

# MPA NEWS



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## Biodiversity "Hotspots" Discovered for Large Ocean Predators; Can Serve as Basis for Open-Ocean MPAs, Say Researchers

Tunas, sharks, sea turtles, and other large oceanic predators concentrate in diversity "hotspots" much like those that exist on land, according to new research by a team of German and Canadian scientists. The distinct locations at which these hotspots occur - at intermediate latitudes close to habitat features like coral reefs, shelf breaks, and seamounts - could provide the basis for open-ocean marine reserves to protect threatened species, say the researchers.

Boris Worm and Heike Lotze of Kiel University (Germany) and Ransom Myers of Dalhousie University (Canada) published their findings in the August 19, 2003, issue of the Proceedings of the National Academy of Sciences (US). Their results, generated from scientific-observer records from pelagic longline fisheries in the Atlantic and Pacific Oceans, showed hotspots existing in national waters of Australia (off the Great Barrier Reef, Lord Howe Island, and the northwest coast) and the US (off the east coast of Florida, the Carolinas, and south of Hawaii). Computer-based models developed by the team predicted that large reserves around the hotspots would outperform non-hotspot closures in protecting large pelagic predators.

"The idea of oceanic reserves, and the concept of hotspots as an efficient way to site reserves, seems to make sense to everybody," says Worm. He says existing reserves near some of the areas could be expanded to cover the hotspots. "The fact that these hotspots are found in national waters is very fortunate, because national action can take us a long way toward conserving threatened large predators." There are very likely other predator-diversity hotspots in the world, he says, although finding them will require observer data equal in quality to those used in this study, which were collected by well-funded Australian and US observer programs.

Worm and his team found that most of the hotspots, though high in diversity, sustained relatively low longline catch rates of target species. Conversely, higher catch rates for target species occurred in areas of lower overall diversity. For reserve planners, this entails a decision: whether to site reserves for maximum protection of single species or groups of species. Reserve location, and the accompanying impact on fisheries, would depend on the decision.

Alain Fonteneau, a Seychelles-based tuna fisheries scientist with France's Institute for Research and Development, says the concept of diversity hotspots in the pelagic ecosystem is very interesting, though not surprising. "All predators tend to concentrate their biomass where food is abundant, at least when the habitat is favorable to the species," he says. However, although he favors the use of MPAs for future management of offshore pelagic resources, he is skeptical that the hotspots identified by Worm *et al.* would make the best MPA sites. "A fraction of the US and Australian longliners is really too small to allow an analysis of the management consequences of these potential MPAs," he says. "The validity of this concept should be better explored at a worldwide level, using global tuna, billfish, shark, and turtle stocks/populations, and taking into account the global distribution of resources and all the major fisheries," he says.

Callum Roberts of the University of York (UK) has advocated for years the use of marine reserves for protecting highly migratory species, and welcomes the findings of Worm *et al.* "What is especially intriguing is the juxtaposition of pelagic biodiversity hotspots with [previously identified] reef hotspots," he says. "This adjacency provides us with an efficient means of targeting benthic and pelagic conservation priorities simultaneously."

Although the research by Worm *et al.* focuses on presumably stationary hotspots, Roberts suggests pelagic predators could also be protected with mobile reserves. He cites the use of daily sea-surface temperature maps by the US east coast swordfish fleet to identify frontal areas of high productivity - somewhat like the frontal hotspots identified by Worm, but mobile. "That same technology could be harnessed for protection," says Roberts. "Daily maps faxed to the fleet could include marine reserve areas that would change position with movement of the fronts."

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### BOX: Hotspots paper available online

The paper "Predator diversity hotspots in the blue ocean" by Worm *et al.* is available online in PDF format at [http://www.dal.ca/~bworm/Boris\\_Worm.htm](http://www.dal.ca/~bworm/Boris_Worm.htm). The website also provides access to other publications by Boris Worm, including his paper with Ransom Myers on worldwide depletion of predatory fish communities, published May 2003 in the journal *Nature* (*MPA News* 4:11).

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