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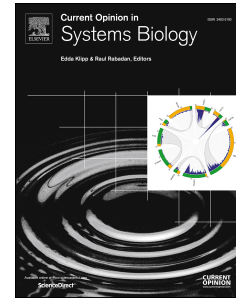
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Ecological Systems Biology: The Dynamics of Interacting Populations

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Keywords: ecology; evolution; microbial communities; interactions; cooperation; mutualism; predator-prey.

Highlights (*85 max characters each*)

- Ecological systems biology studies the emergent properties of biological communities
- Similar interactions lead to parallel dynamics within and between populations
- Tractable microbial system enable tight integration between theory and experiments

Abstract

Ecological systems biology integrates theory and experiments in simple laboratory systems to study how interactions between individuals determine the emergent properties of complex biological communities. This approach reveals parallels between ecological dynamics that result from interactions between populations, and evolutionary dynamics which result from analogous interactions within a population. Tractable microbial systems enable systematic testing of theoretical predications, and identification of novel principles. Notable examples include using a cooperatively growing yeast population to detect theoretically predicted early-warning indicators preceding sudden population collapse, validating predicted spatial expansion patterns using two yeast strains which exchange essential metabolites, and the recent realization that coevolution of predators and prey qualitatively alters the oscillations that are observed in a rotifer-algae system.

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