

CANAN KARAKOÇ

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*Digital version includes external links.

EDUCATION

Ph.D. in Biology, *magna cum laude*

2013 – 2019

University of Leipzig🔗, HIGRADE Graduate School🔗

Leipzig, Germany

Primary advisers: Hauke Harms🔗 and Antonis Chatzinotas🔗

Mentors: Adam T. Clark🔗 and Viktoriia Radchuk🔗

Thesis title: "Context Dependency of Community Dynamics: Predator-Prey Interactions Under Ecological Disturbances"

M.Sc. in Global Change Ecology

2009 – 2012

University of Bayreuth🔗, Elite Network Bavaria (ENB)🔗

Bayreuth, Germany

Advisers: Björn Reineking, Steffen Kolb, George Wang, Detlef Weigel

M.Sc in Biology

2005 – 2008

Cumhuriyet University🔗

Sivas, Turkey

B.Sc in Biology (Minor: Molecular Biology)

2000 – 2004

Akdeniz University🔗

Antalya, Turkey

PROFESSIONAL EXPERIENCE

Brown Lab🔗 Biological Sciences, Georgia Institute of Technology

The Center for Microbial Dynamics and Infection(CMDI)🔗

2024 - Ongoing

Postdoctoral researcher

Atlanta, GA, US

- Microbial dynamics and infection, host-pathogen interactions, disease dynamics.
- Adviser: Sam Brown

Lennon Lab🔗 Department of Biology, Indiana University

2021 - 2024

Postdoctoral researcher

Bloomington, IN, US

- GEMS (Genomics and Eco-evolution of Multi-scale Symbioses) trainee🔗
- Microbial ecology and evolution, bioenergetics, dormancy. Adviser: Jay T. Lennon

Helmholtz Centre for Environmental Research–UFZ

German Centre for Integrative Biodiversity Research (iDiv)🔗

2019 - 2021

Postdoctoral researcher

Leipzig, Germany

- yDiv trainee🔗
- Evolutionary ecology, species interactions, fluctuations, AMR.
- Advisers: Antonis Chatzinotas and Stan Harpole🔗

UFZ

2013 - 2018

Research assistant

Leipzig, Germany

- Experimental community ecology. WG Microbial Interactions Ecology🔗

- iDiv** 2015 - 2016
Guest research assistant Leipzig, Germany
 · Experimental community ecology. WG Experimental Interactions Ecology☑
- University of Thessaly** 2016 & 2014
Guest research assistant, DAAD Scholarship Larissa, Greece
 · Applied microbial ecology. Department of Biochemistry and Biotechnology☑
- Max Planck Institute for Developmental Biology** 2011
Intern, ENB travel grant Tübingen, Germany
 · Evolutionary ecology. Department of Molecular Biology☑
- Technical University of Munich** 2010
Intern, ENB travel grant Munich, Germany
 · Microbial ecology. Technical University of Munich, Department of Soil Ecology☑
- University of Bayreuth** 2010 – 2012
Technical assistant Bayreuth, Germany
 · Field/lab work. University of Bayreuth, Department of Soil Physics; Department of Biogeography (EVENT); Department of Plant Physiology (TERRECO) and Agroecosystem Research.
- Cumhuriyet University** 2005 – 2008
Research & teaching assistant Sivas, Turkey
 · Applied microbial ecology. Department of Molecular Biology and Genetics.
- Antalya State Hospital** 2003
Intern Antalya, Turkey
 · Laboratories of Microbiology, Immunology & Biochemistry.

PUBLICATIONS

Published

First author:

- O'Sullivan, T.*, **Karakoç, C.***, Wollein-Waldetoft, K., and Brown, S. P. (2025). Risk of death during acute infection is accelerating across diverse host-pathogen systems and consistent with multiple models of host-pathogen interaction. *Equal contribution. *mSphere*, pages e00953–24. doi.org/10.1128/msphere.00953-24
- **Karakoç C.**, Thomas, C. A., and Antonis, C. (2020). Diversity and coexistence are influenced by time-dependent species interactions in a predator–prey system. *Ecology Letters*, 23(6). doi/pdf/10.1111/ele.13500
- **Karakoç, C.** (2019). Context dependency of community dynamics: Predator-prey interactions under ecological disturbances. *Ph.D. Thesis*, Leipzig University. <https://nbn-resolving.org/urn:nbn:de:bsz:15-qucosa2-341500>
- Sendek, A.*, **Karakoç, C.***, Wagg, C., Domínguez-Begines, J., Martucci de Couto, G., Van der Heijden, M. G., Naz, A. A., Lochner, A., Chatzinotas, A., Klotz, S., Gómez-Aparicio, L., and Eisenhauer, N. (2019). Drought modulates interactions between arbuscular mycorrhizal fungal

diversity and barley genotype diversity. *Equal contribution. *Scientific Reports*, 9(1):1–15. doi.org/10.1038/s41598-019-45702-1

- **Karakoç, C.**, Radchuk, V., Harms, H., and Chatzinotas, A. (2018). Interactions between predation and disturbances shape prey communities. *Scientific Reports*, 8:2968. doi.org/10.1038/s41598-018-21219-x
- **Karakoç, C.**, Singer, A., Johst, K., Harms, H., and A., C. Transient recovery dynamics of a predator–prey system under press and pulse disturbances. *BMC Ecology*, 17
- **Karakoç, C.** (2012). Population response to fluctuating temperature regimes – an analysis with a model microorganism. *M.Sc. Thesis*, University of Bayreuth. Can be downloaded at <https://drive.google.com/open?id=1G1qFInk2tTqpVSJmXC6x6KkmmvJ8uILH>

Other:

- Glidden, C. K., **Karakoç, C.**, Duan, C., Jiang, Y., Beechle, r. B., Jabbar, A., and Jolles, A. E. (2023). Distinct life history strategies underpin clear patterns of succession in microparasite communities infecting a wild mammalian host. *Molecular Ecology*, 32(13):3733–3746. doi.org/10.1111/mec.16949
- Zhao, Q., Van den Brink, P., Xu, C., Wang, S., Clark, A., **Karakoç, C.**, Sugihara, G., Widdicombe, C. E., Atkinson, A., Matsuzaki, S., Shinohara, R., He, S., Wang, Y. X. G., and De Laender, F. (2023). Relationships of temperature and biodiversity with stability of natural aquatic food webs. *Nature Communication*, 14(3507). doi.org/10.1038/s41467-023-38977-6
- Jurburg, S. D., Buscot, F., Chatzinotas, A., Chaudhari, Narendrakumar, M., Clark, A. T., Garbowski, M., Grenié, M., Hom, E. F. Y., **Karakoç C.**, Marr, S., Neumann, S., Tarkka, M., van Dam Nicole, M., Weinhold, A., and Heintz-Buschart, A. (2022). The community ecology perspective of omics data. *Microbiome*, 10(225). doi.org/10.1186/s40168-022-01423-8
- Clark, A., Mühlbauer K., L., Hillebrand, H., and **Karakoç, C.** (2022). Measuring stability in ecological systems without static equilibria. *Ecosphere*, 13(12):e4328. doi.org/10.1002/ecs2.4328
- Clark, A., Arnoldi, J.-F., Zelnik, Y., Barabas, G., Hodapp, D., **Karakoç C.**, König, S., Radchuk, V., Donohue, I., Huth, A., Jacquet, C., de Mazancourt, C., Mentges, A., Nothaaß, D., Shoemaker, L., Taubert, F., Wiegand, T., Wang, S., Chase, J., Loreau, M., and Harpole, S. (2021). General statistical scaling laws for stability in ecological systems. *Ecology Letters*, 24(7):1474–1486. doi/10.1111/e1e.13760
- Saraiva, J. P., Worrich, A., **Karakoç, C.**, Kallies, R., Chatzinotas, A., Centler, F., and Nunes da Rocha, U. (2021). Mining synergistic microbial interactions: A roadmap on how to integrate multi-omics data. *Microorganisms*, 9(4). doi.org/10.3390/microorganisms9040840
- Ozbayram, E. G., Akyol, C., Ince, B., **Karakoç, C.**, and Ince, O. (2018). Rumen bacteria at work: bioaugmentation strategies to enhance biogas production from cow manure. *Journal of Applied Microbiology*, 124(2):491–502. doi.org/10.1111/jam.13668

Publications under review and accepted

- Clark A.T., Shoemaker L., Arnoldi J–F.m Germain R., Godoy O., Hallett L., **Karakoç C.**, Saavedra, S., Schreiber, S. A practical guide to characterising ecological coexistence. *Biological Reviews*.

First author works close to submission

- **Karakoç C., O'Sullivan T., Gurney J., Wollein–Waldetoft K. and Brown S.P. Disentangling infection dynamics: A causal framework for host mortality.** Using a *Galleria mellonella* – *Pseudomonas aeruginosa* infection model, we assessed mortality, host damage, and pathogen burden to define causal dynamics of disease progression.
- **Karakoç C., Shoemaker W.R. and Lennon J.T. The evolutionary bioenergetics of making a spore.** We estimated bioenergetic costs of sporulation using multiomics data by accounting the energy required for expression of genes during this developmental program. We then explored the efficiency and evolutionary maintenance of this complex trait at evolutionary time scales informed by bioenergetics.
- **Karakoç C., Behringer M., Schoolmaster Jr. D.R. and Lennon J. T. Mutation accumulation under extreme energy limitation.** We explored adaptive mutations occurred in *Bacillus subtilis* that engages dormancy after 5 years starvation.
- **Karakoç C. and Clark A.T., Hines J., Rall B.C., Latz E., Kavtea A., Schmidt J.S., Harpole S.W., Hilltunnen T. and Chatzinotas A. Competitor constraints in antibiotic resistance.** We used a bacteria-phage system to explore antibiotic resistance challenged by a competitor with various life history and functional traits.
- **Karakoç C. and Clark, A.T., Hines J., Rall B.C., Latz E., Harpole S.W., Hilltunnen T. and Chatzinotas A. Antibiotic resistance under random and correlated environments in a predator-prey metacommunity.** We constructed a bacteria-phage metacommunity system to explore antibiotic and phage resistance trade-off under temporally random and autocorrelated antibiotic regimes.

PRESENTATIONS

Talks

- Contributed talk (2025). Disentangling host, pathogen, and interaction effects on infection-induced mortality. Evolution, Athens, GA.
- Contributed talk (2023). Evolution of complex traits through the lens of bioenergetics. ESA Annual Meeting, Portland, OR.
- Contributed talk (2020). Diversity and coexistence are influenced by time-dependent species interactions in a predator-prey system. ESA Annual Meeting, virtual.
- Contributed talk (2019). Diversity and stability are directly linked to fluctuating species interactions in a predator-prey system. GfÖ, Münster, Germany.
- Contributed talk (2015). Understanding community assembly mechanisms through integrative approaches, EEf-SiTE - Ecology at the Interface, 2015, Rome, Italy.
- Contributed talk (2014). Understanding the role of species interactions under environmental change: Microbial model systems as tools in ecological theory. YoMo Workshop - Ecological modeling across disciplines, Hann. Münden, Germany

- Invited talk (2014/2016). Patterns and processes under environmental fluctuations: Experiments with microbial model systems. University of Thessaly, Department of Biochemistry and Biotechnology, Larissa, Greece.

Posters

- Poster (2025). Dynamics of death: Why and when a host dies during infection. Gordon Research Conference, Microbial Population Biology, Andover, NH.
- Poster (2023). Evolution of survival through the lens of bioenergetics. AbGradCon, San Diego, CA.
- Poster (2021). Community constraints in adaptation to stressors. ESA Annual Meeting, virtual.
- Posters (2018). (a) Resolving Complex Microbial Community Dynamics: A causality analysis with microbial model systems. (b) Impact of Nutrient Levels and Stoichiometry on Microbial Freshwater Community and Functioning in Microcosm Experiments. ISME17, Leipzig, Germany.
- Poster (2014). Transient dynamics of trophically interacting species after disturbance. HETEROCLIM: The response of organisms to climate change in heterogeneous environments, Loches, France.

PROFESSIONAL SKILLS

Computer programs

Proficient	R programming language, tidyverse, \LaTeX
Familiar with	Python, Mathematica, Bash, NetLogo, QGIS/ArcGIS, ImageJ

Wet lab/field

Proficient	Microcosms consisting of viruses, bacteria, protozoa
Familiar with	Nematodes, wax moth, grassland & green house experiments

Illustration/Science communication

	Pen & paper, InkScape, Adobe Illustrator/InDesign
	Procreate, Affinity Designer

Languages

English	Fluent speaking & writing
German	Fluent speaking & writing
Turkish	Native

ACADEMIC MENTORING & TEACHING

Primary supervision

- B.Sc. research credit (2025 – ongoing). Wet-lab methods in microbial ecology and evolution, *Galleria mellonella*-*Pseudomonas* infection system Elisi B., Georgia Institute of Technology.

- B.Sc. summer research (2025). Wet-lab methods in microbial ecology and evolution, Abhiram K., Georgia Institute of Technology.
- B.Sc. research thesis (2024 – 2025). Accelerating mortality driven by pathogen burden and host damage. Charlotte W., Georgia Institute of Technology.
- B.Sc. research experience (2024 – 2025). Testing biofilm formation and antimicrobial activity using synthetic polymers. Jackson L., Georgia Institute of Technology.
- Research project (Summer 2023), Microbial division of labor under ecological disturbances. Michalle M., Indiana University Summer STEM Research Program.
- B.Sc Research experience (2023 – 2024), Microcosms, experimental evolution. Emily C., Indiana University.
- Summer internship (2022). Stability of metabolic exchange and dormancy, Melih Ç., Middle East Technical University.
- B.Sc. project (2020 – 2021). Effect of environmental noise on antibiotic and bacteriophage resistance evolution, Klara-Isabell G., Leipzig University.
- B.Sc. project (2020 – 2021). Fitness costs of antibiotic resistance in various environments, Joanna S., Leipzig University.
- Internship (2018 – 2019) and Master Thesis (2019–2020). Evolutionary rescue in complex communities, Alla K., Leipzig University.
- Internship (2014). Predator–prey interactions under disturbances, Jana H., University of Kassel.

Mentoring

- High school project (2021 – 2022). Complexity Effects Structural Stability: Using Protist Microcosms and Mathematical Modeling to Navigate Realism in Theoretical Ecology, Sylvia, G., OPRFHS IRDI, Chicago, IL.
- B.Sc. project (2021). Effect of environmental noise on microbial evolution, Philipp K., Leipzig University.
- PhD chapter (2019 – 2020). Mechanisms promoting co-existence of blood born parasites in African buffalo, Caroline G., Oregon State University.
- PhD project (2018 – 2020). Microbial communities of amphibian skin microbiomes, spread of pathogenic chytrid fungus, Adriana C., University of Toulouse.
- PhD project (2018 – 2021). Microbial communities and their interactions across trophic levels in mountain lakes, Judit L., Leipzig University.

Teaching

- Undergraduate course (Spring 2025) BIOL 3400: Introduction to Mathematical Biology, Georgia Institute of Technology.
- Graduate course (2021 – 2023). Quantitative Biodiversity, Indiana University.
- Practical research training (2022 – 2023). Microbiology graduate program rotation students, Biology undergraduates, Indiana University.
- Literature seminar (2020 – 2021). Microbial Ecology, Leipzig University.
- Practical training (2018 – 2021). Measuring microbial diversity, experimental evolution, R for data science, Leipzig University.
- Practical courses (2005 – 2008). General biology, Genetics, Molecular Genetics, Biochemistry, Animal Physiology, Microbiology, Introduction to Molecular Biology, Molecular Cell Biology, Cumhuriyet University.

RELEVANT ACTIVITIES

Symposium: Incorporating Dormancy and Rarity to Predict Community Dynamics and Stability Under Environmental Change 2023

Organizer *ESA Annual Meeting 2023, Portland, OR*

Course: Origin of Life 2022

Participant *Complexity Explorer, Santa Fe Institute*

Workshop: Bioinformatics 2022

Participant *GEMS, Urbana–Champaign, IL*

Workshop: Trait-Based Eco-Evolutionary Modeling 2019

Participant, led by Prof. Klausmeier *Leipzig, Germany*

Workshop: Filling in gaps in global understanding of ecological stability and coexistence 2019

Invited participation *Leipzig, Germany*

Workshop: an introduction to Bayesian statistics 2019

Participant, FlexPool travel grant *Münster, Germany*

Course: Introduction to regression models with spatial and temporal correlation R-INLA 2018

Participant, Highland Statistics Ltd., UFZ DEVELOP training grant *Leipzig, Germany*

Workshop: Eco-evolutionary dynamics in experimental microbial communities 2018

UFZ Controlling Chemicals' Fate invited speaker (Prof. Teppo Hiltunen) grant *Leipzig, Germany*

Minisymposium: Experimental evolution & community dynamics 2018

Participant, FlexPool travel grant *Tvärminne, Finland*

Winter school: Marine evolution – patterns and processes, Centre for Marine Evol. Bio. 2011

Participant, Swedish Royal Acadademy of Sciences travel award *Tjärnö, Sweden*

Modelling the fate of microbes in aquatic habitats and assessment of their associated risks 2010

Participant, ENB travel grant *Vienna, Austria*

Other graduate school activities 2013-2018

Courses, soft skill trainings [Link to file](#) *Leipzig, Germany*

Other graduate school activities 2009-2012

Courses, soft skill trainings [Link to file](#) *Bayreuth, Germany*

OUTREACH/SERVICE

Mentorship

- Science Olympiad Mentor (2022–2023). Bloomington South High School, Bloomington, IN

Administrative

- Leadership (2022–2024). IU Postdoc association Career Development Board.

Media interviews

- Interview (2018). Ökosystemforschung im Labor. Norddeutscher Rundfunk NDR.

Voluntary work

- Public outreach (2025). Atlanta Science Festival.
- Event organization (2022). Future faculty preparation conference, Indiana University.
- Session organization (2022). "Life of a postdoc", Graduate conference, Indiana University.
- Community outreach (2021, 2022). Bacterial viruses, Science Fest, Indiana University.
- Social development (2020). Better working culture, UFZ.
- Nature conservation activities (2000-2005) Biodiversity monitoring, Doga (BirdLife International partner), Turkey.
- Voluntary teaching (2004-2005). English, arts. Educational volunteers foundation of Turkey.
- Science philosophy and ethics (2004). Workshop, panel and public survey. Akdeniz University.
- Astronomy seminar series for non-astronomers (2000-2003) Physics department, Akdeniz University.

Memberships

- Ecological Society of America (ESA).
- American Society of Naturalists (ASN).

Editorial

- Community Editor in Frontiers in Ecology and Evolution. Speciality section Population, Community, and Ecosystem Dynamics.

Peer reviews for Journals (appx. 10/year)

- Nature Communication, American Naturalist, Applied and Environmental Microbiology, Biology Letters, Communications Biology, Ecology, Ecology Letters, eLife, Frontiers in Microbiology, PLoS Biology, Scientific Reports.

Peer reviews for Grant Proposals

- National Science Foundation, Division of Environmental Biology (2023)

Scientific Committee

- Ecological Society of America Early Career Paper Award Review Committee (2024)