Case Study: A Bioeconomic Model of Marine Conservation, Fisheries Effort Shift, and Multiple-use Ocean Resource Management

Contact:

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Topic:

How do adaptive fisheries fleet behaviors following area closures impact marine reserve conservation objectives? How does spatial displace impact the broader regional fisheries? Can the related bioeconomic data inform assessment of the impact of other competing ocean uses that may create spatial displacement of fisheries?

Background:

Spatial area closure to fisheries extractive use will prompt adaptive behaviors such as effort shift among the affected elements of the Oregon commercial and recreational fishing fleets. These adaptive behaviors in turn may create differential biological impacts on the remaining unprotected fisheries stocks, offsetting some of the potential conservation benefits of area closures. To the degree that adaptive responses consist of effort shift within the same fisheries, the potential location(s) of these fleet behaviors may depend on the related species/habitat associations within a given distance from the ports of the affected fisheries. Effort shift will also create winners and losers, with related issues of distributional equity. However, effort shift is only one potential adaptive response within the relevant fisheries. Ascertaining the full range of adaptive responses within the impacted fleet will help predict the both the biotic and the economic impacts of spatial closures.

To accurately model the impact of spatial management decisions such as area closures, fisheries data (both historic and predicted change) should be integrated with habitat and species data at a relatively fine level of spatial resolution. Since some species management methods have trans-jurisdictional implications, modeling must also address the potential interaction between state and federal spatial management decisions and policies. While the catalyst for the proposed study is marine reserves implementation, the model thus created will have significance across a range of marine spatial planning decisions where competing ocean uses may create displacement.

For this project, students will work to integrate historic large fisheries data with coast-wide benthic/habitat/species data. Where fisheries landings and economic data is not disaggregated at the necessary level of spatial resolution, criteria for such disaggregation will be developed and refined, with the uncertainty related to such decisions integrated within a probabilistic model.

Existing Data:

* Fisheries landings data by port group
* Ocean benthic mapping data
* Fisheries independent species habitat associations
* Bioeconomic data (ex-vessel landings and CPUE data)
* Spatial attribution via logbooks of some fisheries data
* IMPLAN and FEAM REI models

Data Needs:

The status of fisheries independent data on species habitat associations is evolving. Some of the fisheries dependent data is available only in aggregate and subject to further disaggregation and spatial attribution. Estimation of uncertainty is required in both contexts. Primary data collection related to effort shift is still required. Students would be involved in integrating existing large fisheries data into a single model. Primary data collection concerning fleet behavioral changes (effort shift) will occur during the next year. The ultimate goal is to create the capability to produce planning maps integrating fisheries, habitat and socioeconomic data, and thus model tradeoffs for marine spatial planning.

Desired Area(s) of Expertise for Students:

This project will require expertise in bioeconomic modeling, primary quantitative and qualitative social science data collection, fisheries ecology, geography, computer science, and statistics.