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Towards the development of a process based model of the human dimension; a systems approach to fisheries management.

Drexler M., Bailey R.M., Carella E., Burgess M.G., Saul S., Dorsett C., Clemence-McCann M., Wilcox S., Cabral R., Axtell R.L., Owashi B., Costello C., Gaines S.D., Merkl, A.

Fisheries are complex social, economic, and ecological systems, rendering resource management difficult for scientists and policy-makers. While scientists have broadly developed the tools needed to understand scientific uncertainty, tools to quantify and anticipate the responses to management actions in the human dimension are limited. As a result, a mechanistic modeling platform is in development which more explicitly incorporates fisher behavior dynamics into the system: POSEIDON - Process-based Ocean-system Simulator for Evolving Integrated Domains and Operational Needs. POSEIDON is a spatially explicit model capable of coupling to a variety of ecological sub-models. The model contains a sophisticated agent-based fishing fleet, internal and external market dynamics, policy incentives and constraints, and an iterative optimization routine to help identify policies. Theoretical results, together with those from an application parameterized to the US west coast ground fish fishery, suggest that highly realistic macro-patterns of behavior emerge under a wide range of simulated policy combinations. The model can thus be used to analyze the performance of various management strategies and tradeoffs associated with achieving social, economic, and ecological objectives. In addition to a strategic planning tool, the model, which dynamically represents individual fisher behaviors, will allow managers to anticipate fisher's responses to their actions providing a much needed tool to reduce management uncertainty.

Keywords: Human dimension, socioeconomic objectives, tradeoffs, fisher behavior, agent based model

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