Using Marine Reserves to Protect Highly Migratory Species: Scientists Discuss Potential Strategies, Including Mobile MPAs

One commonly held belief on no-take marine reserves is that although they can be effective in protecting relatively stationary organisms, they are ineffective for highly mobile ones. Oceanic species - including tunas, billfishes, sea turtles, cetaceans, and sea birds - often range over thousands of kilometers in their lifetimes, crossing into and out of protected areas along their seasonal migrations. When outside of the protected areas, they are exposed to fishing impacts, either as the targeted species or as bycatch.

However, there are ways that marine reserves could, theoretically, be effective in protecting such species. Reserves could be made very large, for example, to encompass these species’ movements throughout their entire lives. Alternatively, no-take zones could be placed around the most critical habitats for these species, such as feeding and breeding grounds, or migration corridors. The entire spawning stock for eastern Atlantic bluefin tuna, for example, gathers each year to spawn in a small area of the Mediterranean, at which point the species becomes highly vulnerable to overfishing.

Another option is more revolutionary: that is, reserves could have flexible, “dynamic” boundaries that would follow certain highly migratory species throughout their migrations. In other words, wherever that species was at any point in time, it would be protected by a moving no-take zone. Boundaries for these dynamic reserves would be continually adjusted - monthly, weekly, or even daily - based on satellite transmission of various data, such as the location of frontal areas on ocean currents. (These frontal areas have a tendency to concentrate oceanic predators and their prey, and are already targeted by pelagic fishing fleets using satellite imagery.) Management agencies would regularly report the adjusted boundaries of dynamic reserves to fishing vessels at sea. The dynamic reserve concept was described by Elliott Norse in “Protecting the Least-Protected Places on Earth: The Open Oceans”, MPA News 7:7.

Each of these design options carries substantial challenges, the foremost being that there is no established framework for designating broadly recognized MPAs on the high seas, where many highly migratory species spend much of their lives (see “At World Parks Congress, Target Is Set for High Seas MPAs”, MPA News 5:4, and “Recent Developments Toward a System of High-Seas MPAs”, MPA News 8:1). Setting that roadblock aside for the time being, these MPA options provide possibilities for the conservation of highly migratory species in the future. This month, MPA News asked several scientists for their views on MPA options for pelagic resources. Their replies are posted below.

Firm believer in dynamic MPAs: David Hyrenbach

[David Hyrenbach, a biological oceanographer at Duke University in the US, has published on the subject of high-seas MPAs, including dynamic marine reserves. His current research, funded by a 2007 Pew Fellowship in Marine Conservation, is assessing the extent to which distributions of marine birds, mammals, and turtles in the Alboran Sea (Western Mediterranean) are predictable enough to warrant the designation of MPAs.]

"MPAs will not work in every place and every time. We may fail, for example, to find predictable habitat associations for some species. Other species may cue on highly dynamic or ephemeral features, which managers cannot map and enforce effectively in real-time. Thus, MPAs are one of the many tools in the management toolbox, which includes a broad range of diffuse and focused actions. The modification of fishing gears and practices (e.g., use of ‘tori’ lines or pingers to avoid seabird and cetacean bycatch), and the regulation of human activities to specific regions of the ocean (e.g., shifting a shipping lane to avoid whale strikes or oil spills close to a seabird colony) are other examples of spatially explicit conservation measures.

"I am a firm believer in the use of dynamic MPAs - designed to change the size and location as they track a specific habitat feature associated with species movement or concentration. Resource managers currently have at their disposal the technology to map oceanic habitats (e.g., surface temperature isotherms identifying the position of fronts), to communicate this information to vessels at sea, and to monitor and enforce spatially-explicit management measures in real-time. Moreover, in those instances where the political will exists, the high-tech enforcement of large areas has proven feasible - such as with toothfish fisheries enforcement by Australia and France in their respective EEZs in the sub-Antarctic ([http://www.ens-newswire.com/ens/nov/2003/2003-11-24-03.aspx](http://www.ens-newswire.com/ens/nov/2003/2003-11-24-03.aspx)). Dynamic management measures are already widely used, suggesting that real-time ocean management is, in fact, attainable.

"On a smaller scale, a mandatory ship reporting system is used to avoid ship-strikes of northern right whales off Massachusetts. The use of dynamic MPAs and time-area closures will increase in the future, fueled by the development of predictive habitat models and remote-sensing capabilities.

"Increasingly, real-time habitat models and remote sensing are helping to identify critical bycatch habitats and to monitor fisheries. While dynamic MPAs will require new design concepts (e.g., extensive buffers or real-time monitoring), they will surely become more widely used in the future.

"Nevertheless, MPAs implemented without buy-in from the resource users often end up as ineffective ‘paper parks’. Thus, due to their controversial nature, dynamic MPAs will require vigorous public education and outreach efforts to convey the rationale of their design. Moreover, the formulation of clear and tangible objectives - within the context of a larger marine zoning framework - will be critical to ensure the success of this approach to marine conservation."
No hope for dynamic reserves as management tool: Alain Fonteneau

[Alain Fonteneau is a tropical tuna fisheries scientist with France's Institute for Research and Development. He has advised regional tuna commissions on the use of temporarily or permanently closed areas as a management tool.]

"Dynamic MPAs are definitely an interesting scientific concept, but I have absolutely no hope of seeing them as a management tool for offshore pelagic fisheries, even in the remote future. My negative point of view is based on practical and legal reasons.

"On the practical side: offshore tuna fisheries are conducted by hundreds of vessels belonging to dozens of flag states, with multiple sizes of vessels. It would be impossible to handle and to efficiently apply such mobile MPAs - impossible to inform all vessels, very difficult for fishermen to follow these unpredictable forbidden areas, and impossible to enforce these mobile oceanic zones.

"On the legal side: any closed area designated within the international framework of a regional tuna commission must have boundaries dictated by points and lines on a map, with those boundaries designated under national law by each of the member states. The mobile MPAs, with constantly varying boundaries, would never fit in this basic legal framework.

"My recommendation instead would be to choose quite large and well-selected fixed areas. These MPAs would be based around areas of significant biomass, in spawning zones (where predators are highly vulnerable to fisheries), and in hotspot areas of high biodiversity."

Initially, closures may need to avoid key parts of fishing grounds: Eric Gilman

[Eric Gilman is director of the Fisheries Bycatch Program for the Blue Ocean Institute, a US-based NGO. He has published several papers on bycatch in pelagic fisheries.]

"I am optimistic that a representative system of protected area networks on the high seas will eventually be achieved to help manage interactions between marine capture fisheries and highly migratory, sensitive species groups (e.g., seabirds, sea turtles, and cetaceans).

"High-seas MPAs to protect highly migratory species will require extensive and dynamic boundaries and large buffer zones. Hence, an obstacle to overcome is the development of the scientific basis for designing such MPAs. The state of knowledge is improving to identify topographic and oceanographic features where sensitive species groups tend to be abundant. Marine reserves can contribute to reducing fisheries bycatch of sensitive highly migratory species groups only where the location and time-of-occurrence of hotspots for these species are known and predictable.

"The political reality is that, to get key fishing nations to be a party to high-seas MPA networks, sufficient portions of key productive fishing grounds might need to be left out of international protected status - at least initially. This would allow for gradual introduction of adverse economic and social effects on pelagic marine capture fisheries. It would be better to start with small, modest conservation gains than to lose participation by key fishing nations.

"One consideration in employing high-seas MPAs to manage bycatch is whether regulations will apply to all nations or just to parties that agree to them. If the closures apply only to party States, this could result in increased effort in the area by fleets from non-party States with fewer or no controls to manage bycatch - exacerbating the problem that the MPA was established to address. Measures adopted by regional fisheries management organizations (RFMOs) are binding only upon parties to the Convention that established the RFMO. Illegal, unreported, and unregulated fishing activities will also pose a challenge to the efficacy of high-seas MPAs if resources for surveillance and legally binding measures and resources for enforcement are not in place."

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