

## Multi-trophic-level impact of sublethal interactions between bass and omnivorous crayfish

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**Abstract.** We demonstrate the importance of omnivory and the importance of sublethal predator effects in the dynamics of a littoral zone food web. Using outdoor tanks (1.8 m diameter, 0.4 m depth), we examined possible cascading trophic effects of predation risk by fish (largemouth bass [*Micropterus salmoides*]) through omnivorous crayfishes (three *Orconectes* species) on benthic macroinvertebrates and macrophytes. Even in the absence of predation by bass on crayfish, crayfish mortality was 50% greater in tanks with bass relative to tanks without bass. Consistent with reduced crayfish numbers and reduced feeding by surviving crayfish in the presence of bass, macrophyte cover was lower in the absence of bass. Similarly, abundance of eight of 11 macroinvertebrate taxa was lower (three significantly so) in the absence of bass. Thus, the impact of crayfish on lower trophic levels was reduced by sublethal effects of predatory bass, partly consistent with the trophic cascade model. However, as omnivores, crayfishes directly affected more than one trophic level, detritivorous/herbivorous macroinvertebrates and macrophytes, and thus produced effects inconsistent with the trophic cascade model. Reduced macrophyte grazing by crayfish may therefore be one mechanism by which biomanipulation (addition of predatory fishes) often results in increases in macrophyte abundance, a response usually attributed solely to decreased shading by phytoplankton.

**Key words:** omnivory, predation, herbivory, trophic cascade, sublethal effects, crayfish, biomanipulation, *Orconectes*, bass, macrophytes, macroinvertebrates.