PA41A-0302: A Bayesian-Based Approach to Marine Spatial Planning: Evaluating Spatial and Temporal Variance in the Provision of Ecosystem Services Before and After the Establishment Oregon's Marine Protected Areas

Thursday, 14 December 2017
08:00 - 12:20
New Orleans Ernest N. Morial Convention Center - Poster Hall D-F

Participating in a ten-year monitoring project to assess the ecological, social, and socioeconomic impacts of Oregon's Marine Protected Areas (MPAs), we have worked in partnership with the Oregon Department of Fish and Wildlife (ODFW) to develop a Bayesian geospatial method to evaluate the spatial and temporal variance in the provision of ecosystem services produced by Oregon's MPAs. Probabilistic (Bayesian) approaches to Marine Spatial Planning (MSP) show considerable potential for addressing issues such as uncertainty, cumulative effects, and the need to integrate stakeholder-held information and preferences into decision making processes. To that end, we have created a Bayesian-based geospatial approach to MSP capable of modelling the evolution of the provision of ecosystem services before and after the establishment of Oregon's MPAs.

Our approach permits both planners and stakeholders to view expected impacts of differing policies, behaviors, or choices made concerning Oregon's MPAs and surrounding areas in a geospatial (map) format while simultaneously considering multiple parties' beliefs on the policies or uses in question. We quantify the influence of the MPAs as the shift in the spatial distribution of ecosystem services, both inside and outside the protected areas, over time. Once the MPAs' influence on the provision of coastal ecosystem services has been evaluated, it is possible to view these impacts through geovisualization techniques. As a specific example of model use and output, a user could investigate the effects of altering the habitat preferences of a rockfish species over a prescribed period of time (5, 10, 20 years post-harvesting restrictions, etc.) on the relative intensity of spillover from nearby reserves (please see submitted figure).

Particular strengths of our Bayesian-based approach include its ability to integrate highly disparate input types (qualitative or quantitative), to accommodate data gaps, address uncertainty, and to investigate temporal and spatial variation. This approach conveys the modeled outcome of proposed policy changes and is also a vehicle through which stakeholders and planners can work together to compare and deliberate on the impacts of policy and management changes, a capacity of considerable utility for planners and stakeholders engaged in MSP.

Plain Language Summary

Our work focuses on developing a method to integrate a variety of related inputs, such as geospatial ("mapable") data and expert opinions, into a single coherent Bayesian-based system that permits us to evaluate how the definitive ecosystem services associated with Oregon's Marine Protected Areas (MPAs) and their surroundings may alter over time. Our approach was structured to allow multiple users to apply "weights" to different components within our model and view resultant outcomes in order to compare and contrast the impacts of changing their input preferences, mimicking the effects of policy (or other) changes in the real world. The figure submitted with this abstract showcases a model run estimating shallow-dwelling rockfish spillover from Redfish Rocks MPA after 20 years. If the user preferred, they could investigate what modelled spillover may be after 10 years rather than 20, or they could view what spillover might look like for rockfish that preferred water depths 20 m greater than those set in the displayed model run. Our hope is that this approach may ultimately aid in a variety of planning scenarios (example: public meetings) where parties from varying backgrounds come together for discussion and to make informed decisions about marine spatial planning.

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