

## The Spillover Effect: What Do the Reserves in St. Lucia and Cape Canaveral Tell Us?

One of the most difficult scientific and political questions in MPA planning is that of whether no-take marine reserves can serve to increase fish catches in surrounding fished areas. This effect — achieved when larval or adult fish exit a reserve — often becomes a central issue both for reserve planners and for stakeholders affected by pending closures, particularly fishermen. When future “spillover” of fish out of a reserve is assumed, support for a reserve can be high among fishermen. But with few real-life demonstrations of the spillover effect existing in the scientific literature, how sure can planners and stakeholders be that it will happen?

The authors of a paper published in *Science* magazine on November 30 say that two sites they have studied show the spillover effect is real, and that reserves can play a key role in supporting fisheries. Lead author Callum Roberts of the University of York (UK) hopes the findings “will help remove a major logjam in the debate.” (Co-authors on the paper included Fiona Gell and Julie Hawkins, both of the University of York; Jim Bohnsack of the US National Marine Fisheries Service;

and Renata Goodridge of the University of the West Indies [Barbados].)

The two reserves are the Soufrière Marine Management Area (SMMA) — on the Caribbean island nation of St. Lucia — and the Merritt Island National Wildlife Refuge (MINWR) at Cape Canaveral, Florida.

The SMMA, a zoned MPA that includes a network of five no-take areas, was designated in 1995 to rehabilitate the local reef fishery. The no-take areas constitute 35% of the previous local fishing grounds; in total, the SMMA encompasses 11 km of coastline. From 1995 to 1998, according to the *Science* paper, fish biomass in the no-take zones tripled while biomass in the adjacent fished areas doubled. (Roberts told MPA News that recent, unpublished data show even greater increases, with a quadrupling of biomass in the no-take zones and a tripling of biomass in the fished areas.) While total fishing effort remained stable, the mean total catch per trip by fishermen rose by at least 46%. The paper’s authors know of no evidence for similar fishery or stock improvements in nearby islands.

The MINWR encompasses two areas of estuarine habitat that have been closed to public access and all fishing since 1962, for security of an adjacent rocket launch site. The two areas total 40 km<sup>2</sup>. In recent years, the adjacent fished areas have become a hotspot for catches of record-sized game fish, particularly red drum, black drum, and spotted seatrout. World- and state-record catches of these three species have been concentrated in the authors’ study area, which extends roughly 100 km north and 100 km south of the no-take zones — an area equivalent to 13% of the state’s coastline. Since 1985, for example, most Florida-record red and black drum have come from this study area, despite the fact that similar, suitable estuarine habitat for these fish exists throughout the state.

### What can we learn from this?

Both of the cases described in the *Science* paper involve relatively small-scale reserves and fisheries. “I think we make a strong case that reserves will work at these scales in coastal waters,” said Roberts in an interview.

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### Dear subscriber:

This issue of MPA News covers the months of December 2001 and January 2002, allowing our staff a year-end holiday. In February, our regular monthly delivery will resume.

On behalf of the staff and editorial board of MPA News, I wish you the best for the new year. Please let us know what you are working on in your corner of the world. Our e-mail address is [mpanews@u.washington.edu](mailto:mpanews@u.washington.edu).



John B. Davis  
Editor

### The spillover effect, in brief

Roberts *et al.* in their *Science* article describe the basis for the spillover effect as such:

“Because reserves contain more and larger fish, protected populations can potentially produce many times more offspring than can exploited populations. In some cases, studies have estimated order-of-magnitude differences in egg production. Increased egg output is predicted to supply adjacent fisheries through export of offspring on ocean currents. In addition, as protected stocks build up, reserves are predicted to supply local fisheries through density-dependent spillover of juveniles and adults into fishing grounds.”

Excerpted from Roberts, C.M., Bohnsack, J.A., Gell, F., Hawkins, J.P., & Goodridge, R. Effects of marine reserves on adjacent fisheries. *Science*, 294, 1920-1923 (2001).

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## Recovery of Soufrière after Hurricane Lenny

The Soufrière Marine Management Area (SMMA), featured in the *Science* magazine article by Roberts *et al.*, was hit hard by Hurricane Lenny in late 1999, destroying as much as 80% of the coral cover in some areas of the park. When MPA News profiled the SMMA immediately afterward, Manager Kai Wulf was concerned about early damage assessments, which showed a severe loss of marine life. "I don't know where the fish have gone," he said. (MPA News 1:4)

Two years later, as indicated by data from the *Science* article, most of the fish have come back. "The SMMA has survived, both physically and as an institution," said Wulf. Although some areas of the park still show little revival in terms of coral cover, other spots are in the midst of a rapid recovery. Wulf is now considering adjusting the boundaries of no-take zones within the SMMA to account for this: one of the few places, for example, where healthy stocks of one coral can be found is in a heavily fished multipurpose zone. "I am afraid that the dropping of fish traps could destroy these few remaining colonies," said Wulf.

### For more information


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## Spillover effect

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He suggests, however, that reserves may work just as well across a wide spectrum of scales, geographical locations, and fisheries. "Industrial fisheries in continental-shelf and high-seas waters are in deep trouble," he said. "Many scientists believe that marine reserves could throw such fisheries a lifeline. Our study does not make that case alone. But it does establish that the theory is sound as to how reserves will benefit fisheries." He says the next step is to perform large-scale demonstrations of reserve benefits to industrial fisheries.

Roberts says that comparisons of marine reserves to more conventional fishery management tools (e.g., gear restrictions) should be broader than simply measuring

against the metric of catches of target species. In other words, he says, reserves offer benefits, besides spillover, that other management tools do not. "The key additional benefit is that reserves protect habitats from damage caused by fishing gear such as trawls," he said. "Aside from the important conservation values of such habitat protection, theory also predicts that better quality habitats will reduce the risks associated with present fishery management, including serious stock declines from management failures." 

### For more information

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### Note from the editor:

Mark Tupper, an assistant professor at the University of Guam on the island of Guam in the Western Pacific, wrote the following perspective piece in response to the Roberts *et al.* article in *Science*. Tupper serves as coordinator of the Marine Protected Areas Research Group at the University of Guam Marine Laboratory.

## Putting No-Take Marine Reserves in Perspective


By Mark Tupper, University of Guam

Many scientists agree that tropical fisheries in developing island nations, such as St. Lucia, stand to gain the most from no-take marine reserves. Many of these island fisheries are seriously overexploited and have little or no management of their reef fish stocks. In such cases, where no-take marine reserves are established they serve as the primary (in some cases sole) controls of catch and effort. It seems obvious that any management regime will produce increased yields over no management at all, and for developing tropical nations with several hundred or more species of reef fish, no-take marine reserves might be much easier to enforce than a complex set of catch limits, size limits, and gear restrictions. However, the St. Lucia example is specific to coral reef fisheries and does not prove the global utility of no-take marine reserves to fisheries.

The Florida Fish & Wildlife Conservation Commission instituted stringent regulations on the recreational fishery for red and black drum and spotted seatrout in the late 1980s. Red drum was declared a protected species in 1985 and black drum was declared a restricted species in 1989. Currently the bag limit for red drum is one fish per person, with a slot limit of 18-27 inches long. The Merritt Island NWR is producing trophy-size fish to a small area around Cape Canaveral, but what effect have the existing regulations had on mean sizes of red and black drum along the entire Florida Atlantic coast?

Data collected by the Marine Recreational Fisheries Statistics Survey show that there was a noticeable increase in the mean length and weight of red drum and

black drum in east Florida over the past 20 years. For black drum, the mean weight was less than 1.0 kg for most of the early 1980s but was 2.0 kg in 2000 and again in 2001. Mean weight of red drum also increased from less than 1.0 kg in the early 1980s to a mean of around 2.0 kg through the late 1990s and 2000, reaching a mean of 2.2 kg in 2001. This shows that, whereas an MPA can provide trophy size fish to a limited area outside its boundaries, traditional fisheries management techniques can result in size increases across the entire fishery.

Although the examples discussed by Roberts *et al.* demonstrate the potential benefits of marine reserves to fisheries, the fact is that the great majority of them have not succeeded in meeting their management objectives, even in tropical coral reef systems. Indeed it is rather surprising that the fairly abysmal performance of MPAs has been the basis for a global movement towards marine reserves for fisheries management. Current estimates place the number of "paper parks" at over 80-90% in some countries, and rich nations have fared no better than poor ones. Rather than charging ahead to create hundreds of new MPAs, it makes sense to determine (1) whether or not a no-take marine reserve is the best management strategy for a particular fishery, and (2) how we can better implement and manage current MPAs so that they reach their stated objectives. 

### For more information

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### Indigenous Involvement Often Influenced by Culture and Regional Circumstances: Four Examples

In most areas of the world, indigenous peoples can be important stakeholders in the planning and management of marine protected areas, often offering detailed ecological knowledge of the sea, honed over centuries. Such traditional knowledge, however, is often not fully recognized and acted upon by the non-indigenous government entities that generally designate MPAs. With governmental recognition of traditional ecological knowledge sometimes slow in coming, the closure of marine areas can be an alienating experience for indigenous peoples. As a result, indigenous support for the sites can be low.

For MPA practitioners interested in incorporating indigenous knowledge, it may be useful to look to MPAs where the active participation of indigenous societies is an integral part of planning and management. While the following examples demonstrate what is now occurring with indigenous involvement in MPAs, there appears no general pattern of institution — each case has developed uniquely to the indigenous culture and the area. Yet each is clearly based on respect for indigenous knowledge.

#### 1. Cayos Miskitos and Franja Costera Marine Biological Reserve, Nicaragua

The Cayos Miskitos and Franja Costera Marine Biological Reserve is located on the northeast coast of Nicaragua, in a territory inhabited largely by the Miskito people. Bounded to the north and east by the Caribbean Sea, the reserve covers almost 13,000 km<sup>2</sup> and features a range of ecosystems including coral reefs, seagrass pastures, mangroves, and estuaries. The reserve was formally designated in 1991 as part of a cooperative agreement between 38 Miskito communities and the Nicaraguan Ministry of the Environment (MARENA). An inter-institutional commission — composed of governmental and Miskito representatives — was set up to plan and manage the reserve.

The reserve's first management plan, crafted in 1995, identified several key management issues. Among these were the definitive demarcation of communal territories, and regulation of the extraction of marine resources, particularly lobster — the focus of an intensive, multinational fishery in the region. To aid in addressing these issues, new local management committees have been established to focus on planning and implementing key actions — such as fishing regulations — at selected pilot sites within the reserve.

Cooperation between the central government and the Miskito people has faced its share of challenges. Repeated attempts in the past century by various Nicaraguan political regimes to impose control over the Miskitos have engendered a lack of trust of the government by the tribe. Also, the Miskito communities have traditionally controlled access to non-privately owned land and marine resources in the region, and have been reluctant to share this power with the government. Nonetheless, the local management committees appear to offer promise for improving collaborative management.

A detailed description of the role of the Miskito people in the reserve's management is provided in a case study in the 2000 WWF/IUCN report *Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies*, available online in PDF format at <http://wcpa.iucn.org/pubs/publications.html> (see box, next page).

#### 2. Ulunikoro Marine Conservation Area, Fiji

Fiji's Ulunikoro Marine Conservation Area, designated in 2000, provides a case of bottom-up protection efforts initiated by a local indigenous community. Consisting of coral reef and measuring 0.2 km<sup>2</sup> in area, the small MPA represents the adaptation of traditional Fijian marine-tenure concepts to modern-day fishing concerns.

Three decades ago, the waters around the village of Waisomo supported a thriving fishery. But as catches and fish size dwindled through the 1980s, the local community grew concerned that the resource was disappearing. Convinced by the village headman that a marine protected area would bring back the fish, the village then persuaded neighboring communities to join in pursuing MPA designation from the federal government.

Central to its adoption by the local villages, the modern concept of no-take marine reserves echoes the traditional Pacific-island concept of "tabu", in which local authorities place areas of the sea off-limits to fishing. The Ulunikoro MPA is now a no-take area. The Fijian government has empowered selected villagers to serve as enforcement officials at the site.

An account of the process by which local villagers pursued designation for the MPA is online, at <http://www.wwpacific.org.fj/livingexamplefiji.htm>.

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Last month, in Part One of a two-part study, MPA News offered insights from two experts on the relationship between indigenous peoples and MPAs. This month, we provide summaries of four MPAs planned and managed with the significant involvement of indigenous peoples.

### 3. Gwaii Haanas Marine Conservation Area (proposed), Canada

Gwaii Haanas, an archipelago of 138 islands in Canada's Pacific coast province of British Columbia, has been populated by indigenous peoples for more than 10,000 years, and is now home to about 2000 members of the Haida people. The terrestrial Gwaii Haanas National Park/Haida Heritage Site — composed of the islands but stopping at the high tide line of each — involves a collaborative management regime to ensure equal input from the Haida and the federal government in managing the region's land-based resources. A four-member Archipelago Management Board, established in 1993 and consisting of two representatives each from the Council of the Haida Nation and the Canadian government (represented by the Parks Canada agency), oversees all planning and management of the archipelago. So far, the board has reached consensus on every regional matter it has faced.

Now, Parks Canada seeks to designate an MPA — the Gwaii Haanas Marine Conservation Area — in the waters surrounding the islands, and to establish a similar collaborative management system to manage it.

Designation of the MPA, first proposed in 1988, has encountered a number of obstacles, among them the repeated delay in passage of legislation to establish a national marine conservation area program. In the meantime, another federal agency — the Department of Fisheries and Oceans (DFO) — has jurisdiction over the area's marine resources. Incidentally, DFO will retain responsibility for conservation of fish stocks even if/when the MPA is created for Parks Canada.


The Gwaii Haanas National Park website provides information on the current collaborative management regime for the park, as well as the underlying management agreement between the Haida community and the government of Canada: <http://parkscan.harbour.com/gwaii/>.

### 4. Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, USA

In December 2000, US President Clinton designated a vast, 340,000-km<sup>2</sup> marine protected area around the coral-laden Northwestern Hawaiian Islands (MPA News 2:6). Clinton's executive order contained measures to restrict some activities throughout the reserve, and to establish zones (Reserve Preservation Areas) around certain islands, atolls and banks where all consumptive or extractive uses would be prohibited. Following a period of public comment, Clinton issued a second executive order in January 2001 to revise certain conservation measures in the reserve and make permanent the Reserve Preservation Areas.


The US Office of National Marine Sanctuaries is now working to draft an operations plan for the reserve (available for public comment in early 2002), in consultation with state and federal officials and with recommendations from a reserve advisory council. The 15-member council includes three Native Hawaiian representatives and a citizen-at-large who also happens to be a Native Hawaiian.

Although the islands in the reserve are largely uninhabited, physical remnants of ancestral places, including burial sites, attest to the historic use of the islands by Native Hawaiians. KAHEA ([www.kahea.org](http://www.kahea.org)), a local alliance of Native Hawaiian cultural practitioners and environmental activists, was instrumental in laying the groundwork for the current reserve, through recommending specific policies, coordinating the response of other environmental groups, and generating public support. KAHEA refers to the reserve as a "Pu`uhonua," a place of safety, refuge and recovery.

The official reserve website provides the executive orders, maps, a record of public comment, and more: <http://hawaiireef.noaa.gov/>. 

### Report on indigenous peoples, protected areas available online

*Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies*, a 133-page report published by WWF International and the IUCN World Commission on Protected Areas, is available online in PDF format at <http://wcpa.iucn.org/pubs/publications.html>. English and Spanish versions of the document are available.

The report provides a set of five principles upon which protected area planners should develop partnerships with indigenous peoples. The principles — based upon conclusions from the Fourth World Congress on National Parks and Protected Areas, held in 1992 in Caracas, Venezuela — may be adapted to suit particular situations, legislation, and national policies. 

## Results from the Reader Challenge: Which MPA is the Oldest?

In the past quarter-century, MPAs have experienced a surge in popularity among resource managers looking for tools to help protect underwater habitats and other resources. Of the thousands of MPAs now in existence worldwide, the large majority of them have been designated since the mid-1970s.

But the modern history of marine protected areas began long before that. To get a sense of when, and where, the modern MPA movement began, one must pinpoint when the first MPA was designated. This is easier said than done. With the definition of “marine protected area” often differing from user to user, several MPAs around the world have been named, in print or on the web, as being “the first”.

Wading into this issue, MPA News challenged readers in September to name the oldest existing marine protected area in the world, in hopes that we might help to settle this matter. Our guidelines were fairly simple: nominated MPAs must exist currently, and must fit the IUCN definition of marine protected area (see box in right margin).

### Evaluating the responses

In sorting through the nominations, the MPA News staff had to make some decisions on what to allow. The most critical decision was whether to consider coastal sites, including those without significant areas of open sea. In the end, we did allow these sites to be considered, so long as they had some intertidal or subtidal marine component. Restricting consideration to wholly underwater sites would have greatly limited the nominee pool.

We also had to decide what to do in cases where we knew of older MPAs than ones submitted by readers. Such was the case for South America and Europe. In the interest of providing readers with the most accurate information we had, we elected to publish the oldest MPAs of which we were aware, even if not nominated by a reader.

We received more than 30 nominations in all. The results appear on this page and the next, with the oldest-known site featured first, followed in chronological order by the oldest MPA known from each continent, except Antarctica.

Some of the MPAs seem suspiciously recent to us. Was the oldest European MPA, for example, really designated just 25 years ago? We are printing this list with the condition that these are the oldest MPAs of which we currently know. If you are aware of older, existing MPAs, we would love to know of them — e-mail us at [mpanews@u.washington.edu](mailto:mpanews@u.washington.edu).

### Oldest MPA in the world: Royal National Park, New South Wales, Australia. Designated 1879.

Located on the southern outskirts of Sydney and managed by the New South Wales National Parks and Wildlife Service (NPWS), Royal National Park consists of roughly 150 km<sup>2</sup> of bushland fronted to the east by the Pacific Ocean. It also includes intertidal terrain in Port Hacking, a large tidal inlet. The park is described in some detail on the NPWS website, at <http://www.npws.nsw.gov.au/parks/metro/Met032.html>.

Upon the park's designation in 1879, its regulations included bans on dredging and the removal of sand, rocks, and vegetation. Soon after, prohibitions on the use of explosives, net-fishing, and the commercial exploitation of oysters were added. Ian Brown, senior policy officer with the NPWS, notes that the park authority in 1893 reported that oysters “now cling to the rocks along the shore, as their threatened extinction some years ago was averted by the action of the [national park] Trust”.

The whole of the Port Hacking estuary, including those parts in Royal National Park, is now closed to commercial fishing of all kinds. Recreational fishers are allowed to use only hand-held lines. There is also a prohibition on taking any mollusks in the intertidal zone adjoining part of the park.

Thanks for this nomination go to Ian Brown, NPWS. As nominator of the oldest MPA — to our knowledge, at least — Brown receives an MPA News tote bag.

### Oldest MPA in North America: Breton National Wildlife Refuge, Louisiana, USA. Designated 1904.

The Breton site consists primarily of mangrove and is managed by the US National Fish and Wildlife Service, whose jurisdiction extends 800 feet (244 meters) seaward from mean low tide.

Thanks for this nomination go to Mark Spalding, senior programme officer, Marine and Coastal Programme of the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC), Cambridge, UK.

### Oldest MPA in Asia: Matang Forest Reserve, State of Perak, Malaysia. Designated 1906.

The Matang Forest Reserve incorporates large mangrove areas. The reserve's purpose is to provide a sustainable supply of forest products for the local human population while also providing habitat for fish.

Thanks for this nomination, as well, go to Mark Spalding (UNEP-WCMC).

### IUCN definition of “marine protected area”

The IUCN defines a marine protected area as “an area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.” (IUCN 1992)

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### Oldest MPA in Africa: Tsitsikamma National Park, South Africa. Designated 1964.

Tsitsikamma National Park, on the south coast of South Africa, is a no-take MPA that includes extensive temperate reefs. At its present size, the park stretches 80 km along the coast and 3 nautical miles seaward.

Thanks for this nomination go to Colin Attwood, principal oceanographer, Marine and Coastal Management (an agency of the South African Ministry of Environmental Affairs and Tourism).

### Oldest MPA in South America: Archipiélago Los Roques National Park, Venezuela. Designated 1972.

Los Roques is an archipelago of 40 small offshore islands, including one rocky island and 39 coral cays in an atoll-like formation. The archipelago is one of the largest marine national parks in the Caribbean.

Source: Spalding, M.D., Ravilious C., and Green E.P. 2001. *World Atlas of Coral Reefs*. Prepared at the UNEP World Conservation Monitoring Centre, University of California Press, Berkeley, USA.

### Oldest MPA in Europe: Underwater Reserve of Monaco, Monaco. Designated 1976.

Prince Rainier III of Monaco designated this reserve to provide favorable spawning habitat for fish. The reserve includes bans on fishing, scuba diving, powered navigation, and anchoring.

Source: Monaco Government Tourist Office, New York City, USA.

## Notes and News

**Mozambique protects Bazaruto coral reefs** The government of Mozambique on November 28 extended the boundaries of what had been solely a terrestrial park on the islands of the Bazaruto Archipelago to include 1,400 km<sup>2</sup> of the surrounding waters. The newly named Bazaruto Archipelago National Park features coral reefs and seagrass beds that support a diverse fishery, a strong dive industry, and the largest viable dugong population on the East African coast. The pending management plan for the expanded park includes a zoning system that will establish some no-take areas, particularly in coral communities; elsewhere in the park, seine and hand-line fisheries by island residents will still be allowed.

Three of the five islands of the Bazaruto archipelago were designated a national park in 1971; the park charges tourists a user fee, the revenue of which goes toward conservation efforts and local communities. The Mozambican government anticipates that the new

## The original MPAs

Traditional fishing cultures around the world have engaged in closure-based practices that have functioned to protect marine resources. Perhaps the best-known example of this is the "tabu" or "kapu" concept established by Pacific island cultures centuries ago. Throughout Oceania, the right to fish in a particular area was controlled by a clan, chief, or family, and these controlling entities often established permanent or temporary tabu areas, in which fishing was off-limits. Depending on the culture, this prohibition was tied to a belief system, the death of a family member or chief, or sea burial sites.

With westernization of Pacific island cultures, these tabu areas disappeared. However, some cultures are reinstating the tabu concept in response to modern fishing pressure. In Fiji, for example, reef owners established four new tabu areas this past July. One of the areas marks the re-establishment of a traditional tabu site, around a sacred point on Yanuca Island where Fiji's first paramount chieftain is said to have descended.

### For more information

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park designation for the surrounding waters will help spur more tourism in the area, thus benefiting the local economy and the coral reef ecosystem. For more information: Helena Motta, WWF Mozambique Programme Office, PO Box 4560, Maputo, Mozambique. Tel: +258 1 301186; E-mail: [hmotta@wwf.org.mz](mailto:hmotta@wwf.org.mz).

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**MPA violation punished, based on satellite data** With evidence based almost exclusively on vessel-tracking data gathered from a satellite-based vessel monitoring system (VMS), the US federal government has successfully prosecuted a fishing vessel for repeatedly entering an area closed to fishing. The December 5 ruling against the Massachusetts-based fishing vessel *Independence* and its captain is the first US federal fisheries prosecution based on VMS data without eyewitness verification of the offense by enforcement officials. The scallop vessel was fined US \$250,000, and its federal fishing permit was revoked. The US National Marine Fisheries Service uses VMS to assist in monitoring compliance with closed-area regulations (MPA News 2:5).