

How much is too much? Identifying benchmarks of adverse effects of macroalgae on the macrobenthic community in estuarine intertidal flats

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ABSTRACT

Eutrophication is the accumulation of organic matter typically in response to anthropogenically - enhanced nutrient inputs. In shallow estuaries, macroalgal blooms are a symptom of eutrophication, causing a cascade of adverse ecosystem effects. Confidence in the use of macroalgae as an indicator of eutrophication in estuaries is limited by the lack of quantitative data on benchmarks of adverse effects, which are used to inform thresholds. To determine a benchmark of adverse effects of macroalgal abundance on macrobenthic faunal communities in intertidal flats, manipulative experiments were conducted in two sites in Bodega Harbor and two sites in Upper Newport Bay, California, USA. At each site, twenty - four cages maintained six treatments of macroalgae for eight weeks, with mat depths of 0, 1.0, 1.5, 2.5, 3.5 and 5 cm comprised mostly of bloom-forming green macroalgae in the genus *Ulva*. Mats 1 cm deep, equivalent to a biomass of 110 to 120 g dry weight (dw) m⁻² or 840 to 930 g wet weight m⁻² (estimated by regression analysis), resulted in the reduction of macrofaunal abundance by at least 67% and species richness by at least 19% within two weeks at three of four sites. Loss was attributed to the decline of key functional groups. Surface deposit feeders were eliminated from one site at Bodega Harbor within four weeks and at one site in Upper Newport Bay within six weeks, while 1 cm mats negatively affected suspension feeders and herbivores in Bodega Harbor. In contrast, the other site at Upper Newport Bay was not affected by macroalgal treatment, likely due to an initial community comprised of a high proportion of subsurface deposit feeders tolerant of stressful environments. Macroalgal abundances as low as 110 to 120 g dw m⁻² had significant and rapid negative effects on macrobenthic invertebrates, providing a critical benchmark for adverse effects of macroalgal blooms on ecosystem health. *Synthesis and applications:* Due their responsiveness to nutrient enrichment and negative effects in aquatic ecosystems, macroalgal abundance is a reliable indicator of eutrophication in estuaries. This work provides quantitative data on adverse effects that can inform managers when macroalgal abundance has reached critical levels.

Full Text

http://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2012AnnualReport/ar12_171_188.pdf