

GRADIENT OF FISH PREDATION ALTERS BODY SIZE DISTRIBUTIONS OF LAKE BENTHOS

STEVEN C. BLUMENSHINE,^{1,3} DAVID M. LODGE,¹ AND JAMES R. HODGSON²

¹*Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 USA*

²*Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115 USA*

Abstract. We used normalized size spectra analysis (originally developed in the study of pelagic communities) and a fish bioenergetics model to examine whether predation by fishes affects the size structure of macrobenthos. We conducted the study over five years in three north temperate lakes in which fish were experimentally manipulated while allowing for natural recruitment and mortality in lakes with fish. The resulting variation in predator populations allowed us to address how prey community size structure responds to a gradient of predation pressure. The slopes of normalized size spectra were used to characterize whether community biomass is relatively distributed as smaller or larger individuals with regard to mass. We ask whether predator effects on prey are manifested through fish presence/absence or if a gradient of predation pressure is important. In addition, we examined whether consumption rate of prey by fish is a better measure of predation effects on prey size structure than fish biomass alone.

Our results suggest that benthos size structure responds to a gradient of fish consumption, rather than a qualitative distinction of fish presence or absence. Consumption rates by fish on benthos explained more of the variation in slopes of normalized size spectra of benthos than fish biomass alone. Slope values were more variable at lower consumption rates, which included no predation by fish. Conversely, high consumption rates by fish produced consistent, predictable body size distributions of benthos in which large individuals were relatively underrepresented. However, these results may not be apparent through more traditional analyses based on predator or prey presence/absence, abundance, or taxonomic-based measures. Generalizations addressing patterns of body size distributions within and among ecosystems may be advanced by examining predation and other underlying size-structuring mechanisms.

Key words: *benthic-pelagic links; benthos; body size distribution; fish bioenergetics; Micropterus; normalized size spectra; predation, size selective; predator-prey.*