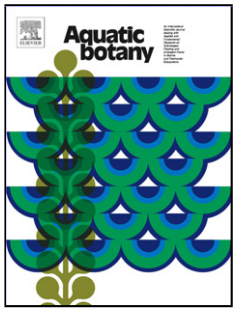

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Size and fitness responses of eelgrass (*Zostera marina* L.) following reciprocal transplant along an estuarine gradient

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Highlights

- Eelgrass shoots were reciprocally transplanted among four environmentally-distinct sites
- Anchoring was improved by longer rhizomes
- Shoots remodeled morphology but not annual or perennial life history
- Fitness and productivity were greater outside than inside existing eelgrass
- Performance differed primarily by outplant site and habitat, not donor population

Abstract. Eelgrass (*Zostera marina*) differs in shoot size, growth rate, and life history investment along a 30-km estuarine gradient in Willapa Bay, Washington (USA). In this study, reciprocal transplants were carried out among four sites in the estuary to test the roles of source population and outplant site for summer-season performance, a method that distinguishes any advantage of locally-tuned phenotypes and whether such trait differences are fixed or phenotypically-plastic. Shoots were measured after 2-3 months for size, leaf emergence rate (productivity) and shoot emergence rate (fitness), as well as simply finding them again (retrieval). Results generally did not support that best performance came from local shoots (few source x outplant site interactions). However, at one site, local shoots had higher fitness than other sources, and for one source, local retrieval exceeded that at other sites. Across all outplants, retrieval improved with rhizome length, suggesting that longer rhizomes provided better anchors. Fitness and productivity were both reduced for transplants into eelgrass relative to those in nearby bare areas at most sites, likely reflecting strong intraspecific competition for transplanted shoots. At this within-estuary scale in summer, morphology appeared entirely plastic, given convergence to local size, but annual vs. perennial life history was strictly a function of source population regardless of outplant site. This reciprocal transplant study supports many of the best practices for restoration, which include effective