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MPA Perspective: Are Traditional Models Adequate for Evaluating Prospective MPAs?

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[Editor's note: This article has been adapted by MPA News from a presentation given by Dan Holland on7 July 2000 at the "Economics of MPAs" conference in Vancouver, BC, Canada. Holland is an economist.]

Whatever its objectives, the function of an MPA is to change (or preempt) the distribution of fishing effort in space, time, and possibly across species. The relevant question is whether the new distribution of effort will be superior to the current one and why.

To evaluate a specific prospective MPA, we need to determine:

- How the level, distribution, and effectiveness of fishing effort will change as a result of the MPA.
- How that will affect the productivity, variability, and value of all impacted fisheries through time.
- Whether it will be useful or necessary to constrain displacement of effort, and whether doing so would be possible or practical.
- How the impacts of the MPA will be distributed across user groups.

Are traditional models adequate? MPAs are likely to have impacts that extend well beyond the fish stocks they are targeted at protecting, as a result of displaced effort. Even when the impacts of an MPA are net positive for fishermen directly impacted by an MPA, incomes of fishermen in other, biologically separate fisheries may fall as a result of the effort they absorb. The flow of effort between areas will continue to change over time in response to changes in relative conditions. MPA models should consider impacts on directly and in-directly connected fisheries as an interactive system and provide information on distributional impacts.

An MPA will induce changes at a variety of time scales. Subannual, annual, and long-term processes may all be of considerable importance in determining overall results. The results of an MPA are likely to take many years, perhaps decades, to be fully realized. It is important to evaluate short-term losses against long-term gains. Models that utilize only annual-level information and provide only short-term or equilibrium predictions are likely to be inadequate.

Some of the basic components of fishery models may change after an MPA is implemented. We should be cautious about incorporating previously estimated parameters into models. For example, technical interactions and availability to fishing gear by age may change as spatial distributions of species and cohorts change. Natural mortality and growth may be altered by changes in habitat and the distribution of fish. Stock-recruitment relationships may change due to aggregation of the spawning stock, which may affect behavior and interaction with the environment.

There are several challenges that modelers face:

- Matching the temporal and spatial scale of physical, biological, and human processes requires altering standard biological and economic models and data collection systems.
- Many key parameters are uncertain and data to determine them is inadequate (e.g., spatial patterns of fish movement and recruitment and multi-species interactions both biological and technical).
- Even basic life history parameters from old models may be suspect.

Models used to provide management advice are rarely suited to evaluate MPAs. Dynamic spatial models of fisheries are needed to evaluate MPAs and other spatial management strategies, but this presents difficult challenges. Developing and perfecting these models will require continuing research on the interaction of underlying spatial processes -- physical, biological and human. Improving models must be viewed as a long-term and iterative process.

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In our next issue....

Measuring the economic value of a proposed marine protected area can be a critical issue in siting an MPA and gaining community support. We'll take a look at how some leading economists and biologists are calculating the market and non-market values of MPAs.

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