

Benthic–pelagic links: responses of benthos to water-column nutrient enrichment

S. C. BLUMENSHINE, Y. VADEBONCOEUR, AND D. M. LODGE

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

K. L. COTTINGHAM¹ AND S. E. KNIGHT

Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706 USA

Abstract. Although the responses of pelagic algae and invertebrates to gradients of nutrient enrichment are well known, less is known about the responses of benthos to such gradients or how benthic and pelagic responses may interact. We performed a 9-wk experiment in 2000-L mesocosms in the field to test for the effect of water-column nutrient enrichment on phytoplankton, algae on sediments (epipelon) and hard surfaces (plastic strips), as well as pelagic and benthic primary consumers. The experimental design consisted of 4 nutrient enrichment rates (0, 0.5, 1.0 and 2.0 $\mu\text{g P L}^{-1} \text{d}^{-1}$, together with N to yield an N:P ratio of 20:1 by weight). Nutrient enrichment induced significant increases in chlorophyll *a* in phytoplankton and attached algae, but not epipelon. Zooplankton biomass was significantly higher in enriched mesocosms than in controls over the initial 4 wk of enrichment, but the effect was not sustained over the course of the experiment. Densities of sediment-dwelling, and hard-substrata-associated invertebrates were higher in enriched treatments relative to controls. Emergence of benthic insects also increased with enrichment. Size and species composition of benthic macroinvertebrates differed between enriched treatments and controls. Our results suggest that nutrients added to the water column were quickly converted into benthic biomass, likely reducing pelagic responses to enrichment.

Key words: nutrient enrichment, mesocosm, benthic-pelagic links, periphyton, macroinvertebrates, Chironomidae.