

The Science and Politics of Marine Reserves: When Planners Raise Community Hopes of Higher Fishery Yields

There is broad scientific agreement that no-take marine reserves can generate benefits, such as protection of biodiversity. There is debate, however, over evidence that these benefits include larger yields for nearby fisheries. The “reserve effect” for fisheries — thought to occur via export of larvae and adult fish from a reserve to fished areas — is difficult to measure, due in part to the complexity of ocean systems (*MPA News* 5:6 and 5:7). Depending on local conditions and the species of interest, positive impacts of reserves on fishery yields could take years to occur and be detected. In some cases they may not occur at all.

Suggestions by planners that a reserve will increase yields can be very useful in securing fishing-community support for designation. If such increases do not occur as anticipated, though, the disappointment could lead to frustration and non-compliance. How are planners handling this challenge? This month, *MPA News* provides a sample of reserve-planning cases in which the topic of increased yields was introduced, and describes what role it played in shaping stakeholder sentiment. In the next article (page 3), *MPA News* asks three scientists what promises can be made to stakeholders on the benefits of reserves to their community and environment. Readers are invited to compare and contrast the articles.

No-take MPAs in the Philippines

More than 400 community-based, no-take MPAs have been designated in the Philippines since 1980. Initiated largely as part of NGO-directed coastal management projects, Philippine MPAs are approved by local government units following extensive public consultation. With many Philippine coral reefs severely overfished, the potential for larger catches flowing from the protected areas is an attractive concept to fishing communities.

Liza Eisma is executive director of the Coastal Conservation and Education Foundation (CCEF), a Philippine NGO that has helped guide several MPA-planning processes. She says the issue of increased yields comes up regularly in community discussions with CCEF personnel. “Our community officers will discuss the present state of the fisheries in the nation (and in the locality if there is available data), the issues and

challenges, and the potential benefits of MPAs,” she says. “But they do not necessarily promise an increase in fishery yields. More, they focus on how MPAs can address the issues of fisheries degradation and overexploitation. Our officers explain the science of MPAs in the simplest terms, how they can contribute toward fishery enhancement, and how they can render socioeconomic benefits to the community over time.”

Eisma says the level of community support for MPAs in the Philippines is not entirely dependent on the expectation of increased fishery yields, although that expectation is a leading factor. “The creation of MPAs is also attributable to the community’s sense of ownership of the sanctuary, stewardship for its protection, and increased income in tourism through user fees,” she says. She adds that when MPAs fail to protect resources — which occurs as much as 90% of the time in the Philippines, according to researchers (*MPA News* 2:11) — it is usually due to lack of local governmental support or enforcement, or conflicts between user groups. It is not due, she says, to community frustration from lack of increased fish yields, leading to non-compliance. In fact, Eisma knows of no MPAs that failed to result in increased fishery yields in surrounding waters. “There may be cases in which the increased yields took a longer time to occur than others,” she says, “but that can be attributed to poor siting of the MPA, pollution, siltation, mining operations in adjacent areas, or even to natural occurrences such as El Niño events.” Measurement of the yields has been conducted as part of community-based monitoring programs.

Danny Ocampo was a community officer for CCEF on three MPA-planning processes, and still consults for the organization. (He is presently with Greenpeace Southeast Asia.) Ocampo says the processes focused on comparing past and present fishery catches, and how stakeholders wanted their resources to be in the future. “We discussed the possibility of establishing a protected area, or ‘fish breeding area’, to help restore the fish population in the sanctuary and eventually on the surrounding reefs,” he says. “We never gave them a hard figure for what to expect in terms of fishery yields.”

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Ocampo says community participation was based on the concept of assuring future generations a bountiful harvest. "There were some fishermen who said they joined the effort not because they wanted more fish for themselves but for the next generations," he says. "In this case, community support was tied to the long-term goal of providing more fish to their children, while still focusing on the fact they expected the sanctuaries to replenish their dwindling fish stocks."

Some MPA-planning processes have involved firmer assurances of increased fishery yields than others. Brian Stockwell, a biologist at Silliman University (Philippines), has served as a fisheries consultant to more than 30 community-based MPA-planning processes in the Philippines. In these processes, says Stockwell, the primary reason for communities to establish MPAs has been simple: to increase fish catches. He says such expectations are reasonable, and has advised communities on what to anticipate. "I tell the community that fish stocks will increase outside the reserve, but not for five to seven years," he says. "We generally see a noticeable increase inside the reserve within two to three years." He also tells them the rate of increase is dependent on the types of fishing gear used outside the reserve. "MPAs will not be effective if gear that destroys habitat and targets juvenile fish is used," he says. "This means ceasing gear such as blastfishing, cyanide, and fine mesh nets."

Stockwell is confident that fish yields will indeed increase as a result of reserves, although he acknowledges that few studies have conclusively proven such increases to occur. He attributes this to poor sampling design and the length of time required for adequate studies. "The only study I am aware of in which fishing improved over time in the Philippines was at Apo Island, which required more than 10 years of data collection," he says. He aims to demonstrate that Apo Island was not an isolated case. With other researchers, he is planning a series of fishery-yield studies near MPAs to examine the subject.

Like Eisma, Stockwell says the failure of many Philippine MPAs has little to do with a community not seeing an increase in fishery yield. "One of the main reasons for failure is that the community did not fully support the MPA in the first place, and thus poaching occurred," he says. "Those MPAs that have worked are the result of social workers first living with the community and educating them on the benefits of MPAs." In other words, he suggests that for fishery yields to increase, fishermen must first be convinced the yields will increase. Compliance and larger catches will result.


Multi-use MPAs in Colombia

In the San Andrés Archipelago of Colombia, a four-year process to map and zone three multi-use MPAs (the "Seaflower MPAs") is concluding this year. The community-based process, featuring creation of no-take

and no-entry zones within the MPAs, was keenly influenced by the potential for larger local fishery yields. Granted, much of the increase would come from reallocation of fishing rights: locally based fishermen are almost entirely artisanal, and they voted to create large zones where only artisanal fishing was allowed, thus excluding rival, off-island-based industrial fleets. (Overall catch will be reduced under the plan, although artisanal fishermen will be allowed a larger share.) But reserve effects were considered as well, beyond simply the placement of artisanal fishing zones near no-take areas.

Marion Howard is former coordinator of the MPA project for CORALINA, a regional Colombian government agency that oversees the archipelago's natural resources and sustainable development. "Fishers expect that if no-take zones and no-entry zones include entire ecosystems and essential habitat, the MPAs will eventually replenish some fisheries," she says. "To fishers, this is common sense. CORALINA told the community that there was no guarantee of spillover effects because whether productivity would increase, and in what timeframe, would depend on an array of ecological and human factors. However, we did cite studies and anecdotes — as did visiting experts — that indicated that increased productivity and spillover would happen with proper management."

Howard says the expectation of increased fish catches from conservation was very important to securing community support for the project. "Asked if MPAs would benefit them, 96% of local fishers surveyed during planning said yes, and the main reasons given were improved marine conservation and productivity," she says. "Also, 97% of fishers said some zones should be closed to extraction, showing that fishers link catch with conservation and are aware that degraded habitats and ecosystems are less productive."

Howard says that what a community should expect in terms of impacts from a new MPA depends on the site and the MPA design: i.e., the planning process, objectives, zoning, administrative structure, management, and regulations. "MPAs should be designed and managed to satisfy local needs — in addition to international and national conservation and sustainable development goals — and to address problems at the particular site," she says. "MPA design cannot follow a formula or adhere to set protocols, and impacts cannot be predicted with any degree of certainty. Therefore, it is important that the users themselves choose MPAs as their preferred management alternative. Planners, managers, and scientists should be frank with the community about what is known and unknown, and the planning process should be open and transparent. Furthermore, stakeholders should be actively involved from the beginning and participate in decision-making, if legally possible, so that ownership and responsibility for impacts are shared." 

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Scientific Opinion on Promises of Higher Fishery Yields

MPA News asked three scientists what they considered to be fair or unfair assurances to stakeholders on the fishery effects of marine reserves. The scientists, who have each published previously in *MPA News*, were:

Trevor Willis of the University of Bologna, Italy (see "The Science of Marine Reserves: How Much of It Is Science?", *MPA News* 5:6)

Ben Halpern of the University of California Santa Barbara, USA (see "Moving the Discussion About Marine Reserve Science Forward", *MPA News* 5:7)

Tundi Agardy of Sound Seas, a US-based NGO (see "Dangerous Targets And Inflexible Stances Threaten Marine Conservation Efforts", *MPA News* 3:11)

The following pieces are in the words of each scientist:

Trevor Willis: "The biggest promise that should *not* be made is that local fishery yield will increase"

The biggest promise that should *not* be made is that local fishery yield will increase. Sure, one can raise the possibility that it could happen, but even if the peculiarities of a particular place allow local replenishment outside reserve boundaries to occur, it will take time. The problem is that we have no empirical means of predicting whether (and if so, when) yield *per se* will benefit from reserves for particular places and species – only general theoretical principles. It is even more difficult to obtain data that demonstrate contributions to production from reserves, and the best examples we have so far come from tropical multi-species fisheries. Temperate examples are hard to come by. A more realistic promise might be to postulate no loss to the fishery if a reserve is implemented (there are a couple of examples where this has happened — catch per unit effort did not decrease even though the area fished was reduced). If benefits to local yield accrue in the future, great, but it is a dangerous promise to make.

We can now be fairly certain that *not* fishing in a particular area will protect a resident proportion of a population that was previously fished. This allows those individuals to grow and provide a source of recruits that will disperse outside the reserve (how far depends on the species). From the fisheries perspective, this is the old idea of "insurance" against recruitment overfishing. Such measures may have prevented some of the catastrophic collapses of previously productive fisheries, and may yet prevent future ones. It certainly does no harm to have more eggs in the water.

One of the more important things that might be more effectively communicated to stakeholders is that the biological effects of MPAs are not yet well-known. This should be regarded as a good reason to implement them, rather than an argument against them. Our limited

experiences to date indicate that reserves are likely to reinstate "lost" ecosystem processes and, as such, provide valuable controls for learning about the effects of fishing. At a time when fishery biologists are beginning to embrace concepts of ecosystem-based fishery management, it is surprising how little emphasis has been put upon the idea of using unfished reserves to determine general management goals. It is absolutely safe to promise that no-take reserves can serve this function, for the greater good of a given fishery. Such concepts are less tangible and therefore more difficult to communicate than "it will give you more fish", but are long-term functions for reserves that can potentially ensure the productivity of a fishery better than any local-scale spillover.

Ben Halpern: "Some species will rebound sufficiently and quickly enough to provide rapid and large benefits to some fishermen"

It is always difficult, and dangerous, to make promises, but there are fisheries effects of marine reserves that one can almost certainly expect, and some that one can be almost certain will not happen. Here I focus on just two of the many of each kind. It is also important to remember that fishermen are only one of many stakeholders with interest in marine resources, such that reserve goals, and therefore expectations, should always represent a balance of these interests.

Highly likely: 1) *Some species will rebound sufficiently and quickly enough to provide rapid and large benefits to some fishermen.* The scallop example from the Georges Bank closures off of New England, USA, where catches in adjacent waters increased dramatically within a few years, is an excellent example of this (*MPA News* 2:3). In general, fast-growing species that recruit frequently, are not highly mobile, and that have not been decimated by fishing should rebound more quickly, although there will always be exceptions. 2) *In the long term (10-20 years), larger-scale reserve networks will be better at sustaining more stable, and maybe more abundant, fish populations than could traditional gear and effort regulations.* This stability (and abundance) results from reserves allowing large, fecund individuals to survive and reproduce, whereas traditionally regulated fisheries (except for extremely effective slot fisheries) will always target and remove the largest individuals first (significantly reducing reproductive output and the population stability provided by this output).

Highly unlikely: 1) *Every single species will benefit from the creation of marine reserves.* This is almost certainly not true, and it is hard to imagine any single management strategy that could do this. 2) *Marine reserves will replace the need for any other form of management.* Unless reserve networks are very large (>50% of the total area), there will always be a need for other regulations for at least some species outside the reserves.

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Tundi Agardy: "It is better to focus on the undisputed benefits"

I am confident we can say that MPAs are an important — perhaps the most important — tool for conserving marine habitat to protect biodiversity (and, to a lesser extent, to conserve ocean wilderness). Well-designed and -executed MPAs can prevent habitat destruction, fisheries overexploitation, and damage to ecosystem dynamics caused by selective removal of ecologically important species at the site. MPA designations raise attention and political will to better address even indirect threats like pollution. There is also some evidence of "biodiversity spillover", or increased species richness in adjacent areas.

What is more contentious is the extent to which MPAs, and the newer MPA networks modeled on larval dispersal, can enhance or restore fisheries in adjacent areas. While build-up of biomass has been shown to

occur outside MPAs in some areas (e.g., scallops on Georges Bank), it is hardly a universal phenomenon, and the problem of displaced effort is a real one with which MPA planners have to contend.

It is better to focus on the undisputed benefits: protection of unique areas, maintenance of biodiversity, conservation of essential fish habitat, and protection of culturally important areas. Stakeholders should be told that MPAs can help reduce user conflicts and better integrate the management efforts of different agencies, both necessary to attain the goals listed above. Scientists should be truthful about uncertainties, and stress how MPAs can further ecological knowledge and understanding about management effectiveness and potential. But we should admit that deriving these many benefits requires active management and enforcement, costly as these things can be. 

Bottom Trawling Prohibited Below 1000 Meters in Mediterranean


All areas of the Mediterranean and Black Sea deeper than 1000 m will be permanently off-limits to bottom trawling, according to a decision in late February by the General Fisheries Commission for the Mediterranean (GFCM), the main intergovernmental fishery management body in the region. The binding measure will take effect in late June 2005, although individual GFCM member states may object in the meantime to its applying to them.

The prohibition was influenced by a comprehensive study, conducted in 2004 by WWF and IUCN, on the status of deep-sea ecosystems in the Mediterranean basin. The study recommended as a precautionary measure that fisheries be prevented from extending beyond 1000 m; the measure would protect deep-sea biodiversity, including the nurseries of juvenile deepwater shrimp. That depth represents the current technological limit for most of the Mediterranean deepwater shrimp fleet. Much of the Mediterranean deep sea, with depths to 5000 m, remains unexplored by science or industry. (The IUCN/WWF report, *The Mediterranean Deep-Sea Ecosystems*, also called for a representative network of deep-sea MPAs in the region and is available online at <http://www.panda.org/downloads/marine/bookmeddeepsea.pdf>.)

GFCM has released no official figure on the size of the pending gear closure. However, biologist Sergi Tudela of WWF-Mediterranean estimates it at 55% of the entire basin surface (including the Black Sea), or 1.63 million km² in total. This would be larger than the 950,000-km² bottom-trawl closure recommended in February for the Aleutian Islands in Alaska (*MPA News* 6:8). In comparison, the Great Barrier Reef Marine

Park, widely considered the world's largest MPA, is roughly 350,000 km².

Enforcement of the measure will be the responsibility of the 24 member states of the GFCM, which surround the Mediterranean sea. Part of the closure will be within the 12-nm territorial seas of these states, but most will be on the Mediterranean high seas, outside of national authority. Enforcement of the latter portion will be more complex and challenging, as is the case with high-seas governance (*MPA News* 5:4). Tudela points out, however, that the areas that would have been most accessible to advances in gear technology are generally closer to coasts: that is, in territorial seas rather than deeper international waters. "So those waters within 12 nm are important," he says. He adds that regional fisheries ministers are discussing the concept of implementing fisheries protection zones beyond coastal states' 12-nm limits, which could have the effect of helping states enforce the trawl prohibition.

Fishing industry response to the measure has been relatively muted so far, although European industry representatives with interests in other regions have expressed concern that it could spread as a concept to other parts of the world. There have also been statements that the firm 1000-m limit unnecessarily excludes some promising fishing grounds slightly beyond this depth while leaving open some shallower but still fragile areas, including sites with deepwater corals. François Simard, marine program coordinator for the IUCN Centre for Mediterranean Cooperation, says a regional network of MPAs could protect unique seabed ecosystems too shallow to be covered by the prohibition. 

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Notes & News

Queensland designates three MPAs with indigenous help

The Australian state of Queensland has negotiated with indigenous communities to designate three new MPAs to protect against the effects of coastal development on important underwater habitats. Called Fish Habitat Areas, or FHAs, the sites are the newest of 71 such areas designated throughout coastal Queensland (*MPA News* 6:3), and the first to involve indigenous interests in planning. Any activities requiring the disturbance of habitats within FHAs are either prohibited or require special authorization, depending on site regulations. Fishing is allowed.

The new FHAs, all in north Queensland, are the result of three years of consultation and negotiation between the state's Department of Primary Industries & Fisheries and local indigenous communities. The negotiations largely involved exclusion of particular locations from the FHAs to allow for future small-scale development. Two of the new FHAs are on Cape York and together total 594 km²; the third is in Bowen and measures 197 km².

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Report available on MPAs in Tanzania, Zanzibar

A new World Bank report offers a framework for developing a comprehensive system of multi-use MPAs for Tanzania and Zanzibar within the next 50 years. *Blueprint 2050: Sustaining the Marine Environment in Mainland Tanzania and Zanzibar* emphasizes the use of community-based adaptive co-management to build a flexible system of MPA networks. The Tanzanian government in 2003 announced its intention to set aside significant portions of its waters as multi-use MPAs in coming years, including 20% of its seas by 2025. Government officials have endorsed the new publication.

The report stresses incorporation of poverty reduction as a goal in MPA management. Jack Ruitenbeek, an independent consultant who co-authored the report with Indu Hewawasam (World Bank) and Magnus Ngoile (Tanzanian National Environmental Management Council), says managers who ignore poverty do so at their peril. "By ignoring the linkages between ecosystem management and poverty alleviation, threats to ecosystem integrity increase if local populations see MPAs as a threat," says Ruitenbeek. "This has been a recurrent problem, for example, in enforcing the no-take areas of Tanzania's Mafia Island Marine Park." *Blueprint 2050* suggests that poverty improvement will arise from three mechanisms: greater fishery catches over time (namely from stoppage of unsustainable

fishing methods such as dynamite fishing), availability of methods for generating alternative income, and greater local empowerment. The report recommends establishment of a Marine Legacy Fund to assist in funding the MPA system; the fund would draw upon multiple sources of income, potentially including deep-sea fishery license fees, tourism charges, and oil/gas royalty shares, among others. The 140-page report is available for US \$20 from the World Bank bookstore. To order, go to http://publications.worldbank.org/ecommerce/catalog/product?item_id=4610653.

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Report: 20-30% of UK waters should be no-take

The British government agency responsible for wildlife conservation has called for 20-30% of each marine habitat in the UK to be protected from all extractive use. In a strategy report released in March, English Nature said the scale of this protection was necessary to promote recovery of overexploited marine ecosystems, and that some habitats might require protection even beyond the 30% target. The report also called for introduction of a marine spatial planning system for UK waters, incorporating the network of protected areas as well as zones allowing various resource uses. The percentage-based call for no-take areas echoes that of a recent report by Britain's non-governmental Royal Commission on Environmental Pollution, which recommended that 30% of UK waters be set aside as no-take (*MPA News* 6:7). Currently, less than 1% of UK waters are closed to all extractive use.

The English Nature report marks a new approach in the UK, based on management of whole ecosystems rather than individual habitats and species. Many of the changes advocated by the agency, like the spatial planning system, would require enabling legislation from Parliament. A draft bill potentially including these changes is likely to be drawn up by the middle of next year, says Kate Bull, maritime protected areas officer for English Nature. "English Nature would like to see a fully operational marine spatial planning system in place in UK waters by 2012," says Bull. She notes this goal is in line with a global target for establishment of representative MPA networks set at the World Summit on Sustainable Development (*MPA News* 4:3). The 70-page report *Our Coasts and Seas: Making Space for People, Industry and Wildlife* is available online at http://www.english-nature.org.uk/science/coasts_and_seas/default.asp.

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Publication available on Russian MPAs

Russian Conservation News, a quarterly magazine, has produced a special issue devoted to marine and coastal protected areas in Russia. It is the first-known overview of Russia's federal level MPA system, which consists of 31 sites in the Arctic Ocean, Pacific Ocean, and Black and Caspian Seas. In all, 93,000 km² of marine area are protected under various regulatory frameworks. The 41-page special issue includes an introduction to general Russian MPA issues, case studies of eight MPAs, and data on each of the 31 sites. *Russian Conservation News* is published by the Center for Russian Nature Conservation, a project of the Tides Center, a US nonprofit organization. To order a copy of the special issue (Issue #36), send a US \$5 check payable to "CRNC/Tides Center" to *Russian Conservation News*, PO Box 57277, Washington, DC 20037-7277, USA.

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Book available on Barents Sea protected areas

A new book provides an introduction to the protected areas of the Barents region of Europe, comprising the northern parts of Finland, Norway, Russia, and Sweden, as well as the Barents Sea. Featuring detailed descriptions of 55 protected sites, including 20 with marine habitat or coastlines, the book establishes a baseline for measurement of resource protection in the region.

The site descriptions provide information on legislative status, geographical features, habitats, species, access, regulations, accommodations, and management contacts. An appendix lists 1200 additional protected sites in the region, including more than 200 marine or coastal protected areas.

Author Morten Günther of Norway's Svanhovd Environmental Centre says that although few protected areas in the region were designated specifically to protect marine biodiversity, there are sites with substantial marine portions. More than half of Russia's 42,000-km² Franz Josef Land Federal Zakaznik, for example, is marine — 26,000 km². The main challenges facing MPAs in the Barents region, he says, are climate change, overfishing, and petroleum industry activity.

The 376-page *Field Guide to Protected Areas in the Barents Region* is available for NOK 348 (US \$56) plus postage. To order, send a request by e-mail to fieldguide@svanhovd.no. More information on the book is available in PDF format at <http://www.svanhovd.no> and at <http://home.online.no/~egnter/Field%20Guide%20Promo.pdf>.

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International workshop: establishing MPA networks

An international workshop will discuss an initiative of the World Commission on Protected Areas-Marine to develop a framework for establishing representative networks of MPAs by 2012, a goal set by the UN Convention on Biological Diversity in 2004 (*MPA News* 5:9). The workshop will examine the efficacy of the framework — developed for national policymakers and practitioners — and allow participants to share their experiences in establishing MPA networks. It is scheduled for 15-17 July 2004 in New Orleans, Louisiana, USA. Discussions will cover approaches to planning and development of MPA networks at ecosystem-relevant scales, integrated within national and regional frameworks of sustainable development and marine and coastal management. Participation will be by nomination only; limited financial assistance will be available. For more information on the workshop, including a nomination form, e-mail Annie Hillary at Annie.Hillary@noaa.gov or Lynne Mersfelder-Lewis at Lynne.Mersfelder@noaa.gov.

Letter to the Editor

Dear *MPA News*:

Incorporating the potential impacts of climate change into MPA planning is certainly a wise approach. Often we focus on the root causes of climate change while forgetting that there are tangible actions we can take in response to ecosystem change.

In your March issue, *MPA News* published a list of six things for managers to consider ("Advice for coral MPA managers on managing for climate change"). I would like to suggest a seventh item. In American Samoa, a US territory in the central South Pacific, managers have been encouraging, investing in, and facilitating research into areas of coral reef science linked to climate change. For example, Chuck Birkeland of the University of Hawaii has begun a three-year study in American Samoa investigating genetic and physiological differences between corals inside and outside of bleaching-prone areas. If genetic differences exist, this will have implications for selected area management, as these areas may make good seed banks in the event of mass mortality.

Additional studies have examined factors that may provide increased natural resilience and resistance to climate change and therefore allow for longer term MPA success. Specifically being investigated are the amounts of UV shielding that mycosporine-like amino acids confer in corals of the lagoons and nearshore (cooler, deeper) reefs of Ofu Island in American Samoa. These results may provide evidence that a number of Ofu coral species are more tolerant of high levels of UV irradiation, suggesting that some reef areas are more resilient to climate-change stress. Much of this work was made possible by work of Peter Craig and Eva DiDonato, both of the National Park Service (DiDonato has since moved on), and this has proved to be a model for interagency and federal-state/territory collaboration.

While we may not be able to address the causes of global climate change in small island settings, I encourage managers to understand all aspects of their resources as best as possible, as such knowledge will undoubtedly assist with long term management efforts.

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