

## REGULATION OF PLANKTONIC MICROBIAL COMMUNITIES BY NUTRIENTS AND HERBIVORES<sup>1</sup>

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**Abstract.** We conducted a series of single-factor and factorial experiments in two north-temperate lakes (Peter and Paul lakes, Gogebic County, Michigan, USA) to study regulation of heterotrophic microbial communities. In single-factor experiments large *Daphnia* were added to enclosures, and these were compared to enclosures without *Daphnia*. These treatments contrast the major food-web configurations that occur in these lakes as a consequence of cascading trophic interactions. Bacterial abundance and the incorporation of methyl [<sup>3</sup>H]-thymidine into DNA by bacteria were similar in treatments with and without *Daphnia*. Ciliates were significantly reduced while heterotrophic flagellates were only marginally reduced by *Daphnia* additions in the Peter Lake experiments. Protozoans were not affected by *Daphnia* additions in the Paul Lake experiment. Factorial experiments compared the relative significance of large daphnids and nutrients as regulators of bacteria and protozoa. Treatments included controls, *Daphnia* additions, nutrient (N plus P) additions, and a combined *Daphnia*–nutrient treatment. Bacteria responded to nutrient additions but not to *Daphnia*. Protozoa, on the other hand, were strongly affected by *Daphnia* and to a lesser extent by nutrients. These experiments suggest that the trophic cascade is truncated at the level of protozoans. Protozoa appear to be partially regulated by predators, whereas bacteria show no response to changes in either *Daphnia* or protozoa.

**Key words:** aquatic food webs; bacterial production; bottom-up vs. top-down control; ciliates; heterotrophic flagellates; heterotrophic microbial communities; plankton; protozoa; trophic cascade; zooplankton.