
Inferring intrinsic growth rate and per capita interactions from ecological time-series

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Abstract

Knowledge about the *per capita* interactions between organisms and their intrinsic growth rates, and how these vary over environmental gradients, allows understanding and predicting species coexistence and community dynamics. However, estimating these important parameters thus far required complicated experimental setups, which entail isolation of organisms from their natural communities, thereby potentially rendering conclusions from experimental results of limited realism. Here, we provide a novel approach for inferring these key parameters from time-series data by using weighted multivariate regression on the *per capita* growth rates of populations. Beyond the validation of our approach on synthetic data, we reveal from experimental data an expected allocative trade-off between grazing resistance and rapid growth in algae. Application of observational data suggests facilitation between cyanobacteria and chrysophyte, indicating a possible explanation for cyanobacteria bloom. Our approach offers a way forward for inferring *per capita* interactions and intrinsic growth rates directly from natural communities, providing realism, mechanistic understanding of eco-evolutionary dynamics, and key parameters to develop predictive models.

Keywords: Intrinsic growth rate, per capita interaction, time, series, LVmap, weighted multivariate regression

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