



Giant Marine Reserves Pose Vast Challenges

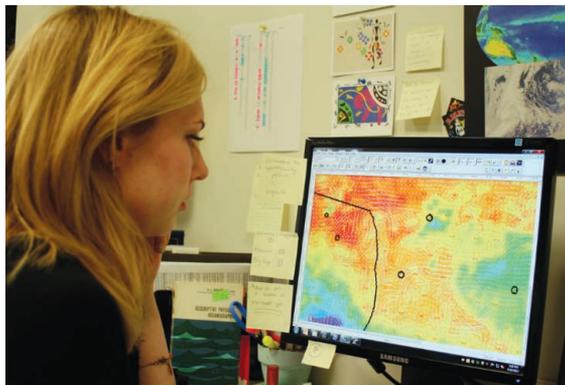
Huge no-fishing zones might save widely traveled tuna and other species, but monitoring their effectiveness—and enforcing catch bans—will require new approaches

HERNDON, VIRGINIA—On a typical workday, Alyson Kauffman pores over oceanographic data streaming into her computer from all over the world, including maps of plankton concentrations and water temperatures. Then, the analyst at GeoEye, a satellite company headquartered in this Washington, D.C., suburb, sends reports to her clients, who are fishing vessel captains at sea. Each report highlights otherwise invisible “hot spots” where they might find concentrations of valuable species such as tuna and swordfish. “Our job is to make fishing vessels more efficient,” she says.

A growing number of those hot spots, however, are becoming off-limits to such high-tech fish killers. Over the past 6 years, the United States, Australia, and the United Kingdom have created huge marine reserves that have banned fishing in more than 1.9 million square kilometers of ocean—an area equivalent to the size of Mexico. And more “megareserves” are on the way, with nations seriously considering plans to ban fishing in an additional 3.6 million square kilometers of marine habitat over the next few years (see map).

Unlike an older generation of preserves that mostly focused on small patches of coral or coastal fish stocks, these vast new sanctuaries are designed to protect high-seas ecosystems that include fish and other animals that routinely wander over huge territories.

The trend delights conservation scientists who are worried about overexploitation of the world’s oceans. The reserves “are a real game-changer,” says fisheries scientist Daniel Pauly of the University of British Columbia, Vancouver, in Canada. Fishing fleets now have technology that allows them to penetrate even remote, deep waters that once “served as refuges for a lot of fish,” he



Eye in the sky. Satellite images designed to help fishermen could also be used to spot poachers.

No go. New reserves are off-limits to commercial fishing boats, such as this tuna seiner in Micronesia.

notes. “There’s an urgent need to replace them with big, manmade protected areas.”

Giant reserves are also posing unprecedented challenges to scientists and policymakers, however. Researchers are struggling to design and fund studies that will enable them to monitor changes over vast areas and determine whether the reserves are actually helping to rebuild marine populations. And managers are trying to figure out how they can affordably enforce fishing bans in remote waters. Some environmentalists, meanwhile, fear that the push to create megareserves could become a charade if nations are allowed take credit for conservation without actually giving the new sanctuaries real protection.

The big three

Three giant reserves have so far attracted most of the attention. In 2006, then-President George W. Bush designated some 362,000 square kilometers around the Northwestern Hawaiian Islands as a U.S. Marine National Monument in which all exploitation would be banned. The United Kingdom followed in 2010 by creating a much bigger reserve around the Chagos Islands in the Indian Ocean. Last year, Australia banned all fishing in much of the Coral Sea—at 989,842 square kilometers, the biggest no-take zone in the world.

Of the trio, only the Chagos Islands reserve had been heavily fished—primarily for tuna. Most of those stocks are now depleted, and conservationists hope the sanctuary will help restore them. But commercial fishers—who largely opposed the creation of the reserve—have their doubts. Speedy tuna can travel great distances, notes Julio Moron of OPAGAC, the Spanish tuna fleet association headquartered in Madrid, so even a megareserve will have “have negligible effects on the pelagic [open-ocean] ecosystem,” he predicts.

Mainstream marine biologists are more optimistic. Studies in the nearby Pacific have found that tuna there don’t necessarily swim vast distances, so some scientists believe that some Chagos tuna could spend their entire lives inside the nearly 1000-kilometer-wide preserve. “Tuna don’t migrate randomly,” says Heather Koldewey, a geneticist at the Zoological Society of London. “They stay near seamounts, islands, upwellings, and good feeding grounds—and the Chagos provide all these.” Bruce Collette, a senior scientist at the Smithsonian Institution’s National

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Museum of Natural History in Washington, D.C., predicts that Chagos stocks could “reach a density not seen on Earth in many decades.” And tuna won’t be the reserve’s only beneficiaries, adds marine ecologist Charles Sheppard of the University of Warwick in Coventry, U.K. “The tuna ban also stops the loss of sharks, billfish, seabirds, and turtles” that tuna fishers once killed unintentionally.

A monitoring challenge

Proving that the reserve is helping tuna and other species, however, could be difficult. Prior to the ban, researchers relied largely on catch data to make population estimates. Now, with fishing boats banned there, they are exploring alternatives.

On a cruise through the Chagos reserve late last year, for example, researchers tested some electronic eyes that can count creatures without killing them. Jessica Meeuwig, a quantitative ecologist at the University of Western Australia in Perth, suspended in midocean a crosslike device with two cameras pointed at a bag of bait designed to attract fish. The cameras record for 3 hours, enabling the researchers to “determine what species are present, their relative abundance, and their size,” she says. And by returning to study sites repeatedly over time, researchers should ultimately be able to determine if the populations are, in fact, increasing.

Biological oceanographer Andrew Brierley of the University of St. Andrews in the United Kingdom has taken a complementary approach, using a state-of-the-art echosounder to survey the waters around Meeuwig’s cameras for fish and other animals. The sonar data “will tell us how representative the pictures are of that part of the ocean,” he says.

Sanctuary managers, meanwhile, are trying to get their arms around how best to prevent poaching within their vast domains, which can take days to cross in ships. One option, using satellite imagery and data to spot poachers, is getting a close look in studies funded by the Pew Environment Group of Washington, D.C. “Satellite sensing is not cheap, but it’s a lot cheaper than sending [an airplane] to patrol a big area,” says John Amos, president of SkyTruth, a nonprofit organization based in Shepherdstown, West Virginia, that is exploring the idea. He believes companies like GeoEye that help fishers find

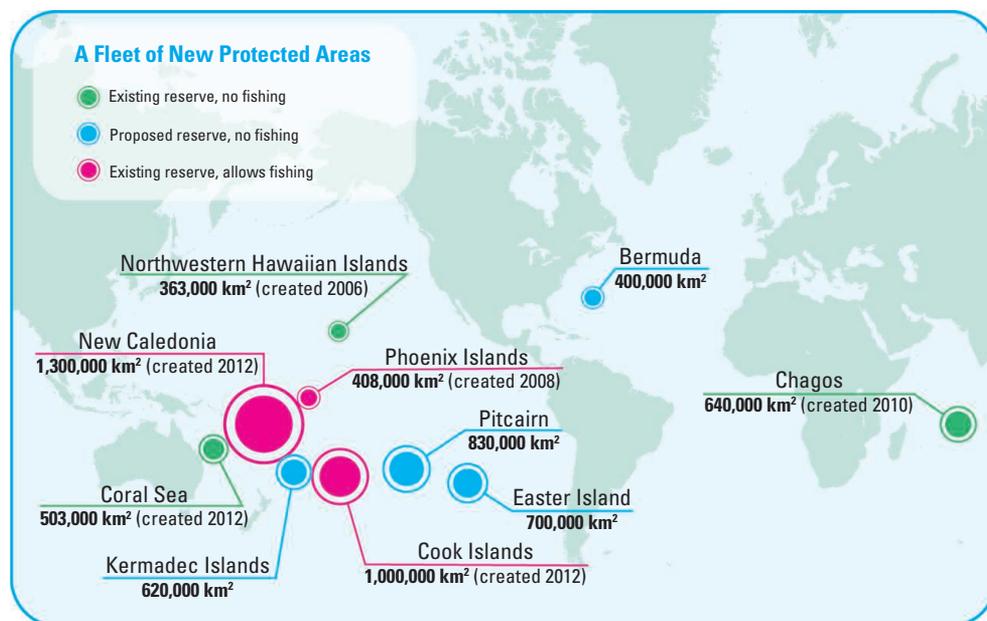
their catches now produce imagery that is detailed enough to help identify vessels that are breaking the law. (GeoEye officials say they would be ready to help.)

Mega-expansion

The enforcement challenge could soon get bigger. Five more giant no-take reserves are now on the drawing boards, notes Jay Nelson, director of Pew’s Global Ocean Legacy program, which has played a major role in promoting the idea. They include efforts to protect the United Kingdom’s Pitcairn Islands and Bermuda, the Kermadec Islands of New Zealand, and Chile’s Easter Island. “The time to create large, well-protected marine reserves is before they’re targeted by the industrial fishing fleets,” Nelson says. “Ten years from now will be too late.”

to the administrators of the Hillary Institute of International Leadership awards in New Zealand and the U.S. Peter Benchley Ocean Awards, who said that they thought the whole reserve was fully protected when they gave awards to Tong last year. Current plans, developed with the assistance of the nonprofit Conservation International in Arlington, Virginia, call for increasing the total no-take area to 25% of the Phoenix reserve in 2014. “Because of its strategic location, it could play an important role conserving tuna if all of it became a no-take area,” Pauly says.

Similar fine print accompanies some other recent announcements of megareserves. This past summer, the Cook Islands announced that it would create the world’s biggest marine park, covering



Still, the public and the press may need to carefully scrutinize any new grand marine conservation claims to avoid misunderstandings. For instance, President Anote Tong of the Pacific island nation of Kiribati won several environmental prizes after he created the 408,000-square-kilometer Phoenix Islands Protected Area in 2008. He has repeatedly called it “a fully protected marine park, ... off limits to fishing and other extractive uses.” But, in fact, fishing is forbidden in just 3% of the reserve, which is located in the Central Pacific, home to the world’s last major tuna stocks. In the rest of the reserve, just as in the rest of the Central Pacific, fishing by foreign fleets has continued at a pace that regional fisheries scientists have warned is excessive. This was news

1 million square kilometers of the southern Pacific. New Caledonia quickly trumped that with the announcement of a 1.4-million-square-kilometer preserve. Neither, however, plans to restrict fishing.

Still, conservationists are pleased that nations are thinking big. If nothing else, megareserves that ban fishing can be cost-effective, notes Ashley Strub, a fisheries economist at the University of British Columbia, Vancouver. Her research has found that a small reserve can cost 100 times more per square kilometer to set up and administer than a giant one. But big reserves don’t necessarily replace small ones, she adds. “Coastal and small-island reserves protect different species than open-ocean ones,” she says. “You need both.”

—CHRISTOPHER PALA