Abstract

OA: Vulnerability Assessment of California Current Food Webs and Economics to Ocean Acidification

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Increasing fossil fuel emissions and the resulting increase in atmospheric CO_2 levels will likely lead to a decline in seawater pH of 0.3 by the year 2100. Changes to seawater pH and the saturation state of aragonite and calcite (the minerals many organisms use to build protective structures) will not occur uniformly over space, but could lead to reduced populations of marine species including calcareous corals, benthos, and plankton groups. Though there is considerable ongoing effort in the field and laboratory to understand direct effects of ocean acidification on particular species, there have been few attempts to forecast the indirect and cumulative impacts of acidification, climate change, and harvest on whole food webs and fisheries. Here the authors propose to evaluate the likely economic and ecological outcomes of ocean acidification in the California Current. Specifically, they will:

 Use a **Regional Ocean Modeling System (ROMS)** to predict 50-100 year spatial projections of ocean acidification, as well as salinity, currents, and upwelling**.** ROMS will be coupled to global circulation models and IPCC CO_2 scenarios.

 Build on previous literature reviews and ongoing experiments to develop **scenarios for the biological response of calcifying organisms** to pH.

 Use an **Atlantis ecosystem model** to project these direct impacts of acidification on

lower trophic levels, the resulting food web-mediated response of harvested and protected stocks, and catches by US West Coast fisheries. Atlantis will be driven by dynamic, spatially explicit fields from ROMS.

 Measure **interaction effects and cumulative impacts** of acidification, hypoxia, temperature, and fishing.

 Estimate **spatial economic impacts** of acidification by linking output from the Atlantis ecosystem model to the **IO-PAC input-output model**. This translates seafood landings into economic impacts on the broader West Coast economy.

 Identify how stock productivity, fishery management **reference points** and **consequences of harvest policies** shift under alternate ocean conditions**.**

 Test management strategy performance in the face of ocean acidification and other global change. These strategies will range from current single-species fishery management rules to harvest control rules that respond to simple metrics of ecosystem productivity and susceptibility.

 Provide information to managers regarding potential impacts and vulnerability of species, marine areas, and fishing economies. This will primarily involve engagement with the Pacific Fishery Management Council through NOAA's Integrated Ecosystem Assessment.