
Prey parasitism affects predator-prey dynamics and the evolution of predator foraging

Loïc Prosnier*¹, Vincent Médoc¹, and Nicolas Loeuille¹

¹institut of Ecology and Environmental Sciences - Paris (iEES Paris) – Université Pierre et Marie Curie (UPMC) - Paris VI, CNRS : UMR7618, Institut de recherche pour le développement [IRD] : UR242, Université Paris-Est Créteil Val-de-Marne (UPEC), Institut national de la recherche agronomique (INRA), Université Paris Diderot - Paris 7, Sorbonne Universités – 7 quai Saint Bernard, 75005 Paris, France

Abstract

While parasitism is a very common consumer strategy, how parasites constrain the dynamics of ecological networks is still unclear. In this study, we explore through modeling how parasitism on prey may affect the ecological dynamics of a two-prey-one-predator module, as well as the evolution of predator foraging. We distinguish two scenarios: (1) virulent parasites that reduce the basic growth rate of their host; (2) manipulative parasites that increase the vulnerability of their host to predation. Evolution of predator diet is constrained by a trade-off (concave or convex) between the two prey. We show that the effects of parasitism on trophic dynamics depend on the scenario we consider. Virulent parasites reduce coexistence whereas manipulative parasites promote it. The stability of ecological dynamics is often reduced. Allowing for the evolution of the predator foraging frequently facilitates system coexistence. Nevertheless, the trophic structure associated with the evolutionary equilibrium varies greatly depending on the scenario and the intensity of parasitism. Predators may specialize on either one or the other prey according to considered scenario. At intermediate effect we either observe a diversification of predator strategies leading to the coexistence of two specialist predators for a convex trade-off, or generalists in the case of concave trade-offs. Finally, we discuss how these qualitative results in term of ecology (structure and stability) and evolution (predator foraging strategy) may be tested by an experimental approach.

Keywords: EcoEvolutionary model, adaptive foraging, parasitism, coexistence, resilience

*Speaker