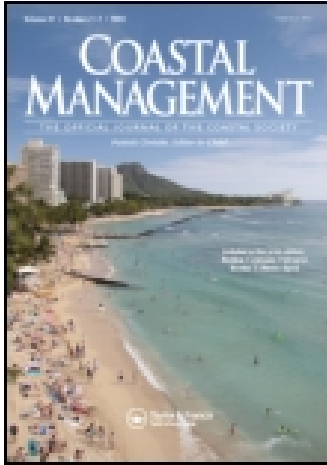


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Coastal Management

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/ucmg20>

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Published online: 01 May 2015.

To cite this article: Jesse g. Hastings, Michael k. Orbach, Leah b. Karrer & Les Kaufman (2015) MMAS in Eastern Tropical Pacific Seascape, Coastal Management, 43:2, 172-188, DOI: [10.1080/08920753.2015.1005537](https://doi.org/10.1080/08920753.2015.1005537)

To link to this article: <http://dx.doi.org/10.1080/08920753.2015.1005537>

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MMAS in Eastern Tropical Pacific Seascape

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This article is part of a special issue that provides insight into global conservation science by analyzing a 5-year, \$12.5 million global marine conservation science and policy program. In this article, we summarize the development of the program in Coiba Island in the Gulf of Chiriquí Panama, and the Galapagos islands of Ecuador, both part of the Eastern Tropical Pacific Seascape. In Panama, the history of Coiba island as a federal penal colony shaped the process and outcome of the program. In the Galapagos, the unique science history of the islands and subsequent international recognition influenced the outcomes of regional marine managed areas.

Keywords Eastern Tropical Pacific Seascape, marine conservation, nongovernmental organizations, science to policy

Socioeconomic, Institutional, and Environmental Context

The Eastern Tropical Pacific Seascape¹ (ETPS) covers approximately two million square kilometers, encompassing the national waters, coasts, and islands of Colombia, Costa Rica, Ecuador, and Panama. It includes seven United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites, including the offshore islands of Cocos (Costa Rica), Malpelo (Colombia), and Galápagos (Ecuador) (www.conservation.org). Nearly one third of the world's whale species, as well as fur seals, sea lions, numerous shark species, and important populations of globally endangered sea turtles and sea-birds, migrate back and forth through the Seascape (www.conservation.org). However, the species and habitats in ETPS are threatened by increasing coastal human populations. Pressures include urban expansion and construction in sensitive areas, unsustainable fishing and rapid tourism growth (www.conservation.org).

In response to these pressures, government and nongovernment organizations (NGOs) have joined forces to ensure the sustainability of the marine ecosystems. In particular, the four ETPS countries signed the San Jose Declaration, an agreement to “seek the support of international and regional organizations, including Conservation International (CI), to improve stewardship of their shared marine life and environment” (www.conservation.org). Through such regional cooperative mechanisms, which include networks of marine protected areas, comprehensive marine legislation and innovative field

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conservation projects, efforts are underway to improve the condition of the marine environment.

Marine Management Area Science (MMAS)–funded research studies and science outreach initiatives focused in Coiba, Panama, and in Galapagos, Ecuador, which are consequently the focus of this article.

Panama

Coiba national park is located in the Gulf of Chiriqui. While the island of Coiba is the largest island in the park, it also includes 37 other islands. For almost a hundred years, Coiba served as a penal colony for the Panamanian government, coincidentally protecting its biodiversity from human impacts (Steinitz et al. 2005). The waters of the park have a high concentration of rays, turtles, sharks, and numerous species of finfish, lobsters, oysters, and other invertebrates (UNEP-WCMC 2011).

In 1992, Resolution 21 by the National Authority of the Environment in Panama laid the groundwork for the park. In 2004, Coiba was established as a national park (Steinitz et al. 2005), and the associated law mandated the creation of a management plan and many of the governance structures now associated with it, including the Directive Council. The Directive Council is a council vested with decision-making powers and made up of representatives from government, civil society, and users, and academia. Normally meeting every three months, the Directive Council operates as a governance mechanism enabling discussion, communication, and feedback among a diverse range of groups.

There are multiple institutions and stakeholder groups involved in the science and governance of Coiba national park. The Smithsonian Tropical Research Institute (STRI) and the University of Panama, a respected Panamanian research institution, have been conducting research both in Coiba national park and the park's adjacent buffer zone. STRI coordinated the development of the park's management plan. The government entities ANAM (Panama's National Authority for the Environment) and ARAP (Panama's Aquatic Resources Authority) are the most involved government players. One NGO involved in Coiba's governance is MarViva, a regional marine organization (focused on marine protected areas and marine resource management); it was involved in the initial political process of Coiba's declaration, sits on the Directive Council, and supplies modern, sophisticated boats to assist in fisheries enforcement in the park. Another NGO involved is ANCON (the National Association for the Conservation of Nature), a Panamanian environmental organization that also sits on the Directive Council and is particularly active in communities in the so-called buffer zone of Coiba national park.

Galapagos

The Galapagos is known worldwide as a place for exotic and abundant wildlife and natural outdoor splendor. The Galapagos is a UNESCO World Heritage Site, which encompasses both a national park (est. 1959) and a marine reserve (est. 1998). The human population of the islands has been growing rapidly. With no indigenous population, inhabitants from mainland Ecuador have been migrating to the Galapagos to take advantage of the relatively higher standard of living and income from tourism opportunities (Villacis and Carrillo 2013). Therefore, despite the fact that the national park and the marine reserve provide legislative protection, the ecosystem of the Galapagos is under threat. Tourism impacts and impacts from land-based sources put the marine and terrestrial ecosystems at risk. The Galapagos National Park works with the long-standing

Charles Darwin Research Station and many stakeholders to manage the marine reserve through various councils.

MMAS in ETPS

Unlike the other MMAS regions, in ETPS MMAS was part of a region Seascape (Atkinson et al. 2011), which includes the coastal and marine waters of four nations; the other three MMAS regions were single nation in scope. By being part of a large area in which the government and other stakeholders worked together toward ocean governance, the research was able to influence, and be influenced by, a larger audience of stakeholders.

In practice, MMAS in ETPS focused research in Coiba National Park and to a lesser extent in Galapagos National Park, with a commitment to share tools, methods and insights throughout the Seascape. MMAS in ETPS benefited from a strong CI Galapagos office with ten years' experience and a strong, albeit relatively nascent, regional CI ETPS office based in Galapagos. In contrast, there was no CI office in Panama until three years into the MMAS Program. Another dynamic within the program was the contrast between conducting studies in Galapagos National Park, which is a well-established MMA with decades of natural science studies, and Coiba National Park, which was only recently established and had a limited research history. Figure 1 is a map of Panama MMAS study sites, Table 1 is a list of the Panama and Galapagos MMAS study locations and principal investigators (PIs), and Figure 2 is a rough timeline of MMAS in Panama and Galapagos.

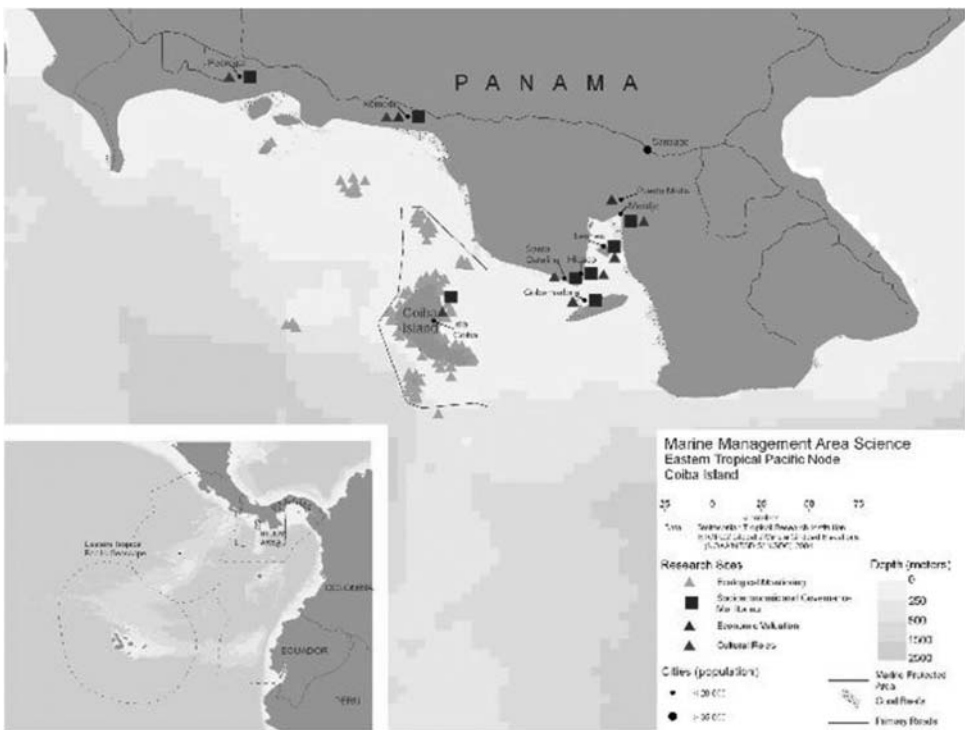


Figure 1. Panama MMAS Locations

Table 1
Main Panama, Galapagos and ETPS wide MMAS studies, PIs and locations

Topics of research (PI)	Principal investigators (institutions)	Study locations
Core Ecological Monitoring – Panama (Guzman)	H. Guzman (STRI)	9 marine sites inside the Coiba MMA and 9 unprotected marine sites in the surrounding region of the Gulf of Chiriqui.
Core Socioeconomic Monitoring – Panama	O. Jordan (Alianza para la Conservacion el Desarrollo) & R. Montenegro (Conservation Strategy Fund)	10 communities potentially impacting the Coiba National Park: Pedregal, Remedios, Hicaco, Santa Catalina, Pixvae, Los Díaz, Bahía Honda, Malena, Puerto Mutis, Gobernadora
Core Socioeconomic and Governance Monitoring – Panama	D. Suman (University of Miami)	Literature reviews, semi-structured interviews in Panama City and Santiago.
Core Cultural Roles Monitoring - Panama	D. Cordero (University of Panama)	Seven communities potentially impacting CNP: Las Palmas, Mariato, Montijo, Rio de Jesús, Soná, Santiago, Remedios
Core Economic Valuation – Panama	R. Montenegro (Conservation Strategy Fund)	Numerous communities in the provinces of Chiriqui and Veraguas.
Fisheries Assessment – Panama	A Vega (University of Panama)	Several communities in the provinces of Chiriqui and Veraguas. Additional data from marine sites.
Core Ecological Monitoring – Galapagos	S. Banks (Charles Darwin Research Station)	Numerous marine sites in and out of Galapagos Marine Reserve.
Core Socioeconomic and Governance Monitoring – Galapagos	D. Quiroga (University of San Francisco)	Communities on islands of San Cristobal, Isabela, Santa Cruz.
Enforcement Chain Analysis – ETPS	O. Rosero (MarViva)	Literature review and interbviews in Panama, Costa Rica, Ecuador and Colomiba.
Extinction Resistance of Threatened Species - ETPS	G. Edgar (University of Tasmania)	Existing data from across ETPS.

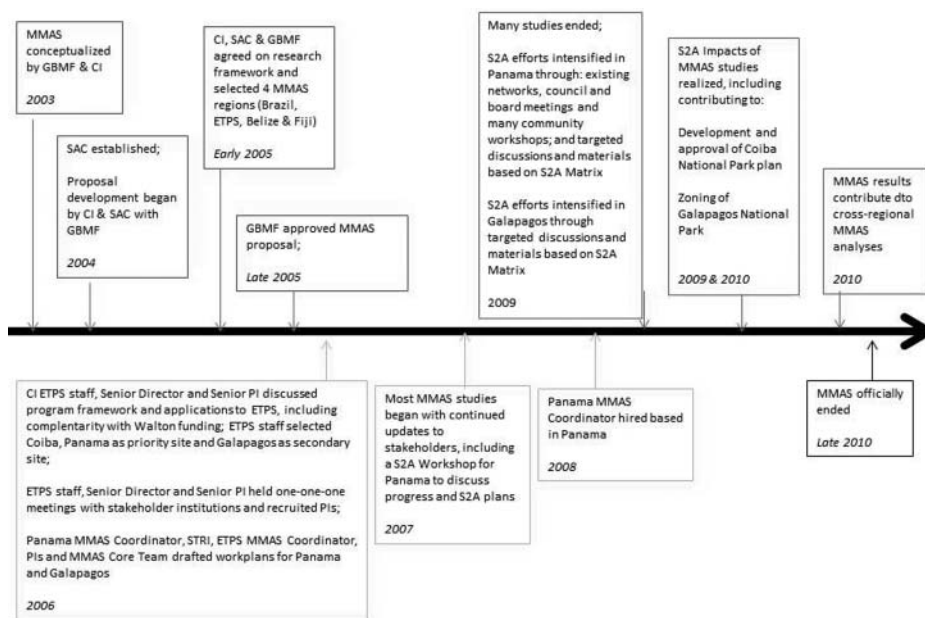


Figure 2. ETPS MMAS timeline.

MMAS Initiation

As with the other MMAS regions, ETPS was identified as one of the priority regions for MMAS during the Science Advisory Committee (SAC) meetings hosted by the Gordon and Betty Moore Foundation (Moore Foundation) in early 2005. Consistent with the global MMAS framework and to ensure comparability across regions, all four MMAS regions, including ETPS, conducted ecological, socioeconomic and governance monitoring, cultural roles studies, and economic valuations. Building on the overall MMAS framework and the core set of studies, the next step in building the MMAS program in ETPS was to tailor plans specifically to ETPS. Since ETPS is a huge area covering four nation's waters, an important step was prioritizing where to work within the region.

The process of selecting focal sites began shortly after Moore Foundation approved the MMAS grant in late 2005. Of particular importance was a series of meetings in early 2006 between the MMAS Core Team and the CI-ETPS staff² and regional colleagues during which they considered how MMAS could dovetail with CI's increased focus on Seascapes. At the time, CI-ETPS had received significant funding from the Walton Family Foundation (Walton Foundation) for work throughout the Seascape and was looking to build the ETPS science program in concert with other donors. Walton Foundation funding did not include support for science or monitoring; consequently, the MMAS funding was a welcome complement.

After discussing the ETPS knowledge needs and the MMAS global framework and principles, CI-ETPS and MMAS Core Team agreed that MMAS in ETPS focus primarily in Coiba National Park and that some limited support also go to Galapagos. However, it was also agreed to conduct two region-wide studies to address priority issues: enforcement and threatened species (see Tables 1 for specifics). By

drawing on the CI-ETPS network of colleagues, these studies were developed in consultation with stakeholders and the results were then shared to influence decision-making through materials and workshops orchestrated by CI-ETPS in each of the four countries.

Panama. One of the early issues that arose with regard to MMAS in Panama was oversight. The MMAS Core Team and CI-ETPS reached an agreement, similar to the other MMAS regions, that the development of the research plans would be a multistakeholder relationship engaging CI-ETPS, the MMAS Core Team, and the PIs. CI-ETPS would be responsible for ensuring the research was relevant and ultimately used by decision-makers; the PIs would ensure quality science; and the MMAS Core Team would ensure the research fit within the global framework and contributed to cross-regional analyses.

Galapagos. While Panama received the majority of the funding, Galapagos was selected to receive limited funding to conduct ecological, socioeconomic, and governance monitoring. Galapagos was included because CI-ETPS saw Galapagos as a good opportunity to harness existing ecological monitoring data and to fill the gap in socioeconomic and governance data. Due to the worldwide prominence of the national park and the presence of the Charles Darwin Research Station, the Galapagos possessed a huge amount of ecological data that could complement MMAS data from other regions. In addition, CI-ETPS had received a \$2 million grant from Walton Foundation, and MMAS money was seen as a complement this funding.

MMAS PI Identification and Workplan Development

Panama. Lacking a Panama-based office, a partnership needed to be established to facilitate in-country coordination. Since STRI was in charge of the drafting of the Coiba National Park management plan and keen to incorporate the MMAS findings into the process, STRI agreed to be the in-country partner office for MMAS working closely with the rest of the CI-ETPS team based in Panama and Ecuador.

For the selection of PIs for the studies, CI-ETPS prioritized supporting Panamanian scientists as much as possible to draw on their expertise, to support in-region capacity and to facilitate science-to-action (S2A). The resulting PIs were all Panamanian. While most were academics, experts were also drawn from two NGOs with relevant expertise that also had strong understanding of policy processes.

Developing the workplans for the various studies took many rounds of revisions and back and forth discussions between the MMAS Core Team, CI-ETPS, and the PIs. During the early 2006 joint meeting of the MMAS Core Team and CI-ETPS senior, they met with key stakeholder organizations, visited Coiba National Park and initiated discussions with potential PIs. The one-on-one meetings with stakeholders, including Department of Fisheries, ANCON and MarViva, were particularly useful in engaging stakeholder input regarding knowledge needs and how to tailor the research to fit policy agendas, such as focusing the ecological monitoring around commercially important fisheries based on input from Department of Fisheries.

In June of 2006, to ensure the input of a wide range of Panama stakeholders into the design of the studies, CI-ETPS together with ANAM hosted a large Science-to-Action Workshop in Santiago. Forty people from organizations including MarViva,

ANCON, and the University of Panama, as well as from user groups such as fishing and tourism industries, attended the workshop. Over three days, these groups gave their input into the design of the MMAS projects to ensure their application to Coiba. The reception of stakeholders to this workshop was excellent; there was a general level of excitement that their input was being sought early in the MMAS study design process.

To further ensure the science-to-action linkages, CI-ETPS, and several of the PIs were involved in the Coiba Scientific Committee, which was set up to evaluate and oversee scientific projects relating to the Park, and the Coiba Directive Council. Involvement in the Council meetings created opportunities to share project information with government, NGO, and local stakeholders as the design process moved forward.

Galapagos. Drawing on the scientific expertise based in Ecuador with experience in Galapagos, PIs were identified from the Charles Darwin Research Station and the University of San Francisco. As in the other regions, the PIs worked with CI-ETPS and MMAS Core Team to draft the workplans.

MMAS Implementation: Data Collection and Capacity Building

Panama. Most of the Panama MMAS studies started in 2007 and 2008 after workplans were fully constructed and there had been sufficient time to adapt them based on consultation between the local, national, and international scales.

The studies proceeded with the PIs working relatively independently. While the Ecological Monitoring Study collected data from marine sites both within and outside the national park, the Socioeconomic and Governance Study, the Economic Valuation Study, and the Cultural Roles Study centered their data collection around selected communities in the provinces of Chiriqui and Veraguas. The goal was to select communities engaged in different economic activities to allow comparison and deeper analysis. As a result, 10 of the 36 communities in the area were selected to reflect the diversity of activities with potential to impact the park, including fisheries, cattle raising, tourism, and agriculture.

Due to the existing high scientific capacity in Panama, capacity building through the studies was not emphasized to the level of other MMAS sites. However, selected PIs used students or interns to assist in data collection, and there were workshops at STRI where the data was used in teaching workshops.

Galapagos. Data collection for the two MMAS studies in Galapagos started in 2007 and 2008 and went relatively smoothly. CI-ETPS stayed involved with the PIs through periodic discussions and feedback, and relayed this information to the MMAS Core Team. Due to high capacity at the Charles Darwin Research Station, capacity building was not emphasized.

MMAS Science-to-Action: Translation and Dissemination

Panama. As Panama MMAS results emerged, the key messages and insights were communicated with government and institutional partners through three primary mechanisms. First, the conservation community in Panama is small and personal and

professional networks reach to all parts of it. MMAS PIs attended the same workshops, meetings, and luncheons, enabling frequent informal exchanges and interactions about emerging results.

Second, many MMAS PIs were active on both the Coiba Scientific Committee and the Coiba Directive Council, enabling formal, iterative interaction about the studies during meetings. The Directive Council met (on average) every two to three months and included representatives of many different stakeholder groups in Panama, including ANAM, ARAP, MarViva, ANCON, fishermen, tourism representatives, and mayors from the municipalities of Santiago. The Coiba Scientific Committee had five representatives including two MMAS scientists representing STRI and the University of Panama.

Overall, these exchanges were very effective in keeping stakeholders informed as to the progress of the studies. The Directive Council, by bringing together representatives from all the relevant stakeholder groups of Coiba, provided a forum for information exchange and dissemination. Stakeholders on the council, especially government and NGO stakeholders mentioned how they were satisfied with the dissemination of MMAS study results.

For local communities, interim results were communicated through participatory workshops during the creation of the Coiba management plan. There were at least 27 workshops with over 1,000 participants during which preliminary zoning of the park, identification of information needs and priority sites, and rules for artisanal and commercial fishing, were discussed providing an opportunity to discuss MMAS results and solicit additional information from stakeholders.

There was a mixed reception by local stakeholders at the participatory workshops. Stakeholders were initially hostile to the idea of a management plan and the associated MMAS studies as they did not see how they would benefit them; indeed, they were concerned that Coiba National Park would limit their fishing and reduce their development opportunities. MMAS PIs and STRI consultants felt that as the workshops continued, while there was not complete agreement on the decisions around the management plan, stakeholders started to feel like they had an adequate opportunity to participate and doing so gave legitimacy to the process. A MMAS researcher noted:

First it was really aggressive, because they had been in many previous workshops and meetings with little or any benefits or been depressed by people. It took us a while to gain their trust and their confidence. Once they saw the process was clean, straightforward . . . they started to work with us. For example, with fishermen, we started with five or six fishermen per meeting. We ended with 100 or more fishermen per meeting, voting and taking decisions on this is going to be the regulations for the area. Not everybody is happy, but at least the majority is happy.

Fishermen interviewed admitted the workshops helped reduce community stakeholder hostility toward the Park. A local community representative of the Fishermen's Association in Remedios voices the dominant feelings of the fishermen about participating in the workshops when he says:

Initially, there was a very bad reaction [to the workshops]. Fishermen are not accustomed to regulations. There was much frustration. . . . MarViva had

workshops, ANAM had workshops, and the fishermen contributed their opinions about what should happen. . . . It was more difficult at the beginning, and as the plan was explained it became a little bit better, not 75%, not 100%, or something like that, but maybe 25% better.

The third mechanism for sharing MMAS results was through a planned initiative specific to the MMAS studies that involved strategic meetings with target audiences complemented with engaging outreach materials (e.g., white papers, posters). This planned initiative was led by CI-ETPS once the CI Panama position was established. As in the other MMAS regions, a detailed S2A matrix was developed and used to plan out S2A efforts. For each study, the main messages were identified and then the relevant conservation efforts and target audiences were identified and finally the appropriate outreach materials were planned. In addition to the previously noted one-on-one discussions, these plans were discussed with partners during a meeting with the Coiba Directive Council in April 2010.

As an example of how this S2A Matrix was implemented, one of the main S2A strategies was pulling the results from across the studies to gain awareness of, and support for, the Coiba National Park management plan. CI-ETPS staff organized an extensive outreach campaign to local communities to educate them and try to increase their support of the management plan, which involved a series of community workshops. In addition to discussions and presentations, to convey the relevant messages from the studies, CI-ETPS staff produced and disseminated over 1,500 booklets, posters, t-shirts, and calendars. These materials explained MMAS results in an easy to understand fashion that demonstrated the importance of the management plan (Hastings 2011). Complementing this outreach campaign was a national media campaign, engaging MMAS PIs in radio interviews and contributing to newspaper articles (see Table 2 for study results from Panama).

Galapagos. As research progressed, results were shared with stakeholders across the islands, primarily through existing relationships. The Charles Darwin Research Station had been involved in a partnership with the Galapagos National Park; these interactions continued and allowed emerging MMAS data to be shared. Similarly, the University of San Francisco interacted with various Ecuadorian ministries and government departments through its research and shared results as they emerged.

The main efforts for result dissemination and policy translation took place in late 2009 and early 2010. The coordinator, as in the other MMAS regions, developed the S2A Matrix to determine how to most effectively influence conservation agendas. In the S2A Matrix, for each study, he mapped out: the anticipated resulting messages (e.g., see Table 2 for a summary of the key messages by study), the relevant target audiences (e.g., community members), relevant conservation agendas (e.g., establish new MMAs), and appropriate materials to highlight the relevant, key messages (e.g., poster, video).

Dissemination of messages was adapted based on the audience to which it was delivered; messages were simpler when delivered to fishermen and more politically oriented with delivered to ministries. CI-ETPS was involved with a participatory management board for the Galapagos National Park and the Marine Reserve; it was used as one of the main mechanisms of dissemination to a wide variety of stakeholders after results had been finalized (see Table 3 for study results from Galapagos).

Table 2
Panama MMAS studies final results

Topics of research (PI)	Main results (abstracted from study final reports)
Core Ecological Monitoring—Panama (Guzman)	Commercial, non-commercial, and total fish biomass increased between 2007 and 2009, with the largest increases recorded in protected areas. For shellfish species, conch and oyster densities rose significantly in protected areas. Conversely, sea cucumber density decreased to near the point of local extinction in protected sites. Live coral cover decreased non-significantly (ca. 15%) between 2002 and 2009 in both protected and unprotected areas.
Core Socioeconomic and Governance Monitoring—Panama (Mate)	46% of all families have reaped benefits derived from the creation of Coiba NP, regarding basic services, access roads and increase in tourism. However, 72% perceive their income to have decreased after the park's creation and the fishing to be worse than the previous year. Most residents (>90%) exhibit concern for environmental conservation as a resource for their subsistence, but also a 37.3% of all families considers that the organizations that manage these resources are taking supplies from the people. On average, most families do not have information about Coiba NP (52%). 31% of residents have been invited to Coiba NP meetings, but consider that their opinions are not taken into account when making decisions. Most families consider that the authorities of Coiba NP have not shared information about the park (68%). There is a lack of coordination between agencies associated with the park. There is low participation of some members on the Directive Council, in particular mayors and fisheries groups.
Core Cultural Roles Monitoring—Panama (Cordero)	The community buffer zone is characterized by important cultural traditions—artisan

(Continued on next page)

Table 2
Panama MMAS studies final results (*Continued*)

Topics of research (PI)	Main results (abstracted from study final reports)
	traditional work, sea stories, music, poems, traditional food, and religious celebrations.
Core Economic Valuation—Panama (Montenegro)	The area of Coiba provides 275 fishing jobs, while it provides 50 tourism jobs. The Management Plan will cost \$13 Million USD over 5 years; The net present value of fishing and tourism from Coiba is \$35 million over 20 years, approximately \$20 million from fishing and \$15 million from tourism. There is the potential to charge more for Coiba user fees if park service and infrastructure are improved. There are 46 boats that use Coiba approximately 30% of their time.
Fisheries Assessment—Panama (Vega)	Fish size is related to sexual maturity. There is a correlation between the size of hook used and the sexual maturity of fish caught. There is regional and depth variation among size classes and the maturity of commercial fishes as Lutjanis and Serranids. The variation in maturity between areas gives a good tool to determine nursery areas, which then can be used to regulate fisheries and restrict fishing based on reproductive cycles.

MMAS Conservation Impacts: Policy and Management Outcomes through 2014

Panama

Development and Approval of the Coiba Management Plan. The main goal of the MMAS studies in Panama was to strengthen the management plan of Coiba. Interviews revealed that MMAS studies provided data for a rigorous scientific baseline for the management plan. The management plan guides how local, national, and even international groups interact with the park, and the fact that the MMAS studies were critical in the management plan creation meant that MMAS studies will have an enduring impact on management and policy. Because of the timing of the completion of the MMAS studies, the local Socioeconomic and Governance, Economic Valuation and the Fisheries Assessment studies were most influential in the plan (Jordan 2010; Montenegro 2010; Vega 2010). A government employee explains:

Table 3
Galapagos MMAS studies final results

Topics of research (PI)	Main results (abstracted from study final reports)
Core Ecological Monitoring—Galapagos (Banks)	There is a positive correlation between enforcement levels and predatory fish biomass. Corals that survived El Nino events became more resistant to subsequent events, suggesting subset selection.
Core Socioeconomic and Governance Monitoring—Galapagos (Quiroga)	The creation of the GMR has benefited the people living in the Galapagos. GMR has meant the establishment of a sizeable area that is relatively free of an industrial fleet. The only people legally permitted to fish in the Galapagos are the local fishermen, who number a bit more than 1,000 although only one third of them are truly active. However, overexploitation of fisheries continues to be an issue in the GMR, owing in part to weak adaptive management and law enforcement. The Participatory Management System (PM) in the Galapagos has been effective in lowering the level of tensions and disputes amongst the various sectors, mistrust and inequalities still persist.

Conservation International financed the studies to feed into the management plan. . . . The studies were intended to create a baseline in the park and strengthen the management plan. The studies were a first diagnostic of the area of the park. . . . The fisheries assessment was in my opinion the most important and relevant to the management plan and the process. . . . The workshops . . . were also very critical to the development of the plan; they enabled the working with fishermen.

Perhaps more importantly, the project's participatory approach had a significant impact on how the management plan was developed and consequently the sustainability of the park. In Panama, Coiba's management plan is not viewed as just a standard Panamanian protected area management plan. There is a significant amount of pride in the plan and how MMAS studies have contributed to it. A MMAS researcher explains:

One of the big achievements of the process of MMAS was the energy and the integration of the initiative. . . . [It] contributed much to the people of the management plan, always talked with them. Much of the results of the MMAS work will be integrated into future plans, future visions to

conserve the area. This is a durable product of the initiative, that it was integrated into the management plan, and can help to craft the future vision of Coiba.

CI staff further explains in 2014:

The previous management plan was conducted by Spanish consultants and no one read it. Similarly, when the relatively new management plan was first being discussed the budget was focused on natural science with almost no funds for stakeholder meetings. MMAS changed that perspective. MMAS encouraged a much more participatory process, which was more expensive, time-consuming and complicated, but as a result there was much more buy-in. . . . MMAS offered a whole new dimension and balance. The project incorporated the people perspective not only by conducting social science studies, but by ensuring key stakeholders was engaged in the management planning process.

This participatory approach is considered to continue to influence conservation efforts in Panama. “Social marketing” has become common terminology. As of 2014, the scientists at STRI, which were previously focused on natural science, are now working more on the social aspects relevant to their research and its conservation implications.

Establishment of a No-Fishing Zone within One Mile of Coiba Island. The results from the Fisheries Assessment, which showed the importance of maintaining snapper reproductive stocks protected by no-take areas, and the Socioeconomic and Governance study, which determined the areas and frequency of fishing activity as well as governance issues, helped to convince the Directive Council and local fishermen groups to agree to fishing no-take zone ringing Coiba one mile from the coast (Jordan 2010; Vega 2010). This no-take area was established by legal decree and is 20% of the park area.

The process in zoning the park in general was also assisted by MMAS study results. A workshop of 36 local experts on preliminary zoning inside the Coiba NP was held in August 2007. Besides the no-fishing zone, the studies contributed to discussions on resource management zones, absolute protection zones, primitive zones, cultural zones, natural recuperation zones, and special use zones.

Fishermen Agreement to Change Hook Sizes to Ensure Reproduction of Silk Snapper.

Results from the Fisheries Assessment, which showed that fishermen were catching sexually immature snapper, helped to increase public support for use of medium hook sizes (Vega 2010). The studies showed that medium hooks, by catching larger fish after they had time to spawn, helped to ensure reproductive success and continuation of the silk snapper fisheries, ensuring economic as well as biological benefits. Three fishermen’s workshops and two broader stakeholder workshops where these issues were discussed were held in 2008, which led to an informal agreement on use of medium hooks, which was approved as annex to the Park management plan in 2009 and more formally approved as a stand-alone fisheries management plan in 2013.

Creation of Four Commissions of the Directive Council. Presentations on the Socioeconomic and Governance study, which showed that there needed to be increased coordination and information exchange between institutions responsible for Coiba National Park,

helped influence the establishment of four sub-commissions of the Directive Council (Suman, Mate, and Samonte-Tan 2010). These commissions were tasked to work on specific management issues, such as communication and legal issues, and increase coordination and information exchange across the sectors and agencies. As of 2014, these committees have continued to play an important role in coordinating different agencies.

Galapagos

Contributions to Zoning Discussions for Galapagos Marine Reserve. Findings from the Ecological Monitoring and Socioeconomic and Governance Monitoring studies contributed to zoning discussions for the Galapagos Marine Reserve (Banks 2010; Quiroga 2010). MMAS key messages were presented in an information packet distributed to prominent government officials, which helped to enable discussion and feedback as to the best zoning decisions for the reserve in 2010. During the subsequent few years, a RARE campaign titled “Take Care of What’s Ours for Ourselves” was conducted to promote the benefits of conservation to communities for themselves and for their children. This campaign has led to a marine spatial planning initiative, which is based on the premise that planning is in the community’s interests. This marine spatial planning has tied into the zoning process, which has gained new political commitment, and is now underway to examine tradeoffs of zoning options drawing on the ecological and socioeconomic monitoring data.

Emergent Themes from ETPS

Themes that emerged through the examination of MMAS in ETPS were:

Program Initiation

Entry of MMAS into Panama was optimal. While, like the other MMAS regions, the basic structure of this global MMAS initiative was decided on by a small group, there was very early engagement with CI-ETPS staff. Therefore, these offices were able to use their region-specific knowledge to advise how MMAS best could enter the region, including holding discussions with key stakeholders. For example, these offices had knowledge of, and were directly engaged in, the Coiba management plan process, enabling the MMAS studies to immediately make an impact with ongoing work. Likewise, early discussions with CI-ETPS in Galapagos laid the groundwork for easy entry into Ecuador and, consequently, helped ensure links to marine management planning processes.

Networks, Partnerships, and Coalitions

MMAS succeeded in quickly linking up to several strong partners in Panama. CI-ETPS, being part of CI’s worldwide organizational structure, were obvious early partners; however, STRI was the Panamanian partner that allowed the MMAS studies to have the greatest leverage over the course of the initiative. STRI is a respected research institution and had extensive networks throughout Panama. This partnership allowed quick recruitment of highly qualified Panamanian PIs, knowledge of the Coiba management and science context, and most importantly, knowledge of the country’s governance processes and immediate access to Coiba’s Directive Council and its Scientific Committee.

Choices of partners in Galapagos were more limited than in Panama. CI-ETPS made the obvious choice in choosing to quickly link up to the Charles Darwin Research Station. The station, because of its recognized expertise, existing data, and close linkages to the Galapagos National Park Service, could leverage the studies into management and policy impacts.

Participation across Scales and the Science–Policy Boundary

Several factors enabled engaged participation in Panama across scales and the science–policy boundary. Most importantly, the Coiba Directive Council and the Scientific Committee functioned as an efficient MMAS information sharing and coordination mechanisms. Regular meetings solicited input and kept a wide range of Panamanian NGO and government stakeholders informed and updated, boosting the MMAS studies' local legitimacy. Second, involvement of CI offices ensured that programmatic decisions were made by those with a better understanding of the science and management context. Decentralization allowed CI-ETPS to complement MMAS funding with funding from the Walton Foundation. Combined funding enabled a greater number of participatory workshops where community input into MMAS studies during the data collection and result dissemination phases took place.

Engaging Panamanian and Ecuadorian scientists had the advantage of not only supporting local capacity, but also the PIs possessed a strong knowledge of the socioeconomic, ecological, and cultural realities of ETPS, as well as extensive personal and professional networks. The early workshop in 2006 allowed stakeholders to give input into the design of the MMAS studies. These factors eliminated a learning curve that would have resulted from foreign scientists coming into the country; it also allowed the PIs to better understand salient science and management needs. Local PIs used discussions across scales—up to the MMAS Core Team—and across the science–policy boundary to engender participation and solicit input from a wide range of groups.

Interviews revealed that these factors encouraged the vast majority of stakeholders from the government, academic, and NGO sectors to feel engagement and support for MMAS studies. Community members, while not as supportive of MMAS studies generally—instead focusing on their development needs—found that participatory workshops gave them opportunities to voice their opinions and have a (limited) say.

In Galapagos, the involvement of the Charles Darwin Research Station and the University of San Francisco in existing ongoing participatory processes meant that they could quickly harness knowledge of management needs and use these connections to disseminate results.

Accountability and the Ability to Learn

From the beginning, MMAS planned that the Panama studies would feed into Coiba's management plan. It was not a coincidence but rather a well-thought-out strategy. The implementation of this strategy progressed relatively smoothly and therefore produced few situations to learn from mistakes. Downward accountability in Panama was greatly strengthened through meetings of the Directive Council, existence and use of the CI-ETPS offices, and participatory workshops in communities.

Science to Action

While S2A outreach efforts by CI-ETPS were helpful in communicating results to communities and the general public at the end of the MMAS cycle, earlier ongoing engagement and clear management linkages were more critical to S2A impacts. As noted previously, having scientific results translated into communicable, understandable language and inputted directly into ongoing processes such as Directive Council meetings ensured that the MMAS study results would be used. In Galapagos, the efforts of CI-ETPS complemented the ability of the Charles Darwin Research Station to spread key messages and motivate management and policy change.

Assessment Context

Panama represents the clearest example among the MMAS regions of why it is necessary to have a firm knowledge of political, socioeconomic, and institutional realities of a country before studies begin. The existence of organizational offices better enables foreign-funded initiatives to understand the local context. For example, the knowledge of CI-ETPS that Coiba was constructing its management plan meant that MMAS could engage where its results would be immediately used. Likewise, a strong scientific capacity in Panama ensured that MMAS knew it could rely on local scientists and utilize their knowledge and networks; a strong civil society ensured that MMAS results would be used by NGOs beyond CI.

Acknowledgments

The data analyzed for this synthesis article were primarily drawn from a comprehensive review of the MMAS program, performed by Dr. Hastings and others (Wells, Hastings, and Moure 2011, available at <http://www.science2action.org/files/s2a/s2aprogramassessment.pdf>). Additionally, some material in this article overlaps with material in an article in press *Conservation and Society*, entitled J. Hastings, Developing participation in large-scale conservation: Lessons from Belize and Panama [copyright Medknow Publications].

Notes

1 Seascapes are large, multiple-use marine areas, defined scientifically and strategically, in which government authorities, private organizations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and the promote human well-being (http://www.conservation.org/publications/Pages/seascapes_in_focus.aspx).

2 For simplicity, "CI-ETPS" will refer to CI staff based in Galapagos, Costa Rica, and Panama, including the senior scientist from STRI who was hired to be the coordinator based in Panama. Note that this senior scientist was replaced with a CI staff position based in Panama three years into the project.

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