1. Title page:

- Project Number HRI -1-2016
- Project name: Healthy Reefs for Healthy People: Strengthening the Scientific Foundation
- Grantee: Smithsonian Institution
- Author of the report: Melanie McField, Ana Giró, Mélina Soto, Ian Drysdale, Marisol Rueda and Nicole Craig.
- Address: Smithsonian Marine Station, 701 Seaway Dr., Ft. Pierce FL 34949
- Period covered in the report and date of presentation October 11th 2018 to October 1st 2019 (Date of Submission: October 2 and 11, 2019.).

2. Executive summary to date: briefly describe activities and results to date.

Healthy Reefs for Healthy People (HRI) is a globally unique international collaboration among reef research, management and conservation institutions dedicated to safeguarding the MAR which runs along the coasts of Mexico, Belize, Guatemala and Honduras. HRI works closely with over 72 partners throughout the region, to convene and coordinate collaborative monitoring and communication about the overall health of the Mesoamerican Reef and our efforts to manage it. HRI uses scientific data to generate coral reef management plans and evaluation tools that regional leaders, local partners, and policymakers can use to protect the MAR such as the Report Cards and Eco-Audits. Its mission is to improve scientific understanding of the functioning of the reef and enhance its ecosystem health through implementation of science-based management interventions. HRI is creating a more informed and powerful stakeholder base, a fundamental requirement to the successful implementation of conservation management actions.

HRI has maintained its leadership position in the conservation of the MAR and has become a global leader in science-based adaptive management that provides direct assistance to conservation practitioners and decision-makers.

During this granting period, HRI held its 6th Regional Partners Meeting in the island of Caye Caulker, Belize. More than 40 participants from the 4 countries of the Mesoamerican Reef Region gathered during the week of October 22nd to 26th, to collaboratively develop the 2019 Report Card and share lessons learned from conservation and management efforts.

HRI finished conducting coral reef monitoring in Mexico (43 sites with additional 56 sites from partners), Belize (47 sites with an additional 54 from partners), Guatemala (10 sites) and Honduras (76 sites). All of the data has been entered into the HRI-AGRRA online platform and it has been analyzed. The team is currently working on the development of the 2020 Report Card in which all the analyzed data will be shared, as well as management recommendations put forth by all partners.

In commemoration of the Mesoamerican Reef Day (March 10), HRI launched its Mesoamerican Reef Data Explorer Platform in collaboration with Atlantic and Gulf Rapid Reef Assessment (AGRRA.org), where users are able to visualize over 10 years of reef health data, through interactive maps and pictures.

The HRI team has participated in national, regional and international meetings to share its work and advances in the management and health of the Mesoamerican Reef.

HRI has advanced in targeting the four cornerstone strategies: healthy watersheds, healthy fisheries, healthy communities and healthy futures.

Healthy Watersheds – HRI's direct involvement with the local West End water management entity, Polo's Water Association, has allowed a new section of the community to be linked to the potable water system. The area known as Sunset Villas had requested to receive Polo's water service for many years, but a majority of signatures had not been reached. As of January 2019, there are now another 71 connections being billed by Polo's. We now need to actively fundraise to design and build the needed sewage infrastructure for this area, as well as two other sections of the community (Millerville and Brick Oven) that are not connected to the existing system.

In Mexico, HRI's Coordinator participates actively in the Yucatán Peninsula, Solidaridad and Benito Juárez watershed and clean beaches committee's meetings presenting the health of the reefs, the coral disease outbreak, and the direct link of these threats that impact water quality - thus the need for ratification of the Cartagena Convention's Protocol for land-based pollution and tertiary waste water treatment plants. In association with CEMDA, Amigos de Sian Ka'an and Centinelas del Agua, HRI has widely communicated the importance of wastewater discharge standards, and the urgent need to update the law, which is more than 10 years delayed for its review.
(http://www.cemda.org.mx/organizaciones-de-la-sociedad-civil-hacen-un-llamado-al-nuevo-gobierno-federal-para-proteger-de-la-contaminacion-a-rios-lagos-acuiferos-y-mares-del-pais/?fbclid=IwAR0YPMPr-u_bRWMyNaqJUWbA2Cts43w8EIe1gXogvyhgu305eLg_j16sIic)

In addition, HRI's Coordinator has been closely involved in the organization of a strategic meeting in order to design Quintana Roo's action plan toward Stony Coral Tissue Loss Disease (SCTLD) or(white syndrome as preferred in Mexico), involving all stakeholders. Core actions are focused on improving wastewater treatment, best practices and communication among all stakeholders. Pairing both of these initiatives, HRI's Coordinator is leading the coastal development working group and has presented the action plan and the urgent need to improve waste water treatment at numerous forums. In addition, meetings with municipality of Puerto Morelos and the local water company has led to a communications campaign urging houses to connect to the existing sewage system.
(https://www.dropbox.com/sh/5m1lbl3pqmgv2co/AADF1WUCV0SA6hBjI5yQpbo1a?dl=0)

Our Communications Consultant, has been screening the documentary titled "Flows" at different universities/highschools and public forums in Quintana Roo (mainly Playa del Carmen and Cozumel). This documentary shows the connectivity of the world's largest aquifer, to the mangroves, jungles and corals in the Mesoamerican Reef, as well as its threats such as water pollution and coastal development. It has served as a communication strategy to invite people to change their habits and demand better water quality services from the local government.
(https://www.dropbox.com/sh/oxvjfucmaes05sl/AABTGxZPkKxz9xCkzKj29rqQa?dl=0)

During November 2018, our Communications Consultant was invited to participate at EarthX event, a first in Mexico City. She screened "Flows" in 2 different locations (at EarthX venue and at Cinepolis Cinema) and also participated in a panel with experts on sustainable tourism, sharing her expertise, information and opinions about reef health in Q. Roo.
(https://www.dropbox.com/sh/ts3fgffkfyo7cla/AAC4SQmYLJwvmzRBR0mCAJdSa?dl=0).

The municipality of Solidaridad (Playa del Carmen) invited HRI to screen "Flows" at the city theatre, it garnered an attendance of over 500 people at the end of January 2019. This sets an important precedent, where the local municipality knows and recognizes the issue, and receives comments from the audience to take action, acting as a responsible local government and listening to the community's needs.
(https://www.dropbox.com/sh/2t1bygx7978z6up/AADx0SEdsFbjFO840qjUW3Cla?dl=0)
Link to documentary and trailer:
https://www.dropbox.com/s/wfva0qp5ydhg206/Flows%20links.docx?dl=0

Another older documentary, but still portraying the actual problems of inadequate water treatment and sargassum mismanagement, is named "Erosion" which has been screened to a lesser extent, but is also serving as an important call to action.
(https://www.dropbox.com/sh/j8talv1ybgl3wjh/AABTyqIh1S_rqRK6g5fwA9Rga?dl=0)
Link to documentary and trailer:
https://www.dropbox.com/s/xszcqsgriv9da6a/Erosi%C3%B3n%20links.docx?dl=0

Healthy Communities – Our human communities in the Mesoamerican Region depend on productive coastal ecosystems. HRI is improving the understanding of the linkages between human and ecological health and promoting sustainable development alternatives. This strategy is closely linked with healthy watersheds and fisheries; we need healthy waters and sustainable fisheries in order to have healthy communities. HRI is collaborating with the Global Coral Reef Monitoring Network (GCRMN) and is planning a training workshop on socioeconomic monitoring to be held in Roatan, Honduras from December 9th to 13th, 2019. The workshop will focus on the methodology of the Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon). This workshop is part of the "Building Capacity for Coral Reef and Human Dimensions Monitoring within the Wider Caribbean II: The Mesoamerican Reef Region" project, which aims at increasing and improving management capacity for coral conservation in the Mesoamerican Reef Region by implementing integrated socio-economic and bio-physical coral reef monitoring training workshops. This project is led by GCRMN- CAR SPAW RAC and was co-written with HRI.

Healthy Fisheries – Our strategy includes activities supporting ecosystem-based fisheries management, including the region-wide protection of parrotfish, important fish spawning sites, and the promotion of fisheries replenishment zones.

HRI is working closely with strategic partners within key organizations and continues to push for more conservation science and funding for management in the Cayman Crown reef and other important fish spawning aggregation areas. HRI is a partner and co-sponsor of the recently awarded grant to MAR Fund from the French Fund for the Environment (FFEM). It strives to advance science, conservation and MPA establishment in the Cayman Crown a shared area between Belize and Guatemala, starting this year. HRI, in collaboration with Fundación Mundo Azul, is currently working on a small- grant submitted to MAR Fund titled "Cayman Crown: support conservation of the jewel of the MAR through solid science". This project is scheduled to end at the end of April 2020.

In Mexico, the process of updating the protected species law (NOM-059-SEMARNAT-2010) and its public consultation process allowed to submit a request to include 10 species of Caribbean parrotfish. The proposals have been approved during the Revision Committee Meeting in October 2018, and approved by the National Commission for Legislation Reviewal, but was not published within the legal delay. This delay can be explained by the change in Government that occurred in December 2018 and which has postponed numerous processes. With the collaboration of partners and other interested organizations, HRI has led a communication strategy to keep pushing for its publication in the near future.

(https://www.dropbox.com/s/wzb1u7su2b0notu/Carta%20NOM%20059%20SEMARNAT%202010.pdf?dl=0).
However, in the meantime, parrotfish were included in the management plan of the Mexican Caribbean Biosphere Reserve under rule 88. This huge MPA covers more than 5 million hectares of territorial sea, representing a fair portion of the MAR.
(https://www.dropbox.com/s/6hvyrmnefv7tucb/DOF%20-%20Diario%20Oficial%20de%20la%20Federaci%C3%B3n.pdf?dl=0)
The NOM-059 law was finally published on November 14th, 2019, one year late but including the 10 submitted parrotfish species and the Orbicella corals:
https://www.dof.gob.mx/nota_detalle.php?codigo=5578808&fecha=14/11/2019

Our Communications Consultant was invited to La Paz, B.C.S., Mexico to participate in a promotional video for the campaign "Espirítu Santo es Parte de Ti". The aim of this campaign is to invite people in La Paz to preserve parrotfishes specially at Espíritu Santo Island. At the filming video, Marisol Rueda talked about the ongoing process to protect them in Quintana Roo, talking about the different processes in a timeline from 2014 to present, as an example of what has been achieved in other states. (https://www.dropbox.com/sh/d03kuxg0m8hdzdp/AAD4iFKc_SGj6I3x5NZZK74ia?dl=0).

In Honduras, HRI is collaborating with partners in Utila (CORAL, BICA Utila, CEM and WSORC) and Guanaja (BICA Guanaja and CEM) to monitor the success of no-take zones established on both islands. In Guanaja, 5 new monitoring sites were created within the 2 no-take areas in 2016, but only 3 were surveyed again this season due to weather constraints. While on Utila, the recent declaration in May 2018 of 2 no-take zones had led to HRI creating 4 new monitoring sites in 2018. These new 4 sites are not part of the 2018 survey, as the partner in charge of gathering this data (CEM), did not share the data gathered with HRI and did not upload it to our online data entry portal.

Healthy Futures – HRI has been focusing in the new disease outbreak affecting Mexico's coral reefs. HRI's Mexico Coordinator is now leading some trial treatments.

As previously stated, HRI Mexico actively participates in the organization of a strategic action plan to focus on the SCTLD outbreak affecting Quintana Roo. In collaboration with MPA authorities (CONANP) and fisheries department (INAPESCA), treatment trials have been deployed in Puerto Morelos and Cozumel. Results are not positive for brain corals, but it seems to reduce the speed of affectation for *Orbicellas* and *Montastreas* which are important reef building corals.

The Secretary of Ecology and Environment (SEMA) in Quintana Roo held a series of workshops in order to modify the solid waste management law. Both our Mexico Coordinator and Communications Consultant attended the meeting and were able to present recommendations, which were integrated in the new text. This now includes banning plastic bags and straws, as well as styrofoam for food packaging. The modifications have been passed along to state deputies for approval, with a publication around mid 2019. HRI has been invited to review the last version of the law before its publication.

(https://www.dropbox.com/s/es358792esbib2e/LEY%20DE%20RESIDUOS%20PeriodicoOficial_EXTRAORDINARIO_2019-06-18.pdf?dl=0).

Our Communications Consultant participated in a workshop to give recommendations on the management plan to regulate plastic bans. Plastic industries are still against the new law but are participating in the different workshops.
(https://www.dropbox.com/sh/kyphxfbjwo4ielp/AABylLnzNGo29CIoFLMAsGrra?dl=0).

In order to accompany this process, our Communications Consultant has been highly involved in the "Desplastifícate" campaign, presenting to the general public and at environmental education forums, in order to portray the plastic issue and how changing our consumption habits are on-point solutions. She participated in a GIZ workshop where solution providers from Chile and Mexico City were invited to Quintana Roo to evaluate the feasibility of implementing those solutions; such as refill stations for home products (soap, water, and others); plastic bottle exchange for credit to buy at known cinemas or supermarkets, etc.
(https://www.dropbox.com/sh/gx9nve2awfke6fv/AAA2Y3Zcksj0Xza_5AULWXffa?dl=0).

A Mexican movie named "Más Allá de la Herencia" (Beyond the Inheritance) has been produced in Cancún, Quintana Roo. The commercial movie portrays the plastic issues our oceans are facing and how young people are worried and trying to do something about it. Both Mexico's Coordinator and Communications Consultant were invited for an interview that will be shown after the movie's credits, along with other people working in conservation around the area. These interviews will also serve for a side-project to produce a Mexican documentary about plastics named "La Ola Rota" (The Broken Wave). "Más Allá de la Herencia" hasn't been launched yet, but it is expected to be screened in more than 300 cinemas around Mexico this year.
(https://www.dropbox.com/sh/z4e5m8z34n2v4vv/AAC8AcpUkOdrSJjbcWnevBB0a?dl=0).

Our Communications Consultant also participated at Universidad Tecnológica of Cancún at a panel directed to more than 200 students from tourism careers about reef health indicators, the sustainable use of aquatic ecosystems in Q. Roo, and the benefits of working in multidisciplinary networks. This panel was organized within the 10th anniversary celebration of International Beach Cleanups. (https://www.dropbox.com/sh/rtsv8srs3e4xuzy/AADZiPMCrBBDr3_3nhqaNziea?dl=0).

A pilot study focused on reseeding king crabs was carried out in patch reefs within Cancun's MPA, in the area known as Manchones, from September 2018 to January 2019. In collaboration with the Fisheries Department and MPA authorities, 24 previously caught King Crabs were introduced in order to follow their impact on macroalgae cover. The detailed methodology and results are in the report (in Spanish): https://www.dropbox.com/sh/nlpn0c7e6mwaxil/AAC4DNIgs4Y2I-VJvDh3NlDea?dl=0. After 5 months, a clear impact on the benthic community was observed with a decrease in turf algae and macroalgae followed by an increase in calcareous and crustose algae; which are encouraging results as turfs tend to overgrow and asphyxiate corals, while crustose algae favor the settlement of coral recruits. At the end of 6 months, the crabs were not able to be found, which ended the experiment. Nevertheless, those observations are promising and a second phase to this pilot study will soon begin. The second phase of this project has been designed in collaboration with SI and Old Dominion University and is seeking the adaptation of mariculture techniques to local conditions in order to achieve the production of king crab juveniles to scale up the reseeding effort and, potentially, become an opportunity for diversification of activities for local coastal communities. Once again, this second phase is being developed in collaboration with the Fisheries Institute and is embedded in its coral restoration program and in parallel with a similar project in Belize.
Link to phase 2 project:
https://www.dropbox.com/s/35yycwwbimgx5uo/Proyecto%20Cangrejos%20Fase%202.docx?dl=0

3. Objectives: The objectives of the project, as established in the approved proposal.

A. Convene and Coordinate the region's collaborative monitoring and communication about the overall health of the Mesoamerican Reef and our efforts to manage it.
B. Healthy Watersheds: Working alongside existing local and national water entities, HRI will promote the adoption and replication of effective management schemes that will allow better management of potable and waste water in coastal communities improving reef health (and community health).

C. Healthy Fisheries: HRI aims to advance the network of scientifically justified replenishment zones or no-take fish refuges, protecting at least 10% of territorial sea by 2020, including 75% of the known fish spawning sites. Increase herbivory and reef health by protecting parrotfish region wide by 2018.
D. Healthy Communities: Convey consistent, scientific information and recommendations to policymakers, decision-makers and the public, such that the connections between reef health, human health and socioeconomic sustainability, result in effective conservation action at an unprecedented scale.
E. Healthy Futures: Expand HRI science to address main impediments to reef health by exploring management interventions and monitoring specific responses including emergency bleach watch monitoring if needed to improve our understanding of reef resiliency.

4. Project progress

The originally planned methodology for each of the objectives still applies. Each of the objectives and accomplishments is explained in the following paragraphs.

A. Convene and Coordinate the region's collaborative monitoring and communication about the overall health of the Mesoamerican Reef and our efforts to manage it.

- **Collaborative training and reef monitoring with partners**

During this grant period no trainings were held, since the trainings where done in spring of 2018. (https://www.dropbox.com/s/d9y9apr3dp5i8ga/AGRRA%20Trainees.xlsx?dl=0).

Monitoring started after training and has now finished, with 286 sites monitored throughout the region. In Mexico we monitored 99 sites (43 HRI and 56 from partners), Belize 101 sites (47 HRI and 54 from partners), Guatemala 10 sites and Honduras 76 sites. Belize and Mexico coordinators are also gathering additional data from partners (normally about 60% of the sites in these countries in the report cards are from partners) in order to be included into the 2019 RC. Most of the data has been entered into the HRI-AGRRA online platform for analysis. We had a successful monitoring season with many partners collaborating (https://www.dropbox.com/sh/xrk8rrxoux3pzf8/AACukmgzDBJVOIPtNTGwuK57a?dl=).

- **Enhance partner capacity and participation with HRI**

Four new partners have joined the initiative in the last year (see point 7 of this report).

HRI is the only group consistently providing training in species identification and reef monitoring techniques in the MAR. These trainings enhance partner capacity and participation with HRI during our monitoring season.

The Healthy Reefs Initiative was pleased to host the 6th Regional Partners Meeting in Caye Caulker in Belize. More than 40 participants from the 4 countries of the Mesoamerican Reef Region gathered during the week of October 22nd to 26th at the Hotel Plaza to collaboratively develop the 2019 Report Card and share lessons learned from conservation and management efforts. The main objectives and session of the meeting were:

- *Session 1. Status of MAR Coral Reefs* – This session included an overview of the 2018 Coral Reef Monitoring effort in the MAR and provided a preliminary look at the results and current state of the reef.
- *Session 2. Issues & Solutions* -This session focused on the key issues that are affecting the MAR's coral reef health, as well as existing and new solutions to improve reef condition. The

session included presentations from speakers, updates from each country and group discussions on several key topics such as the new coral disease outbreak, coral restoration, efforts to reduce macroalgae, challenges in waste water treatment, advances in no-take reserves, and efforts to monitor and protect other important ecosystems, particularly mangroves.

- *Session 3. Connectivity in the MAR* -Rare lead a special session resulting from a National Fish and Wildlife Foundation funded project which focused on evaluating large-scale ecological and environmental data sets, genetics, fisheries data, and biophysical modelling to develop a model to assess the efficacy of MPA networks. The findings can be used to identify and communicate the most effective management strategies to restore and sustain biodiversity while balancing protecting nature and human use.
- *Session 4: Coral Reef Report Card* - During this session, partners developed an initial storyboard content for the 2019 Report Card and worked in their country groups to identify success stories, key management recommendations and communication strategies for the Report Card launch. The purpose of the Report Cards is to catalyze greater conservation action through effective communication and regional partnerships.

The meeting organizers: HRI Team - Melanie McField, Director; Nicole Craig, Belize Coordinator; Ian Drysdale, Honduras Coordinator; Ana Giró, Guatemala Coordinator; Mélina Soto, Mexico Coordinator; Marisol Rueda, Communications Consultant. International Partners: Patricia Kramer, AGRRA and HRI; Courtney Cox and Abel Valdivia, Rare. (Meeting Report https://www.dropbox.com/s/qr2x8vj7nex0e6w/2018%20HRI%20Regional%20Partner%20Meeting%20Report%20FINAL.pdf?dl=0
and meeting agenda:
https://www.dropbox.com/s/r9untrw21u2yp4d/Final%20Agenda%20HRI%202018%20Partner%20meeting.docx?dl=0).

In Guatemala, HRI has participated in several meetings and workshops on coral reef restoration, parametric insurance for reefs, artificial reefs, ocean acidification, development of a regional strategy and action plan to conserve, protect and restore key marine habitats in the wider Caribbean Region. She has also participated in a meeting organized by UNEP CLME+, focused on developing the regional strategy and action plan for the conservation and restoration of coral reefs and associated habitats (mangroves and seagrass beds) in the Wider Caribbean. And a Regional Strategy and Action Plan for the Valuation, Protection and/or Restoration of Key Marine Habitats in the Wider Caribbean 2021 – 2030. During the meetings, HRI's work and the status of reef health has been highlighted through documents and presentations.
(https://www.dropbox.com/s/ypvdokllgtv124q/SoMH-RSAP-Framework-version-APR2019-Final.pdf?dl=0).

Researchers and NGOs from the Mexican Pacific coast reached out to our Mexico Coordinator in order to share HRI's experience of collaborative monitorings and report card elaboration. They are in the process of replicating such initiative and invited Melina's to be one of the main reviewers of the final product. Link:

https://www.dropbox.com/s/4oxxg7wu06a4m5a/Minuta%20taller%20L%C3%ADnea%20base_CDMX2019.pdf?dl=0

HRI Honduras was invited to Santa Marta, Colombia, by Instituto de Investigaciones Marinas y Costeras "José Benito Vives de Andréis" (INVEMAR) to also share HRI's experience of collaborative monitorings and report card elaboration. They are in the process of replicating such initiative and invited HRI to become a partner and to help carry out the collaboration process.

- **Enhance public awareness and support for marine conservation**

While our primary efforts are focused on effectively communicating what we learn with partners in the Mesoamerican Region, our ability to protect coral reefs also extends outside of our MAR borders, so international outreach is important. We continue to share information through our Regional Partner Meetings, Report Cards, Eco-Audits, Monitoring Trainings, MAR Data Explorer and social media.

In Mexico, focus has been made on the communication about the SCTLD with talks given in the 3 planetariums, public meetings and universities, to key stakeholders as well as to municipal development, ecology and tourism authorities. Infographic was made with CONANP Cozumel and several press releases were sent as a communication strategy. The Coordinator has participated with one talk at the Mexican Society for Coral Reefs Congress in Colima, Mexico and two talks at the Association of Marine Laboratories of the Caribbean in Punta Cana, Dominican Republic (https://www.dropbox.com/s/7ao1f0llid2s26e/AMLC_AGRRA_Melina%20Soto_HRI.pptx?dl=0). She shared HRI's model for collaborative monitoring and management improvement as well as some of HRI's initiative to restore herbivory in the reefs. HRI, the MAR's health, SCTLD information and Regional Action Plan presentation have also been presented to a wide range of audience, from scientific committees to dive shops and fishers' cooperatives, between 15 to 20 talks given in 2019. A workshop was organized in Belize to share the knowledge and experience about SCTLD in order for the local partners to take the needed actions.

The documentary Flows, talking about the connectivity and fragility of our underground river system and reefs has been also shown in several public venues such as El Jardín de Todas in Playa del Carmen and Culture House at Cozumel, with the participation of our Communications Consultant Marisol Rueda and other partners. She has also given talks to other NGO's such as Manta Mexico Caribe about what HRI does and the importance of preserving our Mesoamerican Reef. (https://www.dropbox.com/sh/nyil1h97a5tv747/AAAafqoxnCRRugj45GBNqKrIa?dl=0).

As stated in previous sections the campaign "Desplastifícate" has also been given at different forums and now will be part of the GETECCA tools (state multisectorial group on communication and environmental education focused on water) for the different municipalities to use it during their public environmental education forums.
(https://www.dropbox.com/sh/0vkoaqg0rn635ol/AABQOgj5U92I2PaPd0ZNAgyna?dl=0).

HRI is also partner of OLAS, an initiative surveying the marine disposal of plastics, and we will help in the dissemination of communication campaigns in social media of different threats and facts about plastics and ecosystems, and after the 2019 Report Card is launched they will also help distribute our information among their partners. (https://www.dropbox.com/sh/59tbn6c3hh3f95g/AAAe_KIIIPu-a0u5Eb-wi9qga?dl=0).

Our Communications Consultant has also participated at the TV Show CREA from Cancún to talk about the Mesoamerican Reef and the work HRI does regarding monitoring, threats and solutions. (https://www.dropbox.com/sh/en6apmvls7jpv2g/AADgSgu6YMuCek0OlzEM3ZhDa?dl=0).

In Belize, public communication has been enacted in varying ways. In respect to Stony Coral Tissue Loss Disease (white syndrome, SCTLD), HRI has been very involved in public and partner communication. With news of the disease arriving in the neighboring country, Mexico, Healthy reefs began informing partners of the proximity and urgency of the disease. In April of 2019, Healthy Reefs hosted two workshops for partners that focused on coral disease identification, Stony Coral Tissue Loss Disease, treatment methods and response planning. Healthy Reefs along with local partner Fragments of Hope, appeared on national television to raise public awareness and urged the public to remain vigilant. Following the disease's arrival, Healthy Reefs has also contributed to a major news story that again focuses on raising public awareness and vigilance.

Healthy Reefs was also a part of a Smithsonian Institute funded documentary on the disease that will bring Belize's work with SCTLD and the repercussions of the disease to a global stage.
Additionally, Healthy Reefs has presented at the workshop hosted by the Earth Journalism Network that focused on improving environmental journalism in Belize. Local journalists were taught about the reef report card and how to translate its key messages to their readers, as well as how to spot environmental stories and issues that need to be shared.

The Belize HRI Coordinator has also participated in several meetings and workshops on reef related issues that have helped to support capacity building and planning to meet the overall goal of improving reef health. These workshops include attending the Commonwealth Blue Charter meetings, Stony Coral Tissue Loss Disease workshop and the United Nations Climate Action Summit.

Ian Drysdale presented at the international scientific conference for the Gulf and Caribbean Fisheries Institute (GCFI), which was held in November 2018 in San Andres, Colombia. During this same trip, he was also invited to co-host a workshop at INVEMAR (Santa Marta, Colombia), to share how HRI has been able to bring together 4 countries under a common monitoring and reporting cycle. The MPAs in Colombia wish to follow the same path and use the publishing of a similar "report card" as a means to create more collaboration among all the stakeholders and to standardize monitoring efforts.

Drysdale and Giró were invited to attend the "Latin America and Caribbean Interdisciplinary Symposium on Ocean Acidification" in January 2019, also at INVEMAR in Colombia, hosted by the Ocean Foundation. The 2-part workshop focused on 1: creating a regionally focused approach to monitoring OA; while the second part focused on training attendees to use the kits provided to carry out monitoring of OA. HRI was not invited to the second part of the workshop, as there were no more kits for other countries.

All Coordinators and Communications Consultant have given talks and conferences in national meetings about HRI work and the 2018 Report Card after the official launch event. These meetings have helped enhance public awareness and support for marine conservation in the MAR.

Following regional report named: *"Status and Trends of Caribbean Coral Reefs 1972-2012" the* GCRMN (*Global Coral Reef Monitoring Network*) has been requested by ICRI (*International Coral Reef Initiative*) to provide for 2020 a global analysis of the status of the reefs, HRI has recently contributed this report by giving access to the data for the MAR.

Social media is a great tool used by HRI to enhance public awareness. In the last months, HRI's social media programming (for Facebook, Twitter, Instagram and YouTube) included at least one 'institutional' or original content publication per week. Previously, the institutionally produced content happened only once a month. By following the plan of at least once a week, we have increased our institutional content a minimum of 400% up to 800% in some months, having more than 6,000 people reached with HRI's publications.
Link of all supporting documents for collaborative training and monitoring reef health can be found here:
https://www.dropbox.com/sh/ldas3g7hrkfjzb6/AACleNjO1IhWm83NlygqQ7FEa?dl=0

Supporting documents for all social media and communications can be found here:
https://www.dropbox.com/sh/gf9dbht4ipifr5m/AACDKgN5guACkzXQtxSpoIfMa?dl=0

Mesoamerican Reef Data Explorer Platform Launch

In commemoration of the Mesoamerican Reef Day (March 10), HRI recently launched its Mesoamerican Reef Data Explorer Platform in collaboration with Atlantic and Gulf Rapid Reef Assessment (AGRRA). The Launch was made via Facebook Live on March 11th (since March 10th was a Sunday and for media traffic it was better to have the launch on a week day). One stream was made in Spanish and one in English
(https://www.facebook.com/HealthyReefsForHealthyPeople/videos/2111185485839027/
; https://www.facebook.com/HealthyReefsForHealthyPeople/videos/637028026749833/).
Users were able to visualize the change on reef health data collected over 10 years, between 2006 and 2016, through interactive maps and pictures. Data is accessible by site and by indicator used to determine the Reef Health Index: coral cover, macroalgae cover, herbivorous and commercial fish biomass.

The major threats such as coral bleaching events as well as the new rapid coral tissue loss disease detected since summer 2018 in Mexico are also available in the Mesoamerican Reef Data Explorer Platform.

Our reliable measures of reef condition allow us to identify the most urgent threats and responses. HRI training workshops continue to strengthen scientific capacity. Our partners are scaling-up and improving management in 47 MPAs spanning almost 60,000 km2.

Link to the Data Explorer:
https://oref.maps.arcgis.com/apps/MapSeries/index.html?appid=9556c100e1d9424fa9b3c1748454e297

B. Healthy Watersheds

- **Effective management of wastewater in the West End community improves local water quality and reef health.**

HRI's direct involvement with the local West End water management entity, Polo's Water Association, has allowed a new section of the community to be linked to the potable water system. The area known as Sunset Villas has been requesting to receive Polo's water service for many years.

As of January, 2019, there are now another 71 water connections being billed by Polo's. We now need to actively fundraise to design and build the needed sewage infrastructure for this area. Only 24 homes are currently connected to the sewage treatment system. A new main pipe and pumping station need to be designed and built to reach the remaining 47 connections, at an approximate cost of $50K.

- **Replicate successful Water Board management scheme in two more areas by 2020**

Over the last few years, HRI has helped provide a successful example and pilot program of improved water and sanitation management in the town of West End, Roatan, Honduras. Our direct involvement has led to having 98% of the community connected to the local waste water treatment plant: 284 connections out of a possible 290 without major infrastructure built. Using an estimate of 61 gallons of sewage produced per day per connection, there is an average of 28.8 million gallons of sewage treated per year, based on having 284 connections to the plant. The local water management entity, Polo's Water Association, has been spearheaded by HRI's Honduras Coordinator and his collaboration has led to acquiring grants to better improve and increase treatment.

Two other local water boards have reached out to Polo's Water for assistance. These boards are struggling to provide safe drinking water, with sewage treatment beyond their scope due to their

inadequate billing and funding situations. Meetings were held with both Los Maestros and Los Fuertes (Aug and Sept 2018) water boards, where Polo's Water general guidelines for management were shared. The two boards were tasked with creating an inventory of connections, in order to have accurate numbers. These will allow us to work towards securing grants or donations to purchase water meters, the first and most important step in creating an efficient management scheme. To date, these two water boards have not responded to calls about their progress.

As of December 2019, 284 households and businesses are connected to the treatment plant, of a total of 290 possible connections, resulting in 98% of households/businesses being connected and receiving improved treatment. Polo's Water has a total of 370 potable water connections, but not all of these can be connected to the treatment system without major infrastructure being built.

- **Working to Improve Waste Water Management in Mexico**

Even though most of our efforts on successful water management schemes are being focused on Honduras, HRI has been pushing for better water management in Mexico.

The Mexican law that establishes the contaminant limits for discharge in the environment has finally been opened for public review, after more than a decade of delays. The concentration limits established in the previous version do not secure the health of the environment and do not meet the legal standards of the Cartagena Convention (as highlighted in our Eco-Audits). HRI has actively participated in providing technical information, in tight collaboration with partner organizations Amigos de Sian Ka'an and CEMDA, to ensure the new version complies with international obligations and protects water quality. The proposal for updating the Mexican law that establishes contaminants limits for discharge in the environment was submitted to the official online portal for public laws consultation (Comisión Federal de Mejora Regulatoria) on March 6th, as a group and as individuals, in order to achieve higher impact and reach more key stakeholders.
Link: http://www.cofemersimir.gob.mx/expedientes/21218

To date, no response to this proposal had been received nor the updating had been published in the official diary. It is known that over 2000 comments have been received and that the change in government has postponed several legal processes.

The group of organizations that were involved in the proposal for updating reminded through a letter and press note the importance of better contaminants' limits and wastewater treatments (http://www.cemda.org.mx/organizaciones-de-la-sociedad-civil-hacen-un-llamado-al-nuevo-gobierno-federal-para-proteger-de-la-contaminacion-a-rios-lagos-acuiferos-y-mares-del-pais/?fbclid=IwAR0YPMPr-u_bRWMyNaqJUWbA2Cts43w8EIe1gXogvyhgu305eLg_j16slic).

The Coordinator keeps actively working in Watershed Committees to recommend the compliance of Cartagena Convention Pollutant limits and tertiary waste water treatment in Quintana Roo. A fact sheet about Cartagena and NOM 001 has been written in collaboration with HRI partners and sent to the new secretary for environment (SEMARNAT) as well as to the new commissioners for NPAs (CONANP) and water (CONAGUA). HRI Mexico has been invited to the Senate for the Ocean and Water special forum, where this information has been presented also.

Link to Healthy Waters supporting documents:
https://www.dropbox.com/sh/5m1lbl3pqmgv2co/AADF1WUCV0SA6hBjI5yQpbo1a?dl=0

C. Healthy Fisheries

- **Increase herbivory and reef health by protecting parrotfish region wide by 2018**

As stated previously, in Mexico, the parrotfish are now protected by the management plan of the Mexican Caribbean Biosphere Reserve. The 10 parrotfish species that were submitted to be added to the protected species list NOM-059-SEMARNAT-2010, were approved by the technical committee prior to its publication in late October. Unfortunately, since then, there has been a change in administration of the government and numerous on-going processes are on hold. In order to kindly remind to the new authorities about the importance of the publication of such a strong tool, a letter was sent with the support of several other organizations.
https://www.dropbox.com/sh/jk8v2i8txeyhjo0/AAAfUdfAgKwNn9gv0AwSI31Ka?dl=0
The law was passed on November 14th, 2019, protecting 10 species of Caribbean parrotfish and putting Mexico at the lead regionally in terms of herbivorous fish protection.

CORAL has been invited to sit at the committee that is rewriting the Fisheries Law for Honduras. CORAL has agreed to support HRI's request to include a couple of articles that foster protection of parrotfish and herbivores in this new draft of the law. The need to rewrite this recently published law is due to the fact that over 48% of the articles contained within it cannot be made into regulations. The document that was approved through the consultation process, that lasted over 8 years, is not the same document that was published as the law. Apparently, certain interest groups changed the law, and did it in a way that would benefit their interests, but it was not done correctly and now the entire law needs to be rewritten. There has been no other progress to report on the writing of the new fisheries law for Honduras.

HRI recently signed a collaboration agreement with the *Mancomunidad de Municipios del Golfo de Honduras* (Gulf of Honduras Municipalities Conglomerate) in June 2018, which brings together 21 mayors from the Honduran north coast and 1 from Guatemala: Puerto Barrios. This agreement has allowed HRI's Drysdale to meet with them twice at their monthly meetings. At the last meeting in February 2019, HRI proposed the conglomerate to protect herbivores at the municipal level. This proposal was well received and approved by the attending mayors, and a follow-up meeting is scheduled for April 9th. This follow-up will mostly focus on training the local Environmental Municipal Units on the importance of protecting herbivores and helping them draft the adequate legislation. This legislation then needs to be presented to the Municipal Corporation by each mayor, looking to establish a "North Coast Corridor" where herbivores will have some degree of protection. There was no follow-up meeting on April 9th, and there has been no reply from the MMGH to calls on when to meet again.

One of the mayors at the February meeting proposed elevating this protection, once in place by all municipalities, to a Congressional decree. This would make the municipal legislations stronger, as they would all fall under a Congressional decree, which could only be abolished by another Congressional decree; whereas a Municipal decree can be abolished by the next mayor elected into office.

HRI is collaborating with the Interamerican Association for Environmental Defense (AIDA) to enhance public awareness about the importance of protecting parrotfish. Two fact sheets have been made to highlight parrotfish, their importance and why we need to protect them, as well as other herbivore fishes. The factsheets also highlight coral reef ecosystems and their current threats. The factsheets were shared through our social media.
(https://www.dropbox.com/s/khsjzxu9h7zpccq/FinalPF20190308fn_IMP.pdf?dl=0
https://www.dropbox.com/s/s3kc3olo6g26jd1/FinalPF20190308fn_WEB.pdf?dl=0).

Link to HRI Facebook outreach:
https://www.dropbox.com/s/191mdfg9rcd7q2m/AIDA%20Parrotfish%20fact%20sheet%20-%20Statistics.png?dl=0
Link AIDA distribution:
https://www.dropbox.com/s/78bq1wrn0ihv9i0/Distribuci%C3%B3n%20AIDA.docx?dl=0

- **Enhance commercial fish biomass and reef health by protecting spawning aggregation sites.**

HRI Coordinator for Guatemala, Ana Giró, continues to push for more conservation science and funding for management in the Cayman Crown reef. Guatemala has the smallest percentage of the MAR and offers full protection to only 0.6% of its territorial seas and 0% of reef habitats. Cayman Crown provides the opportunity to engage Guatemala in greater conservation efforts, improve MPA management capability and potentially provide new economic opportunities. Ana has been meeting with the Fisheries Department (DIPESCA), Fundaeco, CONAP, the Ministry of Defense and the Ministry of Foreign Affairs to push for the protection of the site. The new approach to protect the site will be to create a fisheries replenishment zone through a ministerial agreement through the fisheries department. The Ministry of Foreign Affairs will be pushing for the protection of the site. Ana is currently working on the technical report to hand in to the ministries including the zoning of the area and its ecological justification for protection.

Cayman Crown has been included in the document on the proposed expansion of replenishment zones for deep water in Belize; we are waiting for the official declaration of the site. This has taken several months, we still don't have a definite resolution.

HRI is a partner and co-sponsor of a regional grant to MAR Fund from the French Fund for the Environment (FFEM). HRI has been essential in the FFEM grant writing and follow up process that are required by FFEM. HRI worked hand by hand with MAR Fund for the proposal writing in order to implement the project, assisting in the compilation of data and reporting on regional fish spawning aggregations, as a step towards improved management. This project has been approved by FFEM in December 2018, however the project hasn't started due to delays by FFEM, we hope the project starts in January 2020.

(https://www.dropbox.com/sh/f6ett4nvnk4g5sa/AAD8JhMgX7KaxSSalU4b1irla?dl=0).

HRI in collaboration with Fundación Mundo Azul is leading the project titled: "Cayman Crown: support conservation of the jewel of the MAR through solid science". This project has been awarded through the smalls grants program form MAR Fund. The objective of the project is to Generate a solid scientific knowledge baseline to support protection of the newly discovered Cayman Crown reef in the Caribbean coast of Guatemala.

- Two sites selected were monitored using the AGRRA methodology. This monitoring will provide information on reef health based on the Reef Health Index made by the Healthy Reefs Initiative and AGRRA.
- Two photomosaics are being developed to evaluate species composition and cover. The photomosaics will serve as graphical images, this will be the starting point to see changes over time on this specific areas within the sites selected.
- One water temperature and one pH/temperature loggers were installed on the Cayman Crown Reef to give an idea about changes in water temperature and pH on the reef over time.
- BleachWatch monitoring was also made during the last week of October.

- **Increase the percent of sea within fully protected zones to 10% by 2020**

HRI continues to work to increase the percent of sea within fully protected Replenishment Zones. In Guatemala and Belize, HRI has provided scientific data that is being used in both countries to push for the protection of the Cayman Crown reef. In Belize, Cayman Crown has been included in the document on the proposed expansion of replenishment zones for deep water in Belize; maps have been reviewed however, we are waiting for the official declaration of the site. In Guatemala scientific data has been presented to the Environmental Committee of the National Congress, Fisheries Department (DIPESCA), Fundaeco, CONAP, the Ministry of Defense and the Ministry of Foreign Affairs to push for the protection of the site. The new approach to protect the site will be to create a fisheries replenishment zone through a ministerial agreement through the fisheries department. However, the process has been slow due to the fact that this year has been an election year.

Mexico Coordinator has been elected as member of the committee for fish replenishment zones inside the Alianza Kanan Kay, an alliance of NGOs, authorities and fishing cooperatives looking toward increasing to 20% the FRZ in Quintana Roo. Mélina has assisted to the alliance's assemblies and presentations to fishing cooperatives interested in this tool. https://www.dropbox.com/s/8xr02r5rche53w8/MINUTA%2014%C2%B0%20ASAMBLEA%20GENERAL%20ALIANZA%20KANAN%20KAY..pdf?dl=0

Link of all supporting documents for Healthy Fisheries can be found:
https://www.dropbox.com/sh/sbb9ke6jwsh0de5/AACHTjzk0C_djJkls45lBQpka?dl=0

D. Healthy Communities

- **Demonstrate the linkages between human, economic and reef health**

HRI is collaborating with the Global Coral Reef Monitoring Network (GCRMN) and is planning a training workshop on socioeconomic monitoring to be held in Roatan, Honduras from December 9th to 13th, 2019. The workshop will focus on the methodology of the Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon). This workshop is part of the "Building Capacity for Coral Reef and Human Dimensions Monitoring within the Wider Caribbean II: The Mesoamerican Reef Region". Subsequently to the training, a socioeconomic site assessment will be done in 4 MPA sites selected in each of the 4 countries.
(http://www.socmon.org/regions.aspx?region=Caribbean&centerpoint=17.5,-72.0&zoomlevel=5).

E. Healthy Futures

- **HRI leads the incorporation of the latest reef science into reef management testing out new theories to improve reef management**

Pilot restoration sites have been selected to test methods and success of re-seeding Caribbean King Crab and *Diadema* and manually removing macroalgae.

HRI's Macroalgae Reduction Strategy goes beyond innovative reporting on ecosystem health and management, to enter into the research and development of innovative techniques to improve reef health aimed at alleviating a major problem: macroalgal proliferation. The proliferation of fleshy macroalgae has continued in the region, despite the protection of grazing parrotfish in Belize, Guatemala and offshore Honduras.

Pilot sites have been selected in Mexico, Honduras and Belize to test several methods to restore herbivory. Data will be available in our next report.

- Re-seeding of King Crabs in Mexico

A pilot study was held in patch reefs in Cancun's MPA, in the area known as Manchones, from September 2018 to January 2019.
In collaboration with the Fisheries Department and MPA authorities, 24 previously caught King Crabs were introduced in order to follow their impact on macroalgae cover. The detailed methodology and results are in the report (in Spanish):
https://www.dropbox.com/sh/nlpn0c7e6mwaxil/AAC4DNIgs4Y2I-VJvDh3NlDea?dl=0.

After 5 months of study, a clear impact on the benthic community was observed with a decrease in turf algae and macroalgae, followed by an increase in calcareous and crustose algae which are encouraging results as turfs tend to overgrow and asphyxiate corals while crustose algae favor the settlement of coral recruits. At the end of 6 months, the crabs were not able to be found which ended the experiment. Nevertheless, those observations were found promising and a second phase to this pilot study is beginning. The second phase of this project has been designed in collaboration with SI and Old Dominion University and is seeking the adaptation of mariculture techniques to local conditions in order to achieve the production of king crab juveniles to scale up the reseeding effort and, potentially, become an opportunity for diversification of activities for local coastal communities. Once again, this second phase is being developed in collaboration with the Fisheries Institute and is embedded in its coral restoration program and in parallel with a similar project in Belize. The results of this pilot project were presented at the AMLC Conference in Punta Cana, Dominican Republic.
https://www.dropbox.com/s/m9u168cb43wac7s/AMLC_Rest_Melina%20Soto_HRI.pptx?dl=0

To provide potential solutions for macroalgae proliferation in Belize, HRI partnered with Fragments of Hope to conduct a pilot study, which tests the herbivory potential of the Caribbean King Crab. The pilot took place within a no take zone of the Gladden Spit and Silk Cayes Marine Reserve. During the pilot, we established 2 experimental and 2 control patches. The experimental patches were seeded with twelve crabs translocated from a local fisherman's shade. The study used the AGRRA benthic protocol to record benthic data prior to introducing the crabs, at one month and at six months. At the end of the experimental period, the study saw a decrease in Turf algae and an increase in live coral cover. The long-term goal of HRI and our partner organization Fragments of Hope, would be to create a separate research project proposal to lend technical and scientific support to a Co-op or organization for the potential development of a sustainable King Crab Mariculture linked to a 'hand's on' Reef Ecosystem Restoration Plan/management strategy for Belize.

- Manual removal:

In partnership with Centro Ecológico Akumal, a pilot study was designed in order to evaluate the effect of manual removal of macroalgae on the survival of recently transplanted coral fragments for restoration purposes. Due to weather issues and logistics complicated by the departure of the partner organization Global Vision International (GVI) from Akumal, which was providing with volunteers for the experiment, the project has suffered some delays. However, the experiment has been successfully completed during the summer and results have shown that:

  - Outplanting method selection is key. Concrete showed to be the more efficient fixation method. The use of nails and cable-ties do work, but take a long time for the frags to naturally fuse to the bottom so they need extra aid to get fixed.
  - The benthic cover in the surroundings is important to select the area to outplant corals; the presence of crustose coralline algae (CCA) helps maintaining other algae groups in lower levels in comparison of areas with less CCA cover. CCA seemed to promote the fragments to fixate naturally in a quicker manner and allowed a higher survival.

- Macroalgae cover percentage was high in the beginning of the experiment (average 35%) but *Lyngbya* cyanobacteria soon started blooming over the reef, reaching a high cover when the seawater became warmer (peak of 9-10%).
- The survival of the outplanted corals was slightly higher under the continuous maintenance treatment (survival of 90-100%, cleanings about each 2 weeks) and fragments got fixed to the substrate in a quicker fashion, although the difference among the other treatments with absence or seldom cleaning was not that significant (85-90%).

(https://www.dropbox.com/s/08rxrnwp2g1ueig/Fleshy%20Macroalgae%20Manual%20Removal%20VFINAL.docx?dl=0)

In Honduras, HRI is coordinating with the Roatan Marine Park and community dive operators on selecting exact sites for the removal of macro-algae. They will work through a volunteer program established by the park, as soon as the required government approval/research permit is issued.

King Crab supporting documents:
(https://www.dropbox.com/sh/zpyxuldwoor1yz5/AAC6OaK6hbjSv2EMc3KswrWha?dl=0)
https://docs.google.com/document/d/1uqYX2qksrqKWmgv2ILN4kZtO8MYvOQdk0bCHt7K4aY4/edit

- **Restore key herbivorous *Diadema* populations**

Over the last decade, *Diadema* densities have slightly increased an average of 0.04 ind/m^2 in the MAR region. The highest change observed for Guatemala is mainly due to the inclusion of a higher number of monitoring sites, some of them showing high densities of *Diadema*. Mexico shows a decrease of 0.05 ind/m^2, going against the regional tendency. Regional densities of *Diadema* are still about 6 times lower than densities reported before the 1980's mass mortality event (https://www.stri.si.edu/sites/publications/PDFs/2015_Lessios_annurev-marine-122414-033857.pdf). Recovery of *Diadema* populations is still slow more than 30 years after the die off. The need for effective herbivory to counteract macroalgae proliferation in the region is a strong argument to develop and strengthen *Diadema* reproduction and restoration programs.

Nevertheless, a few sites along the MAR region have shown in the past few years the highest densities, which could serve as potential collecting sites to supply larvae to restore other neighboring areas. This is the case for Honduras where 5 sites have been located to have densities higher than 1.5 ind/m^2 of *Diadema*.
(https://www.dropbox.com/sh/h2tf12tjk6bumlr/AAD1mZ9QzxDgCKIHEeuzTWDGa?dl=0).

A research plan has been drafted between HRI, RMP, Roatan Coral Restoration Foundation (CRF), Roatan Institute for Marine Sciences (RIMS) and CORAL encompassing a coral and *Diadema* restoration project in Half Moon Bay and in Dixon Cove (see map). The project was scheduled to begin after acquiring research permits from the Protected Areas Department, but due to the need to expend these funds, the project went ahead without permits. The local co-managers were all in agreement of carrying out the project without the permit.

The two sites selected were Half Moon Bay, as this bay shows the highest water quality in West End (based on CORAL/BICA data), and Dixon Cove, on the south side of the island. This second site is a bay where one cruise ship terminal operates, which operates a waste water treatment plant. Other tourism providers around this bay do not treat their waters, and thus the area where the urchins were installed have lower water quality.

HRI will also collaborate with the Mahogany Bay Cruise Ship Port, as they have identified a possible site for *Diadema* relocation. All pending permits and approvals by the Protected Areas Department.

Reef Restoration Network

HRI's Guatemala and Honduras' Coordinators continue serving on the Steering Committee of the MAR Reef Restoration Network. They play a crucial role to apply and spread the Network's best practices, experimental designs and recommendations. Numerous projects in the region participate in coral nursery efforts, either through raising nursery corals or out-planting nursery corals to new areas. HRI plays an important role in the success of these restoration efforts through the coordination and exchange of reef health information regionally. The Guatemalan Coordinator has participated in meetings to select the Guatemalan site that will be included into the parametric insurance model for the reefs developed by MAR Fund and the Reef Rescue Initiative.

HRI is also expanding reef restoration to focus on critical ecosystem functions like herbivory, in addition to coral propagation. This new restoration work is aimed at directly addressing the macroalgal proliferation problem highlighted in our Report Cards, as parrotfish alone cannot contain their growth and water quality improvements require longer time-frames and substantially more financial resources to implement on a regional scale. Thus, this additional layer of active management through restoration of other herbivores and manual reduction of macroalgae is being explored.

Coral disease outbreak in the Caribbean

Sick corals first appeared offshore the Miami-Dade County area in September 2014. The outbreak area has since progressed 175 km to the northern limit of the Florida reef tract and southwest to Looe Key in the Lower Keys. Numerous coral species (except the acroporids) have been afflicted, disease prevalence has reached 80% of all colonies present at a site, and a number of coral diseases have been observed. On July 3rd 2018, researchers from UNAM and CONANP discovered a reef near Puerto Morelos, Mexico to have a severe outbreak of coral disease affecting similar species and exhibiting similar patterns as those in Florida. Although diseased colonies have been observed in other reefs in the north of the Mexican Caribbean, the prevalence seems to be lower (50% of several species are affected). Photos and information about this in Mexico are posted at www.barcolab.org.

To date the disease is present in all 450 km of Quintana Roo's coast, except Banco Chinchorro so far, a greater distance than in Florida, which took 4 years to spread. In less than a year the stony coral tissue loss disease has claimed about 40% of colonies from the 20-coral species that are affected by this white syndrome. This affectation is equivalent to the decrease observed in coral reefs during the past 40 years. Lately, the disease prevalence seems to have lower but it is unclear if it is because colonies are now so spread out that it slows down propagation or if it is related to environmental causes.

Attempts of treatment have been made in collaboration with CONANP Cancun, Puerto Morelos and Cozumel, and colonies have been rescued within the INAPESCA facilities. Teams have treated about 40 colonies using antibiotic in a paste of shea butter covered by epoxy, following protocol developed by Dr. Karen Neely from NOVA University. Preliminary results show less than a 40% success for species such as *Pseudodiploria strigosa,* whereas we have observed an 80% success rate with *Orbicella* species (*annularis* and *faveolata*). Success is estimated as the lesion is stopped by the application of the treatment. Unfortunately, in the majority of the cases the colony soon shows new lesion in another area, which then has to be treated as well. Treatment does not appear cost effective to save the reef and is rather now seen as an emergency tool to slow down the pace of the disease on important big reef building colonies. Fragments put in quarantine at INAPESCA have shown a 100% survival and no longer show signs of disease. Rescuing fragments from colonies that show resistance to disease, bleaching and other events can help ensure a brighter future for a further restoration program. This requires investment for more facilities to keep a desirable stock of future donor colonies. Fragments of the pilar coral, *Dendrogyra cylindrus*, locally threatened of extinction are being collected and kept in quarantine at INAPESCA. Those rescues are being organized with personal funds but more is required in order to maintain fragments in good condition and rescue their genetic material for future restoration programs. We have submitted other grant proposals to

attend this emergency. A proposal has been sent to MAR Fund's Coral Rescue Grant in collaboration with the Fisheries Institute and UNAM. Live tissue and gametes cryopreservation will enable to keep the reproduction of these species under controlled environment and plan for future restoration projects. This grant is for $ 25,000.00 however, more than 20 species are actually dramatically affected by the disease and more funds are needed to upscale this project. Healthy Reefs is also drafting, through the National Coral Reef Monitoring Network, the development of a national SCTLD response and action plan.

(https://www.dropbox.com/sh/nlpn0c7e6mwaxil/AAC4DNIgs4Y2I-VJvDh3NlDea?dl=0).

Stony Coral Tissue Loss Disease was seen in Belize in June of 2019. An initial assessment showed that the disease is located within the Bacalar Chico Marine Reserve area, but it is likely to continue moving further south. Healthy Reefs, Hol Chan Marine Reserve and the Belize Fisheries Department launched preliminary treatment efforts using Chlorine and Cocoa butter but these efforts have not been successful. Belize is now reevaluating treatment methods and has discussed using antibiotics at the most recent National Coral Reef Monitoring Network meeting.

HRI has submitted two proposals for the "Development and Implementation of the Mesoamerican Reef Disease Watch Emergency Response Plan" specifically to attend the new coral disease affecting the MAR reefs. Proposals were submitted to the National Fish and Wildlife Foundation and Waitt Roc grants to secure more funding to address this issue. However, due to reasons out of our control, these organizations did not give us the funding.

5. Indicate the advance of the project in relation to the original timetable and explain the reason for any delays there may have been.

- **Increase herbivory and reef health by protecting parrotfish region wide by 2018**

HRI Mexico has submitted the technical files to propose the inclusion of 10 parrotfish species to the protected species list. Although most of the files were ready and had been reviewed and approved by the General Direction for Wildlife (Federal Institution), the official submission had to wait until the public consultation was finally opened. It opened mid-August (after almost 3-year delay) and all 10 proposals were submitted on line and in paper during the first days of September. The 10 species have been approved by both the revision committee in 2018 and the National Commission in 2019 but the law has not been published as of yet. This is why Healthy Reefs and partner organizations have sent a letter to the new Environmental authorities (Mexico changed government in December 2018) to remind them of this pending process:

https://www.dropbox.com/s/wzb1u7su2b0notu/Carta%20NOM%20059%20SEMARNAT%202010.pdf?dl=0

Macroalgae manual removal pilot project in Akumal has been delayed due to permits that were not arriving. Presidential, state and municipal elections delayed several administrative processes and the end of the actual administration slowed down everything. Weather conditions and GVI leaving Akumal (they were participating with volunteers) have delayed the normal development of the project but it has successfully concluded by summer 2019. Although the original plan couldn't be followed as planned because of critic logistic and weather constraints, and some adjustments had to be implemented on the go, the findings provided some important considerations for the immediate and mid-term of the coral restoration project in Akumal:

- Outplanting method selection is key: concrete showed to be the more efficient fixation method.

- CCA seemed to promote the fragments to fixate naturally in a quicker manner and allowed a higher survival.
- The survival of the outplanted corals was slightly higher under the continuous maintenance treatment (survival of 90-100%, cleanings about each 2 weeks) and fragments got fixed to the substrate in a quicker fashion, although the difference among the other treatments with absence or seldom cleaning was not that significant (85-90%).
- Growth rates differed slightly between treatments, but the average growth of outplants was around 0.5cm/month and the average generation of 0.5 new ramets/month.

https://www.dropbox.com/s/08rxrnwp2g1ueig/Fleshy%20Macroalgae%20Manual%20Removal%20VFINAL.docx?dl=0

Progress has been made regarding activities related to gathering information on coastal poverty and socioeconomic indicators, however we will further advance on gathering this information during 2020by collaborating with the Global Coral Reef Monitoring Network. Progress has been halted or delayed due to many changes within GCRMN that have not allowed to project to begin. The plan is to have a socioeconomic indicator training workshop (SocMon) and gather more of this information. HRI will collaborate with GCRMN in all logistics to create this first training session on Roatan in Dec 2019.

The SocMon MAR campaign aims to create a set of comparable indicators across the region, which is why regional partners from the 4 MAR countries are being trained in this methodology. The comparable indicators will be gathered by all involved parties, and shared with HRI to then publish alongside the EcoAudit or the Report Card.

Belize:
The restoring herbivory project was completed in Belize in 2018 and found both a reduction in Turf Algae and an increase in coral cover in experimental sites. This success prompted expansion of the project to now culture crabs to translocate at smaller sizes and in larger densities. The Mexico and Belize country coordinators successfully received funding towards this project.

6. Obstacles: Indicate if there have been any obstacles to the development of the project that have prevented achieving the planned goals or complying with the timetable, and how you have solved or plan to solve the situation.

The territorial dispute between Guatemala and Belize continues to add a layer of complication and has been an issue to advance in the protection of the Cayman Crown reef. However, we are working closely with local and regional partners to move forward. HRI has also been working on securing funding for the declaration and management of the site. The electoral year in Guatemala has been a setback for the advancement in declaring the site for Guatemala, but HRI continues to work with the different ministries to push for declaration.

The decision of the Municipality of Roatan to no longer cover Polos Water Board's electric bill and past debt, forced Polo's Water Board to re-prioritize their efforts in order to solve this immediate fiscal hurdle, before they could reach out to coordinate with other water boards. Coordination is now getting underway.

Recent Government changes in Mexico by the end of 2018, have delayed numerous projects and administration processes. Environmental issues do not appear as priorities and this sector seems on hold. However, collaboration with organizations and MPAs authorities is still supporting and promoting conservation projects and initiatives. Strong networks are more than ever an important tool to make impact in the region.

There is no AGRRA data for 3 sites in Guanaja, within their FRZs, due to bad weather conditions during the week of monitoring. And there are no AGRRA sites within the 2 NTZs recently declared in Utila due to lack of information sharing and/or data entry by CEM, who took on the responsibility for these sites.

7. Links with other organizations: Describe any alliances established as a result of the project development.

The recent collaboration with the Mancomunidad de Municipios del Golfo de Honduras (Gulf of Honduras Municipalities Conglomerate), might lead to protecting herbivores in the entire north coast of Honduras.

8. Description of activities for next period: Briefly describe the activities that will be undertaken in the next period.

- Production and Launch of the 2019 Mesoamerican Reef Report Card.
- 2020 Mesoamerican Reef Monitoring
- 2020 Partners Meeting
- 2020 EcoAudit
- Search for funding to connect more houses and/or businesses to the treatment plant in West End.
- Work with partners to further MPA zoning or enact new MPAs to protect SPAG sites.
- Implement recently initiated pilot restoration studies.
- Demonstrate the linkages between human, economic and reef health through different assessments like coastal poverty and impacts to human health due to changes in Reef health.
- Follow-up regarding the definition of socioeconomic indicators for the MAR.
- Reintroduce *Diadema* urchins and corals into Half Moon Bay in West End, and Mahogany Bay in Dixon Cove, Honduras.
- Continue collaboration on the campaign to reduce and ban single-use plastics in Q. Roo.

9. Project development table

Please see attached Project Development Table with updates.

Annex 1. Project Development Table

Objective	Output / Expected Result	Activity (4 year project)	Activity Year 3	MONTHS OF YEAR 3												Performance indicator	Sources and means of verification	Impact Indicator	Sources and means of verification	Assumptions & risks	Percentage of accomplishment of indicators / outcomes.
				OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP						
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HEALTHY REEFS - CORE STRATEGY																					
Collaborative training and reef monitoring with partners	Reefs are being regularly monitored by qualified local biologists, with consistent training opportunities	Reef monitoring activities	Reef monitoring activities	X	X											> 80 sites monitored by HRI	one database updated	Standardized quality data collection - based on agrra.org methodology	database	funding needed for monitoring	100% - all 4 countries carried out monitoring
																3 training workshops held	3 training workshop reports with signin sheet, photos and test results.	regular assessments of reef condition (2018) shows increase in reef health, particularly increased fish and decreased fleshy macroalgae	review of collectors scores on testing	funding for workshops	100% Trainings have been organized and held in Mexico, Belize and Honduras (where Guatemalan trainees participated)
	Sound data regularly collected on reef health	Training workshops and certification of local data collectors	Training workshops and certification of local data collectors													>30 researchers certified	test results and cumulative log of certified researchers	Local capacity (# certified data collectors) increased by 30 people this year		local capacity to pass tests	100%- 69 people have been certified
Production of Report Cards (X) and New Community Health Report Card (Y)	Reef managers, general public, and decision makers are able to evaluate reef health via Report Cards, and understand link to human economy and health (Y)	Production and launch of report cards	Production and launch of report cards	X	X	x	X	x	x	x	x	x	x			4000 Report Cards printed	receipts of printing	Improvements in reef health (barring external impacts e.g hurricanes, coral bleaching) as measured in the Report Card		public looses interest	100%- in all four countries for 2018 Report Card. Now working on the 2019 RC
													X			4 launch events successfully get media attention (both per year in report card years)	Launch reports and copies of media coverage	RC is a reference document cited in publications and management documents		hurricane or bleaching damages reef	
Evaluation reef management through a 2020 Eco-Audit (frequency being reduced to every 5 years)	Country -level evaluations of degree of implementation of recommended management actions. Scores for each country	Perform evaluation. Produce and Launch 2020 Eco-Audit														1000 Eco-Audits printed	Receipts of printing	Proven progress in management actions. MAR % implementation increases from 62% to 75% by 2020		public looses interest	Next period
																4 launch events gain media attention	Launch event reports and copies of media stories	partner survey indicates the EcoAudit is useful		lack of govern-ment interest or incentive for con-servation measures	
Enhance partner capacity and participation in HRI	More engaged, effective partners, better utilization of HRI products to help achieve their conservation objectives	Partners participate in annual HRI meeting - setting priorities	Partners participate in annual HRI meeting - setting priorities	X	X											partners' responses on HRI annual surveys find that at least 80% are satis-fied with HRI program	at least one major example of a collaborative 'win' each year.	continued support for HRI as meas-ured thru partner participa-tion and survey results		status quo	100% - Partners Meeting was held on October 2018
		ongoing social media posts participation in workshops and partner efforts	ongoing social media posts participation in workshops and partner efforts	x	x	x	x	x	x	x	x	x	x	x	x	HRI staff record at least 1 major conservation 'win" per year relying on the collaboration, as verified in news articles	Success stories in Report Cards RCs demonstrate partner capacity and en-gagement	Management actions result in increased reef health		conflicts with partners of contentious environmental issues, funding etc.	100%- in all four countries

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	Enhance public awareness and support for marine conservation	More informed public engaged in conservation, better decision making	Launch events, regular TV and newspaper articles	Launch events, regular TV and newspaper articles								X	X	X	X	X	>40 media stories per year about conserva-tion issues and HRI launches of reports public perception survey results	log of media reports log of public engage-ment in main conservation issues	engaged public and commu-nity supports conserva-tion activities increased reef health results from actions (increased RH Index score		competing headlines - economic interests counter to conserva-tion	100%- in all four countries
	HEALTHY WATERS																				
	Effective management of waste water in the West End community improves local water quality and reef health	70% of West End community connected to water treatment plant through second phase KfW project	Connect 90 homes/businesse s to waste water treatment plant	Connect 20 homes/business es to waste water treatment plant							x	x	x	x	x	x	93% of households paying for waste water treatment Gallons of waste water treated increases during period	Number of households connected obtained from water board records At least $10,000 raised in order to make 10 connections @$1,000 each	reduction in macro algae on proximate reefs reduced contami-nation proximate waters as measured in water quality tests		House-holds want to connect and pay for treatment. HRI Honduras succesfully raised at least $10,000 Nutrients from mainland could still fuel macroal-gal growth	25% New potable and sewage tariff implemented succesfully. As of Dec 2018, 284 homes and businesses are connected to treament, which equals 98% of possible connections without major infrastrutures being built = 25% Half Moon Bay has recevied a Blue Flag Beach Pogram award for complying with all water quality parameters, thanks to the adequate management of the treatment plant. 100% -1 grant has been awarded to Polo's Water: 1 from CORAL for $61K.This $61K grant has not yet been executed, and it will be used to create new sewage connections in 1 or 2 sections of West End. The amount of connections will depend on improvements/upgrades made to the treatement plant. 33 new sewage connections were made, 2 new (5HP) air pumps were bought, water quality analysis of treatement plant influent and effluent and there are pipes and other materials in Polo's wharehouse for future projects = 100%
	Replicate successful Water Board management scheme two more areas by 2020	2 other coastal water boards/districts are using Polo's Water Board water mgmt. scheme as	Meetings and workshops held where mgmt. scheme is presented to existing water boards and fully explained Honduran water mgmt. entity (ERSAPS) meets with water boards creates tariff spreadsheet	Meetings and workshops held where mgmt. scheme is presented to existing water boards and fully explained Honduran water mgmt. entity (ERSAPS) meets with water boards creates tariff spreadsheet		X							X	X			at least 2 Meetings and workshops carried out per year. at least 2 Meetings and workshops carried out per year	Attendance lists and meeting photos (in annexes: HON Meeting with Los Maestros Water Board, HON Los Fuertes Water Board) Attendance lists and meeting photos	Other coastal water boards understand current scheme and want to implement it Other coastal water boards have real and accurate tariff schemes in place		Water boards want to improve mgmt. of water works communities accept water and sanitation tariff	100% - Meeting with Los Maestros and Los Fuertes water board. No progress to report up to April 2019, as we have not had replies from these two water boards on how they are or not implementing changes to their management. 50% - New tariff spreadsheet created for Polo's Water, one community meeting with ERSAPS = 50% 100% there has been another community meeting where the entire community approved dissolving the other water board and allowing Polo's Water to run the entire system for West End. This meeting was held in Feb 2018.
	8 coastal municipalities are improving sanitation	IDB and Honduran Govt. acquire funds for sanitation projects 2 IDB/Honduran Govt. funded projects are underway to improve sanitation	Honduran Govt. ratifies Cartagena Convention (which includes LBS Protocol) 2 sanitation projects are underway that improve effluent water quality	Honduran Govt. ratifies Cartagena Convention (which includes LBS Protocol) 2 sanitation projects are underway that improve effluent water quality	X												Cartagena Convention ratified by congress Projects approved to improve sewage treatment meeting new standards	Ratification printed in official gazette Project timeline. News of projects is published in IDB newsletter or newspaper	LBS water quality norms are now legal in Honduras Projects measure reduced contamination in treatment plant effluents. HRI measures improved reef health in near area.		Convention is ratified by congress. Congresman Irias helps push ratification. interna-tional entities want to fund sanitation projects. IDB funds sanitation projects in Honduras	100%- Cartagena convention has been ratified and printed in the official gazette. 25%- Still waiting for Finance Ministry to request funding to IDB. 25%- IDB has approved a $600K budget to create project blueprints, specifically focused on West Bay treatment plant, Roatan sanitary landfill, among others. 50% the Ministry of Finances has approved the entire funding for the West Bay treatment plant.
	Identify new water-treatment technologies to improve wastewater treatment in the MAR	Find new and emerging technologies that treat waste water	Search online and printed articles that explain new treatment methods and	Search online and printed articles that explain new treatment methods and													At least one applicable technology identified	Staff web-based research	reduced contamination of water quality as measured by treatment plants			100% - have identified technology but no funding to replicate. Searching for less expensive options

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MAR		technologies	technologies							X	X	X	X	X	X	At least one new technology applied (by 2020)	reduced macro algae in nearby reefs	reduced macro algae in nearby reefs			
HEALTHY FISHERIES																					
Increase her-bivory and reef health by pro-tecting parrot-fish region wide by 2018	Legal protection of parrot-fishes regionally (Mexico and coastal HN missing)	Write and submit proposal for the inclusion of all caribbean parrotfish species in NOM-059	Prepare technical justification for protecting 10 species.	X	X	X										regulation is passed, 10 species of parrotfish are protected.	Eco-Audit verified legal documents	increased reef health due to successful im-plementation of herbivore protection. Herbivore biomass increases.		macro algae response may be slower than expected due to excess nutrients. Change of grouper diet to parrotfishes diet due to scarcity of groupers.	80% - 10 species' justification documentation has been submitted to the SEMARNAT. The proposals have been approved during the Revision Committee Meeting but the law is still not published. The Herbivores are now protected under the RBCM managment plan.
	Continue communi-cations efforts	Social awareness	Social awareness		x		x		x		x					Communication through social media, radio, con-ferences, tv, newspapers, magazines.	Statistics from FB, TW and YouTube tally the amount of people reached by social media outreach. Survey monkey to meas-ure perception and/or change of habits. Radio, tv, conference, press records	Knowledge of importance of herbivores in the Q.Roo state increases.			70% - Communications efforts had been done mainly through conferences, debates and podcasts with 2018 RC results and communication of herbivory activities to do by HRI, and parrotfishes importance. HRI has collaborated with AIDA by providing technical support for the protecion of Parrotfish. It helped elaborate two fact sheets for public awareness on the importance of parrotfish. HRI Mexico participated in national and international scientific conferences, had several high level interviews (Aristegui, France 24) but also to local media and forums. From Oct to Apr, 1 projection of Erosion in Nursery School Playa del Carmen, presentation of Flows at EarthX Mexico City as well as participation on the ecotourism and reef panel by Marisol Rueda, same documentary Flows projected at the Playa del Carmen Theatre organized by the municipality, 1 participation at the Environmental Education Workshop organized by SEMA, and at the Plastic Free event organized by SEMA with the conference Desplastificate, 1 HRI talk to Manta Mexico Caribbean Project volunteers. All events talked about the importance to reduce macroalgae and its relation to the natural herbivores, the parrotfishes. Honduras: met with North Coast Municipalities Conglomerate to propose Municipal Ordinances that will protect herbivores in all these municipalities
Enhance com-mercial fish biomass and reef health by pro-tecting spawning aggregation	Protection of at least 3 more spawning sites	work with partners to further MPA zoning or enact new MPAs to protect SPAG sites	work with partners to further MPA zoning or enact new MPAs to protect SPAG sites	X	X	X	X	X	X	X	X	X	X	X	X	% of known SPAG sites in protection	Eco-Audit measures this statistic	increased reef health due to successful im-plementation of SPAG site protection -increasing commercial fish biomass over approximatey 5-10 years		poor enforce-ment, lack of political will	Eventhough there has been no advances in % of protection for SPAGS. Proposals have been written to advance in Spawning Aggregation work and protection in both Belize and Guatemala. Proposals to FFEM has been approved and is soon to be starting.
																				low popula-tion density hampers recovery of stocks	Not yet evaluated
Increase the percent of sea within fully protected zones to 10% by 2020	Increased NTZ	Expand existing NTZs and establish new MPAs including full replenishment zones	Expand existing NTZs and establish new MPAs including full replenishment zones	X	X	X	X	X	X	X	X	X	X	X	X	Increased area in NTZ	Eco Audit statistics measure % in NTZ	Increased biodiversity and reef health		Not having political will. ICF and DIGEPESCA approve French Cay FRZ	50% - Proposals have been written to advance in Spawning Aggregation work and protection in both Belize and Guatemala. Proposals to FFEM and Oceans 5 have been presented. FFEM was awarded. There has been no progress due to the fact that the NTZ havent been established yet, however we are working on this and hope to have a change in next years reporting. Proposals have been written and the FFEM has been approved.
HEALTHY COMMUNITIES																					

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Demonstrate the linkages between human, economic and reef health	Result 1: Assessment of impacts to human health due to changes in Reef health.	Expert and partner review of Socio-ecological indicators for the MAR	Expert and partner review of Socio-ecological indicators for the MAR	X					X	X	X	X				voting of HRI partners results in agreement on methodology for social indicators that successfully make linkages	Socio-Ecological indicators working group activity report	Experts and partners will endorse socio-logical indicators developed		Partners agree on methodology	40% - HRI has collaborated for the establishment of socio economic principles for the design of replenishment zones in the MAR (as a follow up on the previous project on biophysical principles), a project leaded by COBI and TNC. Conversations and plans with GCRMN to collaborate on a joint proposal that has been approved by the NFWF is set to start in spring 2019. Projectt includes Soc-Mon training for HRI, and HRI training others in the wider Caribeban on AGRRA.
		Field data collection of social indicators Methods, and raw data collected using social science methods Methods appropriate for MAR	Field data collection of social indicators Methods, and raw data collected using social science methods Methods appropriate for MAR					X	X	X	X	X				Field data collection of social indicators	Methods, and raw data collected using social science methods	knowledge generated helps target socialization and conservation campaigns to be more successful, resulting in an improvement in Eco-Audit score and rate of impplementation by 20202		We identify and hire expert to design and lead this work in all 4 countries (implemented by HRI and partners)	15% - Funding through GCRMN and NFWF for spring 2020 for training and field data collection. During December of this year a training on SocMon will be happening, this will foster our knowledge for field data collection.
	Result 2: Assessment Coastal Poverty Index Assessment	Synthesis of information on Coastal Poverty	Synthesis of information on Coastal Poverty							X	X	X	X	X	X	Collection and synthesis of CPI information from secondary sources. Poverty information and tailors for Coastal Communities	Report on poverty index within the MAR			Updated secondary information exists and coastal geographical scope and analysis can be confined to the MAR.	15% - SI contract to P. Kramer to finalize this is being developed
HEALTHY FUTURES																					
HRI leads the incorporation of the latest reef science into reef management testing out new theories to improve reef management	Result 1: MAR-wide Coral Bleaching emergency response plan in operation, with an established protocol.	Coral Bleaching monitoring on selected sites in the case on an event	Coral Bleaching monitoring on selected sites in the case on an event		X										X	Plan is ap-proved by HRI partners	Bleach watch data, photo-graphs, videos.	some reef areas do not bleach as extensively, these are related to models of resiliency which are then validated and used to guide manage-ment		Partners must be willing to monitor sites.	100% in 2017 - all 4 countries carried out bleaching monitoring which resulted in 107 sites surveyed. NO warning de coral bleaching en 2018. But the network was used in Mexico in order to monitor for SCTLD spreading
					x										X	Plan is im-plemented by at least 10 partners				Predictions about events are uncertain	100% in 2017 - all 4 countries carried out bleaching monitoring which resulted in 107 sites surveyed
															x	At least 40 sites are monitored next bleaching event (if funds are secured)					
		Evaluate the bleaching impact in the MAR and evaluate reef resiliency models	Evaluate the bleaching impact in the MAR and evaluate reef resiliency models						X	x	X	X				Report on MAR bleach-ing is com-plete and publicly available.	Report on impacts on bleaching in the MAR. Maps are validated about reef resiliency potential	Coral bleaching patterns are understood and validate resiliency models that guide MPA zoning		Partners are not interest-ed in partic-ipating in the coral bleach watch and emer-gency re-sponse plan.	70% - Coral BleachWatch for 2017 - Andrea Rivera defended her PhD - including much of this analysis in April. She and Israel Munoz have prepared a draft scientific publication
	Result 2: Conduct pilot studies to determine the feasibility for the restoration of	Support 3 pilot sites to test methods and success of re-	Set up pilot sites, test mariculture method and have a	X		X		X	X	X	X	x	x	x	x	3 pilot sites established and studies underway with clearly defined partners, research permits, and preliminary results	preliminary reports from each site	fleshymacroalgal cover is reduced by at least 50% in pilot sites		HRI needs additional project funding - and cofunding with partners	66% - 2 pilot sites in Mexico (King Crab (finished) and manual removal (undergoing)), 1 pilot site in Belize (King Crab) have been implemented and finalized. Phase 2 is beginning. 2 pilot sites in Honduras for Diadema have been identified and protocol has been created. Waiting on permits but will begin work in April 2019. The Diadema apartments have been installed in the two sites in Roatan, and AGRRA benthic data has been taken at all of them. The next step is to move the urchins into the apartments (beginning of Oct) and monitor their effectiveness of grazing in early Dec.

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	herbivory through Diadema and Caribbean King Crab.	seeding Caribbean king crab and Diadema	preliminary report prepared on progress to date																	external impacts (hurricanes, coral bleaching, sargassum or dis-ease)	2 sites have been identified in Roatan, Honduras called Half Moon Bay and Dixon Cove, where pilot study will be carried out. Protocol has been written and approved by Melanie. Parcels for coral replanting have been identified and sectioned-off underwater, while corals for replanting (A. cervicornis) have been awarded to HRI project from another coral nursery on-island.
	Result 3: Facilitate natural recruitment of Diadema to enhance densities and im-prove reef health	Characterize sites with high abundance of Diadema.	Characterize sites with high abundance of Diadema.			X	X	X	X	X	X	X	X	X	X	Report on Diadema abundance and site characteris-tics	analysis of existing data and report produced	improved reef health in areas with high Diadema		experiments may not succeed	Urchins from Tela to Roatan will not be transported, as expert (Dr. Bodmer) suggests this will stress the urchins, and pockets of healthy Diadema's have been identified in both Half Moon Bay and Dixon Cove. The Diadema apartments have been installed in the two sites in Roatan, and AGRRA data has been taken at all of them. The next step is to move the urchins into the apartments (beginning of Oct) and monitor their effectiveness of grazing in early Dec.
		Test low-cost methods of facilitating recruitment in 3 areas	Test low-cost methods of facilitating recruitment in 3 areas													Manuscript and management recommendations based on experiment results are produced	experi-mental data analyzed and re-ported	lower macro algae measured in high Diadema density areas ways to enhance natural Diadema recruitment are discovered		natural pattern may be random funding is needed for this project	