Estuaries and Coasts (2011) 34:701–711
DOI 10.1007/s12237-010-9356-4

NOTE

Food Web Structure in a Chesapeake Bay Eelgrass Bed as Determined through Gut Contents and ^{13}C and ^{15}N Isotope Analysis

James G. Douglass · J. Emmett Duffy · Elizabeth A. Canuel

Received: 25 February 2010 / Revised: 18 July 2010 / Accepted: 30 October 2010 / Published online: 11 January 2011

Abstract Changes in seagrass food-web structure can shift the competitive balance between seagrass and algae, and may alter the flow of energy from lower trophic levels to commercially important fish and crustaceans. Yet, trophic relationships in many seagrass systems remain poorly resolved. We estimated the food web linkages among small predators, invertebrate mesograzers, and primary producers in a Chesapeake Bay eelgrass (*Zostera marina*) bed by analyzing gut contents and stable C and N isotope ratios. Though trophic levels were relatively distinct, predators varied in the proportion of mesograzers consumed relative to alternative prey, and some mesograzers consumed macrophytes or exhibited intra-guild predation in addition to feeding on periphyton and detritus. These findings corroborate conclusions from lab and mesocosm studies that the ecological impacts of mesograzers vary widely among species, and they emphasize the need for taxonomic resolution and ecological information within seagrass epifaunal communities.

Keywords Mesograzer · Diet · Seagrass · Stable isotope · Omnivory · Food web

J. G. Douglass (✉)
Northeastern University Marine Science Center,
430 Nahant Road,
Nahant 01908, MA, USA
e-mail: j.douglass@neu.edu

J. Emmett Duffy · E. A. Canuel
Virginia Institute of Marine Science,
1208 Greate Road,
Gloucester Point, VA 23062, USA

Introduction

Theory and experiments suggest that the diversity and feeding behaviors of consumers at intermediate trophic levels are important in determining how top-down and bottom-up trophic effects are compounded or attenuated within a community (Duffy 2002; Cardinale et al. 2006; Douglass et al. 2008). Unfortunately, the species-specific feeding ecology of middle trophic levels remains poorly resolved in some seagrass ecosystems. Consequently, the intermediate consumers in seagrass food webs have often been lumped into broad functional categories (e.g., Wetzel and Neckles 1986; Cerco and Moore 2001), which helps to create tractable models but may obscure important differences among species. For example, the small epifaunal invertebrates known as "mesograzers" are generally believed to benefit seagrass by consuming algal epiphytes (Jernakoff et al. 1996; Hughes et al. 2004; Valentine and Duffy 2006), but species-specific studies suggest a less benign role for some mesograzer taxa. While many mesograzers do consume mostly epiphytic microalgae, others graze directly on seagrass and macroalgae and have caused destruction of macrophytes in cultures (Kirkman 1978; Short et al. 1995; Duffy and Harvilicz 2001) and in the field (Kangas et al. 1982; Haahtela 1984). Conversely, certain mesograzer species, such as *Gammarus mucronatus*, have been shown to facilitate growth of macroalgae, and others, i.e., *Idotea balthica*, have displayed intra-guild predation (Duffy and Hay 2000; Duffy et al. 2005; Jaschinski et al. 2009). Most of these findings come from mesocosm and laboratory experiments, however, making it difficult to assess the prevalence and importance of these mesograzer feeding habits in the wild, where a wider range of available