

Macrofaunal community response to extreme concentrations of green macroalgae in a naturally eutrophic estuary

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Increases in the size and frequency of green macroalgal (GMA) blooms in estuarine systems are strongly linked to anthropogenic nutrient enrichment, making it an important concern in managing estuarine water quality worldwide. However, the relationship between macroalgae and anthropogenic nutrient loading is confounded in many Pacific Northwest (PNW) estuaries where contributing waters are naturally enriched by seasonal upwelling offshore and stands of nitrogen-fixing trees (*Alnus rubra*) onshore. Unfortunately, baseline conditions are not well quantified in this region, making it difficult to isolate anthropogenic stress from natural variability. Many studies have shown that the response of macroinvertebrate communities to GMA can provide insight into the level of ecological stress exacted by blooms of various extremes. Quantifying this biological response is a critical component to quantifying nutrient levels that constitute stress in a naturally eutrophic estuary. We conducted a field experiment investigating benthic macrofaunal community responses to a range of GMA biomass (0.9 - 6.2 kg dw/m²), across three habitats distinguished by the presence/absence of burrowing thalassinid shrimps (*Upogebia pugettensis* or *Neotrypaea californiensis*) at four sites in the Yaquina estuary on the central Oregon coast. Our goals were to determine if the presence of an ecosystem engineering shrimp provided a mechanism of resilience to the GMA mat, and to identify macroinvertebrate species that could serve as indicators of GMA-associated stress. The application of GMA did not significantly affect infaunal community structure between sites with and without burrowing shrimp, though the community structure remained distinctly different across habitats, both before and after being treated with GMA. However, several macrofaunal species showed a significant response to the treatment in all habitats: two amphipods (*Allorchestes angusta*, *Ampithoe* sp.) and two polychaetes (*Polydora cornuta*, *Capitella capitata* complex) increased in abundance, while those of a tanid (*Leptochelia dubia*), a cumacean (*Leucon subnasica*), and an amphipod (*Foxiphalus similis*) decreased. These species may be useful indicators of GMA-associated stress in PNW estuaries.