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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

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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

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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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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New Fund to Provide Small Grants to Caribbean MPAs

The United Nations Environment Programme's Caribbean Environment Programme (UNEP-CEP) has established a fund to strengthen MPA management in the Caribbean. The CaMPAM (Wider Caribbean Marine Protected Area Managers) Small Grants Fund will provide grants of up to US $8,000 in the form of technical or financial assistance. Projects will be supported in the categories of development of management/administrative systems; damage assessments and restoration; staff training; and purchase of selected equipment.

Instructions on applying are available in Word format on the UNEP-CEP website, at http://www.cep.unep.org/programmes/spaw/MPA/mpa.htm.

New Approach for Measuring the Performance of MPAs

Often, the reasons for establishing a marine protected area are to protect a resource or ecosystem while providing various social and economic benefits, among them increased fishery catches. As more MPAs are designated around the world, the ability to evaluate the effectiveness of these areas in meeting their policy objectives becomes increasingly important.

Jackie Alder of Edith Cowan University (Australia) has suggested that there is an urgent need for useful approaches capable of measuring MPA performance. In a paper she co-authored and delivered last month at the "Economics of MPAs" conference in Vancouver, British Columbia (Canada), Alder stated, "An assumption underlying the growing support for MPAs is that they meet conservation goals and provide economic benefits, such as to fisheries and ecotourism. However, continued support for MPAs will be at risk if managers cannot assess whether multidisciplinary objectives are being fulfilled."

To serve this need for an evaluative technique, Alder is exploring one approach, called Rapfish. Short for "Rapid Appraisal for the Status of Fisheries," Rapfish was originally developed at the Fisheries Centre of the University of British Columbia for evaluating the sustainability of fisheries. Alder has adapted it to evaluate MPA performance, and says it holds promise as a tool for managers to score their MPAs' performance quickly and across disciplines.

The Rapfish model

Under Alder's adapted approach, Rapfish allows the measurement of MPA performance in the following "dimensions":

- maintenance of living and non-living resources
- market value of the MPA and its resources
- social expectations
- maintenance of ecosystem functions
- management

Each of these dimensions is subdivided into a list of detailed attributes, which are scored on a sliding scale — such as from 0 to 3, with 0 representing a good score and 3 representing a bad score.

Managers fill out a scoring sheet and submit it to Alder, who uses a statistical program to analyze each MPA by individual dimension and total score. Alder is able to compare each protected area to 20 MPAs that she has already analyzed from around the world, ranging from those with "poor" performance to those with "better" performance.

Alder noted that the computer program she used to analyze the 20 MPAs — called the Statistical Package for the Social Sciences — is expensive and beyond the budgets of most developing nations or community organizations. She said work was needed to transfer the analytical methods to cheaper technology. In the meantime, she has invited MPA managers and researchers to use her model to evaluate their own MPAs and submit their data to her for analysis. Ideally, she said, she would like to analyze at least 100 MPAs prior to encouraging the model's wide use in MPA management. [To participate, contact Alder at the e-mail address below.]

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Explaining Variation in MPA Performance

Many MPAs fail to achieve their policy objectives, but little social scientific research exists to explain the variation in MPA performance. Responding to this gap, Mike Mascia of the Duke University Marine Laboratory (North Carolina, US) suggests that an understanding of institutions and individual choices can be used to predict the effectiveness of MPAs and improve MPA policy.

In a paper delivered last month at The Coastal Society's 17th International Conference (Portland, Oregon, US), Mascia offered a comparative study of three MPAs in the Wider Caribbean, analyzing the factors that shaped these areas' social and biological performance. The results, he said, were in line with recent academic theories on the evolution of institutions for collective action. That is, positive social and biological outcomes for the MPAs were correlated with clear boundaries, well-defined resource-use rights, accessible conflict-resolution mechanisms, and user self-governance rights, he said.

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Courses Provide Training for Managers in Caribbean, Western Indian Ocean

Spurred by concerns that many MPA managers are insufficiently trained to provide effective resource protection, two projects on opposite sides of the world have begun preparing practitioners to handle the challenges of planning and management. Organized in the Caribbean and the Western Indian Ocean, the capacity-building projects have combined classroom-style lecture courses with discussions, field trips, and networking opportunities. [For a description of project funders and organizers, see box below.]

Training the trainers

The training course for the ongoing Caribbean project aims primarily to instruct managers who will in turn train local personnel in MPA management. This strategy, called Training of Trainers (ToT), is intended to multiply the course's impact.

"The program focuses on providing the managers not only with knowledge on all aspects of MPA management, but also with the skills to transmit the acquired knowledge to others," said course organizer Alessandra Vanzella-Khouri of the United Nations Environment Programme-Caribbean Environment Programme (UNEP-CEP). One full module of the course is dedicated to teaching and communications skills, while each additional thematic module includes examples and suggestions for transmitting that module's concepts.

Vanzella-Khouri said that careful selection of participants is important for ensuring course effectiveness. "A major criterion [for participant selection] is the commitment by each participant to undertake tailored training activities at the local level, preferably with his or her MPA," she said.

The Caribbean project held a 14-day course in May 2000 for Spanish-speakers, attracting 15 managers from eight nations. A similar course for English-speaking managers occurred in November 1999. More courses are planned for 2001; beyond that, there may be similar courses offered for Caribbean terrestrial areas as well, said Vanzella-Khouri.

The idea for the course grew from a 1993 regional needs assessment that revealed that capacity-building and training efforts in the Caribbean were brief and non-systematic. UNEP-CEP conducted a second needs assessment in 1998 that confirmed the 1993 report, at which point the organization began developing the training course.

Training managers

Although similar to the Caribbean course in much of its content, the Western Indian Ocean (WIO) course focused on training managers rather than trainers. Julius Francis of the Institute of Marine Sciences at the University of Dar es Salaam (Tanzania) said the WIO organizers' original intent had been more along the lines of the Caribbean course. However, when planning the WIO project, they realized that most of the region's managers had limited training in MPA management. "Most of the managers had been trained in wildlife management colleges and therefore had no background in marine issues," said Francis.

Offered in February 2000 in Malindi, Kenya, the WIO training course was the final activity of a one-year project to build managerial capacity in the region's MPAs. Trainees in the 13-day course included 17 managers and four others from an array of WIO nations, as well as instructors from both inside and outside of the region.

In the first week, the course focused on the marine environment, planning, and participatory processes, while the second week introduced more applied concepts, such as communication, administration, finances, and monitoring. Field trips to two MPAs featured discussions with park wardens and various stakeholder groups, including fishing organizations, scientists, and conservationists. The project's organizers are now finalizing a training

Funders and Organizers

The Western Indian Ocean project was funded for one year by the World Bank, with additional financial support from Kenya Wildlife Services (KWS). The Coastal Zone Management Centre of the Netherlands, the Institute of Marine Sciences of the University of Dar es Salaam (Tanzania), KWS, and the Western Indian Ocean Marine Sciences Association organized and delivered the training course.

The Caribbean project also received funding from the World Bank, as well as from the United Nations Foundation, the United Nations Environment Programme's Caribbean Environment Programme (UNEP-CEP), and The Nature Conservancy (a US-based NGO). UNEP-CEP organized the course, and The Nature Conservancy coordinated and facilitated it.

The World Bank program that played a role in funding both projects is called "Capacity Building in Marine and Coastal Protected Area Management." The contact person for the program is Carien von Zwol, whose e-mail address is C.vonZwol@rikz.rws.minvenw.nl.

manual for MPA managers based in part on lessons and feedback from the course.

In the interest of sharing information and facilitating cooperation in the future, the WIO organizers are considering developing a communications network for regional MPA managers. "For most of the participants, one of the big advantages of attending the course was the possibility to share experiences between the different parks in the different countries of the region," said a report that evaluated the course. "It was considered very important that this informal network be maintained and that some mechanism for the dissemination of information be established."

Francis noted some of the challenges of networking in the region, however. Few of the parks have reliable telephones or electricity, and even fewer own a computer.

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Tips on Developing a Regional Training Course

Practitioners interested in arranging a course to train regional managers might consider the following tips, collected by MPA News from the experience of the Caribbean and Western Indian Ocean projects:

Find funding: The costs of such a project, including an initial needs assessment and course logistics, add up quickly. Both training courses have required travel and lodging for several participants and instructors over a two-week span. Find a sympathetic institution — perhaps one with a regional focus — and attract its interest in funding the project.

Address the need: The first activity of the year-long WIO project was to hold a regional planning workshop (in June 1999) to identify ongoing MPA management activities and regional training needs. For the Caribbean project, UNEP-CEP conducted a needs analysis prior to developing the training course.

Develop a training manual: Both projects have featured training manuals with modules that can be expanded in longer training courses. Regional case studies provide the manuals with practical examples. Following the course, the manuals can be distributed throughout the region. Creating the manual in a timely and professional manner can be a challenge, said UNEP-CEP's Vanzella-Khouri: it needs to be balanced and comprehensive, yet not overwhelming in its detail.

Provide field trips: Visits to MPAs offer an opportunity for participants to analyze the management challenges of each site, the potential causes of these challenges, and the effectiveness of existing management. Provide detailed background information on each site prior to visitation, and follow up each visit with discussions to review observations.

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