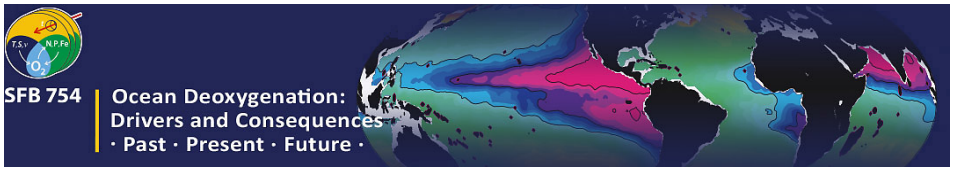

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The effects of hypoxia and ocean acidification on grazing interactions within giant kelp forests

Wednesday, 5 September 2018 15:00 (15)

Climate change is impacting marine ecosystems worldwide through a suite of associated stressors, including ocean acidification, warming, and hypoxia. However, our current understanding of the effects of climate change are primarily confined to single species, single stressor studies. To gain a broader understanding of its impacts at the community level, it is critical to examine interactions between species under multiple stressors. To address this, we examined the effects of ocean acidification and hypoxia within giant kelp forest grazing communities of the California Current, systems that are characterized by rich diversity, economic value, and the natural co-occurrence of low pH, low oxygen waters associated with upwelling.

We measured grazing on cultured juvenile giant kelp, an important foundation species, by four species of invertebrate grazers under the two stressors in laboratory factorial experiments. We ran four-day experiments and found that species differed in their grazing impacts, with the brown turban snail (*Chlorostoma brunnea*) consuming the most kelp, followed by the kelp isopod (*Idotea resecata*), kelp curler amphipod (*Peramphithoe humeralis*), and the purple urchin (*Strongylocentrotus purpuratus*). Overall, hypoxia negatively impacted grazing more than acidification across all four species, suggesting that hypoxia can drive changes in feeding behavior even over short timeframes. In follow up studies to confirm the dominant effect of hypoxia over ocean acidification, we ran a second set of four-day factorial experiments with a lower pH level. Once again, we found that hypoxia negatively impacts grazing across the four species, while acidification has no effect compared to control conditions. In systems where stressors co-occur naturally, it is important and relevant to examine the impacts of multiple stressors, and equally relevant to examine the relative role of individual stressors in driving physiological and behavioral changes to predict thresholds and plan mitigation strategies. This study provides key insights into the impacts of multiple stressors associated with global change through the lens of species interactions, which will shed light on how kelp forest communities might function in the future.

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