

## **Kenneth A. Rose**

### **Horn Point Laboratory**

University of Maryland Center for Environmental Science

#### **Education**

Ph.D., Fisheries, University of Washington, 1985.

M.S., Fisheries, University of Washington, 1981.

B.S., Biology and Mathematics, State University of New York at Albany, 1979.

#### **Areas of professional expertise**

- Mathematical and simulation modeling of ecological systems
- Fish population and food web dynamics
- Fisheries management
- Ecological assessment
- Ecosystem restoration

#### **Professional Background**

2017 – France-Merrick Professor in Sustainable Ecosystem Restoration, Horn Point Lab, UMCES

2015-2017 Associate Dean - Research, College of Coast & Environment, LSU

2001-2017 Professor, Abraham Distinguished Professor (2009-2013), LSU

1998-2001 Associate Professor, Louisiana State University

1987-1998 Research Scientist, Oak Ridge National Laboratory

1983-1987 Consultant, Martin Marietta Environmental Systems

#### **Awards and Special Recognition**

Oscar E. Sette Award for Outstanding Marine Fishery Biologist from AFS, 2020

Chandler-Misener Award (most notable paper) Journal of Great Lakes Research, 2019.

Best Paper in Marine and Coastal Fisheries, 2018.

Fellow of the American Association for the Advancement of Science, 2000.

Award of Excellence for life time achievement, American Fisheries Society, 2014.

Fellow of the American Fisheries Society, 2015.

LSU Distinguished Faculty Award, 2014.

LSU Rainmaker Award for Outstanding Research, 2009.

Abraham Distinguished Prof in Louisiana Environmental Sciences, LSU, 2009.

Best Paper of the Year, Transactions of the American Fisheries Society, 2009.

Most Significant Paper of the Year, North Amer. J. of Fish. Management, 1997.

Lipsey Award for Teaching, Dept. of Oceanography. and Coastal Sciences, LSU, 2003.

Special Achievement Award (for research), Oak Ridge National Lab., 1991.

**Publications (60 examples from a total of 220)**

*Goggle Scholar*: H-index of 61; total of 16,83 Citations

**[Cited >1500]**

Patterns of life-history diversification in North-American fishes: implications for population regulation. 1992. *Canadian Journal of Fisheries and Aquatic Sciences*. {reprinted in the book *Foundations of Fisheries Science*}

Declining oxygen in the global ocean and coastal waters. 2018. *Science*.

**[Cited > 1000]** Ecological forecasts: An emerging imperative. 2001. *Science*.

**[Cited > 500]** Compensatory density dependence in fish populations: importance, controversy, understanding and prognosis. 2001. *Fish and Fisheries*. {reprinted in the book *Foundations of Fisheries Science*}

1. **Rose, K.A.**, and E.P. Smith. 1992. Experimental design: the neglected aspect of environmental monitoring. *Environmental Management* 16: 691-700.
2. Winemiller, K.O., and **K.A. Rose**. 1992. Patterns of life-history diversification in North American fishes: implications for population regulation. *Canadian Journal of Fisheries and Aquatic Sciences* 49: 2196-2218.
3. DeAngelis, D.L., **K.A. Rose**, L. Crowder, E. Marschall, and D. Lika. 1993. Fish cohort dynamics: application of complementary modeling approaches. *American Naturalist* 142: 604-622.
4. **Rose, K.A.**, J.H. Cowan, E.D. Houde, and C.C. Coutant. 1993. Individual-based modeling of environmental quality effects on early life stages of fish: a case study using striped bass. *American Fisheries Society Symposium* 14: 125-145.
5. Tyler, J.A., and **K.A. Rose**. 1994. Individual variability and spatial heterogeneity in fish population models. *Reviews in Fish Biology and Fisheries* 4: 91-123.
6. Tyler, J.A., and **K.A. Rose**. 1997. Effects of individual habitat selection in a heterogeneous environment on fish cohort survivorship: a modelling analysis. *Journal of Animal Ecology* 66: 122-136.
7. Railsback, S.F., and **K.A. Rose**. 1999. Bioenergetics modeling of stream trout growth: temperature and food consumption effects. *Transactions of the American Fisheries Society* 128: 241-256.
8. **Rose, K.A.** 2000. Why are quantitative relationships between environmental quality and fish populations so elusive? *Ecological Applications* 10: 367-385.

9. Kimmerer, W., J.H. Cowan, L.W. Miller, and **K.A. Rose**. 2000. Analysis of an estuarine striped bass population: influence of density-dependent mortality between metamorphosis and recruitment. *Canadian Journal of Fisheries and Aquatic Sciences* 57: 478-486.
10. Cowan, J.H., **K.A. Rose**, and D. DeVries. 2000. Is density-dependent growth in young-of-the-year fishes a question of critical weight? *Reviews in Fish Biology and Fisheries* 10: 61-89.
11. Sutton, T.M., **K.A. Rose**, and J.J. Ney. 2000. A model analysis of strategies for enhancing stocking success of landlocked striped bass populations. *North American Journal of Fisheries Management* 20: 841-859.
12. Kimmerer, W., J.H. Cowan, L.W. Miller, and **K.A. Rose**. 2001. Analysis of an estuarine striped bass population: effects of environmental conditions during early life. *Estuaries* 24: 557-575.
13. Clark, J.S., S. Carpenter, M. Barber, S. Collins, A. Dobson, J. Foley, D. Lodge, M. Pascual, R. Pielke, W. Pizer, C. Pringle, W. Reid, **K. Rose**, O. Sala, W. Schlesinger, D. Wall, and D. Wear. 2001. Ecological forecasts: an emerging imperative. *Science* 293: 657-660.
14. **Rose, K.A.**, J.H. Cowan, K.O. Winemiller, R.A. Myers, and R. Hilborn. 2001. Compensatory density-dependence in fish populations: importance, controversy, understanding, and prognosis. *Fish and Fisheries* 2: 293-327.
15. Jager, Y., and **K.A. Rose**. 2003. Designing optimal flow patterns for fall Chinook salmon in a Central Valley, California river. *North American Journal of Fisheries Management* 23: 1-21.
16. **Rose, K.A.**, C.A. Murphy, S.L. Diamond, L.A. Fuiman, and P. Thomas. 2003. Using nested models and laboratory data for predicting population effects of contaminants on fish: a step towards a bottom-up approach for establishing causality in field studies. *Human and Ecological Risk Assessment* 9: 231-257.
17. **Rose, K.A.**, and J.H. Cowan. 2003. Data, models, and decisions in US marine fisheries management: lessons for ecologists. *Annual Review of Ecology, Evolution, and Systematics* 34: 127-151.
18. Fuiman, L.A., **K.A. Rose**, J.H. Cowan, and E.P. Smith. 2006. Survival skills required for predator evasion by fish larvae and their relationship to laboratory measures of performance. *Animal Behaviour* 71: 1389-1399.
19. **Rose, K.A.**, B.A. Megrey, F. Werner, and D.M. Ware. 2007. Calibration of the NEMURO nutrient-phytoplankton-zooplankton food web model to a coastal ecosystem: evaluation of an automated calibration approach. *Ecological Modelling* 203: 38-51.

20. Jager, H.I., **K.A. Rose**, and A. Vila-Gispert. 2008. Life history correlates and extinction risk of capital-breeding fishes. *Hydrobiologia* 602: 15-25.
21. Murphy, C.A., **K.A. Rose**, M.C. Alvarez, and L.A. Fuiman. 2008. Modeling larval fish behavior: scaling the sublethal effects of methylmercury to population relevant endpoints. *Aquatic Toxicology* 86: 470-484.
22. Stow, C.A., J. Jolliff, D.J. McGillicuddy, S.C. Doney, J.I. Allen, M.A.M. Friedrichs, **K.A. Rose**, and P. Wallhead. 2009. Skill assessment for coupled biological/physical models of marine systems. *Journal of Marine Systems* 76: 4-15.
23. Walters, C., V. Christensen, W. Walters, and **K.A. Rose**. 2010. Representation of multi-stanza life histories in Ecospace models for spatial organization of ecosystem trophic interactions. *Bulletin of Marine Science* 86: 439-459
24. **Rose, K.A.**, J.I. Allen, Y. Artioli, M. Barange, J. Blackford, F. Carlotti, R. Cropp, U. Daewel, K. Edwards, K. Flynn, S.L. Hill, R. HilleRisLambers, G. Huse, S. Mackinson, B. Megrey, A. Moll, R. Rivkin, B. Salihoglu, C. Schrum, L. Shannon, Y.-J. Shin, S.L. Smith, C. Smith, C. Solidoro, M. St. John, and M. Zhou. 2010. End-to-end models for the analysis of marine ecosystems: challenges, issues, and next steps. *Marine and Coastal Fisheries* 2: 115-130.
25. Massoudieh, A., E. Loboschefskey, T. Sommer, T. Ginn, **K. Rose**, and F. Loge. 2011. Spatio-temporal modeling of striped-bass egg and larvae movement and fate in the San Francisco Bay-Delta. *Ecological Modelling* 222: 3513-3523.
26. Stock, C.A., M.A. Alexander, N.A. Bond, K. Brander, W.W.L. Cheung, E.N. Curchitser, T.L. Delworth, J.P. Dunne, S.M. Griffies, M.A. Haltuch, J.A. Hare, A.B. Hollowed, P. Lehodey, S.A. Levin, J.S. Link, **K.A. Rose**, R. Rykaczewski, J.L. Sarmiento, R.J. Stouffer, F.B. Schwing, G.A. Vecchi, F.E. Werner. 2011. On the use of IPCC-class models to assess the impact of climate on living marine resources. *Progress in Oceanography* 88: 1-27.
27. Loboschefskey, E., G. Benigno, T. Sommer, T. Ginn, A. Massoudieh, **K. Rose**, F. Loge. 2012. Bioenergetic modeling of San Francisco Estuary striped bass. *San Francisco Estuary and Watershed Science* 10: article 1.
28. **Rose, K.A.**, M.C. Fabrizio, and B.A. Phelan. 2012. Determining authorship: why is something that seems so simple often so difficult? In: *Scientific Communication for Natural Resource Professionals* (C.A. Jennings, T.E. Lauer, and B. Vondracek, eds.), American Fisheries Society, Bethesda, MD, pp. 7-18.
29. Watkins, K.S., and K.A. Rose. 2013. Evaluating the performance of individual-based animal movement models in novel environments. *Ecological Modelling* 250: 214-234.

30. **Rose, K.A.**, and J.I. Allen. 2013. Modeling marine ecosystem responses to global climate change: Where are we now and where should we be going? *Ecological Modelling* 264: 98-114.
31. **Rose, K.A.**, W.J. Kimmerer, K.P. Edwards, and W.A. Bennett. 2013. Individual-based modeling of delta smelt population dynamics in the Upper San Francisco Estuary: I. Model description and baseline results. *Transactions of the American Fisheries Society* 142: 1238-1259.
32. **Rose, K.A.**, W.J. Kimmerer, K.P. Edwards, and W.A. Bennett. 2103. Individual-based modeling of delta smelt population dynamics in the Upper San Francisco Estuary: II. Alternative baselines and good versus bad years. *Transactions of the American Fisheries Society* 142: 1260-1272.
33. **Rose, K.A.**, S. Sable, D.L. DeAngelis, S. Yurek, J.C., Trexler, W. Graf, and D.J. Reed. 2015. Proposed best modeling practices for assessing the effects of ecosystem restoration on fish. *Ecological Modelling* 300: 12-29.
34. **Rose, K.A.**, J. Fiechter, E.N. Curchitser, K. Hedstrom, M. Bernal, S. Creekmore, A. Haynie, S. Ito, S. Lluch-Cota, B.A. Megrey, C. Edwards, D. Checkley, T. Koslow, S. McClatchie, F. Werner, A. MacCall, and V. Agostini. 2015. Demonstration of a fully-coupled end-to-end model for small pelagic fish using sardine and anchovy in the California Current. *Progress in Oceanography* 138: 348-380.
35. Curchister, E.N., **K.A. Rose**, S.Ito, M. Peck., and M.J. Kishi. 2015. Combining modeling and observations to better understand marine ecosystem dynamics. *Progress in Oceanography* 138: 327-330.
36. Fiechter, J., D.D. Huff, B.T. Martin, D.W. Jackson, C.A. Edwards, **K.A. Rose**, E.N. Curchitser, K.S. Hedstrom, S.T. Lindley, and B.K. Wells. 2015. Environmental conditions impacting juvenile Chinook salmon growth off central California: An ecosystem model analysis. *Geophysical Research Letters* 42: 2910-2917.
37. Collie, J., L. Botsford, A. Hastings, I. Kaplan, J. Largier, P. Livingston, E. Plaganyi, **K. Rose**, B. Wells, and F. Werner. 2016. Ecosystem models for fisheries management: finding the sweet spot. *Fish and Fisheries* 17: 101-125.
38. Larsen, L.G., M.B. Eppinga, P. Passalacqua, W.M. Getz, **K.A. Rose**, and M. Liang. 2016. Appropriate complexity landscape modeling. *Earth Science Reviews* 160: 111-130.
39. Grüss, A., **K.A. Rose**, J. Simons, C.H. Ainsworth, E.A. Babcock, D.D. Chagaris, K. de Mutsert, J. Froeschke, P. Himchak, I.C. Kaplan, and H. O'Farrell, H., 2017. Recommendations on the use of ecosystem modeling for informing ecosystem-based fisheries management and restoration outcomes in the Gulf of Mexico. *Marine and Coastal Fisheries* 9: 281-295.

40. O'Farrell, H., A. Grüss, S.R. Sagarese, E.A. Babcock, and **K.A. Rose**. 2017. Ecosystem modeling in the Gulf of Mexico: current status and future needs to address ecosystem-based fisheries management and restoration activities. *Reviews in Fish Biology and Fisheries* 27: 587-614.
41. Marshall, K.N., P.S. Levin, T.E. Essington, L.E. Koehn, L.G. Anderson, A. Bundy, C. Carothers, F. Coleman, L.R. Gerber, J.H. Grabowski, E. Houde, O. Jensen, C. Mollmann, **K. Rose**, J.N. Sanchirico, and A.D.M. Smith. 2017. Ecosystem-Based fisheries management for social-ecological systems: Renewing the focus in the United States with next generation fishery ecosystem plans. *Conservation Letters* doi: 10.1111/conl.12367.
42. Warden, M.L., H.L. Haas, P.M. Richards, **K.A. Rose**, and J.M. Hatch. 2017. Monitoring trends in sea turtle populations: walk or fly? *Endangered Species Research* 34: 323-337.
43. Breitburg, D., L.A. Levin, A. Oschlies, M. Grégoire, F.P. Chavez, D.J. Conley, V. Garçon, D. Gilbert, D. Gutiérrez, K. Isensee, G.S. Jacinto, K.E. Limburg, I. Montes, S.W.A. Naqvi, G.C. Pitcher, N.N. Rabalais, M.R. Roman, **K.A. Rose**, B.A. Seibel, M. Telszewski, M. Yasuhara, and J. Zhang. 2018. Declining oxygen in the global ocean and coastal waters. *Science* 359: Issue 6371, eaam7240.
44. Levin, P., T. Essington, K.N. Marshall, L.E. Koehn, L.G. Anderson, A. Bundy, C. Courthers, F. Coleman, L.R. Gerber, J. Grabowski, E. Houde, O. Jensen, C. Mollmann, K. Rose, J. Sanchirico, and A.D.M. Smith. 2018. Building effective fishery ecosystem plans. *Marine Policy* 92: 48-57.
45. Kimmerer, W.J., and **K.A. Rose**. 2018. Individual-based modeling of delta smelt population dynamics in the upper San Francisco Estuary. III. Effects of entrainment mortality and changes in prey. *Transactions of the American Fisheries Society* 147: 223-243.
46. Potts, S.E. and **K.A. Rose**. 2018. Evaluation of GLM and GAM for estimating population indices from fishery independent surveys. 2018. *Fisheries Research* 208: 167-178.
47. Ward, E.J. K. Oken, **K. Rose**, S. Sable and K. Watkins. 2018. Applying spatiotemporal models to understand fish population responses to anthropogenic and environmental change in the Gulf of Mexico. *Environmental Monitoring and Assessment* 190: 530. <https://doi.org/10.1007/s10661-018-6912-z>.
48. Lipcius, R.N., D.B. Eggleston, F.J. Fodrie, J. van der Meer, **K.A. Rose**, R.P. Vasconcelos and K.E. van de Wolfshaar. 2019. Modeling quantitative value of coastal habitats for exploited species. *Frontiers in Marine Science* 6, Article 280.
49. LaBone, E., D. Justic, **K. Rose**, L. Wang, and H. Huang. 2019. Modeling fish movement in 3-D in the Gulf of Mexico hypoxic zone. *Estuaries and Coasts* 42: 1662-1685.

50. le Pape, O. Y. Vermard, J. Guitton, E.J. Brown, K.E. van de Wolfshaar, R.N. Lipcius, J.G. Støttrup, and **K.A. Rose**. 2020. The use and performance of survey-based pre-recruit abundance indices for possible inclusion in stock assessments of coastal-dependent species. *ICES Journal of Marine Science* 77: 1953-1965.
51. Grüss, A., **K.A. Rose**, D. Justić, and L. Wang. 2020. Making the most of available monitoring data: A grid-based summarization method to allow for the combined use of monitoring data collected at random and fixed stations. *Fisheries Research* doi.org/10.1016/j.fishres.2020.105623
52. Lewis, K.A., **K.A. Rose**, K. de Mutsert, S. Sable, C. Ainsworth, D.C. Brady, H. Townsend. 2021. Using multiple ecological models to inform environmental decision-making. *Frontiers in Marine Science* 24, doi.org/10.3389/fmars.2021.625790.
53. Hood, R.R., G. Shenk, R.L. Dixon, S. Smith, W. Ball, J.O. Bash, R. Batiuk, K. Boomer, D.C. Brady, C. Cerco, P. Claggett, K. de Mutsert, Z.M. Easton, A.J. Elmore, M.A.M. Friedrichs, L. Harris, T.F. Ihde, I. Lacher, L. Li, L. Linker, A. Miller, J. Moriarty, G. Noe, G. Onyullo, **K. Rose**, K. Skalak, R. Tian, T.L. Veith, L. Wainger, D. Weller, Y.J. Zhang. (in press) The Chesapeake Bay Program Modelling System: Overview and recommendations for future development. *Ecological Modelling* 456, 109635. <https://doi.org/10.1016/j.ecolmodel.2021.109635>
54. Fiechter, J., M. Pozo Buil, M.G. Jacox, M.A. Alexander, and **K.A. Rose**. 2021. Projected shifts in 21st century sardine distribution and catch in the California Current. *Frontiers in Marine Science* 8:685241. doi:10.3389/fmars.2021.685241
55. Zhang, B., R.B. Gramacy, L. Johnson, **K.A. Rose**, and E. Smith. 2022. Batch-sequential design and heteroskedastic surrogate modeling for delta smelt conservation. *Annals of Applied Statistics* 16: 816-842.
56. **Rose, K.A.**, E. Reyes, and D. Justic. 2022. Chapter 16: Estuarine ecological modeling. Pages 380-413, In: B.C. Crump, J.M. Testa, and K.H. Dunton (eds), *Estuarine Ecology 3<sup>rd</sup> edition*, John Wiley and Sons.
57. Fabrizio, M.C., M. J. Henderson, **K.A. Rose**, and P. Petitgas. 2022. Editorial: Habitat and distribution models of marine and estuarine species: advances for a sustainable future. *Frontiers in Marine Science*. doi: 10.3389/fmars.2022.1050548
58. Glibert, P.M., W.J. Cai, E.R. Hall, M. Li, K.L. Main, **K.A. Rose**, J.M. Testa, and N.K. Vidyarthna. 2022. Stressing over the complexities of multiple stressors in marine and estuarine systems. *Ocean-Land-Atmosphere Research*, 2022, Article ID 9787258, 27 pages <https://doi.org/10.34133/2022/9787258>
59. Kallis, J.L., R.A. Erickson, D.P. Coulter, A.A. Coulter, J.E. Garvey, M Brey, M. Catalano, J.M. Dettmers, K. Irons, E. Marschall, K. Rose, M. Wildhaber, and D.C. Glover. 2023.

Incorporating metapopulation dynamics to inform invasive species management: Evaluating Bighead and Silver carp control strategies in the Illinois River. *Journal of Applied Ecology*, <https://doi.org/10.1111/1365-2664.14466>

60. Rose, K.A. in press. Sometimes (often?) responses to multiple stressors can be predicted from single stressor effects: a case study using an agent-based population model of croaker in the Gulf of Mexico. *Marine and Coastal Fisheries*.

### **National Academy of Science Committee Membership and Reports**

Committee on Sustainable Water and Environmental Management in the California Bay-Delta, 2010-2011.

Evaluating the Effectiveness of Stock Rebuilding Plans of the 2006 Fishery Conservation and Management Reauthorization Act, 2012-2013.

Evaluating the Effectiveness of Stock Rebuilding Plans in the United States. 2014.

Review of the Edwards Aquifer Habitat Conservation Plan (3 separate committees and 4 reports), 2015-2018.

Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico. 2017.

### **Presentations (examples)**

1. Two invited talks: One fish two fish, red fish, blue fish: It sounds so simple so why are fish population dynamics so complex? (Public presentation) and Fish population dynamics and fisheries management as complex systems (University-wide seminar). University of Alaska's Complex Systems Lecture Series, Anchorage, AK, April 2005.
2. Environmental impacts of offshore LNG terminals. The Energy Council's Liquefied Natural Gas/Compressed Natural Gas Workshop, Biloxi, MS, April 2005.
3. Use of modeling to separate the effects of multiple stressors on fish populations. Workshop on Predicting the Effects of Overfishing, Eutrophication, and Disease on Estuarine Fish Assemblages. Smithsonian Environmental Research Center, Edgewater, MD, May 2005.
4. Multi-authored collaborative papers: the future is now and we need to catch up. American Fisheries Society 135th Annual Meeting, Anchorage, AK, September 2005.
5. Complexity in forage species population dynamics and management. American Fisheries Society 135th Annual Meeting, Anchorage, AK, September 2005 (contributed).



6. Population modeling: If it is so hard and unpleasant, then why do we do it? or How to be distrusted but popular. Annual Workshop of the Environmental Water Account of the CALFED Program. Sacramento, CA. Dec 2005.
7. Geographic variation in fish growth and population responses to regime shifts in the north pacific: a comparison of herring and saury using NEMURO.FISH, a coupled fish bioenergetics and NPZ model. PICES/GLOBEC Symposium on Climate Variability and Ecosystem Impacts on the North Pacific: A Basin-Scale Synthesis, Honolulu, Hawaii, April 2006.
8. Forecasting using full life-cycle biophysical models: is it enough to search for patterns in disparate time scales, space scales, and life histories? Skill Assessment for Coupled Biological/Physical Models of Marine Systems Workshops, Chapel Hill, NC, July 2006.
9. Towards coupling sardine and anchovy to the NEMURO lower trophic model. PICES 15th Annual Meeting, Yokohama, Japan, October 2006.
10. Complex systems theory, post-modernism, and science and scientists in the CALFED era. 4th Biennial CALFED Science Conference, Sacramento, CA, October 2006 (Plenary talk)
11. Red fish, blue fish, one Fish, two Fish - why are fish populations so complex?, School of Marine Sciences Seminar Series, University of Maine, November 2006.
12. Modeling the effects of hypoxia on fish. NOAA's Ecological Impacts of Hypoxia on Living Resources Workshop, Stennis, MS, March 2007.
13. Modeling the ecological effects of endocrine active compounds on fish: scaling from individuals to populations. International Science Forum on Computational Toxicology, Research Triangle Park, NC, May 2007.
14. Modeling hypoxia effects on Chesapeake Bay fish. CheMS'08: Chesapeake Modeling Symposium, Annapolis, MD, May 2008.
15. Experiences with trying to coupled hydrodynamic, NPZ and fish models. Advances in Marine Ecosystem Modelling Research Symposium, Plymouth, England, June 2008 (Keynote Talk)
16. Coupling hydrodynamic, NPZ, and fish models: can the biology and people keep up with the computers? Workshop on Bridging the Gap between Lower and Higher Trophic Levels, Plymouth, England, June 2008.
17. Physics to fishers modeling: a proof of principle using sardine and anchovy in the California Current. Workshop on applying IPCC-class models of global warming to fisheries prediction, Princeton University, NJ, June 2009.

18. End-to-end models: can the people and biology keep up with the computers? Ecosystem Studies of Sub-Arctic Seas (ESSAS) Annual Science Meeting, Seattle, WA, June 2009.
19. Does hypoxia cause population-level effects in Gulf of Mexico fish? Workshop to Coordinate Gulf of Mexico Hypoxic Zone Research, February 2010, Bay St. Louis, MS, February 2010.
20. Can end-to-end models be assembled from existing models? End-to-End Modeling Workshop, Woods Hole, MA, April 2010.
21. End-to-end models: should we? can we? what is new? ESSAS Annual Science Meeting, Reykjavik, Iceland, September 2010.
22. Two invited talks: From climate to physics to fisheries: a demonstration of an end-to-end model for the California Current System, and Including fleet models in an end-to-end modeling framework. MARIFISH-ICES Joint Workshop on Integrated Ecosystem Modelling, Barcelona, Spain, November 2010.
23. Comparative analysis of stressors affecting delta smelt population dynamics: implications of a spatially-explicit individual-based model. Annual Meeting of the American Fisheries Society, Seattle, WA, September 2011 (contributed).
24. Two invited talks: Session S8 (Linking migratory fish behavior to end-to-end models) and Session S9 (How well do our models really work and what data do we need to check and improve them?). 2011 PICES Annual Science Meeting, Khabarovsk, Russia, October 2011.
25. Are population-level effects of hypoxia on fish truly small or larger but elusive? 20th Biennial Conference of the Coastal and Estuarine Research Federation, Daytona Beach, FL, November 2011 (contributed).
26. Development of a climate-to-fish-to-fishers model for anchovies and sardines in the California Current: proof-of-principle and exploratory simulation of fishing effects. 6th World Fisheries Congress, Edinburgh, Scotland, May 2012 (contributed).
27. Are population-level effects of hypoxia on fish truly small or larger but elusive? 3rd Annual Hypoxia Coordination Workshop, Bay St. Louis, March 2012.
28. Individual-Based Population Dynamics Model of Delta Smelt: Comparing the Effects of Food versus Entrainment. 2012 Annual Workshop of the Interagency Ecological Program, Folsom, CA, April 2012.
29. Modeling movement of fish over spatial and temporal scales: if fish were dumber and people were smarter. Working Group on Integrative Physical-Biological and Ecosystem Modelling (WG-IPEM), Copenhagen, March 2012.

30. Predicting the Population-Level Effects of Hypoxia on Atlantic Croaker (*Micropogonias undulatus*) in the Northern Gulf of Mexico. Annual Meeting of the American Society of Limnology and Oceanography, New Orleans, February 2013 (contributed).
31. Development of a Climate-to-Fish-to-Fishers Model: Implementation in the eastern Pacific Sardine and Anchovy System. Annual Meeting of the American Society of Limnology and Oceanography, New Orleans, February 2013 (contributed).
32. Some advances in ecosystem modeling: Can the data and people keep up with the computers? Lake Erie – Inland Waters Annual Research Review, Columbus, OH, January 2013 (plenary speaker)
33. Modeling Fish Population Responses to Hypoxia: What Do We Need and What Do We Want. Forum for Gulf of Mexico Hypoxia Research Coordination and Advancement, Stennis, MS, April 2013.
34. Development of a climate-to-fish-to-fishers model: proof-of-principle and exploratory simulations using anchovies and sardines in the California Current, ICES Annual Science Conference, Reykjavik, Iceland, September 2013 (contributed).
35. Six words we should ban unless properly defined: Complexity, Complicated, Validation, Mechanistic, Prediction, and Management. American Fisheries Society, Little Rock, AR, September 2013.
36. Can we better understanding the elusive “competition” and “recruitment variability” using individual-based modeling: a case study using red drum, American Fisheries Society, Little Rock, AR, September 2013.
37. Modeling the effects of diversions: can the biology and data keep up with computers? CEER: Conference on Ecological and Ecosystem Restoration, New Orleans, July 2014.
38. Coupling fish to physics in models: If people were smarter or fish were dumber. Deltares, Delft, Netherlands, March 2014.
39. Fisheries modeling: State of the science and challenges, NOAA Workshop on Operational Ecosystem Forecasting, Cambridge, MD, April 2014.
40. Modeling: Diversion effects on fish and best practices, The 5th Annual NOAA/NGI Gulf Hypoxia Research Coordination Workshop, Stennis, MS, July 2014.
41. End-to-End Modeling of Marine Ecosystems: Can the Biology and People Keep up with the Computers? Seminar at the College of Marine Science, University of South Florida, St. Petersburg, FL, October 2014.
42. Ecosystem modeling for fish and shellfish: What to expect? Presentation to the Expert Panel on Diversion Planning and Implementation, Baton Rouge, LA, October 2014.

43. End-to-end modeling of sardine and anchovy in the California Current System. CalCOFI Conference: Predicting the California Current System, La Jolla, CA, December 2014.
44. End-to-end modeling: An emerging tool for ecosystem-based fisheries management. 145th Annual Meeting of the American Fisheries Society, Portland, OR.
45. Modeling the population-level effects of hypoxia on a coastal fish: implications of a spatially-explicit individual-based model. ICES Annual Science Conference, Copenhagen, Denmark, September, 2015.
46. Proposed best modeling practices for fish conservation and ecosystem restoration. 145th Annual Meeting of the American Fisheries Society, Portland, OR, August 2015.
47. Physics to fish - challenges, opportunities, and promise. NOAA's North Atlantic Regional Team (NART) Workshop on "Linking freshwater and ocean dynamics towards integrative ecosystem modeling", Norrie Point, NY, August 2015.
48. Modeling the population-level effects of hypoxia on a coastal fish: implications of a spatially-explicit individual-based model. Ocean Sciences Meeting, New Orleans, February 2016 (contributed).
49. The social aspects of ecological modeling or what they did not teach you in school. International Society of Ecological Modelling Global Conference, Baltimore, MD, May 2016 (plenary speaker)
50. Fisheries science in an era of stakeholder-engaged multi-disciplinary analysis: the "people" part of coupled human-natural systems. 7th World Fisheries Congress, Busan, Korea, May 2016 (keynote speaker).
51. How can we accelerate the use of food web theory in fisheries assessments and management? Coastal and Estuarine Research Federation, Providence, RI November 2017 (plenary speaker)
52. Multidisciplinary science and working in teams: advantages and practical advice. 2017 MEES Student Colloquium, Horn Point Laboratory, September 2017. (Invited speaker)
53. Multidisciplinary team science and engaged stakeholders: two often neglected aspects of coupled human-natural systems. ICES Annual Science Conference, Ft Lauderdale, FL September 2017 (plenary speaker)
54. Recruitment is The Holy Grail in Fisheries Science and Why We Should Keep on Searching. Workshop on Recruitment: theory, estimation, and application in fishery stock assessment models, Center for the Advancement of Population Assessment Methodology, Miami, FL November 2017 (Keynote speaker)

55. Assessing ecosystem restoration using coupled modeling: Necessary, Messy, Doable. Science Keynote presentation at STAC (Science and Technical Advisory Committee) workshop entitled: Chesapeake Bay Program Modeling in 2025 and Beyond: A Proactive Visioning Workshop, Shepardstown, WV, January 17-19, 2018. (Keynote speaker)
56. Using linked models to predict the impacts of hypoxia on Gulf Coast fisheries under scenarios of watershed and river management. Presentation of ongoing NGOMEX project at the Fisheries Monitoring Workgroup Workshop, Stennis, MS, May 15-17, 2018.
57. Predicting marine ecosystem responses to environmental variation: Now is the time to merge bioenergetics and movement ecology. Invited speaker at workshop on bioenergetics as part of the Fourth International Symposium on the Effects of Climate Change on the World's Oceans, Washington, DC, June 4-8, 2018. (Invited speaker)
58. Predicting fish population responses to hypoxia using 2-D and 3-D coupled biophysical models. Invited talk at American Fisheries Society, Atlantic City, NJ, August 19-23, 2018.
59. Delta Smelt Population Responses to Environmental Changes: Can Models Provide the Answers? The 2018 Interagency Ecological Program Annual Workshop, March 2018, Folsom, CA.
60. Simulating fish population responses to coastal hypoxia: movement behavior and the tradeoff between more oxygen and less food. Ocean Deoxygenation Conference: Drivers and Consequences – Past, Present, Future, Kiel, Germany, September 3-7, 2018.
61. Deoxygenation effects on fisheries: a mosaic of effects and responses. Ocean Deoxygenation Conference: Drivers and Consequences – Past, Present, Future, Kiel, Germany, September 3-7, 2018. {keynote}
62. Using linked models to predict the impacts of hypoxia on Gulf Coast fisheries under scenarios of watershed and river management. Presentation of ongoing NGOMEX project at the Fisheries Monitoring Workgroup Workshop, Stennis, MS, May 15-17, 2018.
63. Predicting marine ecosystem responses to environmental variation: Now is the time to merge bioenergetics and movement ecology. Invited speaker at workshop on bioenergetics as part of the Fourth International Symposium on the Effects of Climate Change on the World's Oceans, Washington, DC, June 4-8, 2018.
64. Predicting fish population responses to hypoxia using 2-D and 3-D coupled biophysical models. American Fisheries Society, Atlantic City, NJ, August 19-23, 2018.

65. Delta Smelt Population Responses to Environmental Changes: Can Models Provide the Answers? The 2018 Interagency Ecological Program Annual Workshop, Folsom, CA, March 2018. {contributed}
66. End Models: Linking Physics and Biogeochemistry to Fish. The Fourth Xiamen Symposium on Marine Environmental Sciences, Xiamen, China, January, 2019.
67. Assessing Ecosystem Restoration Effects on Fish and Shellfish: Necessary, messy, doable. Presentation at the quarterly meeting of the Science Technical and Advisory Committee of the Chesapeake Bay Program. September 10, 2019
68. How can we include physics and behavior in fish population and food web models? Virginia Institute of Marine Science, April 26, 2019.
69. Multidisciplinary team science and engaged {-raged} stakeholders: two often neglected aspects of coupled human-natural systems. National Socio-Environmental Synthesis Center (SESYNC), Annapolis. October 22, 2019.
70. Watershed to fish using coupled biophysical models. Seminar at Appalachian Lab, Visiting Scholar Seminar Series, April 4, 2019.
71. Predicting climate change effects on fish using coupled bio-physical models: challenges and opportunities. ASLO Aquatic Sciences Meeting, San Juan, PR, March 2019.
72. Ecosystem restoration: why are so many people unhappy? Seminar given at ARKF Environmental Consulting as part of their Natural Resources Seminar Series, Hanover, Maryland, December 17, 2019.
73. Multidisciplinary team science and engaged {-raged} stakeholders: two often neglected aspects of coupled human-natural systems. Fisheries and Aquaculture Seminar Series, FAO, Rome (Italy), June 21, 2019.
74. Fish life histories and modeling exposure to dynamics stressors. GOMRI Integration Workshop, Center for Ocean-Atmospheric Prediction Studies (COAPS), Florida State University, Tallahassee, FL, January 15, 2019.
75. Predicting fish population responses to hypoxia using 3-D coupled biophysical models. CERF 25th Biennial Conference, Mobile, AL, November, 2019.
76. A Proposed Framework for Analyzing Water Quality and Habitat Effects on Aquatic Living Resources of Chesapeake Bay. Chesapeake Community Research Symposium 2020, June 2020. {contributed}
77. Modeling: What it is and How It Helps Predict the Future of the Chesapeake Bay. BAY 101: A Virtual Seminar Series on the Science of the Chesapeake for Non-Scientists, July 2020.

78. Predictive Movement ecology: we need to act fast to catch up to the problems. 2020 Gulf of Mexico Oil Spill and Ecosystem Science Conference, Tampa, February 2020.
79. Trust in Fisheries Science: Hard to Earn, Easy to Lose, Impossible to Regain. Future of Fisheries Panel Discussion at World Fisheries Congress, September 2021, also presented at the AFS Annual meeting, November 2021
80. Ecosystem modeling, food webs, and connectivity. Keynote at the Coastal and Estuarine Restoration Workshop on Identifying and Assessing Habitat Service Benefits to Fish and Invertebrates, November, 2021 (remote)
81. Responses of Living Resources to Restoration, Workshop on Comparing the Baltic Sea and the Chesapeake Bay: successes, challenges, and what's next? 13th Baltic Sea Science Congress, Denmark, October 2021 (remote)
82. An Individual-Based Model of Delta Smelt Population Dynamics: A Versatile Tool for Life-Cycle Analyses of Management Actions, 2021 Bay-Delta Science Conference, April 2021 (contributed, remote)
83. Scaling laboratory measurements to the field and beyond. Seminar to IMET, September 2021 (remote)
84. Ecosystem modeling, food webs, and connectivity. Keynote at the Coastal and Estuarine Restoration Workshop on Identifying and Assessing Habitat Service Benefits to Fish and Invertebrates, November, 2021 (remote)
85. Quantifying responses of fish and fisheries: How to inform policy/management. 53rd Liege Colloquium: Low Oxygen Environments in Marine and Coastal Waters - Drivers, Consequences, Solutions, Liège, Belgium, May 2022.
86. Skills for Team Science. Mentoring Workshop for Young Scientists and Students. 53rd Liege Colloquium, Liège, Belgium, May 2022.

### **Teaching and Mentoring**

Co-teach MEES 620 (x-listed as Anth 620) Environment and Society, 3 credits, every Fall.  
Teach MEES 609C Skills for Team Science, 1 credit, every other Spring.

Chair or co-Chair of 21 graduate student MS and PhD committees.

Member of another 28 MS and PhD student graduate committees, University of Maryland Center for Environmental Science, Louisiana State University, and outside/adjunct member or external examiner for Universities of Tennessee, Delaware, South Alabama, Queensland, and UC-Davis.

Supervised 14 Post-Doctoral Students.

## **Journal and Review Activities**

Editor: Marine and Coastal Fisheries (2019-)

Associate Editor:

Transactions of the American Fisheries Society (1995-1997)

Ecological Applications (1997-2000)

Canadian Journal of Fisheries and Aquatic Sciences (2008-2014)

San Francisco Estuary and Watershed Science (2008-2017)

Marine and Coastal Fisheries (2008-2019 - became Editor)

Fisheries Research (2010-2014)

Biogeochemistry (2020-)

Frontiers in Marine Science (2021-)

Guest Editor/Editor of more than 10 Special Issues of journals and Books

Reviewer of Manuscripts for more than 50 journals

Reviewer of multiple National Academy of Sciences Reports

Reviewer of Proposals for more than 25 different agencies, foundations, and organizations

## **Advisory, Review, and Workshops (Examples)**

1. Independent Science Board of the CALFED Bay Authority, 2004-2006.
2. Synthesis Workshop on the Pelagic Organism Decline in San Francisco Estuary. Sacramento, CA, October 2005.
3. Technical Review Panel of the CALFED Environmental Water Account, 2001-2006.
4. Ecosystem Management Science and Statistical Committee (SSC) for the Gulf of Mexico Fisheries Management Council, 2005-2013.
5. Science Advisory Panel for the Santa Clara Habitat Conservation Plan and Natural Community Conservation Plan, 2006.
6. Scientific Steering Committee, NSF's Bering Sea Study (BEST) Program, 2006-2008.
7. Review Panel of the Delta Risk Management Strategy for San Francisco Bay, 2007.
8. Panel Review Member, Regional Salmon Outmigration Study Proposal Review, 2008.
9. Review panel of the Long-term Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan (OCAP) Biological Opinion on Delta Smelt, 2008.
10. Scientific Steering Committee of the US GLOBEC Program, 2008-2011.
11. Review panel of the Long-Term Central Valley Project (CVP) and State Water Project



- (SWP) Operations Criteria and Plan (OCAP) Biological Opinion on Salmon, 2009.
12. Certification team for the EnviroFish model, Army Corps of Engineers, 2010
  13. Workshop on Incorporating Climate Change into the Endangered Species Act. NOAA, Seattle, WA, June 2010.
  14. Certification team for the Sacramento River Bank Protection Project Standard Assessment Methodology (SAM), 2010.
  15. Klamath River Expert Panel, Effects of Dam Removals on Coho and Steelhead, 2011.
  16. Klamath River Expert Panel, Effects of Dam Removals on Chinook Salmon, 2011.
  17. Chairperson, Salmonid Life Cycle Model Workshop, Delta Science Program, 2011.
  18. MRGO Final Independent External Peer Review Report for the Mississippi River – Gulf Outlet Ecosystem Restoration Plan Feasibility Study and Environmental Impact Statement, Army Corps of Engineers, 2011-2012.
  19. Review Team of the SALSIM Population Model for Fall-Run Chinook in the San Joaquin River. Ecosystem Restoration Program, CA Delta, 2012.
  20. U.S. Delegate, ICES Working Group on Integrative Physical-biological and Ecosystem Modelling, Copenhagen, Norway, March 2012 (member 2012-2014).
  21. Expert Panel on Fishery Resources for Renewal of the Bay-Delta Plan, California State Water Resources Control Board, 2012.
  22. Invited Presenter, Briefing to the Executive Office of the President, on issues related to large-scale ecosystem restoration, October 2012.
  23. External Peer Review of the Morganza to the Gulf of Mexico Hurricane Protection Project, Louisiana, Army Corps of Engineers, March 2013.
  24. Panel Member, Workshop on Delta Outflows and Related Stressors. Reported to the State Water Board, 2013.
  25. Invited participant, The Art and Science of Reduced Complexity Modeling in the Environmental Sciences. Boulder, CO, March 2013.
  26. Panel Member, Workshop on Delta Inflows and Related Stressors, 2014. Reported to the State Water Board, 2013.
  27. Invited Participant, ICES Working Group on the Value of Coastal Habitats for Exploited Species. (2014-)
  28. Invited Instructor, PICES International Summer School on End-to-End Models for Marine Resources Management and Research, Gangneung-Wonju National University, Korea, August 2014.

29. Member, Fishery Ecosystem Task Force, LENFEST Ocean Program, 2015-2016.
30. Reviewer, Proposals to California Department of Fish and Wildlife special program on Predation Effects on Special Status Fish Species, 2015.
31. Peer Review of the Phase II Post Authorization Decision Documents (PADD) for the Sacramento River Bank Protection Project (SRBPP), Army Corps of Engineers, 2015.
32. Panel Review Member, Methodology and Scientific Basis to Support a Delta Levee Investment Strategy. CA Delta Science Program, 2015.
33. Panel Review Member, NSF Graduate Research Fellowship Program, 2015.
34. Certification of the Combined Habitat Assessment Protocols (CHAP). Prepared by the APMI for the Army Corps of Engineers, 2016.
35. Member, Global Oxygen Research Network (GO<sub>2</sub>NE), UNESCO (first meeting: 2015).
36. Review Team Member, NOAA's Great Lakes Environmental Research Lab, 2016.
37. Review Team Member, Science Panel to assess the use of best available science in the California WaterFix FEIR/EIS, 2017.
38. Standing Member, External Review Board for the Louisiana's Restore Act Center of Excellence, 2017-2019.
39. Named as an at-large member to the Science and Technical Advisory Committee for the Chesapeake Bay Program.
40. Member of the review team to evaluate the operations and organization of the New England Fisheries Management Council. (2018)
41. Chair of the Expert Advisory Panel for the Louisiana Trustee Implementation Group (TIG) in charge of applying for permitting, including preparing the EIS, for the Mid-Barataria Diversion. (2018-2020)
42. Reviewer of the Biological Opinion on salmon, steelhead, killer whales, and sturgeon for the Coordinated Long-Term Operation of the Central Valley Project and State Water Project in the California Delta. (2019)
43. Review team member, Final Independent External Peer Review Report Detroit Temperature Control and Downstream Passage Environmental Impact Statement. (2019)
44. At-large member, Science and Technical Advisory Committee (STAC) for the Chesapeake Bay Program. (2018-)
45. Member, NOAA's Ecosystem Science and Management Working Group. An advisory committee to NOAA's Science Advisory Board. (2019-2022)

46. Member, Independent Scientific Advisory Board (ISAB) and Independent Science Review Panel (ISRP) for restoring salmon on the Columbia River. (2019-)
47. Member of the Delta Smelt Expert Workgroup. Produced a white paper entitled: *"Toward Improved Decision-Support Tools for Delta Smelt Management."* This was for the Collaborative Adaptive Management Team. (2020-2021)
48. Member and Keynote speaker, CERF workshop on "Coastal and Estuarine Restoration: Identifying and Assessing Habitat Service Benefits to Fish and Invertebrates", CERF Conference, November, 2021 (remote)
49. Expert panelist, workshop on "Uncertainty in Numerical Model Applications to Investigate Coastal Eutrophication" sponsored by California water and resource agencies. Sponsored by the San Francisco Estuary Institute (SFEI) and Southern California Coastal Water Research Project (SCCWRP), May 2021 (remote)
50. Leader and Speaker, two workshops on "Agent-based Modeling of Delta Smelt for Management and Conservation" sponsored by USFWS, April 2021 and June 2022 (remote)
51. Invited member of panel discussion, Identifying Critical Uncertainties: Comprehensive Evaluation of System Response (CESR) Report, Chesapeake Community Research Symposium 2022, Annapolis, June 2022.
52. Independent External Peer Review: Howard A. Hanson Dam Additional Water Storage Project Integrated Validation Report and Supplemental Environmental Impact Statement. Prepared for the USCOE. (2022)
53. Chair, Sea Grant-NCCOS National Aquaculture Siting and Development External Advisory Committee. (2023-)