Responses of a prairie wetland to press and pulse additions of inorganic nitrogen and phosphorus: invertebrate community structure and interactions

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With 9 figures and 2 tables in the text

Abstract: Bottom-up experimental manipulation of a wetland food web via press or pulse nutrient additions in Delta Marsh, Canada, demonstrated a differential response among primary producers and associated invertebrate grazers. Microinvertebrate grazers, dominated by Ceriodaphnia dubia, effectively depressed phytoplankton biomass in control, press, and pulse enclosures in the absence of fish predators. Similarly, microinvertebrate grazers increased in density in response to increased availability of periphyton on acrylic rods in both press and pulse nutrient treatments. Subsequently, proliferation of inedible filamentous green algae, in part as a consequence of size-selective herbivory, especially with the press nutrient additions, led to a marked decline in grazer density. Macrophyte-associated invertebrates, mainly chydorid cladocerans, increased in abundance in parallel with macrophyte biomass changes and reduced epiphyton biomass through most of the season. Metaphyton shading (primarily in the press treatment) led to macrophyte decline and eventual decomposition, and substantial reduction in phytophilous invertebrate density. These grazer-algal interactions support the hypothesis of top-down control by grazers on algae (phytoplankton and epiphyton) as a regulatory mechanism in macrophyte-dominated aquatic ecosystems. The transition from epiphyton-dominated to metaphyton-dominated wetland is shown to be facilitated by herbivory, nutrient addition, and continuous availability of nutrients.

Introduction

Shallow water ecosystems respond in a more complex manner to nutrient enrichment (Moss et al. 1996) than deeper lakes that have been the central focus