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Vegetation-Open Water Interface and the Predator-Prey Interaction between Largemouth Bass and Bluegills: a Field Experiment

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Abstract.—A field experiment was designed to test effects of manipulating vegetation-open water interface (or edge) on success of largemouth bass *Micropterus salmoides* preying on bluegills *Lepomis macrochirus*. Four enclosures were placed in a natural lake, with a different level of structural complexity in each: 1) all vegetation removed (NV enclosure); 2) vegetation left untouched (CV); 3) one strip of vegetation 6-feet wide and 15-feet long removed from the middle creating 30 feet of edge (1S); and 4) two strips 3-feet wide by 15-feet long removed at 3-foot intervals creating 60 feet of edge (2S). Three sizes of bass (8, 11, and 14 inches, total length) and two size groups of bluegills (1.0-2.9 and 3.0-4.9 inches, total length) were utilized in the experiment. Predation success of all sizes of bass was much greater in 2S and NV enclosures compared to that in CV and 1S. Effects of increasing edge on predation rates were much greater than anticipated. Capture of bluegills by 8-inch bass was 5.0 times greater in the 2S enclosure than in the 1S, and by 11-inch bass it was 3.4 times greater. While 14-inch bass did not capture any bluegills in the 1S enclosure, they did consume some in the 2S. Predation rate averaged over all sizes of bass was 4.4 times greater in the 2S enclosure compared to the 1S. Effect of edge on predation rates was probably related to changes in the ability of bass to encounter bluegills in various habitats. Simple random encounter and amount of edge available for an interaction do not fully explain observed differences in predation rates. Other factors which likely influenced predation success include effects of open water width between refuges on the probability that bass detect bluegills in 2S and 1S enclosures, and changes in behavioral responses of bluegills to width of open water areas which, in turn, change relative encounter probabilities for bass. Appropriate configurations of edge for a bass-bluegill community should include knowledge of: 1) biomass and size structure of a bass population; 2) desired abundance of bluegills; 3) amount of edge needed per bass as a function of bass size and number; 4) critical size of refuges; and 5) effects of open water widths between refuges on bass and bluegill behavior.

Fishery managers are now beginning to realize the significance of predator-prey interactions in aquatic systems, which shape fish community structure (Gerking 1982). This is reflected in management plans designed to balance numbers between, and improve growth of individuals within, predator and prey populations. However, manual removal of excess predator or prey biomass, or stocking additional numbers of

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