INVESTIGATING FUNCTIONAL EQUIVALENCY: QUALITY AND AVAILABILITY OF FOOD PROVIDED TO BENTHIC DETRITIVORES BY THE SEAGRASSES *RUPPIA MARITIMA* AND *ZOSTERA MARINA*

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by

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ABSTRACT OF THE THESIS

Investigating Functional Equivalency: Availability and Quality of Food Provided to Benthic Detritivores by the Seagrasses *Ruppia maritima* and *Zostera marina*

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Increasing global temperature is predicted to affect ecosystem functions by altering species distributions. Certain species might increase in distribution because they possess attributes that enable them to thrive in conditions resulting from global climate change. A change in the distribution of dominant vegetation types could have profound implications for ecosystem function. This study explores functional equivalency between the seagrasses *Ruppia maritima*, a ruderal species which might be able to take advantage of changes in global climate, and *Zostera marina* (eelgrass), a "climax" species that is a focus of coastal management.

A noticeable increase in water temperature in eelgrass beds in San Diego Bay, California was observed during the El Niño Southern Oscillation Event (ENSO) of 1997/1998. Subsequent to this ENSO, there was an expansion in the distribution of the seagrass *Ruppia maritima*, concomitant with a decline in eelgrass leaf shoot density. *Ruppia* is a weedy seagrass and little research has been done on its ecological importance.

I addressed functional redundancy between *Ruppia* and eelgrass by focusing on the trophic support that they provide to benthic fauna at three sites in San Diego Bay. I focused on trophic support because it is one of the most critical ecological functions that seagrasses provide. In order to measure compare trophic support between *Ruppia* and eelgrass, I measured the amount, availability, and quality of detritus produced in the seagrass beds because the majority of seagrass primary production is provided to fauna through detritus. Measurements of the detrital pool were made during peak levels of biomass for both species.

Differences were minimal in the detrital food pools between *Ruppia* and eelgrass. Seagrass biomass, benthic microalgal biomass, algal epiphyte biomass, and seagrass biomass production rates were greater for eelgrass only at Silver Strand where water temperatures were lower. Algal epiphyte biomass was almost equal to the biomass of *Ruppia*, and was higher on *Ruppia* than eelgrass. Sediment organic content was the only measurement that was greater for eelgrass across all study sites. However, *Ruppia* provided a higher quality of food for benthic detritivores, indicated by the higher nitrogen content in fresh leaves and the faster growth of the detritivorous clam *Macoma nasuta*.

The areal mass of nitrogen, which integrates food quantity and quality, in a *Ruppia* bed was about 1.5 times greater than an eelgrass bed, thus, during periods of maximum biomass, *Ruppia* is able to provide trophic support equivalent to eelgrass. This evidence could be helpful for restoration of degraded seagrass habitats because *Ruppia* is hardy and establishes quickly, perhaps proving to be an attractive species for habitat substitutions. However, the phenologies of the seagrasses differ in San Diego Bay and integrated over the whole year, eelgrass actually provides about 2 times more nitrogen

than *Ruppia*. As a result, in the current climatic conditions in San Diego Bay, eelgrass is functionally more important than *Ruppia* in providing food to benthic detritivores. Nevertheless, if climatic change altered the physical environment enough for *Ruppia* to have a longer period of maximum biomass, it might be able to ameliorate alterations to ecosystem function resulting from a decline in eelgrass.

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