



Promoting a Multi-Stakeholder Network to Develop and Implement a Comprehensive and Effective National MPA Strategy in the Dominican Republic

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**Promoting a Multi-Stakeholder Network to Develop and Implement a
Comprehensive and Effective National MPA Strategy in
the Dominican Republic**

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Promoting a Multi-stakeholder Network to Develop and Implement a Comprehensive and Effective National MPA Strategy in the Dominican Republic

I. EXECUTIVE SUMMARY

The NOAA supported project, Promoting a Multi-stakeholder Network to Develop and Implement a Comprehensive and Effective National MPA Strategy in the Dominican Republic, was designed to strengthen linkages between Marine Protected Areas (MPA) and conservation staff and those supporting the formation of new MPAs in areas of the Dominican Republic. The project supported public-private collaboration, sharing of resources and lessons learned in order to strengthen the effective management of MPAs throughout the country. A key aspect of the project was to encourage both established MPAs and those in the process of being formed to use a more participatory multi-stakeholder and community-based approach in their work, building awareness and garnering greater support among fishing communities and tourism sectors for the importance of no-take MPAs as well as steps that can be taken to lower negative land-based and user-based threats to reefs. The project focused on building a national network of MPA practitioners and supporters, using specific training sites for establishing best-practices in community processes and multi-stakeholder approaches around the Dominican Republic.

Counterpart's 12 - Poster Curriculum Set on Sustainable Coastal Management was adapted to the context of the Caribbean and used to raise awareness of the importance of developing effective marine protected areas among fishermen, community members, local schools and tourists.

Over the life of the project, Counterpart facilitated a series of Participatory Planning Workshops, presentations and trainings in support of MPAs that were attended by over 500 key stakeholders issued from all regions of the country. Site visits and rapid environmental assessments of Punta Cana, Sosua, Bayahibe, La Caleta and Monte Cristi were carried out, in which the state of the coral reefs in each area were evaluated and major threats and conflicts determined, thereby providing a baseline enabling yearly comparisons.

II. BACKGROUND

Marine Protected Areas (MPAs) are a vital tool for restoring populations of over-fished species, which in turn help to restore the health of coral reefs. However, MPAs in the Dominican Republic are for the most part "paper parks" and their long-term success is jeopardized by a general lack of support from various government ministries, affected fishing communities, and the tourism industry. While many no-take MPAs exist in records, poaching and a general lack of enforcement is a serious problem in all areas, to the extent that key stakeholders are beginning to lose interest. Managers are not effectively supported and are frustrated and discouraged, and the danger is growing that many may soon reject MPAs as an effective coral reef and fisheries management tool, without realizing their true potential. During Counterpart's scoping meetings

with government, NGOs, managers, and academics in 2004 and 2005, several pressing needs were identified for the Dominican Republic, including greater support by government, the tourism industry, and fishing communities for coral reef conservation and MPAs. No formal or informal network of MPAs yet existed in the Dominican Republic. The remote nature of many of the MPAs has prevented much interaction and the sharing of lessons learned between areas.

Threats and problems affecting MPA Management in the Dominican Republic:

- Lack of support from the Secretaria De Medio Ambiente
- Lack of NGO's or governing bodies consisting of public-private partnerships to assist park management
- Increased threat to marine areas including over fishing, coral extraction, pollution
- Lack of rules and regulations and enforcement where exist
- Lack of equipment and vehicles for patrolling
- Consistent conflict of interest between fishermen, park administrator, and other stakeholders linked to the tourism development
- Over fishing of conch, spiny lobster
- Lack of a no-take zone
- Use of the inappropriate fishing tool
- Lack of training
- Lack of education and awareness programs

The NOAA supported project, *Promoting a Multi-stakeholder Network to Develop and Implement a Comprehensive and Effective National MPA Strategy in the Dominican Republic*, was designed to strengthen linkages between Marine Protected Areas (MPA) and conservation staff and those supporting the formation of new MPAs in areas of the Dominican Republic. In order to address the lack of communication and collaboration amongst practitioners, the project supported public-private collaboration, sharing of resources and lessons learned to strengthen the effective management of MPAs throughout the country. A key aspect of the project was to encourage both established MPAs and those in the process of being formed to use a more participatory multi-stakeholder and community-based approach in their work, building awareness and garnering greater support among fishing communities and tourism sectors for the importance of no-take MPAs as well as steps that can be taken to lower negative land-based and user-based threats to reefs. The project focused on building a national network of MPA practitioners and supporters, using specific training sites for establishing best-practices in community processes and multi-stakeholder approaches around the Dominican Republic.

Project sites & Profiles

Over the course of the project, Counterpart secured increasing support for the National Network of MPA Practitioners, enhancing coordination and effectiveness. As a result, the number of MPAs forming the network grew from three to eight, with the Damajagua terrestrial park joining the network during the last phase of the project and finding significant applicability for its terrestrial context.

A. Primary Sites

A.1. Parque Nacional del Este, located near Bayahibe on the south-eastern coast of the Dominican Republic, is the best developed of the Marine Parks in the Dominican Republic and as such forms part of the International Coral Reef Action Network. Ecoparque, a local NGO, has been given the official role of managing the park, with experience working with the local fishing communities and tourism industry to make the park function under conditions of very little government support for management or enforcement, and with user fees for the park going directly to the national budget rather than being used to support the management of the marine park. The *Romana-Bayahibe* Hotel Association, composed of six hotels which surround the national park, has been a strong conservation partner for the park, adhering to more sustainable and higher environmental standards for the last five years.

Parque del Este is an ICRAN site, of which the Romana-Bayahibe Hotel Association has been a key supporter and protector of the site, aware of the park's contributions to both biodiversity and the tourism industry, with hotels taking measures to be Blue Flag and Green Globe certified. Other major stakeholders for Parque Nacional del Este include: Subsecretariat of Protected Areas and Biodiversity under the Ministry of Environment and Natural resources, which maintains legal responsibility for management of the park including, protection and conservation as well as law enforcement. Fundacion Amigos del Parque Nacional del Este, a community based NGO which helps with park management, conducts research and community outreach aimed at increasing environmental education and conservation awareness for the park. This NGO has been working with the community for over 10 years, and as such represent a key management and conservation partner for the national park.

A.2. Punta Cana, on the east coast, which is utilized as a primary networking site based on the MPA there, includes the presence of the Punta Cana Foundation's excellent training facilities. This institution is funded almost entirely by Punta Cana Resort and Club, and is therefore a model of support for marine conservation by the tourism industry, particularly as we strive to build sustainable financing mechanisms into the expositing and newly created MPAs in the country.

A.3. Sosua, on the northern coast of Dominican Republic, has generated support of multiple stakeholders there including the Sosua Diving Association, Sosua Vendor and Artisan Association, Sosua Fisherman's Cooperative, and *Sosua-Cabarete* Hotel and Restaurant Association, and Sosua Tourism Cluster, the Ministry of Tourism and the Ministry of Environment and Natural Resources. Since the submission of the NOAA concept paper, Presidential decree No. 634-05 established the Sosua Marine Theme Park, with the purpose of shifting Sosua towards a more sound and sustainable development in order to help reserve of coral reef population and help preserve these marine resources for future generations. The decree also establishes the management authority or Patronage consisting of one member from the Undersecretary of Tourism for the North Region, the Director of Ministry of Environment for the North Region, the Mayor of Sosua, Sosua Hotel Association, and declares Massimiliano Scerra, current President of the Diving Association, as the Executive Director of the Patronage and active Manager for Sosua Marine Theme Park. This patronage will have the authority to set and collect fees for park usage, to be used for management of the park. This revolutionary step by

the government makes Sosua the potential national model for financial sustainability and multi-stakeholder governance, and thus the ideal training site for establishing participatory multi-stakeholder and community-based management plan.

B. Networking Sites

B.1. La Caleta National Park, situated 17 kilometers from the mouth of the Ozama river, near the Las Americas International Airport, consists of an area approximately 12.1 square km. Established in 1986, *La Caleta* was the first MPA established in the Dominican Republic and remains one of the most popular dive sites in the country, reaching a maximum depth of 180 meters and composed mostly of declining coral reef populations due to over fishing. The primary attraction within the park is the Hickory boat, purposely sunken in 1984 to create habitat for threatened species, and considered one of the top diving sites in the Caribbean. Though *La Caleta* is an ecotourism park, and stakeholders have a vested interest in the resource abound (including City Hall of Boca Chica and La Caleta, Ministry of Environment and Natural Resources, Fundacion MAMMA, National Aquarium, Pronaturaleza, PNUD as well as the Dive Industry), it remains a prime example of a paper park receiving little to no support from the government, with no active enforcement of laws or management. Due to its level of threat and close proximity to Santo Domingo, *La Caleta* represents a perfect model site in which to incorporate best practices and establish effective MPA management.

B.2. Monte Cristi National Park, (MCNP), established in 1983 by the Dominican government, covers an area of 561 km² and is located in Monte Cristi Province, in the extreme northwest Dominican Republic. The coastal area of the Park stretches from Punta Rucia to the Haitian border and includes seven keys. The Park is home to an extensive area of the pristine coral reefs. Two major rivers pass through MCNP (Dajabon and Yaque del Norte), supplying water to a series of lakes within the Park. The area of the Park is classified as Subtropical Dry Forest (Bs-S) and is home to a wide variety of flora and fauna. Unique aspects of the flora and fauna of MCNP include a vast area of mangrove forest, more than 150 species of birds, and rare mammals and reptiles, such as the manatee and crocodile.

Unlike other protected areas in the country, MNCP lacks institutional support, with only the local park administration, under the Ministry of the Environment, working to conserve, protect and manage the area. As a result, there has been little effort to design and implement comprehensive, long-term strategies to conserve and enhance the park. With only 10 park rangers on staff, the park is easily targeted and suffers from deforestation, mainly due to the removal of mangroves for firewood, unchecked (and illegal) grazing of livestock within Park's boundaries and overfishing. Other stakeholders in the park include tour operators and eight fisher cooperatives, dominated in particular by the *Bienvenido Espinal Cooperative of Fishers*, headquartered in town of Monte Cristi. The cooperative has 54 active members but provides services to more than 450 fishers from *Punta Rucia* to *Manzanillo*.

B.3. Los Haitises National Park, is located in the Northeast of the country, South of Samana Bay. Established by Law No. 244 in 1968 covering an area of about 600 Km², which included marine and terrestrial areas. This has one of the most wonderful and development mangrove and caves. This park has been one the national that have received a lot support from the international

cooperation in order to alleviate the conflict of interest among the stallholders and lad users. Currently, there is NGO supporting the management and conservation of this, which the Center for the Conservation and Eco-Development of Samaná Bay and its Surroundings (CEBSE) for more than 15 years.

B.4. Jaragua National Park, was established in 1983 by Presidential Decree. This is the largest MPA of the Dominican Republic with 1,374 Km². Its marine area covers about 905 Km². Since 1991, the Grupo Jaragua, which a local NGO has been working with management, monitoring and research with this park in conjunction with Subsecretaria the Areas Protegidas y Biodiversidad under a co-management agreement.

B.5. Damajagua Natural Park, located in Puerto Plata province, is visited by many of the tourists who also visit the Sosúa Bay Marine Park. Protected by law, it is a land-based resource but was added to the network of MPAs because the Damajagua River and watershed feed into the Sosúa Marine Park. Counterpart was invited to Damajagua Natural Park to apply a similar process, establishing a multi-stakeholder co-management model in respect to the terrestrial context, providing an ideal opportunity to address land-based threats to the Sosua MPA.

III. PRINCIPAL PARTNERS

A. *Implementing Partners*

Fundacion Global Democracia y Desarrollo (FUNGLODE): FUNGLODE served as a coordinating agency for efforts at the national and governmental level, including promoting the agenda and priorities of the MPA network with government, as well as for a national media campaign.

Punta Cana Ecological Foundation (PCEF): The Punta Cana Ecological Foundation is funded almost entirely by the Punta Cana Resort and Club and has served the project as a model of support for marine conservation by the tourism industry, particularly as we strived to build sustainable financing mechanisms into the newly created MPAs in the country.

B. *Other project Partners*

The following organizations were key partners that attended the Participatory Planning Workshops.

Local MPA Management Authorities: The following NGOs manage the MPAs constituting the network and have controlled all activities in their respective sites, managing more of the work as the project advanced and applying the management practices acquired as judged beneficial for their marine areas.

Ecoparque (Parque del Este), **Center for the Conservation and Eco-Development of Samaná Bay** (Los Haitises); **Reef Check** (La Caleta); **Grupo Jaragua** (Jaragua).

The *La Romana - Bayahibe Hotel Association*, the *Subsecretariat of Protected Areas and Biodiversity* and the *Foundation Amigos del Parque Nacional del Este* have been key supporters and protectors of the Parque del Este, recognizing the park's contributions to both biodiversity and the tourism industry and promoting environmental education.

The **Sosua Diving Association**, the **Sosua Vendor and Artisan Association**, the **Sosua Fisherman's Cooperative**, and the **Sosua-Cabarete Hotel and Restaurant Association** participated in the multi-stakeholder process that established the Sosua Marine Theme Park. The experience and skills they acquired proved invaluable to the Participatory Planning Process the *Promoting a Multi-Stakeholder Network to Develop and Implement a Comprehensive and Effective National MPA Strategy in the Dominican Republic* project is based on.

The Ministry of Environment and the Ministry of Tourism assisted CPI in securing all needed governmental, private sector and NGO permissions and support needed for the successful implementation of the project. The Ministry of Environment was instrumental in supporting the Fisher-to Fisher exchange, approving permits for coral restoration and formally establishing the Sosua marine park (under the NFWF-funded project) which was an encouraging step forward to legally establish participatory multi-stakeholder and community-based management plan for new MPAs under the NOAA project.

IV. PROJECT PRODUCTS & OUTCOMES

- 1. Establish a collaborative network of MPA managers, fishing communities, and private sector dive and tourism industry representatives in the country to support MPAs and ensure better long-term stewardship of coral reef ecosystems.**

Over the course of the project, Counterpart formed a network of NGOs and institutions supporting coastal management in the Dominican Republic to encourage sharing of lessons learned, stimulate collaborations amongst various sites and synchronize conservation efforts.

Through meetings with key partners at the national and local level, such as the National Aquarium, the Sosua Marine Park Patronage, Reef Check, USAID, MacArthur Foundation and *Fundacion Global Democracia y Desarrollo* (FUNGLODE), Ministry of Environment, Ministry of Tourism, Municipality of Sosua, La Romana - Bayahibe Hotel Association, Sosua Hotel Association, Counterpart secured increasing support for the National Network of MPA Practitioners project, enhancing coordination and effectiveness. As a result, the number of MPAs forming the network grew from 3 to 8.

At all primary sites, Kelvin Guerrero, Counterpart's Project Coordinator, facilitated a series of individual meetings with various stakeholders such as Fishermen Associations, Hotel and Restaurant Associations, local municipal offices, and the dive industry to assess each group's interest, contributions and withholdings towards actively supporting the Network. The main objectives of the workshop were to build capacity among key

actors in order to promote the effective management of the marine area and introduce the participatory planning process.

To foster interactions between MPA practitioners, FUNGLODE agreed to host and formally establish the on-line National Network of MPA Practitioners and expanded the project's reach to include participants from already established MPAs such as La Caleta, Monte Cristi, Jaragua and Los Haitises. To ensure long-term stewardship of coral reef ecosystems, Dr. Austin Bowden-Kerby developed an Internet information exchange forum on the Yahoo Web portal, to share and promote the methods and lessons learned among conservationists and scientists of the region. The Yahoo group is called "Caribbean Acropora Restoration Network" (Caribbean-Acropora-Restoration@yahoogroups.com). The site is reserved for those actively engaged in working with the threatened *Acropora cervicornis* and *A. palmata* corals and the viable hybrid *A. prolifera* and their conservation and restoration. Group members contribute to the group by posting messages, articles and photos and discussing problems solutions and methods to accelerate the work throughout the region. The resources posted contribute to the strengthening of the Network, and linkages to MPAs and restoration of a balanced coral reef ecology.

2. Clarification and improvement of the governmental/legal process of MPA establishment and recognized enforcement procedures.

Counterpart assisted the Government with national policy issues, focusing significant attention and resources on key sites in the country to create model sites for effective MPA management.

The NOAA project built upon the success encountered by the NFWF-funded Sosua Multi-Stakeholder Management Plan which led to the establishment by Presidential decree No. 634-05 of the Sosua Marine Theme Park. The process of officially instituting the park was an initiative undertaken by various stakeholders forming the community of Sosua. The valuable lessons learnt in Sosua were adapted to the needs of the other marine parks constituting the Network. The Initiative contributed greatly to the Government supporting the NOAA project and fostered interest in the value of Participatory Planning in the process of legally establishing new MPAs. Following this success, a unified strategic plan for MPAs was developed to be presented to the national Government of Dominican Republic.

This revolutionary step by the Government makes Sosua the potential national model for financial sustainability and multi-stakeholder governance, and thus the ideal training site for establishing participatory multi-stakeholder and community-based management plan.

Institutional mechanisms for participatory planning and management of biodiversity in coastal and marine areas were enhanced by creating linkages and strengthening the capacity at all levels of stakeholders, including government and non-governmental organizations, such as private business, communities and individuals. The aim of this

process was to facilitate communication, build awareness, increase coordination and provide guidance and technical skills.

Counterpart's Participatory Planning Process was an eye opener for Government officials who were invited to attend the workshops. The process and results of these meetings determined: 1) the differences between stakeholders in terms of goals for their MPA, 2) group differences in perception of the process, 3) how those differences were handled, 4) how decisions were made to benefit all stakeholder groups. Despite some significant differences, some consensus was reached and comforted the Government in its willingness to legally establish new MPAs following this model.

3. Capacity building for fishing cooperatives

In addition to the Participatory Planning workshops, Counterpart decided to engage this group individually and designed a workshop specifically focused on building vision for sustainable alternatives that can help fishermen secure a better future and protect the declining natural resources upon which they depend. The workshops were a great success with member participants eager to express their concerns and becoming integrated in the process.

In addition, with the assistance of local partners including Reef Check Dominican Republic, the Punta Cana Ecological Foundation, Ecoparque, and the Ministry of Environment, Counterpart facilitated a successful "Fisher-to-Fisher" Exchange, bringing fishermen from the Sian Ka'an Biosphere Reserve in Mexico to share lessons learned in effective management and together build a unified vision for the Dominican Republic. In addition to the community mapping and vision building exercises in support of MPAs, the 100 workshop participants were introduced to the "lobster casita" or "lobster shed" methodology, a technique originating in Cuba and successfully adopted by fishing communities living on the coast of the Yucatan Peninsula in Mexico, with individual fishermen now sustainably harvesting up to one ton of lobster a season. Hearing of such a success story, the Dominicans grew convinced that sustainable fishing could not only conserve the environment but also significantly increase the number of catches and subsequently their revenues. Based on market prices, a fisherman would get an average of US \$1 for a pound of bonefish while he could earn US\$200-\$400/day chartering his boat to tourists interested in fly fishing - a considerably higher income than commercial fishing provides.

At the Monte Cristi Fisher-to-Fisher exchange, the 30 fishermen who participated in the activity showed a high level of engagement which led to a longer workshop (3 days). The Mexican fishermen supervised the construction of a "lobster casita". Thanks to the in-depth training they received, the fishermen from Monte Cristi are now able to train other fishermen within the country and other Caribbean islands. The Mexican fishermen suggested that for the "lobster casita" system to bring credible results, more than 100 should be deployed. In order to obtain the results anticipated, and as a direct outcome of the "Fisher-to-Fisher" exchange, the MacArthur Foundation will cost-share purchasing

the necessary materials to build 50 “lobster casitas” which will contribute to the effectiveness of the National Network.

4. Capacity building for conducting various trainings among fishing communities

Counterpart International encouraged the organizations managing Los Haitises National Park, La Caleta, Jaragua, Parque del Este, Sosua Marine Park and Monte Cristi to participate in the workshop sponsored by the Ministry of Environment and Natural Resources and The Nature Conservancy to facilitate a learning network among MPAs to improve management effectiveness. The workshop proved beneficial as it gave all organizations additional tools to strengthen the MPA National Network, including building capacity among MPA managerial staff, NGOs, National and local government agencies for working with fishing communities and the tourism industry. 26 MPA and NGO staff issued from the site areas listed above attended.

In addition, ECOPARQUE, the managing NGO of Parque del Este, has been working with the Fishermen and Boat Operator Associations in order to support better management of the Park, through organizing beach clean-ups in Bayahibe and Guaraguao; increasing environmental education and awareness through facilitating education exchange with students from the two local Dominican Universities; and presentations on the CPI Poster Curriculum. The Punta Cana Ecological Foundation attended a participatory planning workshop and a coral restoration workshop and committed to provide the necessary tools and educational materials to most effectively work with the fishermen.

5. Refinement and publication of CPI’s coral reef management poster set in Spanish

Counterpart’s 12 - Poster Curriculum Set on Sustainable Coastal Management was adapted to the context of the Caribbean and used to raise awareness of the importance of developing effective Marine Protected Areas among fishermen, community members, local schools and tourists.

The poster curriculum was reviewed by FUNGLODE, Ministry of Environment and Natural Resources (Vice Ministry of Protected Areas and Biodiversity, Vice Ministry Coastal-Marine Resources, Department of Environmental Education), National Aquarium-DR, and Reef Check-DR. With additional financial support from FUNGLODE and the Lighthouse Foundation, 1,000 posters were printed and distributed amongst 15 government and non-government organizations throughout the Dominican Republic. These organizations were identified based on their network of constituents and need for educational materials to utilize in their ongoing conservation activities towards coral reef, marine resources, conservation and their sustainable use. The remaining posters will be delivered by Kelvin Guerrero (CPI Project Manager) to scuba diving schools, hotels, and potential future donor or any local NGO working on conservation in DR such SOECI (Sociedad Ecológica de Cibao) or SurFuturo.

Funglode hosted a poster launching event at its headquarters in Santo Domingo, as well as a comprehensive and detailed media strategy including websites, blogs, press releases and news coverage to educate the public about the project.

6. A large and diverse group of people trained in how best to present the awareness poster curriculum to communities, fishing cooperatives, and schools

In order to better equip the various stakeholders with the necessary information to improve management of the surrounding marine resources, Counterpart used the poster curriculum set at all its workshops to improve the outreach and awareness programs, reinforcing the benefits of an effective MPA for fisheries and the tourism industry. The following organizations' representatives were trained to best present the awareness poster curriculum to communities, fishing cooperatives and schools: Subsecretaria de Areas Protegidas y Biodiversidad, Sub-secretria de Recursos Marino-Costero, Dirección Nacional de Educación Ambiental, Acuario Nacional, Reef Check-Dominican Republic, FUNGLODE, Fundacion Ecologia Punta Cana, ECOPARQUE, Grupo Jaragua, Agrofrontera, CEBSE, Bavaro Reef Funds, Consorcio Ambiental Dominicano, Asociacion Hoteles Romana-Bayahibe, Asociacion de Hoteles del Este, Sociedad Ecologica de Cibao, Asociacion de Propietarios de Lanchas de Bayahibe. 78 people were trained and 800 poster sets were distributed.

7. Reef First Aid sites established, one per each three sites to rescue broken hard coral fragments broken by careless divers and boaters, and re-planting them with proper permission sponsored by dive operators and resorts

Reef first Aid sites were established in the Monte Cristi National Park, at Punta Cana, and at the Sosua Marine Park. In addition, site visits and rapid environmental assessments of Punta Cana, Sosua, Bayahibe, La Caleta and Monte Cristi were carried out, in which the state of the coral reefs in each area was evaluated and major threats and conflicts determined, thereby providing a baseline enabling yearly comparisons.

In order to maintain the sites, Dr. Bowden-Kerby conducted field training in coral restoration for the Punta Cana Ecological Foundation (Punta Cana) and AgroFrontera (Monte Cristi). A basic introduction to marine ecology was provided through a "Coral Care and Reef First Aid" presentation and field visit for AgroFrontera Director and Co-Director, as well as two marine park staff. Dr. Kerby trained two Marine Park staff and Fishing Cooperative Members in threatened coral restoration methodology, with 12 staghorn coral branches planted onto a wire mesh frame as a pilot trial for the site.

To support the Reef First Aid Initiative, the Ministry of Environment provided letters of support and permits to conduct the coral restoration work paralleling the participatory planning process and two staff members were assigned to follow the project to learn the methodology and to create "trainer of trainers" within the Ministry.

In terms of the results obtained, the comparative analysis conducted on the coral reefs sites showed that the Punta Cana site was the most successful Acropora coral restoration site with phenomenal growth on both frames and suspended ropes and increases in coral biomass estimated at 8-10 fold. Monte Cristi and Sosua have obtained mixed results that can be attributed to a less favorable geographical location (at the mouth of the Yaque del Norte River with no outlet channel which causes to retain silt and mud in the case of Monte Cristi) and to human sabotage (theft of the coral nursery frame in Sosua). Overall, all 3 sites have obtained encouraging results and the observations made during the assessment will help further improve the restoration techniques developed.

8. Higher levels of interest and commitment for coral reef conservation from the private tourism sector in all three sites, as evidenced by in-kind and cash contributions

The Punta Cana Ecological Foundation (PCEF) reconfirmed the Foundation's continued support for the coral restoration project and provided needed resources for the activities to be carried out at Punta Cana. The resources included training facilities, boat, fuel, staff, scuba diving gear and materials to build coral nurseries.

After attending the Environmental Awareness and Participatory Planning workshops, Coral nursery and restoration work carried out at all three sites was supported by the dive industry who was eager to learn from Dr. Bowden-Kerby how to care for broken corals and remove predators to ultimately bring the reefs, from which they derive their livelihoods, to a more attractive level to divers. The dive industry in Sosua and Punta Cana displayed the greatest willingness to contribute to conservation and restorations activities. Dive shop owners and instructors have signed up to the "Caribbean Acropora Restoration Network" Yahoo Group to exchange tips and general information on the diving sites they bring tourists to. They have also used the portal to communicate with Dr. Kerby and report any issue or ask for advice on how to deal with particular situations affecting the corals. Dive operators have become proficient at coral restoration and were given the Coral Gardens & Reef Intervention manual to refer to when caring for the corals. The dive industry contributed significant resources in staff time, boat, fuel and scuba gear to the project.

The dive industry is instrumental in encouraging more active tourism involvement and financial support for coral reef conservation and no-take MPAs.

9. Greater collaboration and respect among reef users and reef conservationists as evidenced by cooperative action to save the reefs

Establishing "Coral Care and Reef First Aid" programs is an excellent way to generate greater collaboration to educate key people in the tourism, diving, and fishing industries, and government about basic reef ecology.

Among other things, the Program was established to help implement a more systematic approach for increasing awareness and appreciation for the importance of corals and coral reefs, the causes of their decline, and collaborative action to ensure their recuperation.

Dr. Bowden-Kerby's hands-on and low tech methodology enabled communities and volunteers working with corals to obtain positive results when assisting reefs. It was designed for SCUBA diving and snorkeling operators, experienced recreational divers, and resort water sports activity staff.

At the basic level, the program addresses how to remove snails and fire worms, weed seaweeds overgrowing corals, dusting sand and parrot fish waste off of massive corals and elkhorn corals and rescue sea fans torn off by storms for replanting onto fish houses. At a more advanced level, the activities include rescuing and replanting of broken branches, establishing coral hospitals for planting broken and detached corals, removing chicken liver sponges where they overgrow corals, preventing corals from killing each other, rescuing corals dislodged by storms or exposed during extreme low tide and protecting elkhorn coral from overgrowth by sponges and seaweeds or from sea urchin erosion.

In addition to teaching hands-on rescue techniques, the "Coral Care and Reef First Aid" program contributes to supporting no-take MPA areas and coral reef management in general and can be used in awareness programs for fishing communities, tourism operators, children, youth, and visitors.

10. Greater understanding for the fisheries value of no-take MPAs by the fishing community, as evidenced by lower levels of violations to no-take areas and increased peer pressure to conform

Including the fishermen associations to the decision making process guaranteed that the right measures would be taken to protect the environment and the marine resources on which they depend. The response received was very positive, the fishermen were willing to participate in the process, contribute their knowledge and information, and most importantly, they accepted to change some fishing methods and support no-take zones. Most fishermen recognize that they are impacting the marine communities and fishing population, but need help improving their fishing methods.

In Sosua, the majority of stakeholders have agreed to comply with zoning regulations of the recently established Sosua Marine Park Management Plan (including no-take zones), as long as everyone is contributing. Since the fishermen and vendors have been integrated into the process, both stakeholder groups have been the most active participants in the workshop, are adamant about being part of the solution, are motivated to work together and are offering to help in any way possible. An Environmental Awareness Workshop designed for fishermen was conducted by Dr. Bowden-Kerby, with 27 participants, focusing on establishing no-fishing areas, how they function, over-fishing and the negative impacts and the importance of healthy corals for healthy resources.

A workshop on Fisheries Management, Regulation and Coral Reef Conservation was conducted for the fishermen from La Caleta with support from Reef Check, the primary support and NGO for La Caleta National Marine Park. Reef check invited Counterpart International to facilitate the Multi-Stakeholder process in support of MPAs, based on successes in Sosúa and Parque Nacional del Este. The workshop was lead by Kelvin Guerrero, NOAA Project Coordinator in the Dominican Republic.

PROJECT PRODUCTS TABLE: TARGETED VS. FINAL

Project Products	Outcomes	
	Targeted	Final
1. Collaborative network of MPA managers, fishing communities, and private sector dive and tourism industry representatives in the country to support MPAs and ensure better long-term stewardship of coral reef ecosystems.	Form of a multi-stakeholder MPA support network	Secured increasing support for the network of MPA managers through participatory planning process 25 meetings conducted with key partners at the national and local level Fostered exchange of information and best practices via direct interactions between MPA managers and the use of IT.
2. MPA establishment and recognized enforcement procedures	Clarification and improvement of the governmental/legal process	Creation of model sites for effective MPA management Unified strategic plan developed
3. Capacity building for fishing cooperatives	Training visit to DR from fishermen from well-established management areas in other countries (Sian Ka'an, Mexico), to share vision, build capacity among fishing cooperatives, and train in lobster casita construction	3 "Fisher-to-Fisher" exchange workshops attended by more than 100 fishermen who were introduced to the "lobster casita" methodology 30 Monte Cristi fishermen trained over 3 days to become trainers. The impressive success of the "lobster casita" in Mexico convinced the Dominican of alternative and more sustainable fishing means 6 workshops on conservation and fisheries management attended by more than 80 fishermen
4. Capacity building for conducting various trainings among fishing communities	At least 10 MPA and NGO staff	26 MPA and NGO staff from Los Haitises National Park, La Caleta, Jaragua, Parque del Este, Sosua Marine Park and Monte Cristi learned how to conduct trainings among the fishing communities
5. CPI's coral reef management poster set in Spanish	Refinement and publication	12-poster curriculum set on Sustainable Coastal Management was adapted to the context of the Caribbean 10,000 posters printed
6. A large and diverse group of people trained in coral reef management awareness curriculum	20 fishermen, 10 from NGOs, 10 from government, and 10 from the dive industry (50 people	78 people trained issued from the fishing community, NGOs, government and dive industry 800 poster sets distributed

	minimum)	
7. Reef first Aid sites	Established three sites to rescue coral fragments broken by careless divers and boaters, and re-planting then with proper permission sponsored by dive operators and resorts	3 sites with nurseries established in Monte Cristi, Punta Cana and Sosua 5 field trainings in coral restoration conducted 35 people trained Letter of support and permits obtained from the Ministry of the Environment to conduct restoration work
8. Interest and commitment for coral reef conservation from the private tourism sector in all three sites, as evidenced by in kind and cash contributions	Higher levels of interest and commitment	More than \$20,000 of in-kind donations from the dive industry and hotel associations
9. Collaboration and respect among reef users and reef conservationists as evidenced by cooperative action to save the reefs	Greater collaboration and respect	Establishment of “Coral Reef First Aid” Programs Establishment of 2 rapid response teams composed of divers in Sosua and Punta Cana
10. Value of no-take MPAs by the fishing community as evidenced by lower levels of violations to no-take areas and increased peer pressure to conform	Greater understanding	Inclusion of the fishing community in the decision-making process leads to respect of no-take zones Awareness-raising of unsustainable fishing practices Lessons learned from the Mexican fishermen Collaborative effort / self-policing

Since March 2008, the Punta Cana Foundation has continued the coral reef restoration work that was started during the project and has now established 10 coral nursery frames of *Acropora cerviconis* in the marine area of the Punta Cana resort. The corals have been growing steadily and are very healthy. They will be replanted on the reefs in the fall when the water temperature drops.

A Reef Check Monitoring was conducted at Cayo Ahogao, by the Yaque River Delta, and La Granja sites in the Monte Cristi Submarine National Park on May 24. Key species of corals, invertebrates, and fishes were assessed. The purpose of this coral reef monitoring was to establish baseline information on the current health of the coral reef to enable yearly comparisons on biodiversity conservation. In addition, water quality analysis and monitoring were conducted to measure the physical-chemical properties of the Monte Cristi Submarine Park in terms of levels of nutrients (Nitrogen Phosphorus), coeliform, salinity, dissolved oxygen, turbidity and sedimentation and assess the impact inland water runs off from residues of pesticides and fertilizers have on the marine park water. The intersection of aquatic and terrestrial ecosystems at the shoreline of marine coastal zone brings together two very different, complex and yet highly interrelated ecosystems. Together they form the foundation for biodiversity which produces and maintains a huge number of natural resource benefits. These ecosystems are increasingly subject to a range of human activities and are threatened by land-based, atmospheric or aquatic sources of pollution, over-exploitation of living resources and destructive harvesting practices, introduction of alien species and destruction of habitat. During the assessment, a new record of the Indo-Pacific red lionfish *Pterois volitans* was reported. This is the first official reported record of this non-native species for the Dominican marine area. Since this observation, more than twenty individuals were observed in the region. An article on that finding was written by Counterpart's Dominican Republic Project Coordinator, Kelvin Guerrero, and published in the Aquatic Invasions (2008) Volume 3, Issue 2: 255-256.

The NOAA-funded National MPA strategy carried out by Counterpart was recognized at the highest level by the appointment of Counterpart's Project Coordinator as a member the Hispanic Network for Integrated Coastal Management along with the President of Academy of Science of the Dominican Republic and the President of the State University of Santo Domingo. This network is composed of 7 Latin American and 2 European countries and each country has a sub network governed by a steering committee.

V. IMPACT SUMMARY OF THE PROJECT

From the onset, a major contributor to the success of the project was the involvement of the National and Municipal government agencies. They participated in awareness raising workshops, learnt the obstacles to implementation of management plans, possible solutions, and resources needed for a successful functioning MPA. Workshops' results have provided the Ministry of Environment and the Ministry of Tourism the tools to create a legal framework to assist effective implementation and reinforcement of MPAs.

The project also contributed to making stakeholder groups throughout the country become aware of the current state of declining health of the coral reefs, and the urgent need to react as they witnessed the negative financial and social impacts of a depleted marine ecosystem. For example, thanks to the lobster casita demonstration workshop, the fishermen began to envision an alternative to their current practices and the meetings organized by Counterpart enabled to identify co-management of resources through established Marine Protected Areas as a way to sustain and enhance livelihoods.

While the NOAA supported initiative, *National Network of Marine Practitioners*, entails three main sites including Bayahibe, Punta Cana and Sosua, Counterpart has now expanded the program's reach to engage representatives from all national parks in the Dominican Republic to round out the key stakeholders involved in the national network. In January 2008, a workshop was held amongst all Park Staff, hoteliers, national and local government agencies, Fishermen and Boat Operator Associations and NGOs working towards environmental conservation, to share lessons learned from each site, identify resources and expertise in country, and establish a work plan to support the individual needs of each Marine Park and stakeholder group.

Counterpart's multi-stakeholder and community-based approach has proven to be successful and is beginning to be sought after by Governments, NGOs and private sector alike interested in replicating it in other areas, both marine and terrestrial. It also raised awareness and garnered greater support among fishing communities and tourism sectors on the importance of "no-take" MPAs.

The work carried out under the NOAA project will be continued through the USAID Dominican Republic Sustainable Tourism Alliance's program (DSTA) and will build upon the Network of MPAs. Under the DSTA, Counterpart and its local partner (AgroFrontera) will design and implement a community-based co-management plan for coastal waters within the Monte Cristi National Park, promoting practices to increase populations of keystone species and no-take fishing zones. It will also link farmer and fisher cooperatives, government and private sector in support of integrated natural resource management plans. The National Network of MPA Practitioners will be strengthened through the identification and dissemination of best management practices and a MPA workshop with all the MPA Practitioners will be held in Santo Domingo to share experience of sustainable and conservation practices.

In addition, the MacArthur-funded project will develop an integrated strategy of sustainable development and integration from the mountain to the reef (Ridge-to-Reef) and will finance the

construction of 50 lobster casitas for the Monte Cristi marine park, contributing to the implementation of more sustainable fishing practices by the local fishermen.

VI. LESSONS LEARNED AND RECOMMENDATIONS

Not all MPAs are the same; each project site entails its own unique set of problems and internal conflicts between stakeholder groups with various levels of support and collaboration from the national government or managing NGO. For instance, Parque del Este has a very supportive and effective management authority and NGO, Ecoparque, meanwhile on the other side of the country, Monte Cristi lacks the minimal support needed by government, NGOs and private sector to establish a structure for an effective or adaptive management system.

Using a Participatory Planning Process has proven successful to mediate conflicts between stakeholders' groups with potential conflicting agendas. A major breakthrough was realizing that too often, crucial stakeholders are excluded while they should be part of the decision making process.

Engaging people is key to generating high levels of interest and support. The various workshops held at all MPA locations resulted in fishermen, vendors and dive industry to express their apparent willingness to adopt and support best management practices for MPAs.

Marine Protected Areas have entered the political arena and the contribution made by the NOAA-funded project to the marine ecosystems and local economies of the Dominican Republic is gaining global recognition that will be reinforced in the years to come as the world leaders have decided to address the current inadequate protection of the oceans and coasts by creating representative networks of MPAs by 2012.

Finally, financial investments are necessary to expand the MPAs and Counterpart hopes that all stakeholders will support this effort. As countries with coral reefs attract millions of SCUBA divers every year, Counterpart relies on the tourism industry to yield significant economic benefits to the Dominican Republic and for MPAs to contribute to restoring coral reefs while safeguarding valuable fish stocks and important habitats.

APPENDICES

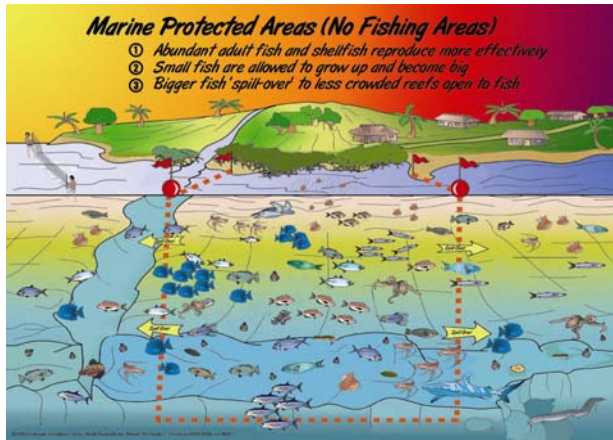
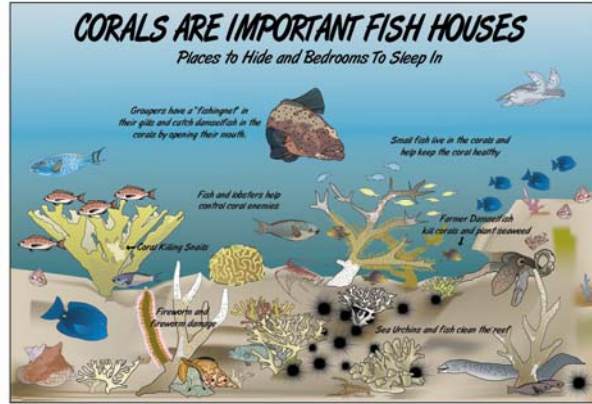
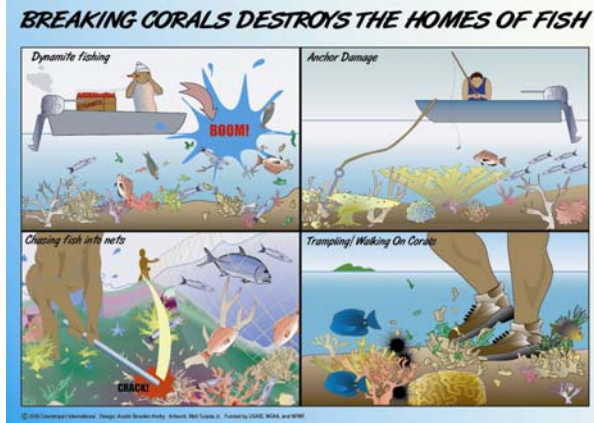
APPENDIX A – SAMPLE POSTERS FROM THE 12-POSTER CURRICULUM SET

APPENDIX B – 12-POSTER CURRICULUM PRESENTATION PHOTOS

APPENDIX C– CORAL GARDENS MANUAL & REEF INTERVENTION

APPENDIX D –ARTICLE ON *INDO-PACIFIC RED LIONFISH*

APPENDIX A - SAMPLE POSTERS FROM THE 12-POSTER SET CURRICULUM



APPENDIX B: 12-POSTER SET PRESENTATION PHOTOS



APPENDIX C– CORAL GARDENS MANUAL & REEF INTERVENTION

CORAL GARDENS HANDBOOK

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Guidelines for Handling and Transplanting Corals

1. Government permission should be secured before beginning coral transplantation work, and the work should be undertaken under the guidance of scientists trained in “*Coral Gardens*” methods. Other types of restoration interventions can be done without such advice and permissions, such as removing seaweeds overgrowing corals, removing disease-spreading *Stegastes* damselfish, and removing coral-killing snails and fire worms. These actions help coral populations regain a more healthy state without handling and moving corals.



2. Handling Guidelines:
 - a. Wash your hands with baby shampoo and seawater directly beforehand. Coral handlers must have very clean hands: no sunscreen, gasoline, or oils.
 - b. Gloves are not recommended unless they are non-absorbent otherwise they can trap foreign proteins that can cause corals to react negatively.
 - c. The part of the human body most similar to coral tissue is the surface of our eyes, so show the corals some sympathy as you touch and handle them.

3. Transport Guidelines:
 - a. Shade the transplants during transport
 - b. Transport the corals in buckets of seawater, one clone (genetic type) per bucket, or carry them in baskets exposed to the air, sheltered from the sun and wind, and splashed not less than once every minute with clean seawater.
 - c. Corals should best be moved during the winter months when the burning rays of the sun (ultraviolet radiation) are less strong (from



November to March in the Northern hemisphere). The closer the site is to the equator the less important the season of transplanting. If corals are transplanted during the summer months, special care should be taken.



4. Planting Guidelines:

- a. Coral branches should be planted with the up-side up. Close inspection shows a lighter color and distinctive “reaching towards the light” polyp pattern on the bottom side of horizontal *Acropora* branches.
- b. The bigger polyps at the end of each staghorn coral branch (called axial or apical polyps) should face upward as much as possible when planted.
- c. If exposure to air is necessary during transplanting, keep them shaded and out of the wind. Splash the corals at least once per minute. Be vigilant... corals are not just pretty stones, but are very much alive and are easily damaged.



5. Site Selection Guidelines:

- a. The transplant site should be of similar light quality to the original site, especially during summertime. However, during the four weeks either side of December 21st, corals taken from 30ft may do well when planted to only 6 feet.
- b. Corals taken from dark bottoms should not be planted onto bright sandy bottoms in the summer months.
- c. If corals bleach seriously, they are not yet dead, and sometimes do recover, but it is much better to avoid this sickly condition, as it stops the corals from growing until the corals regain their color, showing that the tiny brown algae are back.
- d. The best restoration sites have cool, clean, full-strength seawater, with good current flow but sheltered from regular winter storms or tropical storm waves. Avoid difficult sites, such as areas prone to very rough seas, shallow closed lagoons that heat up during summer months, areas with freshwater runoff from the land, and where the environment is very muddy.
- e. Survey the transplant site well before the day of transplanting, so that the best sites are located within the general area and the best method is chosen, allowing the corals to be immediately planted, rather than delaying while the specific sites are chosen and prepared (cleaned, etc.).



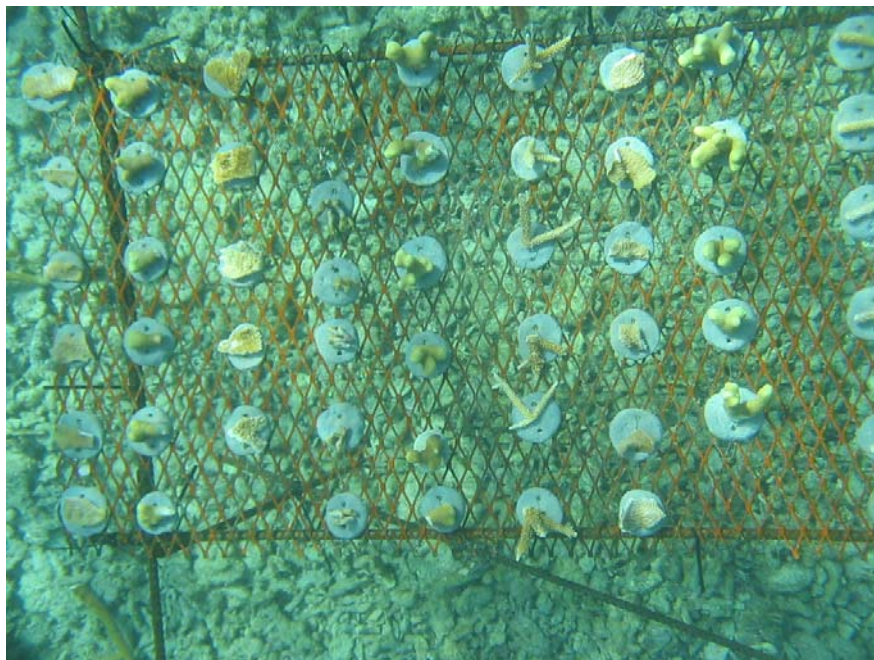
6. Methods Guidelines: Reefs formerly supporting abundant staghorn *Acropora* corals should be restored using methods developed for the energy regime of the site.

- a. Higher-energy reef areas, can best be replanted directly with coral branches, by cementing coral branches into the small holes that are normally found on the dead reef rock (planting them on calm days).
- b. This method requires using either expensive epoxy putty or much cheaper quick-set cement, which is easily hand-made by mixing one part “plaster of Paris” (gypsum powder) with about five parts regular cement. The shelf age of the plaster and cement give different results. The two are mixed as dry powders and then tested for setting time, using a small amount of water, adjusting the mix ratio to lengthen or shorten the time to setting. A five-minute set is good but only small




batches should be mixed at one time, and a ten-minute set might be more suitable. Higher-energy reefs can also be restored using the A-frame method. The frames are planted with 10-15cm coral branches secured to the frames using 10cm cable ties. The planted frames are securely attached to two 4-inch concrete blocks cemented to the reef, after cleaning the area with a wire brush. The frames are pegged to these blocks with L-shaped pieces of ½ inch metal bars stuck through the mesh.

- c. Moderate energy reefs dominated by coral rubble can easily use the A-frame method but with no need to cement the blocks down, simply pegging the frame to them as above. Coral branches can also be scattered into rubble beds with success, if they are relatively clean of sand and silt.



- d. Calmer energy systems such as back reef lagoons dominated by sand and sandy rubble can use A-frames with a single block. Table culture and line culture of corals is another option for sheltered low-energy areas. Culture tables are made of ½ inch metal bars, by bending the bars into U-shaped leg pairs, and using straight lengths of the bars for side and cross pieces. The tables are used for the “cookie culture” method, which grows smaller 3-5cm pieces of corals onto concrete button-shaped disks, each with two small holes and sewn onto wire mesh with 50-pound test fishing line. These corals grown on cookies are best used for replanting high-energy areas once they are 6-12 months old. Line culture can be done between stakes or between culture tables, using clove hitch knots to secure the coral branches with ease to the lines. Small coral branches that fall onto sand always die within a matter of days, so it is important to keep corals elevated above the bottom. Larger coral colonies at least 40-50cm high sometimes do well in sandy environments, and such larger colonies can be first grown on clean rubble, and then moved to the sand two-three years later.



Coral Reef Recoverability: Suggested Assessment Protocols to Determine if Reef Restoration Interventions are Required

Chronic Environmental Problems Causing Permanent Environmental Change

Definition: Root-causes which prevent reefs from reverting to a healthy condition even after the implementation of proper fisheries management plans.

What to look for: 1. poor water quality (murky or green water), 2. formerly clean areas becoming muddy, 3. areas formerly with abundant corals having mostly dead corals

Root causes: land-based pollution, muddy run-off

How to measure: Interviews with older community members about former conditions, monitoring for water clarity, nutrients, salinity, etc. A consideration should be made for determining whether acute rather than chronic problems are behind the degradation, events that are either not natural or that have a much higher frequency due to some change. Such rare events more likely identified by interviewing the community than through scientific monitoring.

Possible Interventions: **No potential exists for effective restoration unless the root-causes are effectively addressed.** If

monitoring and interviews indicate that the problem may not be so severe as to be without hope, coral replanting trials can be attempted, using limited numbers of fragments of silt and freshwater resistant coral species (*Porites*, *Siderastrea*), tied on lines or frames. Coral recruitment studies using stones as hard clean settlement surfaces, deployed during coral spawning season, can be undertaken as well to determine if a lack of larval recruitment or whether post-recruitment survival is preventing recovery. If these experiments give good results, the particular reef area would fall into the alternative steady-state category below.



Alternative Steady-State Conditions due to Changes in the Substrata

Definition: *Water quality does not appear to be the basis of the problem, rather changes in the substrata prevent recovery (rock converted to gravel, substrata covered by thin layer of silt, rock covered by seaweeds, etc.) Interviews with older people confirm that the reef was indeed in a better condition in living memory, and that the causes of the problem are no longer continuing.*

Root causes: Dynamite fishing, reef dredging, overfishing of herbivores, moderate land-based pollution, dredging activities

What to look for: 1. corals crushed into rubble, 2. overgrowth by seaweeds, 3. a fine layer of silt covering the bottom



How to measure: Determine the aerial extent and overall proportion of the reef area affected and look for signs of recovery at the fringes of the damaged zones, look for coral recruitment on stable boulders and nearby areas, indicating that recruitment rather than coral survival is the problem. Monitoring to look for signs of natural recovery reef (or the lack thereof): increasing abundance of juvenile coral colonies >3-5cm, increasing abundance of herbivores, long-term improvements in water clarity, etc.

Possible Interventions: Replanting staghorn coral branches and throwing 30-40cm rocks into unstable rubble areas; establishment of no-fishing MPAs to increase the population of herbivorous fish and sea urchins, which in turn clean excessive seaweeds from the reef, direct removal of seaweeds by hand from particular reef areas prior to the coral spawning season.

Potential Complications: Species imbalances (see next section) may become a problem in the survival of corals in the area to be restored, and if so coral replanting and encouraging natural coral recruitment may not be effective restoration measures. The following is an example of this type of species imbalance problems.

Establishing no-fishing areas may sometimes result in greatly increased numbers of parrotfish, which in turn may target coral transplants and naturally recruiting corals as a food source, suppressing the recovery of the coral population. The potential for this particular ecological imbalance to develop after establishment of a no-fishing area is highest for reefs where there is ample shelter habitat for parrotfish, low abundance of predatory fish (which may take longer to recover), and where coral cover is low.



Altered or Unhealthy Ecosystem due to Species Imbalances

Root causes: Over-fishing of predators important in keeping certain species from becoming over-abundant

What to look for: over-abundance of coral eating *Drupela* or *Coraliphila* snails, over-abundance of *Stegastes* farmer-fish and associated seaweed patches and coral damage, overabundant sea urchins and associated excessive bio-erosion, other types of imbalances due to too many or too few individuals of a species.



How to measure: Reef surveys looking for these particular species and for the particular predators of each of these species, as well as checking for the abundance and health of corals, especially *Acropora* corals, favored prey species for coral eating snails, and preferred habitat for *Stegastes*.

Possible Interventions: Establishment of no-fishing MPAs to encourage recovery of key predator species, removal of overabundant coralivorous snails, and sea urchins from reef areas where they are a problem.

Potential Complications: When a shallow reef area is closed to fishing, particular species can become over-abundant in the months before their predators become reestablished. A primary example is when a lack of moray eels and small reef sharks in the MPA, primary predators of octopus, results in an overabundance of octopus, which in turn increase predation pressure on the remaining shellfish, interfering with the recovery of these species. If monitoring indicates that an imbalance such as this is developing following MPA establishment, octopus fishing in of itself may become a valid restoration strategy to encourage the recovery of shellfish species targeted by octopus.

Previously Common Fisheries Resources Important to Reef Health Become Rare

Root causes: over-fishing, small mesh nets, destructive fishing and loss of habitat

What to look for: 1. low fish and shellfish abundance, 2. predominance of herbivorous fish and smaller individuals of all harvested species, 3. dominance of species not harvested for food or for sale.



How to measure: Monitoring of fish and shellfish stocks for abundance and size, post-catch

surveys, interviews with older fishers.



Possible Interventions: Establishment of permanent no-fishing MPAs, restocking of MPAs with formerly abundant species if their prospects for natural recovery appear to be low, gathering together the few remaining individuals of a species to increase the chances of successful spawning, ban on the harvest of severely overfished species, closure of reef areas on a rotational basis, size limits for commercially harvested species, nylon gill net bans, net mesh size restrictions, destructive fishing bans, SCUBA spear-fishing bans, night torch fishing bans, multi-year ban on key overfished species, ban on commercial sale of particular species important for local subsistence, etc.

Potential Complication: Aggregating surviving individuals of a species may potentially make them an easier target for predators (if any predators in the area have survived), or make them an easy target for poachers, and this should be factored into the restoration strategy.

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Coral Gardens Caribbean Initiative

Description of the Program's Coral Restoration Strategies

Primary Objectives of Coral Gardens Caribbean



1. Build partnerships at the national and local levels for sustainable coral reef management at selected sites with governments, NGOs, communities, and the fishing and tourism sectors
2. Implement a more systematic approach for increasing awareness and appreciation for the importance of corals and coral reefs, the causes of their decline, and greater support for means to ensure their recuperation
3. Support ongoing coral reef management, conservation, and awareness programs at project sites
4. Participatory multi-stakeholder management planning and collaborative actions
5. Support for monitoring coral health over time within project sites
6. Hands-on activities by communities and volunteers working with corals to assist reefs (the focus of this document)

Hands-on Strategies for Increasing Coral and Reef Health **Reef First Aid Program**

Target audience: SCUBA diving and snorkeling operators, experienced recreational divers, and resort water sports activity staff

Basic Level (for people who regularly visit or work on reefs)

1. Snail and fire worm removal
2. Weeding of seaweeds overgrowing corals
3. "Dusting" sand off of massive corals
4. Dusting off parrot fish waste from elkhorn corals
5. Rescue of sea fans torn off by storms for replanting onto fish houses

Advanced Level (requires more training and proper certification)

6. Rescue and replanting of broken branching corals
7. Establishment of coral hospitals for planting broken and detached corals





8. Removal of chicken liver sponges where they overgrow corals
9. Preventing corals from killing each other (overgrowth situations etc.)
10. Rescue of corals dislodged by storms or exposed during extreme low tide
11. Protection of elkhorn coral *Acropora palmata* bases from overgrowth by sponges and seaweeds or from sea urchin erosion

Experimental Level (programmatic level with local scientific partners)

12. Sea urchin introductions to areas overgrown by seaweeds
13. Removal (for transplanting to other areas) or killing

of sea urchins where they have become over-abundant and where they have begun to kill corals (symptom of a lack of triggerfish)

14. Urchin transplants to corals being killed by chocolate *Cliona* sponge
15. Urchin transplants to brain corals with black band disease as a possible means of disease control
16. Antibiotic applications to brain corals affected by black band disease
17. Damselfish removal experiments

Note: at this stage it is important to monitor each intervention for effectiveness, gardening some dive sites (and possibly some of the reef check transects), while resisting the urge to carry out reef first aid activities at other sites, which will serve as control sites to determine whether the methods are effective in helping turn around coral reef decline.

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Endangered Staghorn Coral and Elkhorn Coral Restoration Program

1. Locate and map the remaining populations of these two coral species at both large and fine scale (so they can be relocated easily with GPS or by other less precise means).
2. Record and map the relative abundance of the corals: dominant, common, uncommon, rare, or absent), plus the estimated size of the reef area with the remnant staghorn or elkhorn patch.



3. Record and map the relative health of the corals: percent living tissue compared to dead tissue on standing colonies,
4. Establish regular monitoring plans for surviving coral populations, recording the following:
 - a. Exact (or estimated) number of living *Acropora* corals in the site
 - b. fresh coral death and probable cause (disease or type of predation)
 - c. number of coral-killing *Coralliophila* snails and *Hermodice* fire worms removed,
 - d. percent prevalence of *Stegastes* damselfish infestation in the colonies
 - e. coral growth: measured as change in tagged colony size over time (cm above bottom and largest colony width)



5. Investigate the effectiveness of methods to increase staghorn and elkhorn coral survival within remaining patches on the reefs (algal removal, snail, fire worm and farmer damselfish removal, sponge removal from elkhorn bases, removal of boring urchins from colony bases, introduction of *Diadema* urchins, etc. *Note: we should include some control patches to indicate the rate of decline for uncared-for corals.*

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6. Establish pilot sites for growing endangered corals to increase their biomass as rapidly as possible (based on

lessons learned in PR, Jamaica, and Honduras: planted onto cement cookies, lines, metal frames, and directly onto reef rock)

7. Replant second generation corals to management sites where the corals have declined but where root-causes of destruction are being addressed.



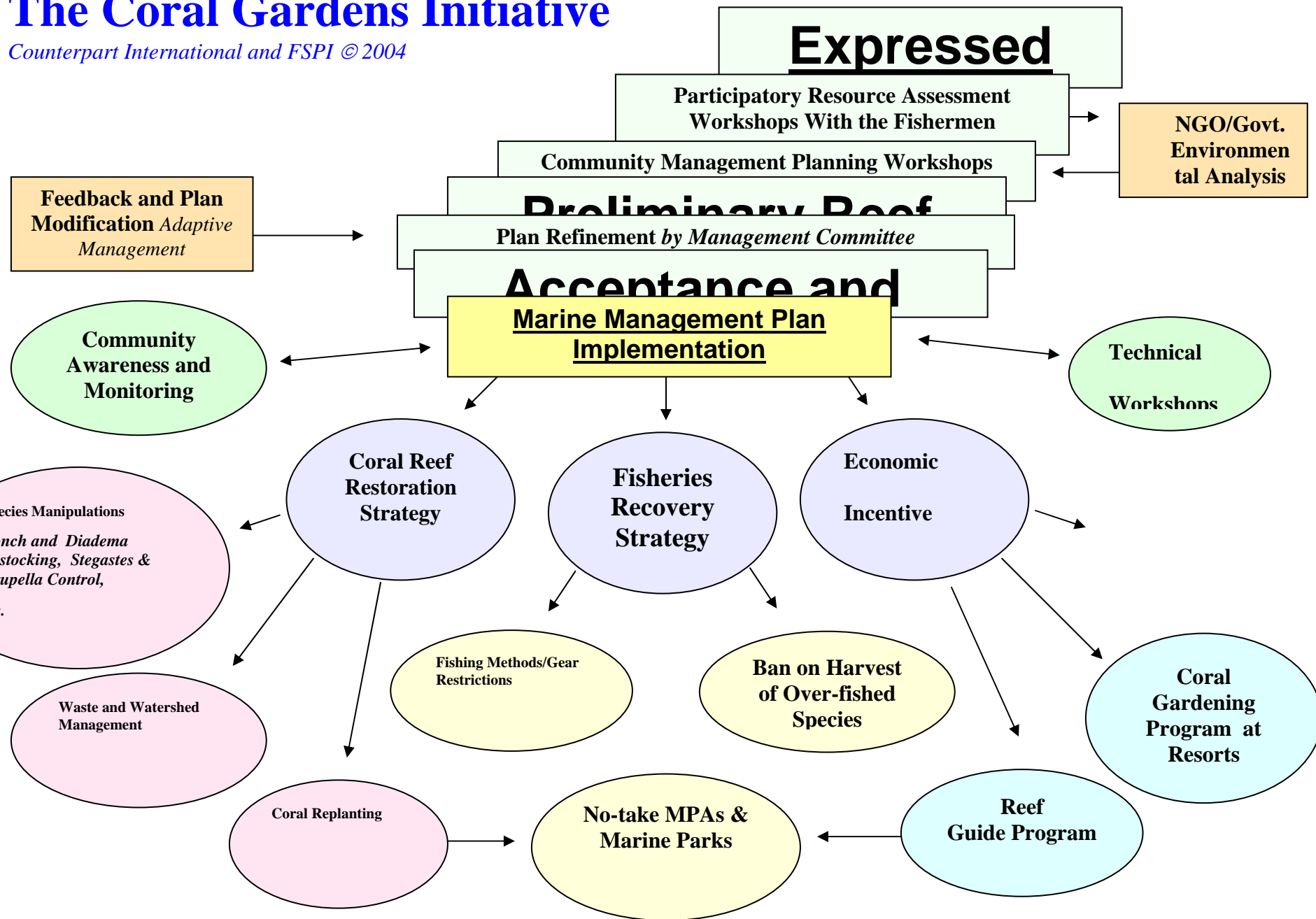
Other Important Coral Gardens Initiative Strategies

1. Support for no-take MPA areas and coral reef management in general
2. Awareness programs for fishing communities, tourism operators, children, youth, and visitors
3. Increase fish habitat and enhance snorkeling areas with “fish and lobster houses”.
4. Support for alternative incomes among the fishing communities adjacent to tourism operations, including the development of “coral gardening” as a new profession at resorts, to take care of and improve heavily-used reef areas.
5. Capacity building programs for fishing cooperatives, local environmental support groups, and other community-based organizations
6. Addressing beach erosion, waste management, terrestrial runoff, and other common development problems in the Caribbean



The Coral Gardens Initiative

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APPENDIX D –ARTICLE ON *INDO-PACIFIC RED LIONFISH*

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Short communication

First record of the Indo-Pacific red lionfish *Pterois volitans* (Linnaeus, 1758) for the Dominican Republic

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Abstract

A new record of the Indo-Pacific red lionfish *Pterois volitans* (Linnaeus, 1758) (Osteichthyes: Scorpaenidae) is reported for the Dominican Republic, observed in the National Submarine Park of Monte Cristi on May 24, 2008. This is the first official reported record of this species for the Dominican marine area. Preliminary data are provided for the invasion and future work.

Key words: Caribbean, Dominican Republic, invasive species, lionfish

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