

Understanding the role of variable fish mobility in the effectiveness of MPAs

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Abstract

Marine protected areas (MPAs) are regions in the ocean where fishing is restricted or prohibited. The goal of this talk is to develop a set of mathematical models to understand how fish mobility affects MPA performance. Specifically, I will argue that MPA effectiveness decreases with fish mobility for single species models with logistic growth, and that densities inside and outside the MPA tend to equalize. Then I will consider a two patch predator-prey model of MPA and show that MPA performance is not only highest for slow, but also for moderately mobile species, and that the increased diffusivity generally has a stabilizing effect on the community as a whole. Thirdly, I will present a two patch consumer resource model where the consumers (fish) mobility comprises both random and preferential movement modes. In this context, I will discuss the notion of the ideal free equilibrium and revisit the effect of increased overall mobility on the MPA performance.