Big Ocean: A Network of the World's Large-Scale Marine Managed Areas

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Abstract: In December 2010 a large-scale MPA network entitled "Big Ocean: A Network of the Worlds Large-Scale Marine Managed Areas" was launched. Of the estimated 4,500 marine protected areas around the globe, the five largest are estimated to encompass 50 percent of all marine areas under management and protection in the world. These sites represent a growing trend in ocean protection: the establishment of large-scale MPAs. For twenty-five years, the Great Barrier Reef Marine Park and World Heritage Area served as the world's only large-scale marine conservation site, dwarfing the next largest sites in orders of magnitude making comparisons difficult. Between 2000 and 2010, four more large-scale MPAs were established: Papahānaumokuākea Marine National Monument and World Heritage Site, the Phoenix Islands Protected Area and World Heritage Site, the Marianas Trench Marine National Monument, and the largest to date at 210,425 mi^2, the Chagos Marine Protected Area. Planning is advanced for at least two more sites and the time of large-scale MPAs seems to have come. Large-scale MPAs compound existing challenges in marine conservation, while also bringing a specific set of issues and opportunities that are unique to such scales, and relatively poorly understood. This paper will review, successes and challenges, lessons learned, in addition to outlining the mandate and next steps for the "Big Ocean" network among the site managers and supporters of large-scale MPAs, inclusive of proposed and prospective sites.

I. INTRODUCTION

A. Background

For twenty-five years, the Great Barrier Reef Marine Park (344,000 km^2, or 134,363 mi^2) and the Great Barrier Reef World Heritage Area, served as the world's single truly large-scale marine conservation site, dwarfing the next largest sites in orders of magnitude that made comparisons difficult at best. In 2000, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (now Papahānaumokuākea Marine National Monument and World Heritage Site; 362,074 km^2, or 139,797 mi^2) came on the scene, focused on coral reefs and protection of cultural heritage in a remote part of the Hawaiian archipelago (PMNM 2008). Six years later, the Phoenix Islands Protected Area[4] (408,250 km^2, or 157,585 mi^2) in the Republic of Kiribati was established for its pristine nature and importance as a migration route and reservoir (Government of Kiribati 2009), as a third, grand Pacific site sharing many of the same attributes and challenges of Papahānaumokuākea and also listed as a UNESCO World Heritage site in 2010. In 2009, also in the Pacific, the Marianas Trench Marine National Monument (246,609 km^2, or 95,216 mi^2) was established encompassing only submerged lands and waters, celebrating tremendous volcanic

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[4] Designated as a UNESCO World Heritage Site in 2010.

undersea vents and remarkable geologic features (USFWS 2010). During 2010 the Chagos Marine Protected Area, now the largest MPA in the world (545,001 km^2 or 210,425 mi^2) and the first large-scale MPA to be designated outside the Pacific, was established in the Indian Ocean to protect a broad range of ecosystems, species, and habitats (CEN 2010; Owen 2010). During early 2010 the Government of Chile proposed setting aside a large area within its extensive Eastern Pacific Exclusive Economic Zone as a large-scale MPA. In October 2010, the Government of Chile declared a portion of this proposed area as the Motu Motiro Hiva Marine Park (formerly referred to as the Sala y Gómez Marine Park; approximately 150,000 km^2 or 57,900 mi^2) (National Geographic 2011). In addition, at the time of writing there are other large-scale MPAs being proposed through national, regional, and international initiatives that would significantly contribute toward the total global marine area actively managed for marine protection.

Of the estimated 4,500 marine protected areas around the globe, the five largest – Chagos Marine Protected Area, Phoenix Islands Protected Area and World Heritage Site, Papahānaumokuākea Marine National Monument and World Heritage Site, Great Barrier Reef Marine Park and Great Barrier Reef World Heritage Area, and the Marianas Trench Marine National Monument – are estimated to encompass approximately 50 percent of all marine areas under management and protection in the world[5]. These vast sites represent a growing trend in ocean protection -– the establishment of large-scale MPAs[6].

B. Rationale

The move toward establishment of such large-scale MPAs is clearly warranted. A few of the most commonly held assumptions underwriting the rationale for the establishment of large-scale MPAs include:

1. A need to increase the scale of marine protection efforts

The past two decades have seen not only an increase in the call for marine protection, but also for such protections to happen at increasingly larger levels of scale and area, including on the high seas. Calls and challenges for large-scale marine protection abound, and are reflected within existing scientific studies and consensus statements (e.g., Walters 2000), international agreements and declarations (e.g., IUCN 2005), as well as conservation literature, including best professional practices handbooks. The most recent and relevant of such calls arose out of the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity, held in Nagoya, Japan, during October 2010. Out of this meeting, the Parties agreed to the need to protect at least 10% of all of the world's marine and coastal ecoregions by 2020, noting the critical role that large-scale MPAs will play in order to achieve this target (COP 2010).

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[5] Source: These calculations were developed by Papahānaumokuākea Marine National Monument utilizing information from the UNEP-WCMC & WWF global database and website information from GBRMPA, PIPA and PMNM.

[6] "Large-scale MPAs" in this document is defined as a marine conservation area close to or over 250,000 square kilometers in size (approximately 100,000 square miles) that is actively managed for protection across the entire geographic boundary of the site. The term does not apply to geographic designations of habitat, foraging areas, or harvest restrictions that are not also accompanied by a corresponding management regime, administrating agency, or consortium of agencies.

2. A call for ecosystem-level management approaches

In recent years, science and policy, as a means to avert the collapse of ocean ecosystems worldwide, overturned the paradigm of managing single species or addressing singular issues to instead focus on managing entire ecosystems and seascape-scale ocean corridors through which highly migratory species, such as tuna, predictably travel across great distances. Successful examples of comprehensive marine ecosystem-based management, however, are few. Large-scale MPAs provide an opportunity to both meet this call while evaluating the benefits and challenges of ecosystem-level management efforts.

3. A complementary approach to smaller-scale MPAs

Most MPAs today exist as single site-based management efforts at smaller-scale levels near or in areas of moderate to high human population levels. In addition, most workshops and trainings regarding MPA site and network design and management, including technical capacity building and governance support efforts, are focused on smaller-scale MPAs along or adjacent to coastal areas. This includes a focus on community-based or locally-managed marine areas.

4. A need to protect remote marine areas

A rapidly-growing genre of marine protection efforts is in remote locations where human presence and impacts are relatively minimal (notwithstanding global impacts of climate change and ocean acidification etc.). Such remote, largely undisturbed areas can serve as important 'natural barometers' for Earth's oceans, and as such are increasingly of scientific and management interest. These remote areas are not only 'biodiversity banks' and 'safeguards' in the face of global change, but also provide unique research opportunities to better understand the effects of such global changes on areas with low to no human presence.

5. A need to protect and perpetuate cultural heritage and traditions

Some of the large-scale MPAs today have been created explicitly to serve as tools to support cultural heritage, including the transmission and perpetuated use of indigenous knowledge, cultural identity and practice by the first peoples of these vast ocean areas. Because many of these cultural heritage considerations and ocean traditions occur at large, oceanic scales, the reflection of such scale within the area designated is both logical and warranted. In the Pacific Islands, reclaiming traditions of ocean stewardship and indigenous navigation are serving as a powerful mandate and rationale for large-scale MPA operations.

C. Network Launched

Recognizing the need to learn from each other, site managers from the world's largest MPAs met together for the first time on December 6, 2010 at a summit called "Big Ocean: A Network of the World's Large Scale Marine Managed Areas" (Big Ocean 2010). The sites represented are all areas that approach or exceed 100,000 square miles (250,000 square kilometers), similar in size to New Zealand. The inaugural meeting of Big Ocean was held in Honolulu, Hawai'i at the US

Office of National Marine Sanctuaries in the National Oceanic and Atmospheric Administration. The meeting was co-convened by the Papahā naumokuā kea Marine National Monument (PMNM) and World Heritage Site in the U.S. Northwestern Hawaiian Islands, and the Phoenix Islands Protected Area and World Heritage Site (PIPA) in the nation of Kiribati in the central Pacific, under a bi-lateral "sister-site" relationship established between the governments of the Republic of Kiribati and the United States of America (Governments of Kiribati and USA 2009).

The founding members of Big Ocean who participated in the inaugural meeting are (in alphabetical order): the Chagos Marine Protected Area (United Kingdom); the Great Barrier Reef Marine Park and World Heritage Area (Australia); the Mariana Trench Marine National Monument (USA); the Motu Motiro Hiva Marine Park surrounding Salas y Gómez Island (Chile); the Papahānaumokuākea Marine National Monument and World Heritage Site (USA); and the Phoenix Islands Protected Area and World Heritage Site (Republic of Kiribati) (Big Ocean 2011a; MPA News 2011). These six sites together represent more than 2.3 million km^2 (approximately 900,000 $miles^2$) of ocean ecosystems (see Figure 1), roughly the same size as the Mediterranean Sea, or one-and-a-half times the size of the Gulf of Mexico.

II. NETWORK PURPOSE

Large-scale MPAs pose many unique management challenges and opportunities. The launch of the Big Ocean network included the development and release of a first-ever managers' communiqué on the importance, contributions and needs of large-scale MPAs (Big Ocean 2011a). The managers' communiqué was authored by the professional management staff of the inaugural member sites, recognizing that each site is in different stages of evolution and development. As stated within this communiqué, the six inaugural site members have agreed to establish the Big Ocean network in order "to work together and learn from one another to improve the effectiveness of our management efforts" (Big Ocean 2011a). Inaugural member sites also agreed to serve as "a learning resource and a supportive peer network, including for new or proposed large-scale marine managed areas" (Big Ocean 2011a).

A. Network Aims

The purpose of the Big Ocean network is straightforward: to provide a forum for communication and networking through which professional managers of large-scale MPAs can work together to be more efficient and effective in their management efforts. To do this, Big Ocean members identified three primary aims for the network: (1) to share information and experience in order to learn to how improve large-scale MPA management practice; (2) to collaboratively investigate and analyze large-scale MPAs in order to increase the conservation community's knowledge and understanding regarding how best to address the unique management challenges and needs associated with marine protection at a large-scale; and (3) to enable consistent and empowering communications between managers, management teams, and supporting partner staff among all member sites, while providing member sites with a united voice through which to share their learning, knowledge, and progress with the outside world (see Box 1).

Box 1: A description of the three primary aims of Big Ocean, as articulated by the founding member sites.

1. **Learning**

   - ☐ We will share information, analyze experiences, and develop lessons learned related to the management of large-scale and remote MPAs in order to improve our management ability and knowledge, and increase the effectiveness of our management actions.
   - ☐ We hope to serve as an information center and technical learning resource, and periodically develop informed management guidance based on our collective experience and group analysis. We will demonstrate successful large-scale marine protection efforts and set standards for practice.

2. **Knowledge**

   - ☐ We will increase our understanding of the world's oceans by working collaboratively together as a network and share resources to support scientific research in our sites, and employ or develop and test real-time remote sensing and surveillance technologies at our remote sites.
   - ☐ We will work together to develop research agendas, apply and test emerging technologies, and share approaches to design monitoring and evaluation efforts at scale.

3. **Communication**

   - ☐ [Internal] We will connect member site managers through regular communication and information sharing. Our network will serve to connect and support the efforts not only the management teams of participating member sites, but also their partner organizations.
   - ☐ [External] We will openly share our conclusions regarding how best to achieve effective management of large-scale MPAs. We will package and collaboratively communicate our findings and lessons with other interested MPA managers (both at large-scale sites or otherwise). We aim to be available to decision makers, government authorities, and stakeholder groups interested in charged with the design and implementation of large-scale MPAs. We will attend international conferences and meetings in order to provide a united voice on large-scale MPAs.

Source: Big Ocean 2011b

B. Network Activities and Outcomes

To do this, Big Ocean member sites, supporting partner organizations, and sponsoring members have agreed to commit human and financial resources toward to operations and maintenance of the network. Big Ocean members have identified a set of proposed activities associated with the three network aims that will be attempted, including:

- Fostering peer learning through sharing of experiences and information, and collaborative analysis and communications around specific learning topics;
- Provision of peer-based technical guidance, mentoring, and support regarding specific management challenges,
- Collaboration on key scientific research issues of mutual interest or concern, and periodic joint scientific investigation and partnerships; and
- Sharing and testing of new management tools and techniques, including remote surveillance and enforcement expertise and technology;

The intention of completing these activities is that through this network, Big Ocean members can improve the effectiveness of their management efforts. Collectively, Big Ocean intends on achieving several outcomes, including measurable improvements in performance and protection progress across member sites and within specific geographic regions, identifying gaps and providing practical guidance that will better align scientific research with large-scale marine management needs, and aide in the development of future large-scale sites by serving as a technical resource and sharing network experiences.

It is hoped that through the Big Ocean, critical partnerships to improve management across vast geographic areas can be forged, gaps related to management information and technical capacity can be identified and filled, practical and experience-based guidance can be offered to better align science with large-scale management needs, and timely support in the development of future and proposed large-scale MPAs can be offered through the experience and lessons of Big Ocean network, particularly in comparison to smaller-scale MPAs. The network also intends on serving as a vehicle to increase engagement with regional and international bodies and non-government agencies involved in marine conservation and particularly interested in supporting the role of large-scale sites.

During the inaugural meeting, members collectively identified shared aspirations, values, and beliefs regarding their large-scale marine management efforts (see Box 2). They then identified a set of shared management challenges and opportunities relating to large-scale marine protection. A summary description of these common challenges and opportunities follow in the next two sections of this paper.

Box 2: Shared aspirations, values, and beliefs between inaugural Big Ocean member sites.

(a) Our sites serve as a modern-day baseline for what healthy marine ecosystems should look like. We believe that if effectively managed, these sentinel sites will remain large areas of relatively undisturbed and unthreatened waters that will serve as invaluable natural barometers to measure global change and improve our understanding of ocean systems and functions.
(b) We believe that our sites represent the potential for improved sustainability and sustainable use of marine resources in our home countries and around the world.
(c) We value our natural heritage and recognize the need to conserve our marine biological diversity. We believe that the preservation of marine biodiversity has benefits not only for nature, but also for the human wellbeing of current and future generations, including food security, education, sustainable economics, and scientific investigation and study to improve human knowledge and understanding.
(d) Our MPAs operate at a sufficient geographic scale and large enough level of complexity to confidently meet the international standards for optimal marine protection appropriate and relevant to the management of our oceans and seascapes.
(e) By working together, we can more effectively address the many common transnational and global 'neighboring' threats that our sites face, particularly overfishing, climate change, seabed drilling and mining, and increasing marine debris.
(f) We believe that large-scale marine protection can provide rejuvenation of ecological function in Earth's waters, and can preserve those few remaining remote ocean areas that exist in a relatively pristine state. We value the role that restored areas can play by providing benefits to humans that we cannot foresee right now.
(g) We recognize and appreciate that despite the cultural and social diversity among our sites, we nonetheless share many common cultural values and beliefs relating to the utility and morality of conserving the world's marine ecosystems.

III. CHALLENGES of LARGE-SCALE MARINE MANAGEMENT

Large-scale MPAs, encompassing integrated marine ecosystems across multiple habitats, compound and magnify existing challenges in marine conservation and management, while also bringing a specific set of issues and opportunities that are unique to such scales, and relatively poorly understood. Examples of unique challenges related to scale include (Big Ocean 2010):

(1) Effective surveillance and enforcement of large ocean areas (including the deep/open ocean subsurface water column) requiring adequate capacity (financing, logistical, and technical ability);
(2) Existing management capacity and resource allocation limitations magnify when spread across such large geographic areas; and
(3) Poor or incomplete understanding of how "source- sink" reproductive and recruitment dynamics relate to native species, particularly for economically valuable highly migratory species that may reside in or travel through the large-scale MPAs during part of their life history.

Furthermore, compounding factors where large-scale MPAs are remotely located include (Big Ocean 2010):

(1) Enormous logistical challenges and access costs associated with management of large, remote areas, far from population centers and resources; and
(2) Public interest and outreach relevance challenges given the physical distance such areas may be from human presence and consistent public awareness.

In addition, large-scale MPAs may face similar threats operating at scales commensurate with the large and remote nature of the sites. Big Ocean member sites share several of the same threats that operate at a large scale (see Figure 2). Climate change impacts, invasive and alien species, illegal fishing, and marine debris are found to be the most commonly shared priority threats faced by Big Ocean members. Despite this consensus, member sites recognize that threats operating at a large-scale are still poorly understood, in some cases the path to address or abate them remains unclear. As large-scale MPA site managers have been isolated from one another by distance and frequency, prior to Big Ocean they have operated without the ability to regularly and formally share experiences, knowledge, lessons, and unique solutions relating to large-scale MPAs.

Big Ocean inaugural member sites recognize that there are significant gaps in the necessary experience and knowledge regarding large-scale MPA management to address these challenges, therefore we need to: (1) work more closely with each other in order to learn from one another and share successes and failures; and (2) build the professional standards of practice for this emerging genre of marine conservation.

Figure 2: A summary table of the high priority threats faced by Big Ocean member sites[7], and the frequency of these threats shared across sites.

	PMNM	PIPA	CHAGOS	MOTU MOTIRO	MARIANAS TRENCH
Climate Change	X	X	X		X
Invasive/Alien Species	X	X	X		X
Marine Debris	X			X	X
Illegal Fishing		X	X	X	X
Human Impact		X			
Vessel Grounding					X
Historical/Cultural Site Degradation	X				
Terrestrial-based Pollution	X				

IV. OPPORTUNITIES to IMPROVE MANAGEMENT

The Big Ocean network is focused on improving the professional practice of large-scale marine management and protection. In addition to the shared challenges that founding members identified during the inaugural meeting, Big Ocean members identified the following set of shared priority management opportunities between inaugural member sites:

(a) Documentation of benefits – We can work together to document and promote the diversity of benefits and comprehensive value of protecting large-scale marine areas. Through our own collective action in support of one another's sites and efforts, we can measure and communicate the biological and social benefits of large-scale marine protection. We hope that our lessons and successes can be useful to other managers around the world who are considering or attempting to address the unique challenges of large-scale MPA management, and will remain open to them.

(b) Share costs of scientific exploration – We can identify specific opportunities where we can pool our human and financial resources in order to share in the costs of supporting scientific research expeditions and increasing our knowledge, particularly under "sister site" relationships.

(c) Learning between neighboring sites – We can share experiences and learn collectively, particularly between neighboring sites and regions. We recognize that we must first each commit to our own internal site learning in order to enable site learning between neighboring Big Ocean member sites. We recognize that given the natural and cultural connectivity between the large-scale MPAs of the Pacific Islands, we have an immediate opportunity to do so among inaugural member sites.

(d) Framing the issues and needs with the public – We can reframe some of the threats we now face to match their relative size and scale that provide new opportunities to bring people together and support social and behavioral change. With the benefits documented from large-scale marine protection, we can provide the public with a message of hope, instead of only telling them that our oceans are in continual decline.

[7] Table reflects attendees from the Second Big Ocean meeting, May 13, 2011.

(e) Scaling up marine protection coverage – We recognize that the national and international marine protection targets of 2020 and 2025 are important, and that we can only succeed at scaling-up global marine protection efforts in time through the proliferation large-scale MPAs. We can serve as a symbol of hope, practical guidance, and peer learning and support for in-design or newly designated large-scale MPAs during this time.

(f) Supportive NGO partnerships – We recognize that recent successes experienced are due in-part to the creative and effective partnerships that government authorities have made with non-government organizations (NGOs). NGOs can help site managers and government authorities more broadly and effectively communicate messages in support of our management efforts without managers advocating directly with government leaders and elected officials.

(g) Provide informed guidance – We can work together to provide clear, practical, and experientially-based guidance on how to effectively plan and implement marine management efforts at increasingly larger areas and scales of complexity by working together. If we work in isolation of one another, such practical guidance tested across multiple sites remains elusive, particularly given the relatively nascent practice of marine protection area management. We work together as site managers to benefit other site managers, as the target audience. We are managers advocating for other managers, providing tools to management practitioners and partners. We work to communicate strategically together and provide relevant tools and information to other managers. We support each other, and recognize the strength that comes from a variety of management approaches.

(h) Work with regional fisheries – We will work with regional fishery management bodies to assist them with marine spatial planning efforts and move beyond a single-species modus operandi. We will be clear with them about the value of large-scale MPAs for fisheries management planning, and the benefit of well-managed corridors for highly migratory fishery species.

(i) Invite broader stakeholders – We will work with stakeholders beyond the usual political and industrial/private sector parties, inviting a broader range of stakeholder groups and interests to become engaged and participate in large-scale marine protection efforts. We will use clear and simple language that will allow access, as opposed to discourage, public and visitor participation.

V. NEXT STEPS

Following off of the inaugural meeting, a second Big Ocean meeting was held on Friday, May 13th, 2011, immediately prior to the Second International Marine Conservation Congress in Victoria, Canada. Resulting from this meeting, a set of network next steps were identified by members that will define the activities and agenda for the Big Ocean over the next 18 months. The primary next steps focus on the implementation of a shared network learning agenda, solicitation of sponsorship and support for proposed network activities, and making the network members and experiences available to proposed or emerging large-scale MPAs.

The shared learning agenda with an initial focus on: (1) identifying a cross-site scientific research agenda at an appropriate scale that is focused on addressing the unique priority management challenges of large-scale MPAs; (2) investigating and potentially field-testing the

state-of-the-art surveillance and monitoring for remote enforcement and data collection; (3) remote island/atoll habitat restoration efforts, with a focus on invasive species removal and control. As of the close of the second meeting, the network recognizes that Big Ocean is providing benefits to both member sites and proposed large-scale that have contacted the network with interest to become involved and access member experience and network learning. Big Ocean has initiated and aims to increase its ability to work together to diagnose and creatively address individual site member management challenges and needs. Such site diagnostics and problem-solving are likely to be a primary service benefiting Big Ocean members and proposed sites.

Figure 1: The geographic location, boundaries (in red), and date of designation (in parentheses) of the six founding Big Ocean network member sites.

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Learn more about the Big Ocean network founding member sites at:

Chagos Marine Protected Area (UK)
http://www.chagos-trust.org/ ; http://cctus.org/
Great Barrier Reef Marine Park and World Heritage Area (Australia)
http://www.gbrmpa.gov.au/
Marianas Trench Marine National Monument (USA)
http://www.fws.gov/marianastrenchmarinemonument/
Motu Motiro Hiva Marine Park (Chile)
http://www.subpesca.cl/controls/neochannels/neo_ch593/neochn593.aspx ;
http://www.portalrapanui.cl/rapanui/salaygomez.htm
Papahānaumokuākea Marine National Monument and World Heritage Site (USA)
http://www.papahanaumokuakea.gov/
Phoenix Islands Protected Area and World Heritage Site (Republic of Kiribati)
http://www.phoenixislands.org/index.php