



Invertebrate distribution on a macroalgae/macrophyte mixed mat in flowing water

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With 6 figures and 3 tables

Abstract: In flowing waters, aquatic fauna is typically concentrated in the benthos, wood or other fixed substrates. Aquatic plants and filamentous algae may also offer refugia for invertebrates within the water column, due to flow attenuation, relatively stable substrate and provision of food. We quantified invertebrate abundance, size distribution and species composition along linear, flow-oriented gradients of mixed *Cladophora* sp. and *Elodea canadensis* mats in Crow Creek, northern Montana (USA). Mats were divided into four sections (0–20, 20–40, 40–60 and 60–80 cm, ordered basal to distal) using a customized sampler. Mat biomass, invertebrate richness and abundance were significantly higher in the 20–40 cm section, driven primarily by *Cladophora* biomass. Meanwhile, *Elodea* biomass was correlated with invertebrate richness in the 60–80 cm section. Most taxa, however, were not individually related to *Cladophora* or *Elodea* biomass, except for a positive relationship between *Elodea* biomass and the amphipod *Hyalella azteca* in the 0–20 cm section, and with cladocerans and copepods (meiofauna) in the 60–80 cm section. Biomass size spectra showed no difference among mat segments, but were prominently skewed towards smaller size classes (meiofauna), demonstrating that mats allow the presence of the meiofauna well into the water column of flowing waters. Stream epiphytic invertebrate communities may exhibit complex patterns in abundance and composition, potentially following a neutral model of colonization, movement, and loss of individuals along a linear flow-oriented substrate, but with strong interacting effects of substrate biomass, possible inter-specific interactions, or distinct microhabitat preferences.

Key words: macrophyte biomass, meiofauna, neutral model, size distribution, *Cladophora*, *Elodea*.

Introduction

Benthic algae dominate primary production in small streams and are the food source for many stream macroinvertebrates (Brown et al. 2008). Benthic algae and attached biofilm enhance benthic structure (Dodds & Biggs 2002, Battin et al. 2003) and the resultant habitat heterogeneity contributes to riverine taxonomic richness (Ward 1998). Considered to be among the most abundant stream algae (Whitton 1970), *Cladophora* is one of the most important contributors to

heterogeneity in streams (Dudley et al. 1986), and has been a significant subject of study (McCormick & Stevenson 1991, Dodds 1991a, b, Dodds & Gudder 1992, Biggs 1996, Shannon et al. 1994, Lamberti 1996, Stevenson 1997, Kemp & Dodds 2001). *Cladophora* mats are very dynamic environments capable of interacting with animal communities in many ways (Dudley et al. 1986, Dodds 1991b, Shannon et al. 1994), producing a stable yet mobile and changing substrate in running waters, lowering water velocity inside and around the mats, and providing spatial structure (Dud-

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