Sarah Gaichas

Research Fishery Biologist
NOAA NMFS Northeast Fisheries Science Center
+1 508 495 2016 | Sarah.Gaichas@noaa.gov | sgaichas

Education

University of Washington *Seattle*
PhD *2000 - 2006*

College of William and Mary, School of Marine Science *Gloucester Point*
M.S. *1994 - 1997*

Swarthmore College *Swarthmore*
B.A. *1986 - 1991*

Graduate Supervision and Examination

Adjunct professor *University of Massachusetts, Dartmouth*

One current UMassD PhD. student committee.
One current Ph.D. student committee at the College of William and Mary (Virginia Institute of Marine Science).

2020 External examiner for a PhD student at University of Iceland
2019 (Exam) PhD student committee at the University of Massachusetts, Dartmouth
2019 External examiner for a PhD student at Dalhousie University
2016 External examiner for a PhD student at the University of Cape Town
2016 (Exam) PhD student committee at the University of Washington
2015 (Exam) PhD student committee at Oregon State University

Experience

Research Fishery Biologist *NOAA/NMFS Northeast Fisheries Sci. Center, Woods Hole, MA*

`Ecosystem Assessment, MSE  September 2011 - present`

Contribute to integrated ecosystem assessments and management strategy evaluations (MSEs) for the Northeast U.S. continental shelf by analyzing research survey, fishery, oceanographic, and economic data, and by developing and testing multispecies assessment models and ecosystem indicators. Conduct research on ecosystem based management reference points balancing multiple objectives. Chair National and Northeast MSE working groups to build capacity and coordinate work plans. Provide results in peer-reviewed literature and to the New England and Mid-Atlantic Fishery Management Councils.

Research Fishery Biologist *NOAA/NMFS Alaska Fisheries Science Center, Seattle, WA*

`Ecosystem Modeling  June 2006 - September 2011`

Analyzed food web, fishery, and research survey data and developed ecosystem models to evaluate the cumulative effects of fishing, climate change, and other factors on the marine ecosystem.

`Stock Assessment  November 1998 - June 2006`

Assessed the condition of commercially exploited fish stocks through analysis of fishery and research survey data combined with population dynamics modeling.

`Observer Program  March 1997 - October 1999`

Conducted statistical analyses of fishery observer data, evaluated present and proposed data collection methods through directed research, and examined uses of observer data in multiple applications.

Research, Science, and Management Organizations

- Mid-Atlantic FMC Scientific and Statistical Committee, (2014-present); determining Allowable Biological Catch (ABC) advice for fishery management and other scientific support.
- Member and past co-chair of the ICES Working Group on North Atlantic Regional Seas; developing ecosystem indicators and integrated ecosystem assessments for Canadian and U.S. waters.
- Co-Chair of the ICES Working Group on Multispecies Assessment Methods: reviewing and contributing to multispecies and ecosystem modeling progress across ICES regions.
- Advisory partner in the European Commission's PANDORA project (2018-2022), which is designing toolsets for new dynamic ocean resource assessments and exploitation.

Publications

Lucey, S. M, K. Y. Aydin, S. K. Gaichas, S. X. Cadrin, G. Fay, M. J. Fogarty, and A. Punt (2021). "Evaluating fishery management strategies using an ecosystem model as an operating model". In: *Fisheries Research* 234, p. 105780. DOI: 10.1016/j.fishres.2020.105780.

Link, J. S, G. Huse, S. Gaichas, and A. R. Marshak (2020). "Changing how we approach fisheries: A first attempt at an operational framework for ecosystem approaches to fisheries management". In: *Fish and Fisheries* 21.2, pp. 393-434. DOI: 10.1111/faf.12438.

Lucey, S. M, S. K. Gaichas, and K. Y. Aydin (2020). "Conducting reproducible ecosystem modeling using the open source mass balance model Rpath". In: *Ecological Modelling* 427, p. 109057. DOI: 10.1016/j.ecolmodel.2020.109057.

Weiskopf, S. R, M. A. Rubenstein, L. G. Crozier, S. Gaichas, R. Griffis, J. E. Halofsky, K. J. W. Hyde, T. L. Morelli, J. T. Morisette, R. C. Muñoz, A. J. Pershing, D. L. Peterson, R. Poudel, M. D. Staudinger, A. E. Sutton-Grier, L. Thompson, J. Vose, J. F. Weltzin, and K. P. Whyte (2020). "Climate change effects on biodiversity, ecosystems, ecosystem services, and natural resource management in the United States". In: *Science of The Total Environment*, p. 137782. DOI: 10.1016/j.scitotenv.2020.137782.

Goethel, D. R, S. M. Lucey, A. M. Berger, S. K. Gaichas, M. A. Karp, P. D. Lynch, and J. F. Walter (2019). "Recent advances in management strategy evaluation: introduction to the special issue "Under pressure: addressing fisheries challenges with Management Strategy Evaluation"". In: *Canadian Journal of Fisheries and Aquatic Sciences* 76.10, pp. 1689-1696. DOI: 10.1139/cjfas-2019-0084.

Karp, M. A, J. O. Peterson, P. D. Lynch, R. B. Griffis, C. F. Adams, W. S. Arnold, L. A. K. Barnett, Y. deReynier, J. DiCosimo, K. H. Fenske, S. K. Gaichas, A. Hollowed, K. Holsman, M. Karnauskas, D. Kobayashi, A. Leising, J. P. Manderson, M. McClure, W. E. Morrison, E. Schnettler, A. Thompson, J. T. Thorson, J. F. Walter, A. J. Yau, R. D. Methot, and J. S. Link (2019). "Accounting for shifting distributions and changing productivity in the development of scientific advice for fishery management". In: *ICES Journal of Marine Science* 76.5, pp. 1305-1315. DOI: 10.1093/icesjms/fsz048.

Townsend, H, C. J. Harvey, Y. deReynier, D. Davis, S. G. Zador, S. Gaichas, M. Weijerman, E. L. Hazen, and I. C. Kaplan (2019). "Progress on Implementing Ecosystem-Based Fisheries Management in the United States Through the Use of Ecosystem Models and Analysis". In: *Frontiers in Marine Science* 6. DOI: 10.3389/fmars.2019.00641.

Deroba, J. J, S. K. Gaichas, M. Lee, R. G. Feeney, D. V. Boelke, and B. J. Irwin (2018). "The dream and the reality: meeting decision-making time frames while incorporating ecosystem and economic models into management strategy evaluation". In: *Canadian Journal of Fisheries and Aquatic Sciences*. DOI: 10.1139/cjfas-2018-0128.

Feeney, R. G, D. V. Boelke, J. J. Deroba, S. K. Gaichas, B. J. Irwin, and M. Lee (2018). "Integrating Management Strategy Evaluation into fisheries management: advancing best practices for stakeholder inclusion based on an MSE for Northeast U.S. Atlantic herring". In: *Canadian Journal of Fisheries and Aquatic Sciences*. DOI: 10.1139/cjfas-2018-0125.

Gaichas, S. K, G. S. DePiper, R. J. Seagraves, B. W. Muffley, M. Sabo, L. L. Colburn, and A. L. Loftus (2018). "Implementing Ecosystem Approaches to Fishery Management: Risk Assessment in the US Mid-Atlantic". In: *Frontiers in Marine Science* 5. DOI: 10.3389/fmars.2018.00442.

Goethel, D. R, S. M. Lucey, A. M. Berger, S. K. Gaichas, M. A. Karp, P. D. Lynch, J. F. Walter III, J. J. Deroba, S. K. Miller, and M. J. Wilberg (2018). "Closing the Feedback Loop: On Stakeholder Participation in Management Strategy Evaluation". In: *Canadian Journal of Fisheries and Aquatic Sciences*. DOI: 10.1139/cjfas-2018-0162.

Olsen, E, I. C. Kaplan, C. Ainsworth, G. Fay, S. Gaichas, R. Gamble, R. Girardin, C. H. Eide, T. F. Ihde, H. N. Morzaria-Luna, K. F. Johnson, M. Savina-Rolland, H. Townsend, M. Weijerman, E. A. Fulton, and J. S. Link (2018). "Ocean

Futures Under Ocean Acidification, Marine Protection, and Changing Fishing Pressures Explored Using a Worldwide Suite of Ecosystem Models". In: *Frontiers in Marine Science* 5. DOI: 10.3389/fmars.2018.00064.

DePiper, G. S, S. K. Gaichas, S. M. Lucey, P. Pinto da Silva, M. R. Anderson, H. Breeze, A. Bundy, P. M. Clay, G. Fay, R. J. Gamble, R. S. Gregory, P. S. Fratantoni, C. L. Johnson, M. Koen-Alonso, K. M. Kleisner, J. Olson, C. T. Perretti, P. Pepin, F. Phelan, V. S. Saba, L. A. Smith, J. C. Tam, N. D. Templeman, and R. P. Wildermuth (2017). "Operationalizing integrated ecosystem assessments within a multidisciplinary team: lessons learned from a worked example". In: *ICES Journal of Marine Science* 74.8, pp. 2076-2086. DOI: 10.1093/icesjms/fsx038.

Gaichas, S. K, M. Fogarty, G. Fay, R. Gamble, S. Lucey, and L. Smith (2017). "Combining stock, multispecies, and ecosystem level fishery objectives within an operational management procedure: simulations to start the conversation". In: *ICES Journal of Marine Science* 74.2, pp. 552-565. DOI: 10.1093/icesjms/fsw119.

Holsman, K, J. Samhouri, G. Cook, E. Hazen, E. Olsen, M. Dillard, S. Kasperski, S. Gaichas, C. R. Kelble, M. Fogarty, and K. Andrews (2017). "An ecosystem-based approach to marine risk assessment". In: *Ecosystem Health and Sustainability* 3.1, p. e01256. DOI: 10.1002/ehs2.1256.

Tommasi, D, C. A. Stock, A. J. Hobday, R. Methot, I. C. Kaplan, J. P. Eveson, K. Holsman, T. J. Miller, S. Gaichas, M. Gehlen, A. Pershing, G. A. Vecchi, R. Msadek, T. Delworth, C. M. Eakin, M. A. Haltuch, R. Séférian, C. M. Spillman, J. R. Hartog, S. Siedlecki, J. F. Samhouri, B. Muhling, R. G. Asch, M. L. Pinsky, V. S. Saba, S. B. Kapnick, C. F. Gaitan, R. R. Rykaczewski, M. A. Alexander, Y. Xue, K. V. Pegion, P. Lynch, M. R. Payne, T. Kristiansen, P. Lehodey, and F. E. Werner (2017). "Managing living marine resources in a dynamic environment: The role of seasonal to decadal climate forecasts". In: *Progress in Oceanography* 152, pp. 15-49. DOI: 10.1016/j.pocean.2016.12.011.

Wildermuth, R. P, G. Fay, and S. Gaichas (2017). "Structural uncertainty in qualitative models for ecosystem-based management of Georges Bank". In: *Canadian Journal of Fisheries and Aquatic Sciences* 75.10, pp. 1635-1643. DOI: 10.1139/cjfas-2017-0149.

Zador, S. G, S. K. Gaichas, S. Kasperski, C. L. Ward, R. E. Blake, N. C. Ban, A. Himes-Cornell, and J. Z. Koehn (2017). "Linking ecosystem processes to communities of practice through commercially fished species in the Gulf of Alaska". In: *ICES Journal of Marine Science* 74.7, pp. 2024-2033. DOI: 10.1093/icesjms/fsx054.

Gaichas, S. K, R. J. Seagraves, J. M. Coakley, G. S. DePiper, V. G. Guida, J. A. Hare, P. J. Rago, and M. J. Wilberg (2016). "A Framework for Incorporating Species, Fleet, Habitat, and Climate Interactions into Fishery Management". In: *Frontiers in Marine Science* 3. DOI: 10.3389/fmars.2016.00105.

Olsen, E, G. Fay, S. Gaichas, R. Gamble, S. Lucey, and J. S. Link (2016). "Ecosystem Model Skill Assessment. Yes We Can!" In: *PLOS ONE* 11.1. Ed. by C. N. Bianchi, p. e0146467. DOI: 10.1371/journal.pone.0146467.

Weijerman, M, J. Link, E. Fulton, E. Olsen, H. Townsend, S. Gaichas, C. Hansen, M. Skern-Mauritzen, I. Kaplan, R. Gamble, G. Fay, M. Savina, C. Ainsworth, I. van Putten, R. Gorton, R. Brainard, K. Larsen, and T. Hutton (2016). "Atlantis Ecosystem Model Summit: Report from a workshop". In: *Ecological Modelling* 335, pp. 35-38. DOI: 10.1016/j.ecolmodel.2016.05

Zador, S. G, K. K. Holsman, K. Y. Aydin, and S. K. Gaichas (2016). "Ecosystem considerations in Alaska: the value of qualitative assessments". In: *ICES Journal of Marine Science: Journal du Conseil*, p. fsw144. DOI: 10.1093/icesjms/fsw144.

Gaichas, S, K. Aydin, and R. C. Francis (2015). "Wasp waist or beer belly? Modeling food web structure and energetic control in Alaskan marine ecosystems, with implications for fishing and environmental forcing". In: *Progress in Oceanography* 138, Part A, pp. 1-17. DOI: 10.1016/j.pocean.2015.09.010.

Smith, L, R. Gamble, S. Gaichas, and J. Link (2015). "Simulations to evaluate management trade-offs among marine mammal consumption needs, commercial fishing fleets and finfish biomass". In: *Marine Ecology Progress Series* 523, pp. 215-232. DOI: 10.3354/meps11129.

Gaichas, S. K, J. S. Link, and J. A. Hare (2014). "A risk-based approach to evaluating northeast US fish community vulnerability to climate change". In: *ICES Journal of Marine Science* 71.8, pp. 2323-2342. DOI: 10.1093/icesjms/fsu048.

Ruzicka, J. J, J. H. Steele, T. Ballerini, S. K. Gaichas, and D. G. Ainley (2013). "Dividing up the pie: Whales, fish, and humans as competitors". In: *Progress in Oceanography* 116, pp. 207-219. DOI: 10.1016/j.pocean.2013.07.009.

Ruzicka, J, J. Steele, S. Gaichas, T. Ballerini, D. Gifford, R. Brodeur, and E. Hofmann (2013). "Analysis of Energy Flow in US GLOBEC Ecosystems Using End-to-End Models". In: *Oceanography* 26.4, pp. 82-97. DOI: 10.5670/oceanog.2013.77.

Fu, C, S. Gaichas, J. Link, A. Bundy, J. Boldt, A. Cook, R. Gamble, K. Rong Utne, H. Liu, and K. Friedland (2012). "Relative importance of fisheries, trophodynamic and environmental drivers in a series of marine ecosystems". In: *Marine Ecology Progress Series* 459, pp. 169-184. DOI: 10.3354/meps09805.

Gaichas, S. K, G. Odell, K. Y. Aydin, and R. C. Francis (2012). "Beyond the defaults: functional response parameter space and ecosystem-level fishing thresholds in dynamic food web model simulations". In: *Canadian Journal of Fisheries and Aquatic Sciences* 69, pp. 2077-2094. DOI: 10.1139/F2012-099.

Gaichas, S, A. Bundy, T. Miller, E. Moksness, and K. Stergiou (2012). "What drives marine fisheries production?" In: *Marine Ecology Progress Series* 459, pp. 159-163. DOI: 10.3354/meps09841.

Gaichas, S, R. Gamble, M. J. Fogarty, H. Benoit, T. Essington, C. Fu, M. Koen-Alonso, and J. Link (2012). "Assembly Rules for Aggregate-Species Production Models: Simulations in Support of Management Strategy Evaluation". In: *Marine Ecology Progress Series* 459, pp. 275-292.

Link, J, S. Gaichas, T. Miller, T. Essington, A. Bundy, J. Boldt, K. Drinkwater, and E. Moksness (2012). "Synthesizing Lessons Learned from Comparing Fisheries Production in 13 Northern Hemisphere Ecosystems: Emergent Fundamental Features". In: *Marine Ecology Progress Series* 459, pp. 293-302.

Link, J, T. Ihde, C. Harvey, S. Gaichas, J. Field, J. Brodziak, H. Townsend, and R. Peterman (2012). "Dealing with uncertainty in ecosystem models: The paradox of use for living marine resource management". In: *Progress in Oceanography* 102, pp. 102-114. DOI: 10.1016/j.pocean.2012.03.008.

Moksness, E, J. Link, K. Drinkwater, and S. Gaichas (2012). "Bernard Megrey: pioneer of Comparative Marine Ecosystem analyses". In: *Marine Ecology Progress Series* 459, pp. 165-167. DOI: 10.3354/meps09582.

Pranovi, F, J. Link, C. Fu, A. Cook, H. Liu, S. Gaichas, K. Friedland, K. Rong Utne, and H. Benoît (2012). "Trophic-level determinants of biomass accumulation in marine ecosystems". In: *Marine Ecology Progress Series* 459, pp. 185-201. DOI: 10.3354/meps09738.

Gaichas, S. K, K. Y. Aydin, and R. C. Francis (2011). "What drives dynamics in the Gulf of Alaska? Integrating hypotheses of species, fishing, and climate relationships using ecosystem modeling". In: *Canadian Journal of Fisheries and Aquatic Sciences* 68, pp. 1553-1578.

Hunsicker, M. E, L. Ciannelli, K. M. Bailey, J. A. Buckel, J. W. White, J. S. Link, T. E. Essington, S. Gaichas, T. W. Anderson, R. D. Brodeur, K. Chan, K. Chen, G. Englund, K. T. Frank, V. Freitas, M. A. Hixon, T. Hurst, D. W. Johnson, J. F. Kitchell, D. Reese, G. A. Rose, H. Sjodin, W. J. Sydeman, H. W. v. d. Veer, K. Vollset, and S. Zador (2011). "Functional responses and scaling in predator–prey interactions of marine fishes: contemporary issues and emerging concepts". In: *Ecology Letters* 14.12, pp. 1288-1299. DOI: 10.1111/j.1461-0248.2011.01696.x@10.1111/(ISSN)1461-0248.anthropogenic-change.

Salomon, A. K, S. K. Gaichas, O. P. Jensen, V. N. Agostini, N. Sloan, J. Rice, T. R. McClanahan, M. H. Ruckelshaus, P. S. Levin, N. K. Dulvy, and E. A. Babcock (2011). "Bridging the Divide Between Fisheries and Marine Conservation Science". In: *Bulletin of Marine Science* 87.2, pp. 251-274. DOI: 10.5343/bms.2010.1089.

Gaichas, S. K, K. Y. Aydin, and R. C. Francis (2010). "Using food web model results to inform stock assessment estimates of mortality and production for ecosystem-based fisheries management". In: *Canadian Journal of Fisheries and Aquatic Sciences* 67, pp. 1493-1506.

Reuter, R. F, M. E. Conners, J. Dicosimo, S. Gaichas, O. Ormseth, and T. T. Tenbrink (2010). "Managing non-target, data-poor species using catch limits: lessons from the Alaskan groundfish fishery". In: *Fisheries Management and Ecology* 17.4, pp. 323-335. DOI: 10.1111/j.1365-2400.2009.00726.x.

Salomon, A. K, S. K. Gaichas, N. T. Shears, J. E. Smith, E. M. P. Madin, and S. D. Gaines (2010). "Key Features and Context-Dependence of Fishery-Induced Trophic Cascades". In: *Conservation Biology* 24.2, pp. 382-394. DOI: 10.1111/j.1523-1739.2009.01436.x.

Gaichas, S, G. Skaret, J. Falk-Petersen, J. S. Link, W. Overholtz, B. A. Megrey, H. Gjøsæter, W. T. Stockhausen, A. Dommasnes, K. D. Friedland, and K. Aydin (2009). "A comparison of community and trophic structure in five marine ecosystems based on energy budgets and system metrics". In: *Progress in Oceanography* 81.1-4, pp. 47-62. DOI: 10.1016/j.pocean.2009.04.005.

Link, J. S, W. T. Stockhausen, G. Skaret, W. Overholtz, B. A. Megrey, H. Gjøsæter, S. Gaichas, A. Dommasnes, J. Falk-Petersen, J. Kane, F. J. Mueter, K. D. Friedland, and J. A. Hare (2009). "A comparison of biological trends from four

marine ecosystems: Synchronies, differences, and commonalities". In: *Progress in Oceanography*. Comparative Marine Ecosystem Structure and Function: Descriptors and Characteristics 81.1, pp. 29-46. DOI: 10.1016/j.pocean.2009.04.004.

Megrey, B. A, J. A. Hare, W. T. Stockhausen, A. Dommasnes, H. Gjøsæter, W. Overholtz, S. Gaichas, G. Skaret, J. Falk-Petersen, J. S. Link, and K. D. Friedland (2009). "A cross-ecosystem comparison of spatial and temporal patterns of covariation in the recruitment of functionally analogous fish stocks". In: *Progress in Oceanography*. Comparative Marine Ecosystem Structure and Function: Descriptors and Characteristics 81.1, pp. 63-92. DOI: 10.1016/j.pocean.2009.04.006.

Gaichas, S. (2008). "A context for ecosystem-based fishery management: Developing concepts of ecosystems and sustainability". In: *Marine Policy* 32, pp. 393-401.

Gaichas, S. K. and R. C. Francis (2008). "Network models for ecosystem-based fishery analysis: A review of concepts and application to the Gulf of Alaska marine food web". In: *Canadian Journal of Fisheries and Aquatic Sciences* 65, pp. 1965-1982.

Aydin, K. Y., S. Gaichas, I. Ortiz, D. Kinzey, and N. Friday (2007). *A comparison of the Bering Sea, Gulf of Alaska, and Aleutian Islands large marine ecosystems through food web modeling*. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-AFSC-178, p. 298.

Gburski, C. M, S. K. Gaichas, and D. K. Kimura (2007). "Age and growth of big skate (Raja binoculata) and longnose skate (R. rhina) in the Gulf of Alaska". In: *Environmental Biology of Fishes* 80.2-3, pp. 337-349. DOI: 10.1007/s10641-007-9231-8.

Gaichas, S. (2006). "Development and application of ecosystem models to support fishery sustainability: A case study for the Gulf of Alaska - ProQuest". Seattle, WA.

Spies, I. B, S. Gaichas, D. E. Stevenson, J. W. Orr, and M. F. Canino (2006). "DNA-based identification of Alaska skates (Amblyraja, Bathyraja and Raja: Rajidae) using cytochrome c oxidase subunit I (coI) variation". In: *Journal of Fish Biology* 69.sb, pp. 283-292. DOI: 10.1111/j.1095-8649.2006.01286.x.

Barbeaux, S. J, S. Gaichas, J. N. Ianelli, and M. W. Dorn (2005). "Evaluation of Biological Sampling Protocols for At-Sea Groundfish Observers in Alaska". In: *Alaska Fishery Research Bulletin* 11.2, p. 25.

Karp, W. A, C. S. Rose, J. R. Gauvin, S. K. Gaichas, M. W. Dorn, and G. D. Stauffer (2001). "Government-Industry Cooperative Fisheries Research in the North Pacific under the MSFCMA". In: *Marine Fisheries Review* 63.1, pp. 40-46.

Dorn, M. W, S. K. Gaichas, S. M. Fitzgerald, and S. A. Bibb (1999). "Measuring Total Catch at Sea: Use of a Motion-Compensated Flow Scale to Evaluate Observer Volumetric Methods". In: *North American Journal of Fisheries Management* 19.4, pp. 999-1016. DOI: 10.1577/1548-8675(1999)019<0999:MTCASU>2.0.CO;2.

Gaichas, S. (1997). "Age And Growth Of Spanish Mackerel, Scomberomorus Maculatus, In The Chesapeake Bay Region". In: *Master's Thesis*. DOI: 10.25773/V5-TWBW-6T04.

Scientific Presentations

Speaker, moderator, and symposium organizer at regional to international professional meetings (AFS, ASLO, Conservation Biology, ESA, GLOBEC, IMCC, World Fisheries Congress) 1995-present. Invited speaker for public lecture series, teacher workshops, and university courses and departmental seminars.