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Organizing and understanding a winter's seagrass foodweb network through effective trophic levels

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Abstract

Trophic structure of ecosystems is a unifying concept in ecology; however, the quantification of trophic level of individual components has not received the attention one might expect. Ecosystem network analysis provides a format to make several assessments of trophic structure of communities, including the effective trophic level (i.e. non-integer) of these components. We applied network analysis to a *Halodule wrightii* community in Goose Creek Bay, St. Marks National Wildlife Refuge, Florida, USA, during January and February 1994 where we sampled a wide variety of taxa. Unlike most applications of network analysis, the field sampling design was specific for network construction. From these data and literature values, we constructed and analyzed one of the most complex, highly articulated and site specific foodweb networks to be done. Care was taken to structure the network to reflect best the field data and ecology of populations within the requirements of analysis software. This involved establishing internally consistent rules of data manipulation and compartment aggregation. Special attention was paid to the microbial components of the food web. Consumer compartments comprised effective trophic levels from 2.0 (herbivore/detritivore) to 4.32 (where a level 4.0 represents 'secondary carnivory'), and these values were used to organize data interpretation. The effective trophic levels of consumers tended to aggregate near integer values, but the spread from integer values increased with increasing level. Detritus and benthic microalgae acted as important sources of food in the extended diets of many consumers. 'Bottom-up' control appeared important through mixed trophic impact analysis, and the extent of positive impacts decreased with increasing trophic level. 'Top-down' control was limited to a few consumers with relatively large production or biomass relative to their trophic position. Overall, ordering results from various network analysis algorithms by effective trophic level proved useful in highlighting the potential influence of different taxa to trophodynamics. Although the calculation of effective trophic level has been available for some time, its application to the evaluation of other analyses has previously not received due consideration.

Keywords: Seagrass community; Network analysis; Effective trophic level; Carbon flow

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