Consequences of spatially variable ocean acidification in the California Current: Lower pH drives strongest declines in benthic species in southern regions while greatest economic impacts occur in northern regions

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Abstract

Marine ecosystems are experiencing rapid changes driven by anthropogenic stressors which, in turn, are affecting human communities. One such stressor is ocean acidification, a result of increasing carbon emissions. Most research on biological impacts of ocean acidification has focused on the responses of an individual species or life stage. Yet, understanding how changes scale from species to ecosystems, and the services they provide, is critical to managing fisheries and setting research priorities. Here we use an ecosystem model, which is forced by oceanographic projections and also coupled to an economic input-output model, to quantify biological responses to ocean acidification in six coastal regions from Vancouver Island, Canada to Baja California, Mexico and economic responses at 17 ports on the US west coast. This model is intended to explore one possible future of how ocean acidification may influence this coastline. Outputs show that declines in species biomass tend to be larger in the southern region of the model, but the largest economic impacts on revenue, income and employment occur from northern California to northern Washington State. The economic consequences are primarily driven by declines in Dungeness crab from loss of prey. Given the substantive revenue generated by the fishing industry on the west coast, the model suggests that long-term planning for communities, researchers and managers in the northern region of the

California Current would benefit from tracking Dungeness crab productivity and potential declines related to pH.

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