

## Vegetation-Open Water Interface and the Predator-Prey Interaction between Largemouth Bass and Bluegills: an Encounter Model

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*Abstract.*—A mathematical model was developed to estimate numbers of bluegills *Lepomis macrochirus* encountered by largemouth bass *Micropterus salmoides* in enclosures which contained 30 feet of vegetation-open water interface (or edge) and 60 feet of edge, as used previously in a field experiment. Edge was originally created in one enclosure by removing a single strip of vegetation 6-feet wide and 15-feet long from the middle (1S enclosure), and in the other by removing two strips 3-feet wide by 15-feet long at 3-foot intervals (2S). In the model, capture probabilities were assumed to be constant and independent of amount of edge. Results of model runs suggested that edge effects would double numbers of bluegills encountered in the 2S enclosure compared to the 1S, under certain conditions of light intensity, assumed bluegill behavior, and bass position in open water between vegetated plots. Spatial distribution of bluegills in both enclosures were identical in these simulations. However, bluegill behavior may be affected by both width of open water between refuges and perceived density of bass in the immediate locale. Model results supported this possibility since predicted numbers encountered were sensitive to subtle changes in assumed behaviors of bluegills in different enclosures. These results demonstrate that the main effect of edge is likely related to changes in number of bluegills encountered by bass. Second, reactions to predation risk on a diel scale may cause behavioral responses by bluegills that are difficult to measure, but which significantly alter their ability to avoid detection. Third, effects of light intensity on the ability of bass and bluegills to see each other has important implications for determining when bass of certain sizes would be most efficient in actively searching for bluegills. An algorithm to estimate suitable open water widths when creating edge will need to incorporate knowledge of bass reaction distances to bluegills, size structure of bass and bluegill populations, bass foraging tactics including temporal and spatial aspects of foraging strategies, and bluegill behavioral responses to their environment.

Encountering prey is the first required step a predator must take if it is to forage successfully, and thus survive and grow. All other behaviors (follow, attack, pursuit, and capture) exhibited by a predator during an

interaction with a prey species can only occur after a predator effectively establishes contact with its prey. Visual contact with prey can be affected by many factors, including predator behavior (Savino and Stein 1989b), prey

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