Effects of climate warming on consumer-resource interactions

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There is increasing evidence that climate warming is impacting biodiversity by disrupting species interactions. Trophic (consumer-resource) interactions, which comprise the fundamental units (modules) of food webs, are of particular importance because they have an intrinsic tendency to fluctuate in abundance, thus running to risk of stochastic extinction during periods of low abundances. Here I present a mathematical framework for predicting warming effects on consumer-resource interactions. This work differs from previous theory in two important ways. First, it uses delay differential equations to realistically depict the developmental delays inherent in ectotherm life cycles, and incorporates mechanistic descriptions of phenotypic trait responses, derived from first principles of thermodynamics, into the dynamical delay model. Second, it investigates the recent IPCC predictions on the increase in the number of hotter-than-average days. I report three key results. First, across latitudes (tropical vs. temperate) and feeding strategies (juvenile vs. adult attacked), a greater increase in the maximum temperature compared to the minimum (hotter-than-average summers) is more detrimental to consumer-resource interactions than a greater increase in the minimum temperature (warmer-than-average winters). Second, across latitude and warming scenarios, effects of warming are more detrimental when the consumer attacks the adult stage of the resource. Third, across warming scenarios and feeding strategies, consumer-resource interactions in the tropics are more at risk of species losses due to warming while those in the temperate zone are more at risk of extreme fluctuations in species' abundances. I discuss implications of these results for biodiversity and biological pest control.

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References

[1] L. Lamport, *LaTeX: A Document Preparation System*. Addison Wesley, Massachusetts, 2nd Edition, 1994.