

The "New" Economics of Marine Reserves: What MPA Practitioners Need to Know

The economic study of no-take marine reserves is evolving. Ten years ago, economists largely examined such reserves from the vantage of the fishing industry, and were generally skeptical of their justification. Now, armed with models that are increasingly informed by fish stock biology and concerns about uncertainty, economists are forging a new understanding of the economic and societal values involved in the practice of reserves.

Experts gathered last month in Vancouver, British Columbia (Canada), to discuss new trends in the study of marine-reserve economics. The conference, "Economics of Marine Protected Areas," sponsored by the Fisheries Centre of the University of British Columbia, offered insights for MPA practitioners on how economists are viewing the field. Several of these insights could assist planners and managers in their work.

Reserves as part of a management program

The conference consensus appeared to be that MPAs were not a panacea for rescuing troubled fish stocks, but that they could be considered as one tool in a kit of management techniques. Rögnvaldur Hannesson, an economist at the Norwegian School of Economics and Business Administration (Norway), said that in the temperate, open-access fisheries he has studied, reserves could be a useful supplement to other methods of fisheries management but should not stand alone.

"Without changing the incentives which entice the industry to invest in fishing boats and increase its fishing effort to obtain the largest possible share of the fish catch, there is no way in which we can prevent the excessive use of capital and manpower in the industry," said Hannesson. "With this incentive structure intact, marine reserves might even make a bad situation worse to the extent that they improve the condition of a fish stock, as this would lead to a greater waste of capital and manpower than otherwise."

Ragnar Arnason, an economist at the University of Iceland, said he would generally prefer that managers implement non-reserve solutions instead, such as fishing charges or private property rights over fishing grounds. He allowed, however, that reserves held some potential for protecting stocks in certain circumstances, depending on the fishery's management (open access or not) and the reserve's size.

"To argue the case for marine reserves, it is necessary to show two things: first, that they work, and second, that they are superior to other available management options," said Arnason, adding that "available management options" referred both to technical and social availability. "It is perfectly legitimate to argue for the introduction of marine reserves not on the grounds that they are the best management method for a particular purpose, but that they are the best method that can be implemented, for socio-political reasons."

Measuring societal values

Of course, the socio-political side of management often involves societal values besides commercial fishing -- such as protecting biodiversity -- that are difficult to measure monetarily. Anthony Cox of the Australian Bureau of Agricultural and Resource Economics (ABARE) recommended that in such cases, it is possible to address the problem through agreements on standards. "Rather than try to monetize the environmental benefits of biodiversity, instead decide on a set of environmental standards and then figure the least-cost method of achieving them," he said.

Cox -- whose presentation was based on the work of ABARE economists Peter Gooday and Kenton Lawson -- advised that cost calculations should incorporate implementation and management costs for the reserve. As well, there may be costs related to fishers' redirecting their activity to other areas, including extra costs in traveling further to fish. The reserve might also influence fisheries by altering fish distribution and migration patterns.

The University of Iceland's Arnason noted the justification for reserves in instances to preserve "alternative valuables," such as biodiversity, recreation, and tourism. "To the extent that marine reserves induce a more proper utilization (or conservation)

of these valuables, they may be justified, even if they do not contribute positively to the fishery as such," he said.

Such valuables are at the center of Rachel Graham's work in Belize. A research associate at the University of York (UK), Graham is searching for ways to develop alternatives to unsustainable fishing practices -- alternatives that will allow families to continue or improve their standard of living. "You can do contingent valuations and cost/benefit analyses until you turn blue in the face, but at the end of the day, alternatives that place the same amount of food, or more, on the family's table are what count," she said.

Economics of compliance

The Belizean fishers with whom Graham is working have been targeting spawning aggregation sites, an activity that she says is damaging the fish stocks. She is encouraging the fishers to turn instead to serving as guides for whale shark tourism during those same aggregation periods, an activity that can be more lucrative and less physically demanding than drop-line fishing. "Our basic economic message for marine reserve creation and support is this: develop acceptable socio-economic alternatives to unsustainable practices with those who have the most to lose -- i.e., the resource users -- and you will have a greater chance for successful marine reserve establishment and compliance with regulation," she said.

Nonetheless, Graham noted, guiding requires a heavier outlay of initial capital than fishing, and is geared toward the younger generation, especially if diving is involved. Furthermore, guides must respond to the demands of tourists who hire them, and Belize is relatively inexperienced as a service-oriented society, she said. "Certain compromises must be made," she said. "The degree to which all parties accept these compromises will show up in the degree of compliance with reserve regulations."

Lynda Rodwell, also with the University of York, said compliance was a critical factor in Mombasa Marine National Park, in Kenya, a no-take marine reserve outside of which there is no fisheries management regime. In the interest of protecting stocks in the reserve, she recommends that measures be taken either to control fishing effort beyond the reserve boundaries or to increase the size of the reserve -- two measures that would have serious implications for local fishing communities. "Implementing either policy successfully requires the communities' cooperation and participation," said Rodwell. "Measures to compensate, retrain, or offer alternative employment to displaced fishers and traders should be fundamental to the management process."

She said that her simulations of reserve plans in Mombasa indicated it would take 10-15 years before the benefits of protection -- i.e., increased fish catches outside the reserve -- were realized. "You need to keep this in mind when you're selling the idea to the community," said Rodwell.

Synthesis of biology and economics

Scott Farrow, an economist at Carnegie Mellon University (US), said one of the more intriguing elements to enter economic discussions of MPAs in recent years has been the biological theory that reserves could cause changes in the population growth rate of fish stocks. By extending the age structure of populations within the reserve, stocks that reproduce more at a later age would experience increasing returns on their reproductive activity. In essence, their population growth rate would accelerate. (The University of Iceland's Arnason and some others have begun to incorporate this theory in their models.)

Farrow describes this idea as parallel to the concept of increasing returns to scale in industrial production, a concept familiar to economists. "Age-structured models [for reserves], allowing different returns to scale in different patches, would be more consistent with what has led to economic concentration in other fields of study," he said. "Economists and marine biologists may be talking past each other until the models capture this element." Such advances in the synthesis of the natural and social sciences are crucial to achieving a consistent analysis of reserves, he said.

Farrow added that the precautionary principle may offer the biggest opportunity for change in the economics of MPAs. To the extent that economic models address uncertainty, they generally stay within a framework of examining whether expected benefits exceed expected costs. However, said Farrow, this standard economic decision rule for creating reserves may be incorrect when uncertainty and irreversibility exist. In such situations, the burden of proof should perhaps be reversed: planners should designate reserves unless the costs to fishers are higher -- significantly higher, he said -- than the benefits of the reserve as a whole.

"Analyses that don't consider this in cases of uncertainty may be implicitly using the wrong decision rule," he said.

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Website on methods of valuing ecosystem benefits

Setting a monetary value on the benefit of an ecosystem can be a useful (though often challenging) exercise for helping to decide natural resource policies. Estimates of the value of an ecosystem can assist in comparing the benefits of different programs or justifying public spending on conservation initiatives.

For non-economists interested in learning about ecosystem valuation concepts, methods, and applications, there is a website available: <http://www.ecosystemvaluation.org>

Funded by the Natural Resources Conservation Service (US Department of Agriculture) and the National Oceanographic and Atmospheric Administration (US Department of Commerce), the website offers practical considerations related to various valuation methods, including the strengths and limitations of each one. It also provides links to other sources of information on ecosystem economics.

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