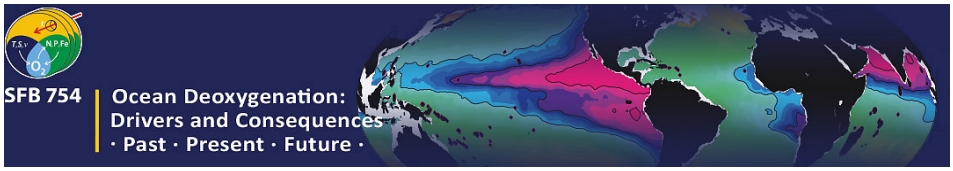

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Economic repercussions of tipping points in the Humboldt upwelling system

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Although the Eastern boundary upwelling ecosystems (EBUS) comprise less than 2% of the ocean area, they contribute more than 20% of the world's marine capture. With catches about currently 8 million and a decadal-scale variation ranging from 2.5 to 13 million tonnes per year, the catches from the Humboldt upwelling system (HUS) are by far the largest of all EBUS. The anchoveta fishery of Peru is the most important fishery of the HUS, and the largest fishery worldwide in terms of biomass output. Globally, it is the most important producer of fishmeal, with a share of roughly one third in global production. While the world price of fishmeal negatively correlated with Peruvian anchoveta catches before 2000, the price has steadily increased independent of Peruvian catches during the past decade, due largely to the growing demand of fishmeal in aquaculture production.
In this paper, we first review the empirical evidence that identifies an effect of changes in Peruvian fish catches on world market prices of fishmeal and fish oil. We set up a stylized bioeconomic model that links catches in the Peruvian anchoveta fishery on the one side to biophysical conditions in the HUS and on the other side to aquaculture and reduction fisheries around the globe to explore the down-stream effects of changes in the HUS. We conclude that a regime shift in the HUS towards oxygen depletion can impair food security in developing countries. An increased world-market price for fishmeal decreases the supply of local markets with small pelagic fish available for human consumption, and increases fishing effort, thus aggravating the problems of overfishing in the long term.

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