

Mesoscale regulation comes from the bottom-up: intertidal interactions between consumers and upwelling

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Abstract

Theory suggests that variation in resource supply should propagate up trophic webs influencing plant–herbivore interactions and abundances. Community regulation models have been tested in several ecosystems, but benthic marine ecologists have largely overlooked bottom-up factors except at the largest spatial scales. We used naturally occurring variation in nutrient supply associated with upwelling intensity (over 10s of kilometre) to test community regulation models. Higher upwelling intensity was strongly associated with increased abundance of late-successional, corticated algae, which in turn had apparent negative effects on ephemeral algae. Corticated algae were resistant to extant levels of herbivory. As a result, corticated algae were more abundant at sites of high upwelling intensity, while ephemeral algae were more abundant at sites of low upwelling intensity. We speculate that human removal of large grazers that can feed on corticated algae may interact with natural variation in nutrient supply to shift community structure over mesoscales.