

MPA News

International News and Analysis on Marine Protected Areas

The State of MPA Science: A Survey of Experts on What We Need to Know

Can marine reserves assist in improving the management of fisheries? This concept has received significant attention lately in the pages of scientific journals and on the agendas of fishery managers. Sometimes called "no-take zones," these protected areas have displayed some evidence of contributing to increased fish abundance outside their boundaries, namely through the outflow of larvae from the reserve. Fishery managers have generally welcomed what they see as a promising tool to help rescue declining fish stocks.

But what do we know about the science of marine reserves? How applicable are the scientific findings from one species and area to the next? The still-nascent science has focused primarily on reef species in tropical waters, while reserves with long-lived temperate species are less-understood. Some MPA experts suggest that it is too early to say that the value of marine reserves in fishery management has been proven.

This month, *MPA News* surveyed a dozen MPA experts around the world for their thoughts on the state of science on marine reserves. We asked them a single question:

If you could have the answer to any scientific question regarding MPAs, what would it be and why?

We hoped to receive a wide range of responses, and we did. Below are their direct quotes:

Dr. Jim Bohnsack, National Oceanic and Atmospheric Administration, Miami, Florida, USA

My question would be: "How much protection can no-take marine reserves provide for the preservation of genetic biodiversity of exploited species?" I consider this the most important question because the loss of genetic biodiversity is essentially permanent and cannot be recovered in ecological time.

Answering this question first requires some knowledge about what effects selective fishing has on population genetics of exploited species. There is almost no information available on this problem although fishing is known to be selective on certain individuals, behaviors, ages, and sizes. The problem is in some ways circular, because without no-take marine reserves there is little opportunity to have control areas to assess selective effects of fishing. As practiced, fishing operates in reverse of animal husbandry in that the most desirable individuals are selectively removed from the genetic pool and less desirable individuals are allowed to breed. This selection can potentially reduce maximum size, reduce growth rates, and modify behavior in ways undesirable from a human viewpoint. Considerable genetic theory exists that indicates that fishing could be a very big problem. Its importance depends on the selectivity of fishing gear, heritability of population traits, and the genetic variability of those traits.

The potential of no-take marine reserves to protect genetic quality is great considering the fact that fishing can remove most of the population; and that densities of individuals, ages and sizes can be much greater in no-

(next page)

Table of Contents

**The State of MPA Science:
A Survey of Experts on
What We Need to Know** 1

**International Workshop Gives
Recommendations for MPA
Planning Process** 4

**Manager Profile:
Carol Bernthal** 5

take marine reserves than in fishing grounds. Exact benefits to individual species will depend on the species, the levels of fishing mortality, and the proportion of the populations eventually protected by no-take marine reserves.

Dr. Sian Pullen, World Wide Fund for Nature UK, Goldaming, UK

My question would be, "Is it possible to determine the percentage of marine habitats that require protection under MPA status in order to ensure the maintenance (and recovery, if necessary) of that habitat and the species associated with it?" For example, can we determine that providing MPA status and good management to 15% of the world's kelp forests or 30% of the world's coral reefs or 20% of the seamounts will ensure that these areas and their associated species are maintained at a favorable status worldwide?

Then we would know what our ultimate goal should be with respect to the international commitments given to establish networks of marine protected areas.

Dr. Perry Alino, Marine Science Institute, University of the Philippines, Quezon City, Philippines

I would like to know the answer as to the mechanisms and extent that natural catastrophic events (e.g., El Niño) affect or interact with human-induced impacts on the reefs. This might help me have fewer sleepless nights trying to rationalize or overcome frustrations in dealing with scientific questions to help MPA management in a developing country like the Philippines. Here, people have grave problems of poverty, and it becomes difficult to contextualize pursuing expensive scientific investigations that people feel do not contribute to getting their next fish on the table.

Dr. Colin Buxton, Tasmanian Aquaculture and Fisheries Institute, Taroona, Australia

I would like to find out more about the effects of effort displacement that arise out of the proclamation of MPAs. This issue is important from a fisheries perspective, particularly in quota management situations and especially if quota is not adjusted to take account of the loss of fishing ground. The relationships are not likely to be simple as loss of ground should in many instances be compensated for by improvements in yield, spawner biomass and enhanced egg and larval production from the MPA. Also of concern are ecosystem effects, such as the formation of urchin barrens in the presence of reduced predation, or loss of kelp canopy as a result of increased grazing, that are likely to be exacerbated at a local scale through effort displacement.

Dr. Martin Willison, School for Resource and Environmental Studies, Dalhousie University, Halifax, Nova Scotia, Canada

I should begin my answer by admitting that it is strongly influenced by a research project in which I am involved. In the Maritime region of Canada, I have helped organize a project in which we have asked a wide range of people, "What are the issues or questions about MPAs that require research in our region?" We have done this in order to steer research in a "participatory" direction, that is, toward the involvement of those who believe they will be affected by the outcome of the research. In this case, it is the involvement of those whose lives or livelihoods will be affected by MPAs.

The overwhelming majority of issues and questions raised by our participants did not concern natural science, and thus the "science" question that I want answered falls in the realm of the social and management sciences. It is impossible to reduce the roughly two hundred issues raised so far by participants to a single research question, but the following is my attempt to render one recurring theme:

"By what methods can we select and manage marine protected areas so as to ensure that they will have the support of those stakeholders and local communities that the marine protected areas will affect?"

This question has numerous sub-themes, including: political and legal process, social and economic assessments, inter-agency rivalry, community-based management, conflict resolution, philosophical foundation, regulation and enforcement, and so on. Several participants proposed that socio-economic and management experiments should be conducted. That is, that we should not assume that we can work out the best methods for marine protected area management on the basis of theory or existing experience, but that we should be open about the need for managerial experimentation. Experimentation

MPA science bibliographies

For online lists of MPA science-related articles and books, visit the following websites:

Fisheries and Oceans Canada (updated as of 1996)— www.oceansconservation.com/mpa/related/mpabiblio.htm

Gulf of Maine Marine Protected Areas Project (updated as of 1998)—www.gulfofmaine.org/library/mpas/biblio.htm

and rational analysis of the results is the foundation of science. Successful comparative case study analysis requires that there be a wide variety of management experiments, including careful data collection and honest reporting. This is the science that I believe we need.

Graeme Kelleher, Former Director, Great Barrier Reef Marine Park Authority, Australia

What effects does bottom trawling have on the whole ecosystem and how big must the "no take" zones be to maintain essential life support systems? Bottom trawling changes habitat, not just stocks, and we need to know how to maintain ecosystems with MPAs.

Dr. Callum Roberts, Department of the Environment, University of York, UK

How do you change opposition to proposed reserves into acceptance? We know there is a need for reserves and we have good reasons for believing they will work, but the key sticking point in most cases is implementation.

Dr. Paul Dayton, Scripps Institution of Oceanography, La Jolla, California, USA

How can we evaluate the cost/benefit ratio as a reserve is scaled in size? There will be a threshold, but how do we identify it?

Dr. Rob Wilder, Director of Education, Pacific Whale Foundation, Hawaii

Perhaps the most vexing scientific question is, "Do no-take MPAs in fact increase total biomass, both within and outside their borders?" My gut reaction is that they do, but the data supporting this key conclusion are still being developed. However, even having an answer to that one question — at first blush my favorite — is still not the top issue I choose.

Instead I dearly want an answer on how the marine environment will look 100 years from now if no-take MPAs are adopted, as opposed to our continuing with business as usual. I believe that with current trends, we are losing marine biodiversity as well as crucial ecosystem structure and function. If serious changes are not implemented soon (and too few are seriously contemplated), then we will all be far worse-off.

Having an answer to this comparative question would provide politicians and ocean managers with the willpower needed to adopt robust no-take zones. To protect fishing as a way of life, now and long into the future, demands a wise, cautionary measure: the setting aside of (possibly networked) portions of the sea as "safe zones."

Dr. Alan Hastings, Department of Environmental Science and Policy, University of California, Davis, California, USA

My question is: "How do larvae of species with sessile adults move from areas where they are produced to where they settle?" This is absolutely key to designing systems of MPAs.

Dr. Tundi Agardy, Conservation International, Washington, DC, USA

I would say the most critical question is, "Over what size area and with what restrictions should MPAs be implemented in order to effectively conserve ecological processes that maintain biodiversity and productivity?" It is a huge question, of course! If anyone knows the answer, even with respect to a single locale, I would love to know it.

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International Workshop Gives Recommendations for MPA Planning Process

The involvement and education of stakeholders can play a key role in the success of MPA planning processes by building support in the community and reducing the likelihood of stakeholder opposition. At the International Workshop on the Role of MPAs and Integrated Coastal Management, held in late July preceding the Coastal Zone '99 Conference in San Diego, California, USA, more than 100 planners, managers, and academics laid out recommendations on how best to manage stakeholder involvement in the MPA planning process.

The table below provides a quick sampling of some of the suggestions provided by the assembled experts. The

workshop divided participants by interest in geographic regions. Each composed a separate list of "do's" and "don'ts" in MPA planning. The table provides each tip according to the regional group that suggested it. Division into regions is not intended to suggest that tips work only in particular places.

Note: A fuller summary of the recommendations from the workshop's regional break-out groups is available by e-mail from Steve Morrison of the (US) National Oceanic and Atmospheric Administration, at steve.morrison@noaa.gov.

Table: Sampling of recommendations from regional groups of MPA experts.

Asia/Pacific and Latin America	Canada/US/Mexico	Europe/Africa	Caribbean
<p>Use a combination of "top-down" and "bottom-up" processes — take advantage of government's strength in providing legal protection while allowing community stakeholders to contribute local knowledge.</p> <p>Establish clear objectives for the planning process.</p> <p>Use a multidisciplinary team of experts as technical advisors.</p> <p>Avoid federal strong-arm tactic to achieve the objectives, as such tactics will foster resentment in stakeholders.</p>	<p>Communicate to stakeholders that the proposed MPA is needed because of threats to the area in question — it is not enough to tell a community that the area is beautiful and, thus, worthy of protected status.</p> <p>Involve all stakeholders.</p> <p>Make sure that stakeholders are patient — the planning process can take awhile.</p> <p>Conduct training for advisory council members on how behave in meetings.</p>	<p>Clarify the government's policy on planning partnership.</p> <p>Negotiate through face-to-face contact.</p> <p>Understand the political, social, and economic context for stakeholders.</p> <p>Assess the governance process continuously to ensure its effectiveness.</p>	<p>Make sure that stakeholder representatives are accountable to their stakeholder groups.</p> <p>Recognize that there will often be short-term pain in order to achieve long-term gain.</p> <p>Equalize among stakeholders the opportunity to influence the process.</p> <p>Provide easy-to-use and easy-to-understand enforcement of MPA rules.</p>

Manager Profile: Carol Bernthal Superintendent, Olympic Coast National Marine Sanctuary, USA

Carol Bernthal is unique among sanctuary managers in the US National Marine Sanctuary Program. Rather than rising through the program's ranks to become superintendent of the Olympic Coast National Marine Sanctuary (OCNMS), Bernthal came straight from a job representing local indigenous tribes on regional resource issues. Bernthal's background provides her a good fit. Among the dozen sanctuaries in the National Marine Sanctuary Program, the OCNMS has the most interaction with indigenous peoples, with four Native American tribes living along its coastal boundary. Each of these tribes holds specific treaty rights negotiated with the US federal government in the 1800s, including access to "usual and accustomed fishing grounds," the majority of which are in OCNMS waters.

Hired by the sanctuary program in January 1999, Bernthal has had a busy year. She arrived in the middle of the controversial gray whale hunt by the Makah Tribe, an event that drew international attention to the Olympic coast. She also oversaw the OCNMS portion of the Sustainable Seas Expeditions, a submersible-led exploration of the National Marine Sanctuary Program's underwater resources. And she's had an impact. Since her arrival, two tribal members of the OCNMS advisory council have resumed their attendance at the council's meetings, where they had previously perceived a lack of sanctuary interest in their input.

For this month's manager profile, *MPA News* interviewed Bernthal about her background and her new job.

MPA News: *Please describe to us the responsibilities of your previous position, and how it prepared you for your current job as superintendent of the OCNMS.*

Bernthal: I previously worked for the Point No Point Treaty Council, a tribal consortium on the Olympic Peninsula. [The Council's name derives from the location where the council's treaty was signed.] Four tribes formed it in order to make joint management decisions on fish and wildlife issues and gain more political clout in negotiations with the state and federal governments. I was hired in 1991 as a habitat program coordinator and senior habitat biologist, working on program development and finding strategic approaches to natural resource issues. We worked on some big issues. The Washington State Timber/Fish/Wildlife Agreement, to which we were a party, dealt with how logging should be managed on private and state forest lands. We also worked with local governments on growth management issues.

The job taught me that you can't sit in your office and hope to solve problems. It's important to learn about a community's issues in order to develop collective solu-

tions. There will always be overlap between your objectives and other peoples', and you have to find where that overlap is. In terms of being offered my current job, the fact that I had a background with the tribes probably helped: having someone who understands tribal treaty rights is important to continuing the relationship between the Sanctuary and the tribes. In fact, when I began my new job, I was a little concerned that people would still view me as primarily a tribal representative. But that really hasn't happened, thankfully.

MPA News: *Can you talk a little about how the OCNMS managed the contentious Makah whaling situation earlier this year, which involved tribesmen harpooning a gray whale in the Sanctuary's waters?*

Bernthal: The Sanctuary's role was really quite minimal, since the decision on whether or not whaling should occur by the Makah was handled primarily through the International Whaling Commission, with hunting oversight by NOAA's National Marine Fisheries Service. [The United States government supported the Tribe's historical right to hunt whales, carrying a request on behalf of the tribe to the International Whaling Commission.] During the official designation of the Sanctuary, it was made clear that the Sanctuary would honor its obligations to the tribes, including the exercise of treaty rights and the protection of marine and cultural resources. As the gray whale population has recovered to its historic level [and been delisted from the US Endangered Species list], the issue is more a moral debate: "Is it right or wrong to kill a whale?" But it was also very much about a tribe regaining some of its cultural heritage and pride, especially for a community that had seen some pretty hard times. It's very difficult for a modern culture without such a heritage to place itself in this situation. In addition, it forces us to examine how we treat "recovered" species: can we allow the use of an animal when the population as a whole has returned to sustainable levels?

(next page)

Olympic Coast National Marine Sanctuary

The Olympic Coast National Marine Sanctuary is located off the Pacific coast of the Olympic Peninsula in the state of Washington, USA. The Sanctuary spans 8,575 sq. kilometers (3,310 sq. miles) and contains rich fishing and shellfishing grounds. It also supports one of the world's most diverse kelp communities and is visited by 29 species of marine mammals, including whales, dolphins, and porpoises. For more information, view the OCNMS web site, at www.sanctuaries.nos.noaa.gov/oms/omsolympic/omsolympic.html.

MPA News: *The role of commercial fishing in national marine sanctuaries has been questioned in the press lately in terms of its appropriateness. Do you foresee its role changing in the future?*

Bernthal: The issue of fishing in marine reserves is going to be a big one in the next few years. Here [at the Sanctuary], we're in the information gathering stage. We're starting to focus our research program on the effect of bottom trawling on benthic habitat and fish communities in areas with variable levels of fishing efforts. In our initial review of historical fishing patterns, we couldn't find any "pristine untrawled" areas within the sanctuary, so we will be doing a comparison of areas that have been lightly and heavily trawled. This is pioneering work for the US west coast. Next summer, we'll look very closely at these sites using remote sensing as well as direct observations using a submersible. We also plan on continuing work to characterize habitats within the sanctuary and gain a better understanding about fish communities and habitat associations. All of this will lend critical information for making informed decisions on the feasibility of locating marine reserves on the Olympic Peninsula.

MPA News: *Do you foresee the designation of no-harvest areas in the sanctuary?*

Bernthal: We're not even close to that at this point. There is much more research that needs to be done, and there would have to be a lot of public outreach and input before we moved forward with any closing of areas. And with

regard to getting tribal buy-in, I would imagine they would want to see pretty strong proof of the impact of fishing before agreeing to close an area because the tribes' rights to fish are limited to specific geographic areas based on their traditional use patterns.

I think no-harvest areas have a role in creating sustainable fisheries over time, but they really need to be done in conjunction with other fishery management tools and they have to be carefully planned and implemented. Traditional fishing management techniques have not been entirely successful to date, so it's time to look at other possibilities, but we do have to be careful not to oversell what MPAs can do. Recovering some of these overfished populations will take time, especially with long-lived species like the rockfish that we have here. If we don't see recovery within a couple years of designating a reserve, does that mean that we abandon MPAs? I hope not. We have to make a long-term commitment to evaluating and reviewing no-harvest areas. They're a fairly new approach, and I imagine there will be changes as we learn and experiment with the concept.

For more information: Carol Bernthal, Olympic Coast National Marine sanctuary, NOAA, Marine Sanctuaries Division, 138 W. First Street, Port Angeles, WA 98362-2600, USA. Tel: +1 360 457 6622; Fax: +1 360 457 8496; E-mail: carol.bernthal@noaa.gov.

Coming up in *MPA News*...

When are consensus-based processes appropriate for the planning and management of MPAs? When are they inappropriate? We'll sort it out... Plus, stay tuned for our guide to MPA nomenclature, a list of MPA-related meetings for the coming year, book reviews, and more news and analysis from around the world.

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