios, and C. C. **Monnahan**. 2016. Overview of the North Pacific blue whale distribution, and the need for an assessment of the western and central Pacific. Scientific Committee of the International Whaling Commission. SC/66b/IA/15.
- Stewart, I. J. and C. C. **Monnahan**. 2016. Overview of data sources for the Pacific halibut stock assessment and related analyses. IPHC Report of Assessment and Research Activities. http://www.iphc.int/publications/rara/2015/RARA2015_11Assessmenddatasources.pdf.
- Stewart, I. J., C. C. **Monnahan**, and S. Martell. 2016. Assessment of the Pacific halibut stock at the end of 2015. IPHC Report of Assessment and Research Activities. http://www.iphc.int/publications/rara/2015/RARA2015_12Assessment.pdf.
- Monnahan**, C. C. and T. A. Branch. 2015. Sensitivity analyses for the eastern North Pacific blue whale assessment. Scientific Committee of the International Whaling Commission. SC/66a/IA/15.
- Monnahan**, C. C. and I. J. Stewart. 2015. Evaluation of commercial logbook records: 1991-2013. IPHC Report of Assessment and Research Activities 2014. p. 213-220.
- Monnahan**, C. C., M. L. Muradian, and P. T. Kuriyama. 2014. A guide for Bayesian analysis in AD Model Builder. <http://www.admb-project.org/developers/mcmc/mcmc-guide-for-admb.pdf>.
- Monnahan**, C. C. and I. J. Stewart. 2014. Evaluation of commercial logbook records: 1991-2013. IPHC Report of Assessment and Research Activities. http://www.iphc.int/publications/rara/2014/rara2014_14commlog_revision.pdf.

QUANTITATIVE SKILLS

Software: Proficient in R, ADMB, TMB, Stock Synthesis, VAST, ss3sim, Stan, JAGS, and git

Statistical modeling: Experience with non-linear, GLM, GAM, mixed effects, and spatiotemporal models in

frequentist and Bayesian paradigms

Fisheries modeling: Coauthor on Pacific halibut assessment; integrated stock assessment with Stock Synthesis, CPUE standardization; simulation testing

R package development: *adnuts* (creator), *ss3sim* (developer), *r4ss* (contributor)

ADMB and TMB development: Created code for new Bayesian algorithms and added these to the source code to speed up Bayesian convergence of models, including 50-50000 fold faster convergence for Stock Synthesis models; created user manuals documenting new and existing Bayesian features

TEACHING

Lead Instruction

- 2019 **Modelos Bayesianos con aplicaciones ecológicas.** [*Bayesian models with ecological applications*]. Week-long summer workshop at the University of Concepción, Chile (taught in Spanish)
- 2018 **Fitting hierarchical models in Template Model Builder.** Week-long summer workshop at the University of Concepción, Chile (taught in English and Spanish)
- 2016 **Introduction to R programming for natural scientists.** FISH 552, University of Washington
- 2016 **Advanced R programming for natural scientists.** FISH 553, University of Washington
- 2014 Co-created and co-taught **Super-advanced R programming.** FISH 512, University of Washington

Guest Instruction Lectures

- 2019 Bayesian integration in age structured fisheries stock assessments. Age-Structured Models in Fisheries Stock Assessment (FISH 555), University of Washington
 - 2016 Non-linear function minimization. Modeling and Estimation in Conservation and Resource Management (FISH 458), University of Washington
 - 2015 Mixed effects models. Data Analysis and Modeling in R (Prof. & Continuing Ed.), University of Washington
 - 2014 Non-parametric, additive, and generalized additive models. Analysis of Ecological and Environmental Data (QERM 514), University of Washington
 - 2014 Object-oriented programming in R: S3, S4 and reference classes. Super-Advanced R Programming (FISH 512), University of Washington
 - 2012 Generalized additive models in R. Analysis of Ecological and Environmental Data (QERM 514), University of Washington
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SCIENTIFIC PRESENTATIONS

- 2019 NOAA Fisheries Groundfish Seminar Series NMFS, AFSC, Seattle WA. *Spatiotemporal variation in the vertical distribution of eastern Bering Sea walleye pollock and implications for gear availability.*
- 2019 School of Aquatic and Fishery Sciences Quantitative Seminar Series, Seattle, WA. Seminar: *Combining data series within a spatio-temporal index standardization model to improve estimates and reduce uncertainty, with application to Eastern Bering Sea pollock.*
- 2019 School of Aquatic and Fishery Sciences Think Tank Seminar Series, Seattle, WA. Seminar: *Overcoming long Bayesian run times in integrated fisheries stock assessments.*
- 2017 International Pacific Halibut Commission, Seattle, WA. Seminar: *Revisiting the effect of hook spacing on halibut catch rates and the implications of catch per unit effort (CPUE) standardization in the central Gulf of Alaska.*
- 2017 School of Aquatic and Fishery Sciences Fisheries Think Tank Series, Seattle, WA. Seminar: *Introducing the no-U-turn MCMC sampler in ADMB and TMB: faster run times for large, complex fisheries models.*
- 2015 School of Aquatic and Fishery Sciences Quantitative Seminar Series, Seattle, WA. Seminar: *Advantages of gradient-based MCMC algorithms for difficult-to-fit Bayesian models in fisheries and ecology.*
- 2015 Center for the Advancement of Population Assessment Methodology, La Jolla, CA. Workshop on data conflict and weighting, likelihood functions, and process error. *Hands-on workshop for ss3sim.*
- 2015 Scientific Committee of the International Whaling Commission. San Diego, CA. Invited participant: *Sensitivity analyses for the eastern North Pacific blue whale assessment.*
- 2014 Center for the Advancement of Population Assessment Methodology, La Jolla, CA. Workshop on growth: theory, estimation, and application in fishery stock assessment models. *An evaluation of alternative binning approaches for composition data in integrated stock assessments.*

- 2014 Marine Mammal Laboratory, Alaska Fishery Science Center, NOAA. Seattle, WA. Invited speaker: *Do ship strikes threaten the recovery of endangered eastern North Pacific blue whales?*
- 2013 School of Aquatic and Fishery Sciences Fisheries Think Tank Series, Seattle, WA. Seminar: *ss3sim: An R package for stock assessment simulation with SS3.*
- 2013 Northwest Fishery Science Center, NOAA, Seattle, WA. Stock synthesis development workshop: *ss3sim: An R package for stock assessment simulation with SS3.*
- 2013 Northwest Student Chapter of the Society for Marine Mammalogy, Seattle, WA. *Population trends of the eastern North Pacific blue whale.*
- 2013 School of Aquatic and Fishery Sciences Fisheries Think Tank Series, Seattle, WA. Seminar: *Next-generation MCMC: theory, options, and practice for Bayesian inference in ADMB.*
- 2012 School of Aquatic and Fishery Sciences Quantitative Seminar Series, Seattle, WA. Seminar: *Splitting historical blue whale catches using spatial GAMs.*
- 2012 Northwest Student Chapter of the Society for Marine Mammalogy, British Columbia, Canada. *Utilizing historical data to infer cetacean biology.*
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SCHOLARSHIPS AND AWARDS

National Marine Fisheries Service/Washington Sea Grant Fellowship in Population dynamics: *Optimizing Bayesian analysis in data-rich stock assessments and management resources in data-limited fisheries* (2013)

SERVICE

- Started and lead reading group on spatial statistics and VAST for employees and postdocs at the Alaska Fisheries Science Center (NOAA). 2019.
- Reviewed the *Draft Revised Recovery Plan for the Blue Whale* for the National Marine Fisheries Service (NOAA), 2018.
- Started and led reading group on Bayesian statistics for graduate students in Biology and Oceanography (in Spanish), at the University of Concepcion, Chile, 2017.
- English tutoring and thesis advice for Chilean graduate students, 2017-18.
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PEER REVIEWS (N=22)

Behavioral Ecology and Sociobiology ($n=1$) | Diversity and Distributions (1) | Endangered Species Research (1) | Fisheries Research (9) | ICES Journal of Marine Science (1) | Journal of Experimental Marine Biology and Ecology (1) | Marine Ecology Progress Series (1) | Methods in Ecology and Evolution (2) | Natural Resource Monitoring (1) | North American Journal of Fisheries Management (1) | PeerJ (1) | PLOS One (1) | Proceedings of the Royal Irish Academy (1) | Theoretical Population Biology (2)