

Inferring the effect of competition on trait evolution

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Abstract

Models of trait evolution usually assume that abiotic factors pull species toward an optimal trait value, whereas competitive interactions drive the trait values apart. However, these models do not consider population dynamics and dynamics of the trait variance and they oversimplify competition. Here we develop a coherent trait evolution model, with abundance-dependent competitive interactions, against a macroevolutionary background encoded in a phylogenetic tree. We use Approximate Bayesian Computation to fit the model to baleen whale body sizes and compare it to a model without population dynamics and a model where competition depends on the total metabolic rate of the competitors. All models suggest that baleen whales undergo weak environmental attraction and strong competition. However, they differ in their predictions of the abundance distribution. Data on abundance distributions, therefore, allow us to distinguish the models from one another, and infer the nature of competitive interactions.

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