New generation of ecological models needed to safeguard future of biodiversity, says researcher

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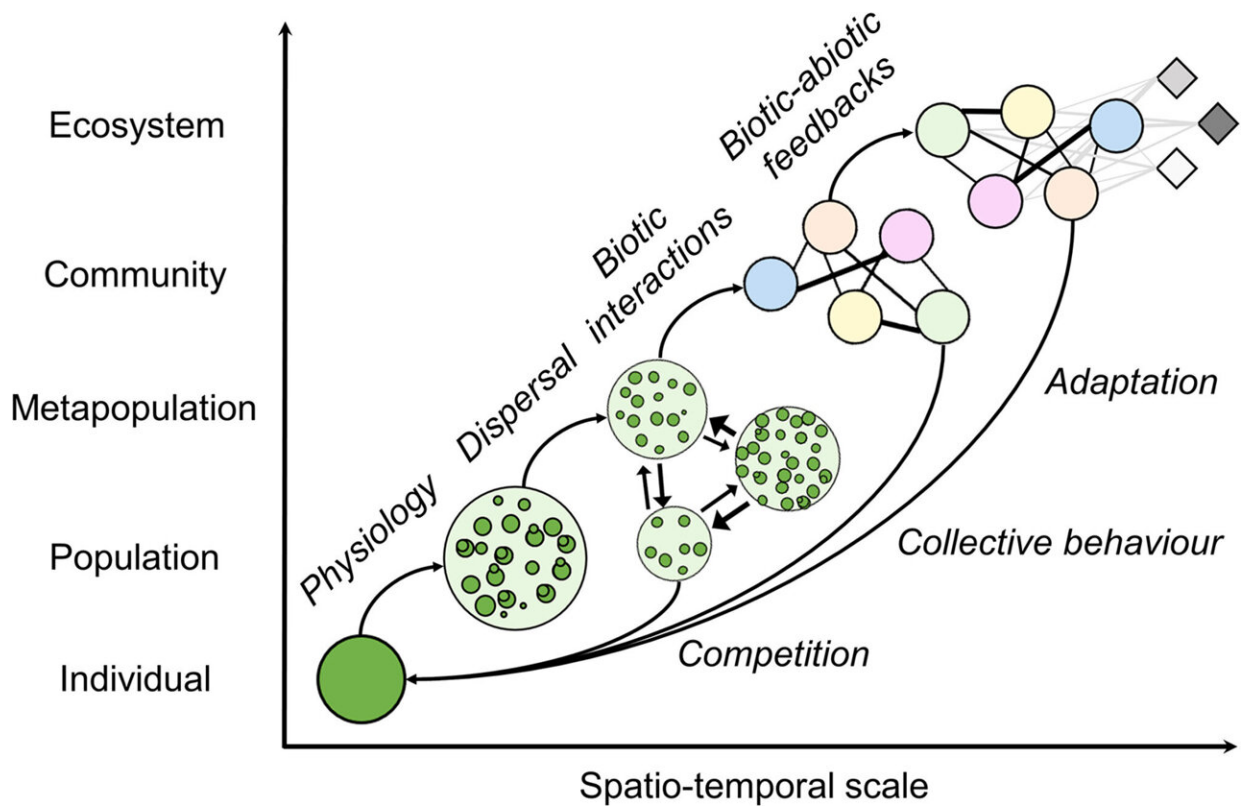

Scale-explicit mechanisms and processes commonly represented in existing mechanistic and process-based ecological models at different levels of biological organization. Credit: *Global Change Biology* (2024). DOI: 10.1111/gcb.17397

Protecting animals, ecosystems and biodiversity is one of the big challenges of our time. With climate change dramatically impacting the planet and transformations in society such as housing development and urbanization, protecting ecosystems and the life they sustain has become increasingly challenging.

One of the most difficult challenges that environmental researchers and protection organizations now face is fully understanding how the elements of a fragile ecosystem react to global and local changes.

In a paper published in *Global Change Biology*, Dr. Alice Johnston, Lecturer in Environmental Data Science, says ecosystem and biodiversity research needs a major change to include models that can be widely applied across environmental research, rather than just focusing on specific problems and questions.

"Robust land management policies and practices are needed to promote and restore ecological resilience in the face of human-driven change. Models are increasingly used to support environmental decisions, providing an understanding of the possible consequences of these policies and practices before their implementation," says Dr. Johnston.

"But because most ecological models are developed for specific purposes, it's a real challenge to build the broad information base needed to predict how complex ecological systems respond to multiple management practices across diverse landscapes.

"What we need are ecological models that are collaboratively developed to account for multiple scales. Such an approach would bridge distinct fields of ecology as we know them today to identify organizing principles for biodiversity, providing an evidence-base for safeguarding ecosystems across interrelated environmental problems."

Dr. Johnston advocates capitalizing on progress that has already been made in ecological modeling to systematically test the predictive power and computational cost of existing scale-specific models at multiple scales. AI-driven methods like those used in climate change forecasting could then extrapolate biodiversity predictions from local to global environmental problems.

Such advances in ecological modeling have relevance to several ongoing projects at Cranfield University, including Defragmenting the fragmented urban landscape (DEFRAG) and Restoring Resilient Ecosystems (RestREco). Both projects are taking a multi-dimensional and multi-scale approach to understanding how a range of ecosystems (urban, grassland, forest) respond to disturbance and support critical services such as air quality and water regulation.

More information: Alice S. A. Johnston, Predicting emergent animal biodiversity patterns across multiple scales, *Global Change Biology* (2024). DOI: 10.1111/gcb.17397

Provided by Cranfield University

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