ABSTRACT

SPATIAL DYNAMICS, STAGE-STRUCTURE, AND THE PREDATOR-PREY INTERACTIONS OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*)

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Largemouth bass are important predators in lake ecosystems, exerting strong top-down control on fish communities. Although the effect of bass on fish communities is well known, there is only marginal understanding of the underlying processes dictating bass predation rates. For example, the spatial aspects of bass-prey interactions are poorly understood. Moreover, bass are often components of complex food webs, where bass both prey upon and compete with other fishes owing to stage-structured population dynamics. I explored the interactions between bass and their prey by considering three distinct questions: 1) How do predator-prey interactions affect fish spatial distributions and habitat use ? 2) Is satiation an important constraint on bass predation rates ? 3) Can complex food webs lead to alternate

stable states in bass and prey abundance? I combined long-term data analysis, whole-lake manipulations, and modeling analysis to explore how predator-prey interactions dictate fish distributions, and the consequences of these distributions for bass predation. At high prey densities, bass do not seek out aggregations of prey, but instead follow a fixed behavior pattern that creates a non-random distribution of predation risk. This behavior creates a refuge for prey in the locations uncommonly inhabited by bass. This simple anti-predator behavior becomes an important constraint on bass predation rates. As a consequence, bass predation rates are always well below their physiological maximum, even when prey are abundant. Lastly, I developed a general model of intraguild predation in stage-structured populations. This model suggests that intraguild predation promotes alternate steady states, where populations are alternately controlled by predation or competition. However, likelihood of such steady states depends on the intensity of density-dependent processes. Collectively, these results highlight the importance of individual behavior in mediating population-level phenomenon, and the importance of stage-structure in predator-prey interactions.

Approved

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