

RANJAN MUTHUKRISHNAN, Ph. D.

Department of Biology

Boston University

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PROFESSIONAL APPOINTMENTS

Research Assistant Professor Boston University Department of Biology	2021-present
Research Fellow Minnesota Aquatic Invasive Species Research Center	2018-present
Assistant Research Scientist Indiana University Environmental Resilience Institute	2018-2021
Postdoctoral Associate University of Minnesota, Twin Cities Department of Fisheries, Wildlife and Conservation Biology Advisors: Daniel J. Larkin and James D. Forester	2013-2018

EDUCATION

Ph. D., University of California, Los Angeles Department of Ecology and Evolutionary Biology Advisor: Peggy Fong Title: An integrated empirical and modeling approach to evaluate determinants of community structure and alternate stable states dynamics on tropical reefs	2013
B.A. in Integrative Biology, University of California, Berkeley	2003

GRANTS

“Using the National Ecological Observatory Network to resolve long-standing debates about the role of diversity on stability, ecosystem functioning, and resistance to invasion. National Science Foundation. \$843,502. Role: Lead PI	<i>Submitted (decision pending)</i>
“Starry stonewort and wild rice: assessment and response” Minnesota Aquatic Invasive Species Research Center. \$342,436. Role: Collaborator	<i>Submitted (decision pending)</i>
“Starry stonewort rapid response monitoring in wild rice beds” Minnesota Aquatic Invasive Species Research Center. \$20,596. Role: Lead PI	2022

“Managing midwestern aquatic invasions in a changing climate” Minnesota Aquatic Invasive Species Research Center. \$39,000. Role: Lead PI	2019-2022
“What will midwestern aquatic invasions look like in a changing climate?” Prepared for Environmental Change Grand Challenges Initiative at Indiana University. \$113,601. Role: Lead PI	2019-2021
“Ecology of invasive species in the Midwest.” Through the Prepared for Environmental Change Grand Challenges Initiative at Indiana University (PI: Ellen Ketterson). \$100,000 to R. Muthukrishnan. Role: Participating Researcher	2018-2022
“Distribution and traits of the fungal pathogen <i>Fusarium virguliforme</i> that influence current and future risk to soybean and other legumes in Minnesota.” Minnesota Invasive Terrestrial Plants and Pests Center. \$412,000. Role: Wrote modeling section of proposal, was not able to participate due to other commitments	2017-2020
“Eco-epidemiological model to assess AIS management.” Minnesota Aquatic Invasive Species Research Center. \$215,000. Role: Collaborator	2016-2018
“Assessing risk of <i>Halophila stipulacea</i> to Virgin Island National Park.” National Park Service. \$32,030. Role: Co-PI	2016-2017

FELLOWSHIPS/AWARDS

Indiana University Environmental Resilience Institute Fellowship	2018-2022
National Science Foundation, Graduate Research Fellowship \$30,000/year for 3 years of support	2008-2013
UCLA Graduate Division, Dissertation Year Fellowship \$20,500	2012-2013
UCLA Graduate Division, Graduate Research Mentorship Fellowship \$18,000	2008-2009
UCLA EEB Departmental Fellowship \$6500	2012
UCLA Foundation Fellowship \$5500	2007
Berkeley Biology Fellowship \$2500	2002

Small Grants

ASLO Early Career Fellow Travel Grant \$500	2019
MAISRC Travel Grant \$400	2018
MAISRC Travel Grant \$400	2017
UCLA Graduate Division, Research Allowance \$500	2012
Departmental Conference Travel Grant \$635	2012
Departmental Research Grant \$1000	2010
Departmental Conference Travel Grant \$500	2009
Departmental Research Grant \$1568	2009
Idea Wild equipment grant \$750	2007

PUBLICATIONS

- MacDougall, A., ..., **R. Muthukrishnan**, and 84 other Authors. *In review*. Long-term transformation of biomass in the grassland biome. *Science*
- McCumber, A., A. Sullivan, M.K. Houser, **R. Muthukrishnan**. *In review*. Are lakes a public good or exclusive resource? Towards value-based management for aquatic invasive species. *Environmental Science and Policy*
- Muthukrishnan, R.**, The Nutrient network, and 22 other Authors. *In prep*. Community dynamics shift from stochastic to deterministic across a global latitudinal gradient in response to environmental harshness. Planned submission to *Proceedings of the National Academy of Sciences*.
- Muthukrishnan, R.**, A. Fudickar, A. Jahn, T. Smiley, P. Title, and J. Lau. *In prep*. Chasing the niche: Climate change responses through behavior, phenology, and range shifts. Planned submission to *Ecography*
27. **Muthukrishnan, R.**, K. Hayes, K. Bartowitz, M. Cattau, B. Harvey, Y. Lin, and C. Lunch. 2022 Utilizing NEON to evaluate tipping points across ecosystems in space and time. *Ecosphere*
26. Glisson, W.J., **R. Muthukrishnan**, C.K. Wagner[†], and D.J. Larkin. 2022. Invasive *Nitellopsis obtusa* (starry stonewort) has distinct late-season phenology compared to native and other invasive macrophytes in Minnesota, USA. *Aquatic Botany*
25. **Muthukrishnan, R.** 2021. The relationship between native species richness and exotic species richness or occurrence will always be negative when the total number of species is accounted for in statistical models: A response to Beaury et al. *Ecology Letters*
24. Seabloom, E.W., E. Batzer, J.M. Chase, W.S. Harpole, P.B. Adler, S. Bagchi, J.D. Bakker, I.C. Barrio, L. Biederman, E.H. Boughton, M.N. Bugalho, M.C. Caldeira, J.A. Catford, P. Daleo, N. Eisenhauer, A. Eskelinen, S. Haider, I.S. Jónsdóttir, K. Kimmel, M. Kuhlman, A. MacDougall, C.D. Molina, J.L. Moore, J.W. Morgan, **R. Muthukrishnan**, T. Ohlert, A.C. Risch, C. Roscher, M. Schütz, G. Sonnier, P.M. Tognetti, R. Virtanen, P. Wilfahrt, E.T. Borer. 2021. Species loss due to nutrient addition increases with spatial scale in global grasslands. *Ecology Letters*
23. Nagy, R.C., ... **R. Muthukrishnan** ..., and 118 other Authors. 2021. Harnessing the NEON Data Revolution to Advance Open Environmental Science with a Diverse and Data-Capable Community. *Ecosphere*.
22. Gill, N., A. Mahood, J. Morissette, K. Duffy, C. Meier, **R. Muthukrishnan**, R.C. Nagy, L. Petri, E. Stricker. 2021. Six central questions about biological invasions that NEON data science is poised to address. *Ecosphere*
21. Houser, M., A. Sullivan, T. Smiley, **R. Muthukrishnan**, E. Grennan Browning, A. Fudickar, P. Title, J. Bertram, M. Whiteman. 2021. Commentary: What fosters the success of a transdisciplinary environmental research institute? Reflections on the role of organizational and individual factors from an interdisciplinary research cohort. *Elementa*
20. **Muthukrishnan, R.**, L. Sullivan, A.K. Shaw and J.D. Forester. 2020. Plasticity in seed production alters the range of possible coexistence conditions in a competition-colonization trade-off. *Ecology Letters*

19. **Muthukrishnan, R.**, K. Chiquillo, C. Cross*, P. Fong, T. Kelley[†], C. A. Toline[†] and D. Willette. 2020. Little giants: A rapidly invading seagrass alters ecosystem functioning relative to native foundation species. *Marine Biology*
 - Published as a Highlight Article with editorial commentary by C. Wild
18. **Muthukrishnan, R.** and D.J. Larkin. 2020. Invasions and biotic homogenization in temperate aquatic plant communities. *Global Ecology and Biogeography*
17. Willette, D.A., K.L. Chiquillo, C. Cross*, P. Fong, T. Kelley[†], C.A. Toline[†], R. Zweng*, and **R. Muthukrishnan**. 2020. Growth and recovery after disturbance of a rapidly-expanding invasive seagrass. *Journal of Experimental Marine Biology and Ecology*
16. Glisson, W.J., C.K. Wagner, M.R. Verhoeven, **R. Muthukrishnan**, R. Contreras-Rangel, and D.J. Larkin. 2020. Desiccation tolerance of the invasive alga starry stonewort (*Nitellopsis obtusa*) as an indicator of overland spread risk. *Journal of Aquatic Plant Management*
15. Shoemaker, L.G., L.L. Sullivan, I. Donohue, J.S. Cabral, R.J. Williams, M.M. Mayfield, J.M. Chase, C. Chu, W.S. Harpole, A. Huth, J. HilleRisLambers, A.R.M. James, N.J.B. Kraft, F. May, **R. Muthukrishnan**, S. Satterlee, F. Taubert, X. Wang, T. Wiegand, Q. Yang, and K.C. Abbott. 2020. Integrating Stochasticity into Community Ecology. *Ecology*
14. **Muthukrishnan, R.**, A.S. Davis, N.R. Jordan, and J.D. Forester. 2019. Use of simulation-based statistical models to complement bioclimatic models in predicting continental scale invasion risks. *Biological Invasions*
13. **Muthukrishnan, R.**, N. Hansel-Welch[†], and D.J. Larkin. 2018. Environmental filtering and competitive exclusion drive biodiversity-invasibility relationships in Minnesota lakes. *Journal of Ecology*
12. **Muthukrishnan, R.**, R.S. Sleith, K.G. Karol, and D.J. Larkin. 2018. Prediction of starry stonewort (*Nitellopsis obtusa*) invasion risk in upper Midwest lakes using ecological niche models. *Aquatic Botany*
11. **Muthukrishnan, R.**, A.S. Davis, N.R. Jordan, and J.D. Forester. 2018. Invasion complexity at large spatial scales is an emergent property of interactions among landscape characteristics and invader traits. *PLoS One*
10. **Muthukrishnan, R.** and P. Fong. 2018 Rapid recovery of an Eastern Tropical Pacific coral reef after experimentally-produced small-scale anthropogenic disturbance. *Marine Environmental Research*
9. Berini, J.L., S.A. Brockman, A.D. Hegeman, P.B. Reich, **R. Muthukrishnan**, R.A. Montgomery, and J.D. Forester. 2018. Combinations of Abiotic Factors Differentially Alter Production of Plant Secondary Metabolites in Five Woody Plant Species in the Boreal-Temperate Transition Zone. *Frontiers in Plant Science*
8. Glisson, W.J., C.K. Wagner, S.R. McComas[†], K. Farnum[†], M.R. Verhoeven, **R. Muthukrishnan**, and D.J. Larkin. 2018. Response of the invasive alga starry stonewort *Nitellopsis obtusa* to control efforts in a Minnesota Lake. *Lake and Reservoir Management*
7. West, N.M., D.P. Matlaga, **R. Muthukrishnan**, G. Spyreas, N.R. Jordan, J.D. Forester, and A.S. Davis. 2017. Lack of impacts during early establishment highlights a short-term management window for minimizing invasions from perennial biomass crops. *Frontiers in Plant Science*.

6. **Muthukrishnan, R.**, J.O. Lloyd-Smith and P. Fong. 2016. Mechanisms of resilience: Strong positive feedbacks produce alternate stable states dynamics on a tropical reef. *Journal of Ecology*.
5. Fong, P., T. Smith and **R. Muthukrishnan**. 2016. Algal dynamics: alternate stable states of reefs in the eastern tropical Pacific. In Glynn, P and Manzello, D eds. Coral Reefs of the Eastern Tropical Pacific.
4. Fong, P., N.M. Frazier*, C. Tompkins-Cook*, **R. Muthukrishnan**, and C.R. Fong. 2016. Size matters: experimental partitioning of the strength of fish herbivory on a fringing coral reef in Moorea, French Polynesia. *Marine Ecology*
3. **Muthukrishnan, R.**, N.M. West, A.S. Davis, N.R. Jordan, and J.D. Forester. 2015. Evaluating the role of landscape in the spread of invasive species: The case of the biomass crop *Miscanthus × giganteus*. *Ecological Modelling*
2. Pittman, S.E., **R. Muthukrishnan**, N.M. West, A.S. Davis, N.R. Jordan, and J.D. Forester. 2015. Mitigating the Potential for Invasive Spread of the Exotic Biofuel Crop, *Miscanthus x gigaentens*. *Biological invasions*.
1. **Muthukrishnan, R.** and P. Fong. 2014. Multiple anthropogenic stressors exert complex, interactive effects on a coral reef community. *Coral Reefs*

* Indicates author was an undergraduate student; † Indicates author was a management or government agency partner

PRESENTATIONS

- Muthukrishnan, R.** 2022. Managing midwestern aquatic invasions in a changing climate. Invited speaker Minnesota Aquatic Invasive Species Research Center Research Showcase. St. Paul, MN.
- Muthukrishnan, R.** 2021. Understanding starry stonewort invasions in a changing climate. Invited speaker University of Minnesota AIS Detectors Speaker Series. St. Paul, MN (Virtual).
- Muthukrishnan, R.** 2020. Understanding the spread of starry stonewort and the role of climate conditions. Invited speaker Minnesota Aquatic Invasive Species Research Center Research Showcase. St. Paul, MN.
- Muthukrishnan, R.** 2020. Life in a changing world: Understanding community resilience and vulnerability to anthropogenic stress. Invited Seminar Boston University, Department of Biology
- Muthukrishnan, R.** 2020. Life in a changing world: Understanding community resilience and vulnerability to anthropogenic stress. Invited Seminar University at Buffalo SUNY, Department of Environment and Sustainability.
- Muthukrishnan, R.** 2020. Critical states: Integrating empirical and modeling approaches to evaluate major community shifts in coral reefs. Invited Seminar University of Auckland, School of Biological Sciences and Institute of Marine Science.
- Muthukrishnan, R.**, D. Willette, K. Chiquillo, C. Cross*, P. Fong, T. Kelley†, and C. A. Toline† 2019. Spread of an invasive foundation species alters community composition and ecosystem functioning in a tropical seagrass community. Ecological Society of America 104th annual meeting. Louisville, KY.

- Muthukrishnan, R.,** D. Willette, K. Chiquillo, C. Cross*, P. Fong, and C. A. Toline[†] 2019. Shift in foundation species as a result of invasion alters ecosystem functioning in a tropical seagrass community. Association for the Sciences of Limnology and Oceanography Aquatic Sciences meeting. San Juan, Puerto Rico.
- Muthukrishnan, R.** 2019. Aquatic invasive species: What are they and why do they matter? Invited speaker Hoosier Fly Fishers association. Bloomington, IN.
- Muthukrishnan, R.** 2019. Life in a changing world: Understanding community resilience and vulnerability to anthropogenic stresses. Invited Seminar Indiana University, Evolution, Ecology, and Behavior Section, Department of Biology.
- Muthukrishnan, R.,** M.K. Houser, and A.V. Sullivan 2018. What will midwestern aquatic invasions look like in a changing climate? Invited lightning talk, ERI Fall Symposium. Indiana University.
- Muthukrishnan, R.,** L.L. Sullivan, A.K. Shaw, and J.D. Forester 2018. Plasticity in seed production alters the range of possible coexistence conditions in a competition-colonization trade-off. Ecological Society of America 103rd annual meeting. New Orleans, LA.
- Muthukrishnan, R.** and D.J. Larkin 2018. Spread risks, impacts and management of starry stonewort. Invited speaker Pelican Bay Watershed District Conference. Detroit Lakes, MN.
- Muthukrishnan, R.** 2018. Life in a changing world: Understanding community resilience and vulnerability to anthropogenic stresses. Invited Seminar University of South Dakota. Department of Biology.
- Muthukrishnan, R.** and N. Phelps 2018. Will AIS Get to Your Lake and Will They Survive – Targeting Resources Where the Risk is Greatest. Invited speaker Aquatic Invaders Summit III. Brooklyn Center, MN.
- Muthukrishnan, R.** 2018. Life in a changing world: Understanding aquatic community resilience and vulnerability to anthropogenic stresses. Invited Seminar University of Nebraska, Omaha. Department of Biology.
- Muthukrishnan, R.** and D.J. Larkin 2017. Aquatic plant invasions: Ions and drivers and carp (oh my). Invited speaker Minnesota Aquatic Invasive Species Research Center Research Showcase. St. Paul, MN.
- Muthukrishnan, R.** and D.J. Larkin 2017. Predicting starry stonewort suitability and risk. Invited speaker Minnesota Department of Natural Resources Fall Aquatic Plant Management meeting. Alexandria, MN.
- Muthukrishnan, R.** 2017. Overview of starry stonewort invasion risks and impacts in Minnesota. Invited speaker Black Dog Watershed Management Commission meeting. Burnsville, MN
- Muthukrishnan, R.,** N. Hansel-Welch, and D.J. Larkin 2017. Untangling multiple drivers of biodiversity-invasibility relationships in Minnesota shallow lake communities. Ecological Society of America 102nd annual meeting. Portland, OR.
- Muthukrishnan, R.** 2017. Prediction of Starry Stonewort invasion risk in Minnesota based on lake level habitat suitability. Invited speaker Shingle Creek and West Mississippi Water Management Commissions meeting. Brooklyn Park, MN
- Muthukrishnan, R.** and D.J. Larkin. 2017. Prediction of Starry Stonewort invasion risk in Minnesota based on lake level habitat suitability. Invited speaker and panelist for Starry

Stonewort special session. Midwest Aquatic Plant Management Society annual meeting. Milwaukee, WI.

- Muthukrishnan, R.** 2016. Can computers help us understand nature: Using computational methods to link empirical and theoretical approaches to ecology. Invited Seminar Macalaster College, Departments of Environmental Studies, Mathematics, Statistics, and Computer Science and Biology.
- Muthukrishnan, R.,** N.M. West, A.S. Davis, N.R. Jordan, and J.D. Forester. 2015. The role of landscapes in invasions: Landscape characteristics and invader traits interact to determine invasion risk in models of a potentially invasive bioenergy crop (*Miscanthus × giganteus*). Ecological Society of America 100th annual meeting. Baltimore, MD.
- Muthukrishnan, R.** 2014. Determinants of coral reef community structure: External forces and internal feedbacks. Invited seminar University of Minnesota, Conservation Biology Seminar Series.
- Muthukrishnan, R.,** S.E. Pittman, N.M. West, A.S. Davis, N.R. Jordan, and J.D. Forester. 2014. Too much of a good thing: Models of a potential bioenergy crop (*Miscanthus × giganteus*) indicate a high risk of biological invasion but show how certain communities may be resilient. Ecological Society of America 99th annual meeting. Sacramento, CA.
- Muthukrishnan, R.** 2013. Catastrophic community shifts in tropical reef ecosystems: External stresses and internal feedbacks. Invited seminar Kansas State University Department of Biology.
- Muthukrishnan, R.** 2012. Catastrophic community shifts in tropical reef ecosystems: External stresses and internal feedbacks. Invited seminar CSU Fullerton Dept. of Biological Science.
- Muthukrishnan, R.** 2012. Determinants of community structure in tropical reef ecosystems: External stresses and internal feedbacks. Invited seminar UC San Diego/San Diego State University Coral Club.
- Muthukrishnan, R.,** J.O. Lloyd-Smith and P. Fong. 2012. Integration of empirical and simulation methods to evaluate alternate stable states on tropical reefs. Western Society of Naturalists 93rd annual meeting. Monterey, CA.
- Muthukrishnan, R.,** J.O. Lloyd-Smith and P. Fong. 2012. Empirical evidence from and simulations of a tropical coral reef show positive feedbacks can produce alternate community states. Ecological Society of America 97th annual meeting. Portland, OR.
- Muthukrishnan, R.,** J. Lloyd-Smith and P. Fong. 2012. Positive feedbacks produce alternate community states: empirical and simulation-based evidence. 12th International Coral Reef Symposium. Cairns, Australia.
- Muthukrishnan, R.** and P. Fong. 2011. Tropical coral reefs shift to greater algal abundance in response to multiple anthropogenic stresses but show resilience when environmental conditions recover. Ecological Society of America 96th annual meeting. Austin, TX.
- Muthukrishnan, R.** and P. Fong. 2010. Benthic community structure and stabilizing mechanisms provide support for alternate stable states in a tropical reef ecosystem. Western Society of Naturalists 91st annual meeting. San Diego, CA.

Muthukrishnan, R. and P. Fong. 2009. Do coral reefs exist as alternate stable states? Preliminary evidence from 2 contrasting reef systems. Coastal and Estuarine Research Federation 20th Biennial Conference, Portland, OR.

Perez, M.**, **R. Muthukrishnan**, and P. Fong. 2009. Rapid recovery of corals on two eastern pacific reefs after an ENSO disturbance depends on oceanographic conditions (Poster). Western Society of Naturalists 90th annual meeting, Monterey, CA.

TEACHING

Instructor of record

Coral Reef Restoration and Resilience. Field research course in the BU Marine semester. Course is split between classroom in Boston and fieldwork in Belize. Boston University Fall 2022

Coral Reef Management in Belize. Freshman seminar and study abroad course split between course work in Minnesota and fieldwork in Belize. University of Minnesota Spring 2017

Invited Faculty

Tropical Biology. Field course in Costa Rica and Panama by the Organization of Tropical Studies. Fall 2013 and Spring 2014

Guest Lecturer

Conservation Biology. “Managing invasive species in lakes” Boston University Fall 2021

Seminar in ecology and environmental biology. “Transdisciplinary Research.” Indiana University Fall 2019

Mathematical and Computational Modeling for Ecology. “Integrating empirical and theoretical approaches for understanding complex systems.” UCLA Spring 2019

Lake and Watershed Management. “Managing invasive species in lakes.” Indiana University Spring 2019

Environmental Biology. “Understanding and managing invasive species.” Indiana University Fall 2018

Introduction to Ecology and Animal Behavior. “Community ecology: Community structure and assembly.” UCLA Summer 2013

Marine Biology Quarter. “Benthic community structure and stabilizing mechanisms provide support for alternate stable states in a tropical reef ecosystem.” UCLA Spring 2012

Mathematical and Computational Modeling for Ecology. “Effects of environmental variation on coral-algal competition.” UCLA Winter 2012

Teaching Assistant

Marine Biology Quarter (conducted in Moorea, French Polynesia) Spring 2010

Marine Biology Quarter (conducted in Moorea, French Polynesia) Spring 2008

Introduction to Ecology and Animal Behavior Winter 2008

SERVICE

Indiana University Diving Control Board Scientific diving subcommittee	2020-2021
Mentor for ESA SEEDS program	2017-2019
Member of ERI Fellows review committee	2019
Staff representative to UMN Department of Fisheries, Wildlife, and Conservation Biology	2017-2018
Member of UMN Graduate Student & Postdoctoral Alliance for Diversity & Inclusion	2018
UCLA Biological Sciences Council	2011-2013

Ad-hoc proposal reviewer for: Biodiversa+ (European Biodiversity Partnership), Minnesota Aquatic Invasive Species Research Center, Indiana University Environmental Resilience Institute, Graduate Women in Science

Manuscript reviewer for: Ecology Letters, Trends in Ecology and Evolution, Coral Reefs, Ecological Applications, Oikos, Limnology and Oceanography, Hydrobiologia, Bulletin of Marine Science, Journal of Applied Ecology, Theoretical Ecology, Functional Ecology, Scientific Reports, Wetlands Ecology and Management, PLoS One, Environment, Development, and Sustainability, Weed Research, PeerJ, San Francisco Estuary and Watershed Science, Journal of Phycology

PROFESSIONAL AFFILIATIONS

Ecological Society of America

Association for the Sciences of Limnology and Oceanography

International Society for Reef Studies

Western Society of Naturalists