Vadim A. Karatayev

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RESEARCH INTERESTS

I use theory and large-scale field data to understand conditions that erode or reinforce resilience in complex ecosystems. In the process, I explore fundamental questions at the interface of community and landscape ecology as well as applied questions ranging from invasive species impacts to conservation in coupled human-environment systems.

EDUCATION

University of California, Davis, California USA
Ph.D., Ecology, 2014 - December 2019. Advisor: Marissa L. Baskett
Dissertation topic: Alternative stable states in heterogeneous and diverse ecosystems.

Cornell University, Ithaca, New York USA
B.S., Biological Sciences with honors *Summa Cum Laude*, May 2014.

PROFESSIONAL EXPERIENCE

NSF Postdoctoral fellow, 2021-present: Uncovering the drivers of ecological synchrony and resilience under climate change. University of Kansas and NOAA SWFSC.

Postdoctoral scholar, 2019-2021: Coupled human-environment systems. School of Environmental Sciences, University of Guelph, Canada.

Visiting researcher, 2018: Synergy Program for Analyzing Resilience and Critical transitions. Wageningen University, Netherlands.

GRANTS AND AWARDS

National Science Foundation postdoctoral fellowship $320,000 (2022)

Collaborator: US EPA Great Lakes Monitoring grant $6,729,000 (2021)

National Science Foundation Graduate Research Fellowship: $102,000 (2014-2019)

UC Davis Graduate Fellowship: $58,000 (2014, 2017)

UC Davis - University of Auckland Graduate Research Award: $10,000 (2016)

Outstanding poster, Ecological Society of America Conservation Science Session (2015)

Grace Capen Award for academic excellence (SUNY Buffalo, 2012)

Outstanding Presentation in Limnology, Great Lakes Research Consortium (2010)

PUBLICATIONS

Google Scholar

(open access PDF links blue)

Code: Github

21. **Karatayev, V.A.**, M.L. Baskett, E.H. van Nes. The potential for alternative stable states in food webs depends on the feedback and on trait diversity. *American Naturalist*.

20. Cuddington, K.F., K.C. Abbot, F.R. Adler, M. Aydeniz, R. Dale, L.J. Gross, A. Hastings, E. Hobson, **V.A. Karatayev**, *et al.* Challenges and opportunities to build quantitativeself-confidence in biologists. *BioScience, in revision.*

19. Fair, K.R. **V.A. Karatayev**, *et al.* 2022. Estimating COVID-19 cases and deaths prevented by non-pharmaceutical interventions and individual actions. *Epidemics*.

18. **Karatayev, V.A.**, V.V. Vasconcelos, A. Lafuite, S.A. Levin, C.T. Bauch, and M. Anand. 2021. A well-timed switch from local to global agreements accelerates climate change mitigation. *Nature Communications* 12:1-7.

17. **Karatayev, V.A.**, M.L. Baskett, D.J. Kushner, N.T. Shears, C.T. Boettiger, and J.E. Caselle. 2021. Grazer behavior can regulate large-scale patterning of community states. *Ecology Letters* 24:1917-1929.

16. **Karatayev, V.A.**, M. Anand, and C.T. Bauch. 2020. Local lockdowns outperform global lockdown on the far side of the COVID-19 epidemic curve. *Proceedings of the National Academy of Sciences* 117(39):24575-24580.

15. **Karatayev, V.A.** and M.L. Baskett. 2020. At what spatial scales are alternative stable states relevant in highly interconnected ecosystems? *Ecology* 101:e02930.

14. **Karatayev, V.A.**, L.E. Burlakova, A.Y. Karatayev, L. Yang, and T. Miller. 2020. Advection exacerbates population decline from habitat loss: maintaining threatened taxa while restoring natural river flow regimes. *Oecologia* 193:773-785.

13. Karatayev, A.Y., **V.A. Karatayev**, L.E. Burlakova, K. Mehler., M.D. Rowe, A.K. Elgin, and T. Nalepa. 2021. Lake morphometry determines *Dreissena* invasion dynamics. *Biological Invasions* 23:2489-2514.

12. Oke, K.B., P.H. Westley, C.J. Cunningham, M.L. Baskett, S.M. Carlson, J. Clark, A.P. Hendry, **V.A. Karatayev**, *et al.* 2020. Recent declines in salmon body size impact ecosystems and fisheries. *Nature Communications* 11:4155.

11. Karatayev, A.Y., **V.A. Karatayev**, L.E. Burlakova, M.D. Rowe, K. Mehler, and M.D. Clapsadl. 2018. Food depletion regulates the demography of invasive dreissenid mussels in a stratified lake. *Limnology and Oceanography* 63:2065-2079.

10.**Karatayev, V.A.**, C. Kraft, and E. Zipkin. 2015. Racing through life: maturation rate plasticity regulates overcompensation and increases persistence. *Ecosphere* 6:203.

9. **Karatayev V.A.**, A.Y. Karatayev, L.E. Burlakova, and L.G. Rudstam. 2014. Eutrophication and *Dreissena* invasion as drivers of biodiversity: a century of change in the mollusc community of Oneida Lake. *PLoS ONE* 9:e101388.

8. Karatayev, A.Y., L.E. Burlakova, C. Pennuto, J. Ciborowski, **V.A. Karatayev**, P.A. Juette, and M. Clapsadl. 2014. Twenty five years of changes in *Dreissena* spp. populations in Lake Erie. *Journal of Great Lakes Research* 40:550-559.

7. **Karatayev, V.A.**, A.Y. Karatayev, L.E. Burlakova, and D.K. Padilla. 2013. Lakewide dominance does not predict the invader species for dreissenids. *Journal of Great Lakes Research* 39:622-629.

6. Burlakova, L.E., A.Y. Karatayev, and **V.A. Karatayev**. 2012. Invasive mussels induce community changes by increasing habitat complexity. *Hydrobiologia* 685:121.

5. Burlakova, L.E., A.Y. Karatayev, **V.A. Karatayev**, M.E. May, D. Bennett, and M. Cook. 2011. Biogeography and conservation of freshwater mussels (Bivalvia: Unionidae) in Texas: Patterns of diversity and threats. *Diversity and Distributions* 17:393-407.

4. Burlakova, L.E., A.Y. Karatayev, **V.A. Karatayev**, M.E. May, D.L. Bennett, and M.J. Cook. 2011. Endemic species: contribution to community uniqueness, effect of habitat alteration, and conservation priorities. *Biological Conservation* 144:155–165.

3.Karatayev, A.Y., L.E. Burlakova, **V.A. Karatayev**, and D. Boltovskoy. 2010. *Limnoperna fortunei vs. Dreissena polymorpha*: Population densities and benthic community impacts of two invasive freshwater bivalves. *Journal of Shellfish Research* 29:975-985.

2. Boltovskoy, D., A.Y. Karatayev, L.E. Burlakova, D. Cataldo, **V.A. Karatayev**, F. Sylvester, and A. Mariñelarena. 2009. Significant ecosystem-wide effects of the swiftly spreading invasive freshwater bivalve *Limnoperna fortunei*. *Hydrobiologia* 636:271-284.

1. Karatayev, A.Y., L.E. Burlakova, **V.A. Karatayev**, and D.K. Padilla. 2009. Introduction, distribution, spread, and impacts of exotic freshwater gastropods in Texas. *Hydrobiologia* 619:181-194.

Publications in review

22. **Karatayev, V.A.**, R.S. Wilson, D.G. Webster, M. Axelrod, C.T. Bauch, and M. Anand. Acclimating to degraded environments: The social rationale for swift action on restoration. bioRxiv

23. Fair, K.R., **V.A. Karatayev**, C.T. Bauch, and M. Anand. Behavioural dynamics can mediate the persistence of emerging infectious diseases. medRxiv

24. **Karatayev, V.A.**, L.G. Rudstam, Karatayev, A.Y., *et al.* Serial invasions disrupt the time course of lake ecosystem recovery. bioRxiv

25. **Karatayev, V.A.**, D.C. Reuman, K.C. Cavanaugh, T.E. Bell, M.C. Castorani, and J.A. Walter. Warm climates erode resilience and trigger region-wide overgrazing of giant kelp forests.

TEACHING

Data Science in Biology, Haskell Indian Nations University (2022). Week-long workshop introducing under-represented students to programming and analysis in R.

R Workshop, UC Davis (2016, 2021) Introduced graduate students to programming.

Training - EDU390 College Teaching: hands-on study of theory, methods, assessment.

ECL 290 Scales in Ecology, UC Davis (2019). Organized and led a discussion seminar synthesizing research on scaling relationships and pattern formation in ecology.

NSF Graduate Research Fellowship seminar (2017). Co-led discussions and gave detailed weekly draft feedback to 8 applicants.

Teaching assistant, **ESP 121 Population Ecology**, UC Davis (2018). Introduced students to dynamical models and led computer labs in R.

Teaching assistant, **WFC 122 Population Dynamics and Estimation**, UC Davis (2015). Introduced students to statistics and population models, led computer labs.

Teaching assistant, **BIOEE 3610 Advanced Ecology**, Cornell University (2013). Labs in formulating and simulating population and community models.

V.A. Karatayev. *Writing fundamental research papers: an informal primer* (PDF).

SERVICE AND OUTREACH

Diversity, equity, and inclusion:

Research mentor: 9 undergraduate students (ecology, applied math, data science)

Graduate mentorship - careers: EEB Mentor Match program (2021-present); Graduate Academic Achievement and Advocacy Program (2017); Postdoc-PhD mentorship panels (2019, 2020, 2021)

Graduate mentorship - research: advice and detailed feedback on writing to 14 under-represented NSF Graduate Research Fellowship applicants (2015-present)

Graduate admissions: reviewed applications and helped develop new scoring criteria to improve DEI in graduate group (2016, 2017, 2018, UC Davis)

Skype a Scientist: Teaching middle and high school lessons on kelp forests, animal behavior, and modeling (2021-present; 7 classrooms, ∼200 students)

Media outreach:

Salmon size decline: The Guardian, The Narwhal, Scientific American

COVID-19 management: 750 Radio News, The Conversation, CBC The National, The Toronto Star, CTV News, Guelph Mercury, CBC Kitchener-Waterloo

Manuscripts reviewed: Ecology Letters, The American Naturalist, Ecological Applications, Oikos, Theoretical Ecology (2), Hydrobiologia, Journal of Great Lakes Research, PeerJ, Journal of Tropical Biology, Frontiers in Ecology and Evolution (4)

Symposium organizer, Stability Across Spatial, Temporal, and Taxonomic Scales. Ecological Society of America 2022, Montreal, Canada.

Review Editor, Frontiers in Ecology and Evolution

INVITED TALKS

NOAA Southwest Fisheries Science Center. Santa Cruz, California. 2022.

Integrative Biology Department, University of Texas, Austin. 2021.

International Initiative for Theoretical Ecology. 2020. YouTube.

Biology Department Seminar, SUNY Buffalo State, NY, USA. 2020.

Université Paris Dauphine, COVID-19 seminar series. 2020. YouTube.

Integrative Biology Department Seminar, University of Guelph, ON, Canada. 2020.

Center for Population Biology Seminar, University of California Davis, CA, USA. 2019.

Royal Netherlands Institute of Sea Research, Yerseke, Netherlands. 2018.

Synergy Program for Analyzing Resilience, Wageningen, Netherlands. 2018.

Cornell Biological Field Station, Bridgeport, NY, USA. 2017.

University of Auckland Leigh Marine Lab, Leigh, New Zealand. 2016.

CORE TOOLS

Software: R, Program MARK, Slurm, Github, LaTeX

Methods: Nonlinear dynamics, Integral projection (integrodifference) models, Stochastic dynamics (individual-based models), Matrix models, Time-delay embedding

Maximum likelihood and Bayesian optimization, Generalized additive models, Mark-and-recapture, Clustering analyses, Gaussian Processes, High-performance computing

WORKING GROUPS

Patterns, causes, and consequences of synchrony in giant kelp forest populations. (2021)

Building biologists' quantitative self-confidence. NIMBIOS working group. (2020)

Causes of Alaskan Salmon size decline. NCEAS working group, Anchorage, AK (2017)

Uncertainty, Sensitivity, and Predictability in Ecology: Mathematical Challenges and Ecological Applications. Mathematical Biosciences Institute, Columbus, OH (2015)

Biological Rhythms and Oscillations Graduate Program. Mathematical Biosciences Institute, Columbus, OH (2014)

Membership: Ecological Society of America, Society for Mathematical Biology, Western Society of Naturalists, Association for the Sciences of Limnology and Oceanography, International Association for Great Lakes Research