

Curriculum Vitae

CONTACT INFORMATION	Ethan R. Deyle Department of Biology Boston University 5 Cummington Mall Boston, MA 02215	edeyle@bu.edu ethan.deyle@gmail.com https://erd.carrd.co/
RESEARCH INTERESTS	Quantitative Ecology, Environmental Data Science, Nonlinear Dynamics, Complex Systems, Ecological Forecasting, Ecosystem-Based Fisheries Management, Marine Ecology, Physical-biological coupling	
EDUCATION	University of California, San Diego , La Jolla, California USA Ph.D., Biological Oceanography, December 2015 <ul style="list-style-type: none">• Dissertation Topic: Nonlinear forecasting as a tool for sustainable, ecosystem-based fisheries management.• Advisor: George Sugihara University of California, San Diego , La Jolla, California USA M.S., Marine Biology, June 2012 University of Cambridge , Cambridgeshire, UK M.Sci., Applied Mathematics, June 2009 Swarthmore College , Swarthmore, Pennsylvania USA B.A., High Honors, Physics, June 2008	
AWARDS AND HONORS	NSF Graduate Research Fellowship, August 2011 EPA Star Fellowship, August 2010 William C. Elmore Prize, Swarthmore College Dept. of Physics and Astronomy, June 2008	
ACADEMIC EMPLOYMENT	Boston University Boston, MA USA <i>Research Assistant Professor</i> , Department of Biology	December, 2019 - present
	University of California, San Diego La Jolla, CA USA <i>Postdoctoral Researcher</i> , Scripps Institution of Oceanography	September, 2015 - December, 2019
MENTORING	Graduate Jacob Jaskiel (BU, Biology Ph.D.); Brenna Stallings (BU, Biology M.S.);	F 2021 - present F 2021 - present
	Undergraduate	

Hannah Connell (BU, Marine Science);	Su 2022 - present
Hannah O’Grady (Mt. Holyoke, BRITE REU);	Su 2022
Gabriel Calistro (BU, Marine Science);	F 2021 - present
Russell Laman (BU, Marine Science);	Su 2021 - Su 2022
Allie Cole (BU, Marine Science);	S 2021
Katie Tyrrell (Wayne State, BRITE REU);	Su 2021

PEER REVIEWED
MANUSCRIPTS

Deyle, E.R., Lucas, A., Pao, G., Ogawa, J., and Sugihara, G. An Empirical Dynamic Framework for Integrating Oceanographic Data Streams and Application to Red Tide Prediction. **in prep.**

Pao, G.M., Deyle, E.R., Ye, H., Ogawa, J., Guaderrama, M., Ku, M., Tonnu, N, Khan, N., Ke, E., Wittenberg, C., Verma, I.M., and Sugihara, G. Causation without Correlation: Uncovering Hidden Causal Links in Transcriptional Networks. *Science, in revision.*

Deyle, E., Bouffard, B., Frossard, V., Schwefel, R., Melack, J., and Sugihara, G. A hybrid empirical and parametric approach to managing ecosystem complexity in a nonstationary world: capturing the combined effects of climate change and nutrients on water quality in Lake Geneva. **Proceedings of the National Academy of Sciences of the United States of America**, **119**(26), e2102466119.

Giron-Nava, A., Ezcurra, E., Brias, A., Velarde, E., Deyle, E., Cisnero-Montemayor, A.M., Munch, S., Sugihara, G., and Aburto-Oropeza, O. Environmental variability and fishing effects on the Pacific sardine fisheries in the Gulf of California. *Canadian Journal of Fisheries and Aquatic Sciences*, **78**(5), pp. 623-630 (2021).

Natsukawa, H., Deyle, E.R., Pao, G.M., Koyamada, K., and Sugihara, G. A Visual Analytics Approach for Ecosystem Dynamics based on Empirical Dynamic Modeling. *IEEE Transactions on Visualization and Computer Graphics*, **27**(2): 506-516 (2021).

Nova, N., Deyle E.R., Shocket, M.S., MacDonald, A.J., Childs, M.L., Rypdal, M., Sugihara, G., and Mordecai, E.A. Empirical dynamic modeling reveals ecological drivers of dengue dynamics. *Ecology Letters*, **24**(3):415-425 (2021).

Chang, C.-W., Ye, H., Miki, T., Deyle, E.R., Souissi, S., Anneville, O., Adrian, R., Chiang, Y.-R., Ichise, S., Kumagai, M., Matsuzaki, S.S., Shiah, F.-K., Wu, J.-T., Hsieh, C.-H., and Sugihara, G. Long-term warming destabilizes aquatic ecosystems through weakening biodiversity-mediated causal networks. *Global Change Biology*, **6**: 6413-6423 (2020).

Giron-Nava, A., Munch, S.B., Johnson, A.F., Deyle, E., James, C.C., Saberski, E., Pao, G.M., Aburto-Oropeza, O. and Sugihara, G. Circularity in fisheries data weakens real world prediction. *Scientific Reports*, **10**(1): 1-6 (2020).

Runge, J., Bathiany, S., Bollt, E., Camps-Valls, G., Coumou, D., Deyle, E., Glymour, C., Kretschmer, M., Mahecha, M., Mu?oz-Mar?, J., Van Nes, E., Peters, J., Quax, R., Reichstein, M., Scheffer, M., Schoelkopf, B., Spirtes, P., Sugihara, G., Sun, J., Zhang, K, and Zscheischler, J. Inferring causation from time series in Earth system sciences. *Nature Communications*, **10**: 2553 (2019).

- Sguotti, C., Sakia, O., Werner, K.-M., Deyle, E., Sugihara, G., and Möllmann, C. Non-linearity in stock-recruitment relationships of Atlantic cod: insights from a multi-model approach. *ICES Journal of Marine Science*, fsz113 (2019).
- Deyle, E. R., Schueller, A., Ye, H., and Sugihara, G. Ecosystem-based forecasts of recruitment in two menhaden species. *Fish and Fisheries* **19**(5): 769-781 (2018).
- Ushio, M., Hsieh, C.-H., Masuda, R., Deyle, E. R., Ye, H., Chang, C.W., Sugihara, G., and Kondoh, M. Fluctuating interaction network and time-varying stability of a natural fish community. *Nature* **554**(7692):360-363 (2018).
- McGowan, J.A., Deyle, E.R., Ye, H., Carter, M.L., Perretti, C.T., Seger, K.D., Verneil, A. and Sugihara, G. Predicting coastal algal blooms in southern California. *Ecology* **98**:1419-1433 (2017).
- Deyle, E. R., Maher, M. C., Hernandez, R. D., Basu, S., and Sugihara, G. Global environmental drivers of influenza. *Proceedings of the National Academy of Sciences of the United States of America* **113** 13081-13086 (2016).
- Deyle E., May R.M., Munch S., and Sugihara G. Tracking and forecasting ecosystem interactions in real time. *Proceedings of the National Academy of Sciences USA* **283**: 20152258 (2016).
- van Nes E., Scheffer M., Brovkin V., Lenton T.M., Ye H., Deyle E., and Sugihara G. Causal feedbacks in climate change. *Nature Climate Change* **5**: 445-448 (2016).
- Clark A., Ye H., Isbell F., Deyle E., Cowles J., Tilman D., and Sugihara G. Spatial 'convergent cross mapping' to detect causal relationships from short time-series. *Ecology* **96**: 1174-1181 (2015).
- Ye H., Deyle E.R., Gilarranz L.J., Sugihara G. Distinguishing time-delayed causal interactions using convergent cross mapping. *Scientific Reports* **5**: 14750 (2015).
- Tsonis A.A., Deyle E.R., May R.M., Sugihara G., Swanson K., Verbeten J.D., Wang G. Dynamical evidence for causality between galactic cosmic rays and interannual variation in global temperature. *Proceedings of the National Academy of Science USA* **112**: 3253-3256 (2015).
- Liu H., Fogarty M.J., Hare J.A., Hsieh C.H., Glaser S.M., Ye H., Deyle E., and Sugihara G. Modeling dynamic interactions and coherence between marine zooplankton and fishes linked to environmental variability. *Journal of Marine Systems* **131**: 120-129 (2014).
- Deyle E., Fogarty M.J., Hsieh C.H., Kaufman L., MacCall A., Munch S., Perretti C., Ye H., and Sugihara G. Predicting climate effects on Pacific sardine. *Proceedings of the National Academy of Sciences USA* **110**: 6430-6435 (2013).
- Sugihara G., May R., Ye H., Hsieh C.H., Deyle E., Fogarty M.J., and Munch S.B. Detecting causality in complex ecosystems. *Science* **338**: 496-500 (2012).
- Sugihara G., Beddington J., Hsieh C.H., Deyle E., Fogarty M., Glaser S.M., Hewitt R., Hollowed A., May R.M., Munch S.B., Perretti C., Rosenberg A., Sandin S., and Ye H. Are exploited fish populations stable? *Proceedings of the National Academy of Sciences USA* **108**: E1224-E1225 (2011).

Deyle, E., Sugihara G. Generalized Theorems for Nonlinear State Space Reconstruction. *PLoS* **6**: e18295 (2011).

SOFTWARE Sugihara, G., Park, J., Deyle, E., Saberski, E., Smith, C. and Ye, H., 2021. rEDM: Empirical Dynamic Modeling 1.9.3. <https://CRAN.R-project.org/package=rEDM>

WORKSHOPS Presenter. *Daily to Decadal Ecological Forecasting along North American Coastlines Workshop*, April 12-14, Woods Hole, MA. (2022)

Presenter. *Nonlinear Dynamics and Fisheries Workshop, Santa Cruz*, November 13-15, Southwest Fisheries Science Center, Santa Cruz CA USA. (2018)

Presenter, Session co-facilitator. *Nonlinear time series modeling*, March 19-20, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami FL USA. (2015)

Co-facilitator. *Emerging methods for empirical analyses of social-ecological systems*, December 15-17, Stockholm Resilience Center, Stockholm University, Stockholm, Sweden. (2014)

Presenter, Session co-facilitator. *Nonlinear time series analysis*, April 16-18, Scripps Institution of Oceanography, UC San Diego, La Jolla CA USA. (2012)

INVITED TALKS Deyle, E.R. *Nonlinear Dynamics in Nature: Mathematics for an Equation-Free World*. Physics & Astronomy Colloquium Series, Swarthmore College, November 17, Swarthmore, Pennsylvania, USA. (2017)

Deyle, E.R. *An introduction to empirical dynamical modeling and application to hypoxia in Lake Geneva*. Gordon Research Conference: Chemical Oceanography, July 23-28, New London, New Hampshire, USA. (2017)

CONFERENCE PRESENTATIONS (SELECTED) Deyle, E.R., Bouffard, D., and Sugihara, G. *A hybrid empirical and parametric approach to forecasting dissolved oxygen in Lake Geneva to address long-term changes in lake biogeochemistry under re-oligotrophication and climate change*. American Geophysical Union Fall Meeting, December 1-17, San Francisco, California, USA. (2020).

Deyle, E.R., Sugihara, G., Ushio, M., and Hsieh, C.-H. *Dynamic stability: Empirical measurements and their insights*. Ecological Society of America Annual Meeting, August 9, New Orleans, Louisiana, USA. (2018)

Sugihara, G., Deyle, E., and May, R.M. *Equation-free mathematics shows ecological interactions are highly episodic*. Ecological Society of America Annual Meeting, August 9, New Orleans, Louisiana, USA. (2018)

Deyle, E.R., Schueller, A., Ye, H., and Sugihara, G. *Ecosystem-Based forecasts of menhaden recruitment using empirical dynamic modeling*. American Fisheries Society Annual Meeting, August 23, Tampa, Florida, USA. (2017)

Deyle, E.R. *An introduction to empirical dynamical modeling and application to hypoxia in Lake Geneva*. Gordon Research Conference: Chemical Oceanography, July 23-28, New London, New Hampshire, USA. (2017)

Deyle E.R., Munch S.B., Ye H., Sugihara G. Quantifying changing interactions in dynamic ecosystems. *Association for the Sciences of Limnology and Oceanography (ASLO) Aquatic Sciences Meeting*, February 22-27, Granada, Spain. (2015)

Deyle E.R., Fogarty M.J., Hsieh C.H., Kaufman L., MacCall A.D., Perretti C.T., Rosenberg A., Ye H., and Sugihara G. Understanding the effect of fishing on other populations. *Association for the Sciences of Limnology and Oceanography (ASLO) Aquatic Sciences Meeting*, February 17-22, New Orleans, LA. (2013)

Deyle E.R., Sugihara G., Fogarty M.J., Hsieh C.H., Kaufman L., MacCall A.D., Munch S.B., Perretti C.T., and Ye H. A new tool for ecosystem based management illuminates climate effects in Pacific sardine. *Association for the Sciences of Limnology and Oceanography (ASLO) Summer Meeting*, July 8-13, Otsu, Japan. (2012)

TEACHING
EXPERIENCE

Boston University Boston, MA USA

Instructor, Marine Biology, (Su 2022)
Instructor, Biology of Global Change, (S 2022)
Instructor, Quantitative Fisheries Analysis, (F 2021)

University of California, San Diego La Jolla, CA

Teaching Assistant, Computational Methods in Ecology and Evolution, (S 2013)