Unifying relationships between complexity and stability in mutualistic ecological communities

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Highlights

- stability conditions for mutualistic systems are derived from first principles
- 'Handling time, which partly determines aspecies rate of resourceuse (and has received relatively little attention inprevious studies), isfound to be crucially important in determining the dynamics ofmutualistic systems
- Two types of critical transitions are predicted and we describe the controllingfactors andconsequences of these transitions
- Properties of potential early-warning signals for the two identified transition types are derived, and differences defined and explained
- Previouscontradictory evidence suggesting increases in the level ofheterogeneity inter-species connections can both increaseand decrease stability are shown to be specialcases of a more general model
- a number of derived parameters are presented that precisely connect basic ecological parameters to system-level behaviour (largely based on the relative strength of interactions and effects on dominant eignenvalues at critical points)
- trade-offs are explored between abundance and resilience, and predictions from the model are found to be in broad agreement with empirical observations