

Top-down and bottom-up effects of a processing detritivore

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Abstract. Detritus processing, the breaking down of organic matter into smaller particles, is an essential operation in aquatic systems because it provides resources to filter feeders and accelerates nutrient release by microorganisms. Detrital foodweb dynamics are influenced by both consumption (top-down) and production (bottom-up) effects. We tested the effects of predators and detritivores on the abundance of microorganisms in an inquiline community in pitcher plants. We manipulated densities of mosquitoes (top predator) and midges (processing detritivore) in a factorial press experiment and measured the response (density) of bacteria, protozoa, and rotifer populations over several generations. We hypothesized that: 1) midges would have a positive effect on microorganisms by increasing nutrient availability (bottom-up effects), 2) mosquitoes would depress microorganism populations through consumption (top-down effects), 3) top-down and bottom-up effects would operate independently, and 4) would attenuate with trophic position. Mosquitoes (predators) had a negative effect on all measured populations. Midges (processing detritivores) had a positive effect on bacteria, but a negative effect on rotifers and some protozoan taxa. The increase in bacterial density probably was the result of nutrient enrichment from detritus processing, whereas the decrease in rotifers seems to have been the result of consumption by midges. Our study shows that the role of processing detritivores is complex and can enhance both bottom-up and top-down effects. Specifically, omnivory can complicate simple top-down and bottom-up predictions. Although they accelerate decomposition by microorganisms and, thereby, can increase resource availability, processing detritivores can also be important consumers in detrital food webs.

Key words: detritus processing, food webs, top-down vs bottom-up, detritivores, microorganisms, *Metriocnemus knabi*, pitcher plant, *Sarracenia purpurea*, *Wyeomyia smithii*, incidental predation, inquilines.