Different methods of modeling simple choice behavior

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Most previous models of adaptive behavioral choice by species in food webs have assumed that organisms instantaneously assume or approximate the behavior that is currently optimal, given the population densities at that point in time. I examine how the population dynamics predicted by this type of model can differ from those of models in which the choice behavior changes dynamically. I use two different one-predator-two-prey systems to make this comparison; one involves diet choice based on prey energy content and handling time; the second involves switching between two prey based on their relative abundance. Dynamic choice models differ in whether there is between-individual variation in behavior, and in whether the absolute fitness difference produced by a change in behavior influences the rate or probability of behavioral change. For both ecological models, dynamic representation of behavior often predicts significantly different population dynamics than does instantaneous optimization. Furthermore, different types of dynamic model often make very different predictions about population dynamics. Extensions of these models to include adaptive behavior in the prey species are discussed, as is competition between different behavioral types within the predator. The results suggest possible behavioral mechanisms leading to complex population dynamics, and highlight the need for more empirical study of the dynamics of behavioral change.

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