

# Refining the tool kit for sustainable fisheries

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As spatial planning is used increasingly to manage fisheries and other ocean resources, researchers are working to determine the best ways to use and refine the various spatial management tools. Among them are marine protected areas (MPAs), one of the most common methods, which limit or entirely curtail fishing in a given area.

A new paper published in the early edition of the [Proceedings of the National Academy of Sciences](#) on July 2 describes research in this area conducted by UCSB Marine Science Institute project scientist Andrew Rassweiler and co-[principal investigators](#) Christopher Costello, Bren professor of resource economics, and David Siegel, professor in the UCSB Geography Department and director of the Earth Research Institute.

According to Rassweiler, considerable research has focused on the ability of MPAs to increase fishery returns, but the potential for a broader range of spatial management approaches to outperform MPAs has received far less attention.

The team wanted to determine whether a fishery might be more profitable if a manager had access to tools other than MPAs, such as zoning (for fishing, energy, recreation, etc.) or spatial user rights, which would affect the distribution of fishing effort in a more nuanced manner.

They used bioeconomic models of seven near-shore fisheries in Southern California to explore the value of optimized spatial management in which the distribution of fishing is chosen solely to maximize profits.

They were able to show that, given the right circumstances, fully optimized spatial management employing a blend of [management strategies](#), including but is not limited to establishing MPAs, can substantially increase fishery profits relative to an optimal non-spatial management in which the amount of fishing is regulated, but not its [spatial distribution](#).

Strategically placed MPAs, they found, can also increase profits substantially compared with non-spatial management strategies; however, profit increases available through optimal use of MPAs only are roughly half those to be realized from fully optimized spatial management using a suite of management tools in addition to MPAs.

Further, MPAs must be placed carefully. Placed randomly, the researchers found, profits dropped. Thus, the higher profits resulting from spatial management strategies can only be achieved if the fishery is well understood and regulations are strategically designed.

"If you gave a manager a variety of management tools, how much could that manager increase profits in his fishery," says Rassweiler in defining the core research question.

The methodology involved modeling the results of three different distinctive management scenarios. In the simplest scenario, the manager is doing a great job of setting the total amount of effort, for example, by placing limits on the number of boats participating in the fishery or the number of days they are allowed to fish, but doesn't tell anyone where to go. In the most complex version, the manager tells everyone exactly how much they can fish in each location. And in a third, intermediate, scenario, which, Rassweiler says, is closest to actual practice, spatial management comes in the form of no-take MPAs, so that the manager can tell people how much to fish overall while also closing designated areas to fishing.

The limitation of the intermediate scenario, says Rassweiler, "is that it's a pretty blunt tool. The manager isn't able to add nuance by saying, 'You can fish there, but only a little bit.' An area is either open to fishing or it's not."

"What we've shown is first, that it's really valuable to give managers more tools, and second, that MPAs are a partial, less-nuanced tool that can get about half the profits as the most valuable tool. But a lot of science has to be done to decide exactly which method to use in a real fishery, and more knowledge has to go into setting spatial regulations than non-spatial ones, because a lot of spatial data is needed," says Rassweiler. "One question we ask but don't really finish answering in this project is, Is the extra effort worth the cost associated with it? Well, it could be if the resulting profits are much higher."

Rassweiler describes MPAs as "almost a silver bullet from a conservation perspective," because if a habitat-rich area is closed to fishing, the fish population will increase. "It's a pretty low bar to enhance conservation using MPAs," he says. "It's a much higher bar to use them as a fishing management tool."

Provided by University of California - Santa Barbara

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