

MPA NEWS



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Managing an MPA on the uncertain frontiers of climate change

Under current greenhouse gas emissions rates, climate change will alter ocean ecosystems dramatically in the coming decades. According to [a study earlier this year](#) on MPAs and climate change, even no-take protections may not offer much long-term cover from dramatic disruption, including significant shifts in species and habitats.

This is why University of North Carolina biologist John Bruno, who led that study, apologized in advance for his “trite” answer when MPA News asked what advice he would give reserve managers. “I think all we can do is to push for a rapid reduction in greenhouse gas emissions,” Bruno said.

Point taken – but as long as the world can still turn around its greenhouse gas emissions trajectory, it is not yet time for MPA managers to throw up their hands and give up. A UN science panel, in a stark call to action issued in October, [said](#) the world still has time to limit warming to within 1.5 degrees Celsius if “rapid, far-reaching and unprecedented changes in all aspects of society” are made. What’s more, MPAs have a role to [play in mitigating emissions](#) by conserving blue carbon and “fish carbon” stocks.

It will not be easy. Many MPA managers can expect to manage for community- and ecosystem-level shifts even in an idealistic, best-case scenario. And while MPAs may not escape the effects of sustained warming over the next century, right now the world [is counting on them](#) to be refuges for ocean biodiversity.

MPA managers are already dealing with practical realities of climate change, which tend to stress already-slim management capacities and budgets. Often MPA managers are on the front lines of observing emerging changes in the ocean, even if it may not always be clear how to attribute them.

In 2017, [we had several experts](#) weigh in with advice on what MPAs can do about climate change over time. This month we ask practitioners what they are doing *right now* to address the challenges they’re already experiencing. And we ask them how MPA management strategies are changing to take emerging climate change trends into account, especially when there is uncertainty.

In next month’s issue, we will continue our climate change coverage but will focus on MPA planning as opposed to management, including how climate adaptation can be integrated in the design of new MPAs.

Tracking down trends across oceans: Hawaiian Islands Humpback Whale National Marine Sanctuary (US)

For the last few winters, beginning [in late 2015](#), sightings of humpback whales have generally been occurring later and in fewer numbers within the [Hawaiian Islands Humpback Whale National Marine Sanctuary](#) and surrounding waters. Sanctuary staff and area scientists, however, don’t have enough data to entirely understand the trend or its causes.

That ocean warming is at work is a primary hypothesis, says Ed Lyman, the sanctuary’s natural resources management specialist and large whale entanglement coordinator. One theory is that warming may be changing the humpback whales’ food availability, causing their behaviors (habitat usage, migration, distribution) to change, he says.

If that is true, however, it is still hard to know whether long-term warming or a cyclical climate factor is at work. “Is it the El Niño?” says Lyman. “Or is it the Pacific Decadal Oscillation? Or is it something broader that is not cyclical, like climate change? We’re not there yet.”

Lyman says the sanctuary hasn’t hit any panic buttons yet. “We have been saying things like ‘the whale sightings are down,’” he says. “We don’t even know whether it’s their numbers that are down or if they’ve just moved elsewhere.”

So the challenge that the sanctuary is facing now is simply understanding what is happening. “We are looking at more ways to quantify the changes that we’re seeing,” he says. The sanctuary is taking two main approaches to this:

- *Collecting more data at home:* It is not easy to get a sense of overall humpback whale populations. “It’s a big ocean,” says Lyman. “They are big needles in a big haystack.”

“All of us have upped our game and have added different techniques and tools,” he says. “For example, the sanctuary wants to use drones more to better quantify the health of the animals.” In 2017, the sanctuary also hired a marine bioacoustics and whale behavior expert (Marc Lammers) whose expertise in studying whales through their sounds is certain to help.

- *Working across the whales’ range:* The Sanctuary has already collaborated with researchers and managers in Alaska – the location of the whales’ summer feeding grounds – but the collaboration is growing stronger in order to understand changes and trends across the population’s range. Scientists in Alaska are also seeing similar trends, with fewer sightings and thinner whales in some areas.

In November, researchers from both states will hold a meeting in Hawaii to review current information and form a strategy to understand current trends. “We’ll look at existing information and the tools and techniques at our disposal to fill in the gaps,” Lyman says.

Making a realistic plan with community input: MPA Adapt project in the Mediterranean

The Mediterranean is one of the marine regions already hardest hit by climate change. With more tropical water temperatures have come invasive species, jellyfish blooms, shifts in native species ranges, and [mass mortality events](#), among other impacts.

María del Mar Otero, an expert in the marine program within IUCN’s Centre for Mediterranean Cooperation, explains that another big challenge is that tourism within MPAs is increasing as the summer season comes earlier. “They need more staff, and they don’t have it,” she says. “So there is less funding and more administration and work to do, and more decisions to make.”

As of 2016, few MPAs in the region had included climate change in their management plans. That year, partners from four countries launched [the MPA Adapt project](#) with five pilot sites: Brijuni National Park (Croatia); Pelagie Islands MPA and Portofino MPA (Italy); and Bonifacio Strait Nature Reserve and Port-Cros National Park (France). The project, which will conclude in May 2019, is supporting the five MPAs as they develop climate adaptation action plans and integrate them into existing management strategies. Ultimately, the goal for the partners is to learn from these five sites to lead other Mediterranean MPAs through the same process, as well as develop basin-wide approaches.

Otero says the project began with trainings for the MPAs on how to conduct rapid vulnerability assessments, related to both biodiversity and socioeconomic factors. Each pilot site has picked relevant indicators to monitor, such as fish stocks or seagrass health.

“Some are focused on tourism and fisheries, and others have been focusing on specific habitats or species,” says Otero. “As part of the assessment, each is working with local stakeholders and discussing ideas for how an MPA might adjust its management plan or monitor changes.”

For example, she says, MPAs can monitor climate change with fishers, or take a proactive approach to catching invasive species for consumption to keep their numbers down. “The focus of all the activities is not around the literal boundaries of the MPA, but around the broader social communities that are impacted by it,” says Otero.

In this sense, capacity-building workshops with divers and fishers, as well as general awareness-raising activities, are important elements of the work. When the project is completed, each MPA will have its own “packet of activities” based on a menu of climate change strategies adapted from other regions.

One lesson from the vulnerability assessments is that it is important to choose a realistic initial timeframe. This is because there are few long-term climate change projections and scenarios at the local scale, Otero says, making it hard to create fine-tuned plans for far into the future.

"Most of the MPAs are projecting impact scenarios on a 20-year timeframe, using their monitoring data from recent years to project relatively near-term trends," she says. For individual sites, projecting beyond that 20-year horizon is difficult until longer-term data sets are ready at the local scale. In any case, says Otero, the managers recognize one thing: "To achieve a management plan in this time of climate change, they need to be able to see as far ahead as they can."

Grappling with emerging disturbance events: Caribbean and Gulf of Mexico MPAs

Sargassum is a brown macroalgae that naturally drifts and aggregates in the Atlantic Ocean, providing essential habitat for several commercially important fish and protected species. It has always washed up on some Caribbean and Gulf of Mexico beaches. In moderate amounts sargassum has crucial benefits on shore, building beaches and supporting a flourishing ecosystem.

But in recent years, sargassum has become a growing social and economic nuisance in the region. Massive, unprecedented influxes of sargassum have turned previously white sand beaches into seas of brown, causing a bad stink as the algae decomposes and causing concern about tourism economies in some areas. Although the causes are complicated, scientists believe that both coastal pollution and [climate change](#) – through warming seas and changing winds and ocean currents – are among the factors involved.

It is an emerging problem for MPA managers in the region, says Emma Doyle of the Gulf and Caribbean Fisheries Institute (GCFI). And it is one that many are ill-prepared to deal with, based on [2017 capacity assessment](#) of more than 30 MPAs in the region that GCFI co-led through its MPACoast program.

In the assessment, most MPAs reported they have low capacity to respond to disturbance events in general, such as hurricanes or oil spills. "The sargassum influx is a good example of another type of disturbance event that's affecting MPAs and challenging their management capacity," says Doyle. What's more, in the face of multiple competing needs, many managers don't list capacity building for managing these kinds of events as a high priority.

Nonetheless, MPAs – especially along coasts where tourism is important – are being pressured to dedicate scarce financial, human, and infrastructure resources to sargassum removal. That is not always a good idea, says Doyle. "Efforts to clean sargassum from MPAs are particularly challenging and sometimes questionable," she says. "In theory, MPAs – more than anywhere – are the place to let nature take its course."

She acknowledges, though, that where the sargassum influx has been particularly extensive, MPAs face the same negative impacts as other coastal areas. The rotting smell of hydrogen sulfide, for example, and detrimental effects on water quality from in-water decomposition can negatively impact the health of important reefs, seagrass, and associated sea life that MPAs seek to protect. "So the pros and cons of cleaning/removal of sargassum in MPAs need to be weighed carefully," says Doyle.

She says some in the private sector are turning to costly and untried infrastructural solutions to the sargassum invasion, and these could bring further environmental impacts on coastal habitats or exacerbate beach erosion. "In the rush to tackle the sargassum influx we are seeing over-grooming of beaches by hotels located within some MPAs, with ever-worsening beach erosion and a toll on sea turtle nesting and hatching," she says.

So what are the near-term solutions that could be explored for MPAs and beyond?

GCFI has worked to provide guidance on specific best practices for beach cleaning, but Doyle says there is a real need for response planning at a national level. This kind of response would agree on priority beaches and other areas such as fisheries landing sites to clean, support communications so that communities and visitors know where to find clean beaches, and set best practices for beach cleaning and appropriate disposal of the sargassum. Doyle cites some recent useful responses:

- The Cayman Islands Department of Environment recently adapted GCFI's best beach cleaning practices to fit with their regulations and processes.
- Saint Lucia Fisheries Department has developed a national sargassum response plan.
- Barbados Sea Turtle Project has developed protocols for rescuing and reviving sea turtles stranded in sargassum.
- STINAPA Bonaire, the national parks foundation, rallied the community island-wide to help clean up Lac Bay, an important Ramsar site.

Beyond the sargassum issue, Doyle cites several other ongoing climate management projects in the Caribbean region. For example, [Local Early Action Planning \(LEAP\) tool](#) has been adapted from the Pacific to the Caribbean, and proven valuable in helping MPA managers and communities to work together in planning for adaptation to climate change, she says. Analyzing the possible impacts of climate change on the biology and ecology of commercially important species can help fishers associated with MPAs anticipate changes in catch and fishing effort. Developing coral bleaching monitoring and response plans is another activity that Caribbean MPA managers are undertaking.

More broadly, says Doyle, "When it comes to climate change, partnering with communities and with relevant agencies is important as MPAs can't do it alone. But they can manage for resilience and can catalyze action and resources for sustainable livelihoods."

Developing flexible and responsive management plans: Nosy Hara National Park, Madagascar

In 2017, Nosy Hara National Park in northwest Madagascar became one of [the first MPAs in the country](#) to incorporate climate change in its management plan. (Nosy Hara is managed by Madagascar National Parks and is part of WWF's high-priority Northern Mozambique Channel transboundary seascape.) This emerged from an EU-funded project that examined climate change at Nosy Hara and five other MPAs worldwide. Through the project, WWF and partners developed a methodology called [CAMPA](#) – Climate Adaptation Methodology for Protected Areas – which guides MPA managers to integrate climate change issues in their work.

Harisoa Hasina Rakotondrazafy, WWF's climate change adaptation coordinator in Africa, says Nosy Hara is already experiencing climate change issues including higher sea temperatures, less rainfall, higher salinity in the dry season, and more intense winds. The winds are now limiting the local community's ability to pursue open sea fishing – their main source of income – during a longer part of the year than in the past.

"Based on the climate change vulnerability assessment done in Nosy Hara five years ago in partnership with several experts, coral reefs are in relatively good health and appear to be recovering from a recent bleaching event," says Rakotondrazafy. "However, fish populations are exhibiting signs of overexploitation and could compromise the ability of the reefs to recover from future bleaching events." For mangroves, she says, climate change is exacerbating the impact of anthropogenic pressures on already degraded forests. In turn, this combination of climatic and non-climatic stresses is increasing the vulnerability of seabirds and marine turtles that nest in the mangroves.

According to a [WWF case study report](#), Nosy Hara's vulnerability assessment helped identify priority adaptation options to support the MPA's strategies. These included mangrove restoration and supporting coral reef resilience, as well as creating alternative income sources for the local fishing community to lessen their dependence on fisheries. Findings supported the update process of the Nosy Hara Management Plan in 2017.

"Climate change was particularly considered at the threat analysis level, which looks at climate implications for the conservation targets and people's livelihoods," says Rakotondrazafy. "The vulnerability assessment done in Nosy Hara was the first of its kind and really helped to put in place the baseline regarding climate-related information."

A big challenge was that long-term and downscaled (local-level) climate information on coastal and marine areas – information needed to inform the threat ranking – was often missing. "Rigorous and continuous monitoring of climate data, coupled with ecological monitoring, will be key to help track the impacts on key conservation targets and to put in place the right strategy," she says.

She notes that distinguishing between climate and non-climate concerns – while also recognizing their interrelation – can be difficult. "Linking the climate and non-climate threats is generally an issue where it creates some complications in the threat analysis," she says. "We should not see climate change as a stand-alone threat. There is a need to look at how it directly affects the targets and how it exacerbates the existing anthropogenic threats. MPAs need to manage both types of threat."

Conservation targets in the long term: Takeaway thoughts

On a longer time scale, as climate change continues to affect conservation targets, Rakotondrazafy expects MPAs will need more creative thinking and flexibility.

"The key question to ask is whether the core of the current MPA will still be viable in the future, in terms of climate impacts and other risks," she says. "MPA managers need now to look at larger management scales, like building more connections with neighboring MPAs. Because in the future, species will migrate to find more suitable areas, ecosystem function may change, and people from inside an MPA may move to other places, or new people may come to the area."

Along those lines, MPA News returned to Ed Lyman of the Hawaiian Islands Humpback Whale National Marine Sanctuary to ask him a hypothetical question. What would happen if whales stopped coming to their namesake MPA?

"It's way too early to go down that path," says Lyman. But if it does eventually happen, he says, it would certainly mean a change. "It would take our primary role away: protecting humpback whales and their environment. For the sanctuary, it would mean we would adjust our mission or we would move elsewhere, so to speak."

John Bruno at the University of North Carolina, whose climate research led off this article, says that as baselines shift, MPA managers may need to rethink their whole concept of what they are preserving.

"One of the strongest signals we're seeing is species range shifts," he says. "This means changing composition in most of the world's reserves. I think managers, over the decadal time scale, need to keep in mind that they may not be preserving specific populations, as environmental conditions change. They may have to change their thinking a bit and focus on preserving 'nature' – i.e., whatever species make it to a particular place and can tolerate or thrive in the conditions of the moment – and not obsess about preserving what's there right now. Because in most reserves, that's going to continue to change."

- This article was reported by Jessica Leber.

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Taking stock of Blue Carbon in MPAs

Coastal habitats are among the most threatened on earth. And as these habitats degrade, humans are also losing a potent way of removing carbon dioxide from the atmosphere, according to a new synthesis of blue carbon science in the latest issue of [Science for MPA Management](#), produced by MedPAN.

That is why marine protection – especially of vegetated coastal habitats like mangrove forests, salt marshes, and seagrass meadows – can be an important climate change mitigation tool. Such “blue carbon sinks,” largely near coasts, have some of the most intense CO₂ absorption capacities in the biosphere.

The report cites one study that concluded MPAs reduced mangrove loss in Indonesia by 14,000 hectares between 2000 and 2010, avoiding 13 million metric tons of carbon emissions. Evidence that marine protection can contribute to climate change targets can also help governments build broader support for conservation, the report notes. One barrier? Less than 20% of countries with blue carbon ecosystems reference them in climate mitigation plans, according to the report.

Strong climate action could save World Heritage reefs

There is a lot of discouraging news for coral reefs these days but a [recent UNESCO report](#) provides a small – if challenging – ray of hope. If the world can contain global temperature rise to within 1.5 degrees Celsius, which is the long-term target under the global Paris Agreement, the UN agency says World Heritage reef sites could potentially survive climate change.

The analysis looks at all 29 coral reef areas listed as World Heritage sites. Under business-as-usual greenhouse gas emissions, 25 out of 29 areas would severely bleach twice a decade by 2040, and all would experience annual severe bleaching by the end of the century. Many would cease hosting coral at all. However, if the world stays within a 1.5-degree target, severe annual bleaching would be avoided and only four areas would likely experience twice-a-decade impacts. Work is ongoing to revise the World Heritage committee climate change policy.

Additional climate change coverage in MPA News

- [MPA News poll: Amid a changing climate and ocean, what can MPA managers do?](#)(2017)
- [New Report on Ocean Warming Highlights the Role of MPAs in Combating Climate Change](#)(2016)
- [How MPAs can help mitigate impacts of climate change via coastal blue carbon, “fish carbon”, and more](#)(2016)
- [MPA Perspective: Climate Change and the U.S. National System of MPAs - Why Places Are Important](#)(2008)
- [In an Era of Climate Change, How Can Managers Ensure that Today's MPAs Remain Relevant Over Time?](#)(2006)

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