



## Tara Stewart Merrill, Aquatic Disease Ecologist

### Research mission:

- Disentangle factors that shape how infectious diseases spread through natural systems
- Quantify how parasites impact ecosystems across multiple trophic levels
- Clarify the effects of environmental change on pathogen transmission

### Summary:

Tara Stewart Merrill examines the causes and effects of parasite and pathogen transmission, exploring these dynamics at scales ranging from host immune systems to entire ecosystems.

Parasites and pathogens make up approximately half of all species, and their effects can ripple through food webs — yet they are often overlooked when scientists study ecosystems. Stewart Merrill is working to correct that. She investigates the consequences of infection on ecosystems, identifying which parasites have outsized impacts and why.

Stewart Merrill's research has overturned previously held assumptions that invertebrate immunity does not matter for disease transmission, showing that variable immune resistance in planktonic crustaceans can influence whether fungal outbreaks reach epidemic levels in lakes. She built a model to easily quantify immune resistance in invertebrate vectors, making it possible to include vector susceptibility in predictions of pathogen

transmission and risk. Next, she hopes to apply this model to mosquito- and snail-borne diseases that infect people.

One of Stewart Merrill's strengths is her ability to generate simple, creative solutions to complex problems. For example, by combining principles of immunology and ecology, she developed innovative ways to measure a host's suitability for a given pathogen. And by uniting separate theoretical perspectives, she found common ground in a divisive debate about whether or not biodiversity reduces disease. The answer: Yes and no, depending on whether we take the host's or parasite's perspective, and on how we interpret disease risk.

Stewart Merrill's numerous awards and distinctions include an NSF Graduate Research Fellowship, an IGERT Fellowship, and a Life Sciences Research Foundation postdoctoral fellowship, sponsored by the Simons Foundation. She chaired the Disease Ecology section at the Ecological Society of America from 2023 to 2024.

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### Select publications:

Johnson PTJ, Stewart Merrill TE, Dean AD, and Fenton A. 2024. **Diverging effects of host density and richness across biological scales drive diversity-disease outcomes.** *Nature Communications.*

Stewart Merrill TE, Calhoun D, and Johnson PTJ. 2022. **Beyond single host, single parasite interactions: Quantifying competence for complete multi-host, multi-parasite communities.** *Functional Ecology.*

Stewart Merrill TE, Hall SR, and Cáceres CE. 2021. **Parasite exposure and host susceptibility jointly drive the emergence of epidemics.** *Ecology.*

Stewart Merrill TE, Rapti Z, and Cáceres CE. 2021. **Host controls of within-host disease dynamics: Insight from an invertebrate system.** *American Naturalist.*

Stewart Merrill TE and Johnson PTJ. 2020. **Towards a mechanistic understanding of competence: A missing link in diversity-disease research.** *Parasitology.*

Stewart Merrill TE, Hall SR, Merrill L, and Cáceres CE. 2019. **Variation in immune defense shapes disease outcomes in laboratory and wild *Daphnia*.** *Integrative & Comparative Biology.*

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