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Rufford Small Grants Conference- Roatan 2021

Scientific and conservation projects in the Mesoamerican Reef that have been sponsored by The Rufford Foundation in Mexico and Central America

Semillas del Océano

ROATAN MARINE PARK

Healthy Reefs for healthy people

Acknowledgments

This conference was organized by Semillas del Oceano, with the support of Roatan Marine Park and Healthy Reefs for Healthy People. We especially thank the Rufford Foundation for funding for the event and for promoting research and conservation in the Mesoamerican Reef. The Semillas del Oceano especially thanks all the presenters for their time and dedication to the conservation of the Mesoamerican Barrier Reef.

Ana Hacohen (RSG, Guatemala)
Alerick Pacay (RSG, Guatemala)
Andrea Rivera (RSG, Honduras)
Ángela Randazzo (RSG, Honduras)
Hazel Araujo (Semillas del Océano, Guatemala)
Ian Drysdale (Arrecifes Saludables, Honduras)
Juan Carlos Carrasco (RSG, Honduras)
Natalí Cardenas (RSG, México)
Viridiana Alvarado (RSG, México)
Zara Guifarro (Roatan Marine Park, Honduras)

INDEX

Introduction

The Rufford Foundation is a UK registered charity which funds nature conservation projects across the developing world. As part of their Rufford Small Grants Program, many individuals working in developing countries have been granted funds to improve the state of natural resources, through projects framed within their university studies or part of projects of a Non-Governmental Organization (NGO). This support is relevant since it is granted to students or people in the early stages of their conservation careers, allowing them to have access to economic resources that are difficult to obtain, since they are not taken as a priority by other donors. Since it was set up over 20 years ago, it has given over 5100 grants to projects over 150 countries. Several individuals working in the Mesoamerican Reef have been granted these funds to support their conservation projects.

As an initiative to share and communicate the results of the successful projects of research and conservation in the Mesoamerican Reef, The Rufford Foundation, with the collaboration of Semillas del Oceano organized a virtual and in-person conference in Roatan, Honduras. The theme of this conference was **"The Mesoamerican Reef (MAR): new trends in scientific and conservation efforts".** In addition to the promotion of the funded programs and creating important networks in the MAR region for future projects, it was an opportunity for researchers and other stakeholders to learn about the Rufford funds and seek the chance to apply to them as well.

Objectives

The aim of the conference were to:

- ·Broadcast innovative research initiatives that promote the conservation of the Mesoamerican Reef System.
- ·Encourage strategic alliances and networking among key stakeholders in the MAR countries.
- ·Socialize the Rufford Small Grants scholarships among key stakeholders of the MAR, as a potential source to develop research in relation to the conservation area.

Summary

The Rufford Small Grants in the MAR Region Conference was held at the Paradise Beach Hotel, in Roatan, located in the Bay Islands of Honduras. There was a total of 10 speakers from Mexico, Guatemala, and Honduras that presented their projects on research and management tools to promote the conservation of the MAR region, which included key topics such as conservation of marine resources (coral reefs, sea grasses, sponges, sharks and rays), citizen science, community participation and management tools (Atlas Coral Allen and Eco-audit).There were 48 attendees:19 in person and 29 in virtual modality from different countries including Mexico, Guatemala, Honduras, Spain, Poland, and Netherlands. The attendees were from the academic, private, and public sectors. In addition, local organizations participated, such as the Roatan Marine Park (RMP) and the Healthy Reefs Initiative, as well as international organizations like the Coral Reef Alliance. At the end of the presentations there was workshop for the in-person attendees where they identified integrated strategies to strengthen the collaborative research and conservation in the MAR region. In addition to the conference, the presenters and organizing committee were invited to collaborate in the coral restoration maintenance activities of Roatan with the RMP.

The Rufford Small Grants in the MAR Region Conference

There was a total of 19 in-person attendees who participated in the conference at the Paradise Hotel, Roatan. Each attendee received a kit which included a promotional tote bag, notebook and pencil, the conference program, and a promotional bandana.

Note: The welcome kits and promotional banners were printed on 2020, as they were ready for the first proposed date of the event which was March 2020. But due to the Covid pandemic -19, this was postponed for the safety of all participants and rescheduled for 2021.

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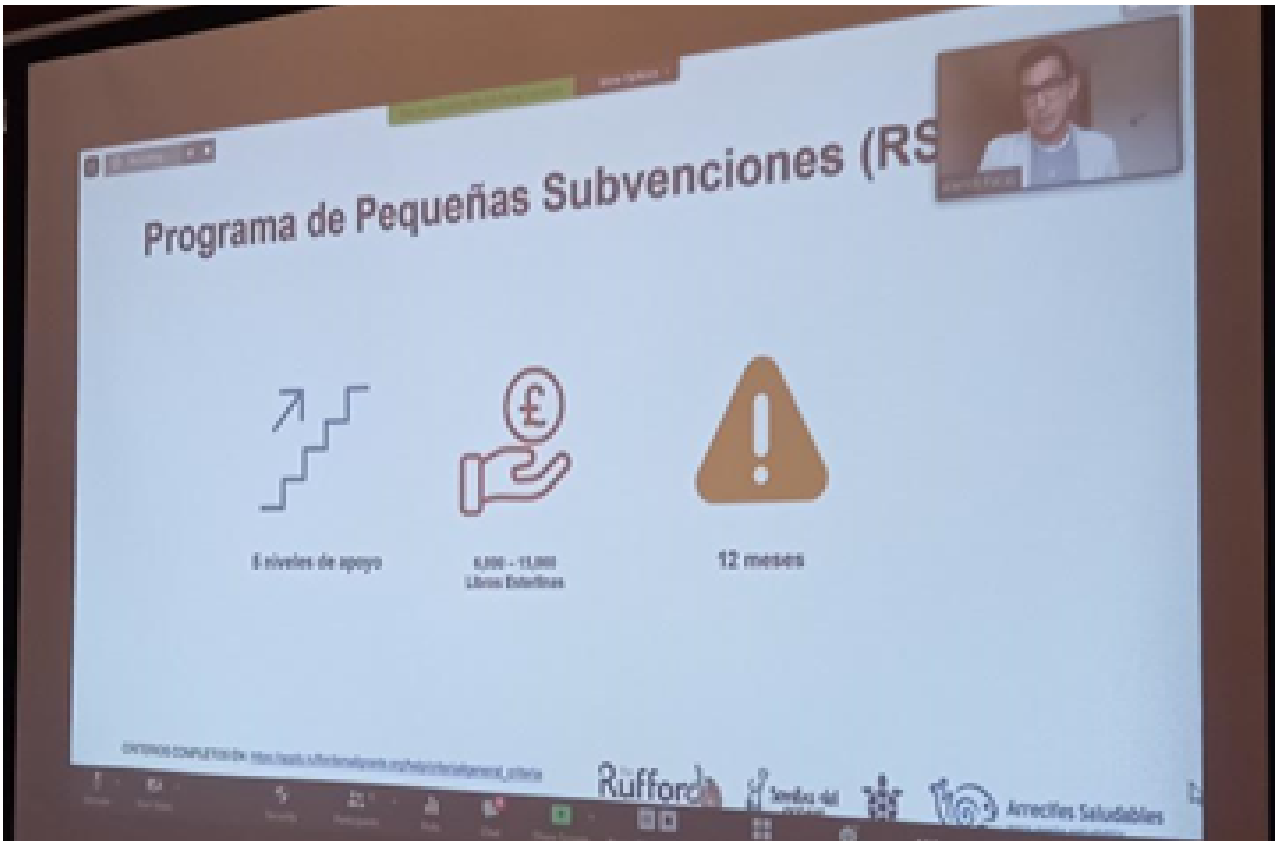
Lectures' summary

Rufford Small Grants- MPhil. Alerick Pacay

TThe Rufford Small Grants program provides funding for nature conservation projects in developing countries. It is a funding process with five levels of support, each grant starts at £6,000 up to £15,000. Eligible participants can apply all year round and once the project has been denied, applicants may re-apply after 12 months. In order to be eligible, the project must have a nature conservation focus, with species that are considered threatened, it must not be in a developed or restricted country; and the applicant must be in the early stages of their conservation career. It is important integrate the project with an NGO or university for the management and administration of donated financial resources.



Resilience on a reef of hope: the Banco Cordelia MPA- Angela Randazzo Ph. D.

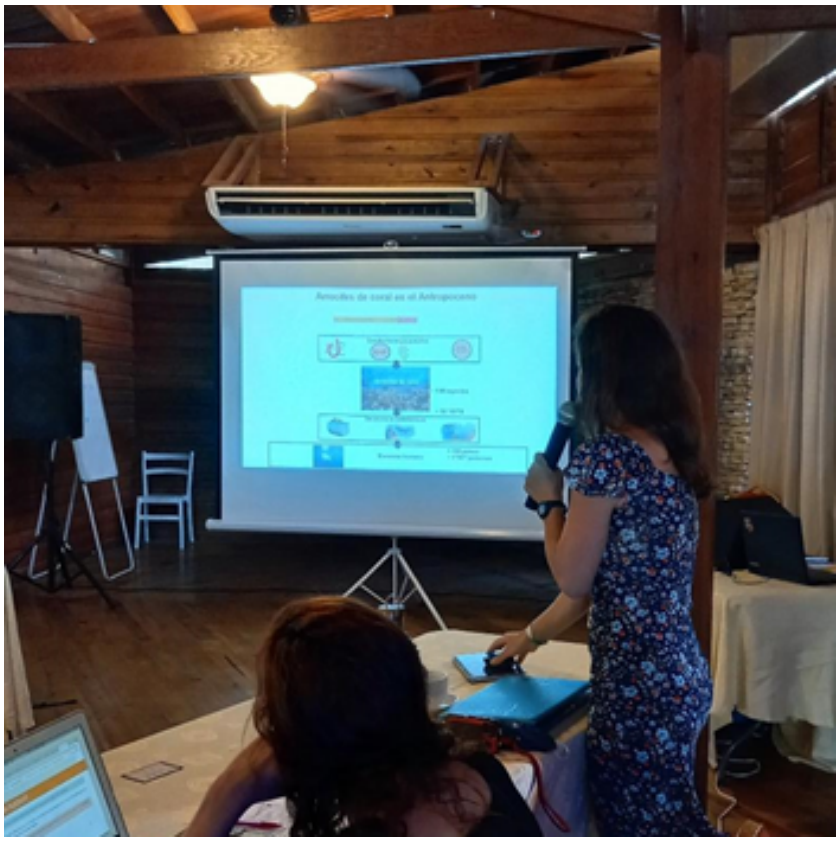
Coral reefs are diverse marine ecosystems that are home to approximately one million species, and to which are associated ecosystem services such as the sustenance of fisheries and tourism in the tropics, as well as coastal protection. These services are valued at more than US $10 trillion and contribute to human well-being by benefiting more than one billion people. However, these valuable ecosystems are threatened by direct stressors that are associated with fishing pressure, pollution, and climate change. Furthermore, these direct stressors are controlled by indirect factors such as overpopulation, markets, globalization, poverty, but also culture and management actions.

Therefore, reef ecosystems are complex socio-ecological systems that can be studied under the approach of resilience, which is the capacity of a system to persist in the face of changes, and essentially maintain its structure, functions and feedback. In relation to the management of coral reefs, by integrating the concept of resilience, there are three opportunities to act: 1) reduce stressors so that the system does not cross a threshold zone where a phase change to an undesired system occurs (for example, the reef can change from hard coral dominance to algal dominance), 2) manage system feedbacks that accelerate phase shifts, and 3) learn from reefs with greater resilience. In this context, the reefs of Banco Cordelia, a protected area located south of the Island of Roatan, Honduras, part of the Mesoamerican Reef System were studied.

This area is known as a reef of hope because of the high covers of hard corals that still characterize it, and particularly high covers of *Acropora cervicornis*, a critically endangered species, thus showing signs of resilience. In this research, coral functional diversity values (a characteristic that describes the resilience of the system) were compared between 21 sites located within Banco Cordelia and 152 sites located around the MBRS.

Resilience on a reef of hope: the Banco Cordelia MPA- Angela Randazzo Ph. D.

Despite its small geographic area (17 km2), the functional richness of coral species is greater in Banco Cordelia than in any other subregion considered (Mexico, Belize, the coast of Guatemala and Honduras, the Bay Islands near the coast and offshore Bay Islands), indicating that this small area contains a good representation of the MAR coral functional features. In addition, Banco Cordelia is home to rare coral species and is considered a refuge for this type of species for the entire MBRS. However, both the functional richness and the functional rarity of Banco Cordelia are negatively impacted by local stressors. Therefore, the management of local stressors related to urbanization (destruction of habitat, contamination of the basin, etc.) is a priority to conserve Banco Cordelia as a refuge for functional diversity for the area.



Stressors and reef condition of Tela, Honduras- Andrea Rivera Ph. D.

The biodiversity and integrity of coral reef ecosystems provide essential ecosystem services for the livelihoods of the global population. However, despite the invaluable ecological and economic importance of coral reefs, the cumulative impacts of local anthropogenic activities and global climate change are eminent causes of their rapid degradation. However, there are reefs in the Honduran Caribbean that despite coral mortality that has increased exponentially in the last 10 years, still show signs of resilience and hope for coral reefs worldwide. For this reason, this work focused on evaluating environmental stressors and the condition of the Tela Marine Wildlife Refuge Bay (RVSMBT), one of the most recent protected marine areas in the Honduran Caribbean.

Through the study, information was generated on local stressors and the physical characteristics that influence the ecological status of RVSMBT. The information generated is highly relevant for the integrated management of the area. Likewise, to have a vision of the state of the reefs of the Honduran Caribbean, the reef landscape was evaluated by means of benthic indicators by year and subregion. A total of 10 key benthic indicators were summarized and categorized into organisms that promote reef growth and those that make it difficult for coral recruits to settle or that may compete directly with corals. Additionally, during the year 2015-2017 a very high heat stress event was recorded, thus causing the third global bleaching event, which also affected the Bahía de Tela.

The severity of bleaching in the Bahía de Tela was monitored for 3 years at 7 sites through the “bar drop” method. The results showed that in 2015 a percentage of 40% of pale colonies was observed since it is the first stress response and colonies with approximately 30% whitening were also observed. This was an El Niño year, and the first formally recorded bleaching observation for the area. During 2016, fewer affected colonies and more normal colonies were found. 2016 was a La Niña year, and there was a lot of precipitation in the Tela Bay. However, 2017 was the hottest year, not related to any phenomenon. In this year, a 10% increase in whitening was observed. Coral cover in the RVSMBT remains high, however, thermal stress events are becoming more frequent, thus increasing the vulnerability of corals in the Honduran Caribbean.

Baseline Study of the Ecological Context of the Miskitos Cays: A Tool for Long-Term Governance and Monitoring- Juan Carlos Carrasco Ph. D.

The Miskitos Cays of Honduras are considered one of the most isolated and least known reef areas in the country. They are located in the east of the country, between 63 and 120 km from the coast. The area comprises around 842 km2 and includes 57 keys, which have reef origins. This area is highly diverse and is home to a variety of extremely heterogeneous habitats, such as mangroves, extensive seagrasses, reef systems, small island lagoons, and deep ocean waters. In July 2019, an ecological characterization of the Miskitos Cays was made, the reef health index was studied in 10 sites, geomorphological aspects of the visited keys were described, the structure of five mangrove sites and two seagrass meadows were evaluated, integrating data from engineering species, fish diversity and total carbon (TOC). The Reef Health Index (ISA) was 4.5 (very good) and one of the highest when compared to the MBRS region. Five mangrove species with at least two structural typologies were found. The basal area of the mangroves was 19.4 ± 9.4 m^2.ha-1.

Three species of seagrass *Thalassia testudinum, Halodule wrightii and Syringodium filiforme* were found with different levels of development in response to the prevailing hydrodynamics. The TOC in mangroves and seagrasses was 114.9 ± 11.3 $MgC.ha^{-1}$ and 191.7 ± 14.4 $MgC.ha^{-1}$ respectively. These values are within the range observed in Caribbean Island systems, below values observed in continental coastal systems of the Caribbean and above values observed in coastal systems of the Honduran Pacific. Large areas of *Acropora palmata* were observed, which may be refuge sites for this species in the Honduran Caribbean. In fact, the sedimentary base of the Miskitos Cays is mainly made up of debris from *A. palmata*. More than 16 thousand fish associated with mangroves and seagrasses were counted, of these 70% were observed in mangroves and 30% to seagrasses, in both systems the fish community was composed of 3% of species of commercial interest (Lutjanidae) and the rest by herbivores, with dominant sizes between 5 and 10 cm.

Baseline Study of the Ecological Context of the Miskitos Cays: A Tool for Long-Term Governance and Monitoring- Juan Carlos Carrasco Ph. D.

In coral reefs, the dominant commercial species was Ocyurus chrysurus with sizes between 11 and 20 cm. As fishing is currently a subsistence activity, that is, it generates little mortality, it is estimated that this species uses the reef as a pre-adult and once it reaches sexual maturity (22.5 cm) it migrates to other areas. The presence of lionfish and SCTLD disease was not detected. The remoteness of the Keys from the influence of rivers, and from urban development, as well as the little activity of scale fishing, can be important factors to keep the ISA in very good condition.

Building capacities for the detection and treatment of “SCTLD” in the Islas de la Bahía National Park- Lic. Zara Guifarro

This RMP-led project aims to build capacities to deal with the Stony Coral Tissue Loss Disease (SCTLD) outbreak in Honduras and the MBRS. In September 2020, this disease was reported for the first time in Flowers Bay, Roatan, thanks to a citizen science report. The marine park committee quickly mobilized to obtain antibiotic treatment in November 2020 and in December 2020 the RMP obtained funds with Ecosude / MAR Fund for this project. This disease affects more than 30 species of hard corals and mainly of the genus *Dendrogyra* and *Meandrites* spp. This project is composed of two phases: 1) monitoring and 2) intervention with antibiotic treatment.

During the monitoring, the aim is to detect the disease in its early phase, the outbreaks are fully managed, the susceptible species and data on the progression of the disease are evaluated. The monitoring is carried out monthly by the "Rover Diver" method for 15 min per site to count a minimum of 200 colonies, in which an evaluation of healthy species, sick SCTLD and species with other conditions (other diseases, whitening, etc.). Currently, these surveys have been carried out in 22 sites around Roatan, selected based on the presence of species vulnerable to the SCTLD, in which more than 22,000 observations have been made and more than 36 species of hard corals have been evaluated. Depending on the presence of the disease and the state of advance, the sites were categorized into pre-invasion (located to the southeast), invasion (mostly in the northeast and mostly affecting susceptible species), epidemic (in the west) and endemic (when the disease has already killed susceptible corals), and the invasion follows the pattern of currents. Interventions with treatment are being carried out in places where there is invasion and epidemic.

The intervention is prioritized according to the coral species (constructor, iconic and endangered), size, density of nearby colonies (in relation to sexual reproduction), percentage of living tissue (between 50-70%) and with few injuries. The composition of the pathogens that causes SCTLD is not yet known, but the treatment used is the combination of amoxicillin and “Base2B” (paste), which has been the most successful among the treatments used in the Caribbean.

Building capacities for the detection and treatment of “SCTLD” in the Islas de la Bahía National Park- Lic. Zara Guifarro

The formula is 400 g of "Base2B" with 50g of amoxicillin (which must be kept cold), and this gives for 6 syringes, between 6-18 coral colonies. Each intervened site is mapped, a mark is placed on the intervened corals, and the interventions are made every month for 3 consecutive months, then returned at the sixth and ninth month to evaluate the effectiveness of the intervention. In total there are 37 intervention sites in which 965 colonies have been treated, more than 1780 treatments have been put, together with 9 diving centers. The most treated species was *Colpophyllia natans*, and the species for which the treatment has been most effective is *Siderastrea siderea* and the least effective are the species of the genus *Meandrina* spp. At the community projection level, 7 workshops have been held, in which 303 people were trained and 30 are now project volunteers. In addition, citizen science is being done, informing and including the community about the disease, its prevention, monitoring and intervention.

Diversity and genetic structure of natural and restored populations of Acropora palmata and Acropora cervicornis in the North of the State of Quintana Roo- Viridiana Alvarado Ph. D.

TDuring the last four decades, the average hard coral cover decreased by approximately 80% in the Caribbean, due in large part to the loss of the populations of *Acropora cervicornis* and *A. palmata*; two functionally relevant species due to their contribution to the formation of the reef structure in shallow waters of the Caribbean. Currently, both species are classified as critically endangered on the Red List of Threatened Species, and subject to special protection in Mexico.

One tool to reestablish these populations is active restoration, for which it is key to know the genetic diversity in the surviving populations. These studies can be carried out through sequencing techniques, called Next-generation sequencing (NGS), with which genetic diversity and population structure can be evaluated, allowing the development of restoration programs that minimize the loss of genetic variation and locate genetically larger populations. various. Based on the above, this study evaluates the genetic diversity of *Acropora* spp. through NGS and Single Nucleotide Polymorphisms (SNPs), within and between populations in 192 individuals (61 A. cervicornis and 131 A. palmata) collected in 9 sites in the North of the Mexican Caribbean in the state of Quintana Roo. To track each genotype, the geographical coordinates of each donor colony were recorded at each sampling site.

Diversity and genetic structure of natural and restored populations of Acropora palmata and Acropora cervicornis in the North of the State of Quintana Roo- Viridiana Alvarado Ph. D.

This will allow: 1) the selection of different genotypes for their propagation, transplantation, and subsequent tracking (collection site, nursery and transplant site), 2) the evaluation of connectivity and genetic diversity between populations, and 3) to make a comparison between a restored population (Cuevones reefs) and natural populations. Integrating diversity and gene flow data into active restoration programs will improve their scope and contribute to the conservation of *Acropora* spp in the Mesoamerican and Caribbean Reef System.

Phase Shifts to Sponge-Dominated Reefs in the Guatemalan Caribbean- T.A Hazel Araujo

The loss of coral cover in Caribbean reefs continues to increase due to major global problems such as degradation of the coastal zone, pollution and climate change. In these disturbed environments, phase shifts are fostered for the dominance of other reef invertebrates. The competition of fleshy macroalgae with corals is widely known, but there are other organisms that could represent interesting percentages. Simple in appearance, sea sponges are one of the most resilient individuals on a reef. It has been argued that the increase of certain sponge species could be a credible future for some current coral sites.

For Guatemala, a considerable percentage of this group has been shown; comparable with the coverage of the other two dominant groups on Caribbean reefs: corals and fleshy macroalgae. Samplings were conducted from October 2020 to January 2021 at 4 reef sites within the Amatique Bay, Guatemala. 36.25 m2 of total area were analyzed at the sites, with a total of 145 quadrants (each 0.25m2), counting 25 points in each quadrant.

The average percentage of sponges in all the sites was 31.06%, followed by the fleshy macroalgae *Dictyota* sp. with 19.54%, the soft corals (subclass Octocorallia) with 4.03% and the stony coral with the highest abundance was *Siderastrea siderea* with 4.01%. It should be noted that *S. siderea* presented high levels of bleaching in all the samplings carried out, being a clear indicator of the worrying loss of corals in these reef sites, who present various threats, mainly due to trawling activities and pollution by tributaries. In addition, 8.13% of the sampled area was stony corals rubble, this being a potential space in which various reef individuals will compete to colonize. Although sponges do not provide the same complexity as corals to a reef, they could provide greater benefits that promote diversity and resilience compared to macroalgae; in addition to providing high ecological contributions such as biofiltration and recycling of nutrients.

Phase Shifts to Sponge-Dominated Reefs in the Guatemalan Caribbean- T.A Hazel Araujo

The most abundant sponge morphology was tubular with 36.66%, which could provide a certain level of complexity to the reef, possibly higher than that of a macroalgae. A phase shift to sponge-dominated reefs deserves important consideration as a future trajectory for Caribbean coral reefs, as sponges and corals have responded differently to the disturbances currently faced by reefs, demonstrating the high resilience capacity of sponges. Faced with a reef phase change where corals are reduced and macroalgae dominate, it is important to analyze what will be the role of sponges as potential competitors of this new dominant group.

Sustainable Management of the Whale Shark in the northern Mexican Caribbean- M. Sc. Natalí Cardenas

This research contributes to the conservation of the ecosystem functions of the Mesoamerican Reef System through the generation of solid scientific information that has been, is and will be useful for the authorities in charge of the management of the natural protected areas of the northern Mexican Caribbean. Every year, from May to September, in waters located to the north of the Mexican Caribbean, the presence of one of the largest populations of *Rhincodon typus* whale sharks is recorded. Since 2016 the species has been listed as endangered, according to the IUCN red list, and is currently the center of one of the most profitable tourist activities in the area.

The activity of swimming with whale sharks shows an increasing trend since its inception in 2002, and more and more tourists are doing the activity. During the 2016 season, approximately 77,000 people were reported on the tour. The main attraction for which whale sharks visit the Mexican Caribbean is the abundance of zooplankton, their main food. In 2005, Pronatura Peninsula de Yucatán and CINVESTAV-IPN, Mérida Unit, began a monitoring project that has continued uninterruptedly, whose main objective is to provide updated information on the status of the whale shark habitat in the Mexican Caribbean, and describe the distribution and abundance of the species in the area.

Additionally, in the last five years new lines of research have been added, for example, the description of the behavior of the whale shark in the presence of tourists. The abundance of food for the whale shark in the area responds to specific hydrographic conditions that have been described due to its continuous monitoring and has allowed the identification of two sub-areas of greater abundance for the species, one located within the Shark Biosphere Reserve Ballena (RBTB) and another known as El Azul, located within the Mexican Caribbean Biosphere Reserve. In the RBTB, the abundance of zooplankton is associated with the intensification of the Yucatán upwelling; while, in the Azul zone, the food for the whale shark responds to the presence of dense masses of fish eggs.

Sustainable Management of the Whale Shark in the northern Mexican Caribbean- M. Sc. Natalí Cardenas

During the first seasons (2005-2008), the work was carried out exclusively in the RBTB; As of 2009, the Azul area was included, which since 2009 has concentrated more than 80% of whale shark sightings. Although it is known that the presence of fish eggs is the main cause of their presence in Azul, there is no information that describes the conditions around this spawning. It should be noted that in the last five years a decrease in the abundance of whale sharks has been observed in the Mexican Caribbean (both in the RBTB and in the Azul area), for which it is necessary to generate information that leads to identifying the cause of these changes in this critical habitat for the species.

Implementation of participatory management programs for the collection of fishing information- Ana Hacohen Ph. D.

The main objectives of this program were to determine the composition of elasmobranchs and provide biological information for the main species that were caught in the area. The pilot community for this project was El Quetzalito, located within the Punta de Manabique Wildlife Refuge, in Puerto Barrios, Izabal, where visits were made from January to July and from October to December. In the months of July to October, no visits were made to the community, therefore, it was decided to respect the fishermen's space and not generate distrust. .The first stage was carried out with the presentation of the project to the local authorities, this being the National Council of Protected Areas (CONAP), where it was explained what was the objective and the importance of carrying out this study in the area, in addition, it was opened the opportunity for the technicians of this institution to be part of the training plan, however, there was no involvement on the part of the institution in the project.

This project was also presented to the fishermen, however, in the first meeting, distrust and fear was noted because they have had bad experiences with previous organizations, that what they seek is only to collect data and create new laws that can reach harm them. Workshops and trainings were held for the community, which included the identification of species by biological characteristics during this process, the fishermen made their contributions to the program indicating the species that were recurrently in the area and which had disappeared throughout the weather; monitoring methodology and scientific monitoring where they had a key to identify them. One of the limitations that were shown at this time was that the fishermen when they returned to the community felt very tired and hungry, many times they did not allow measurements and data collection to be carried out, so, it was fundamental, the include children and young people in the project, since many times, the fishermen were more patient in having them collect the necessary data.

Implementation of participatory management programs for the collection of fishing information- Ana Hacohen Ph. D.

For this reason, the children and young people of the community were trained to carry out measurements, taking the sexual maturity size of the organisms, data collection and taking scientific photographs, first with toy animals, and then, doing it with real animals. This activity had support and feedback in the visits to the community every 15 days. With this program, the following results were obtained: the training of 12 fishermen and 12 local volunteers (children and youth) with complete knowledge to carry out biological monitoring with sharks and rays was achieved. Currently, this program continues to be developed in the community of El Quetzalito.

The database on the status and diversity in the area was updated, registering 31 species of chondrichthyans, the current state of the resource was known, and a baseline was generated, obtaining data from 24 species of sharks, four rays and one chimera. The results obtained during the project were socialized and shared with the fishermen in the last workshop given, learning about how the resource is in the area and how the fisheries are being managed.

Community actions in favor of the conservation of coastal marine resources in MPAs of the Caribbean of Guatemala- MPhil. Alerick Pacay

This project was born because of a previous grant, which was provided by The Rufford Foundation, where children and young people from six Caribbean communities of Guatemala were trained, which were within the Punta de Manabique Wildlife Refuge, and with which, we worked in parallel in the training of environmental educators through the program for the reduction of marine debris. The main objective of this project was to encourage community members to take actions in favor of the environment, through community campaigns, which counteract environmental problems in each community. New trainers were trained to be trained as environmental educators, and the previous generation also participated in this process to train in this activity. The next activity consisted of holding a workshop, inviting all members of the community to carry out a participatory community mapping, in which they were asked to draw a drawing of the community, identify the natural resources they had, and the main environmental problems found in the community.

After completing this step, the educators chose a specific problem and carried out a community action campaign to counteract the negative environmental impact that was being generated. The main results of this project include the participation of 10 environmental educators involved in this new project, eight teachers from the communities trained and involved in environmental problems and more than 200 students actively participating in the implementation of community campaigns. The result was the generation of five action campaigns, which were: Recycling parade in the community of El Quetzalito, since one of the main problems was the clandestine garbage dumps, in which the majority were bags of fried foods and sweets; exchange store in Punta de Manabique, in this campaign the community teachers acquired and bought items from the basic basket, which were exchanged for recyclable products (cans and PET bottles).

Community actions in favor of the conservation of coastal marine resources in MPAs of the Caribbean of Guatemala- MPhil. Alerick Pacay

This was taken to a recycler in the Port Barrios, the urban center of the area, to sell it and buy new products; reforestation event in Cerro San Gil, which was carried out thanks to the logistics and support of Fundaeco in this area, and to the organization and participation of the teachers in the activity; construction of a classroom with eco-bricks in the community of El Quetzalito, led and carried out by members of the community.

In addition to this, there was the support of institutions in the area for the development of the project, these were: the National Council of Protected Areas, the Ministry of Education, and the Municipality of Puerto Barrios.

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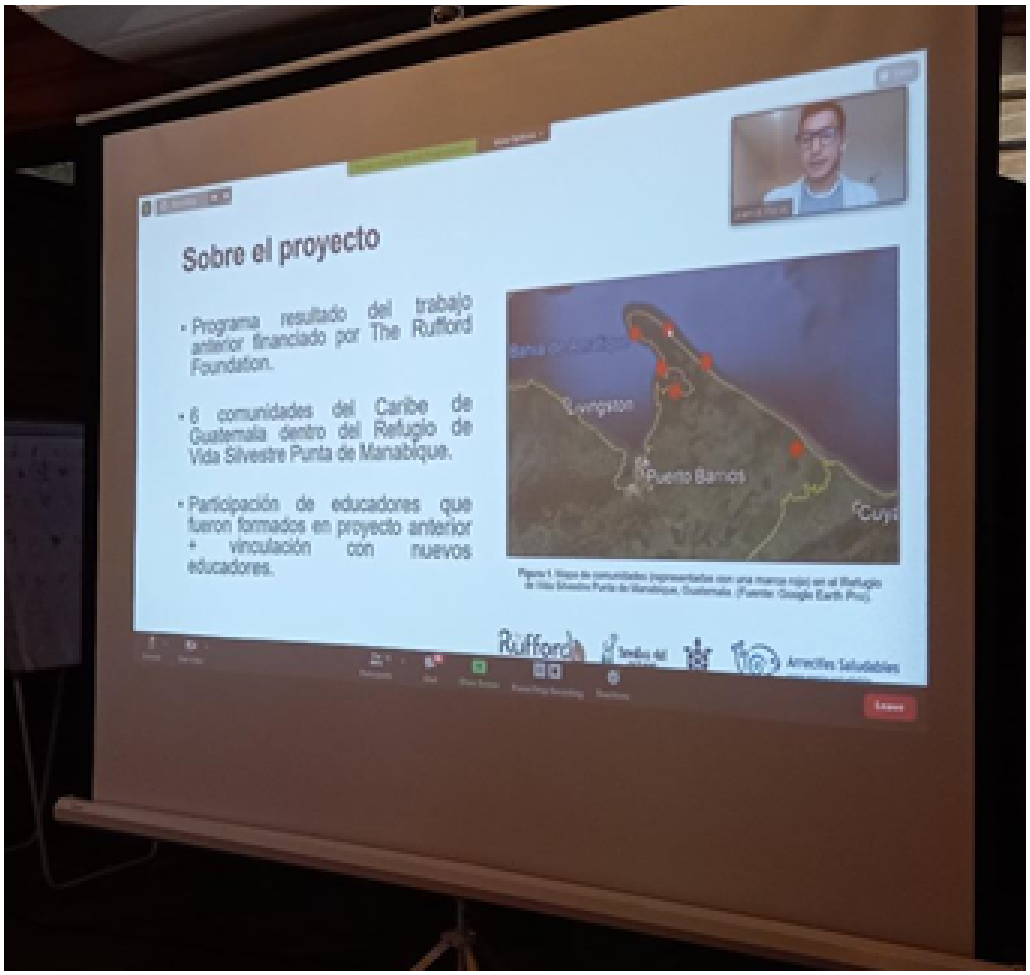
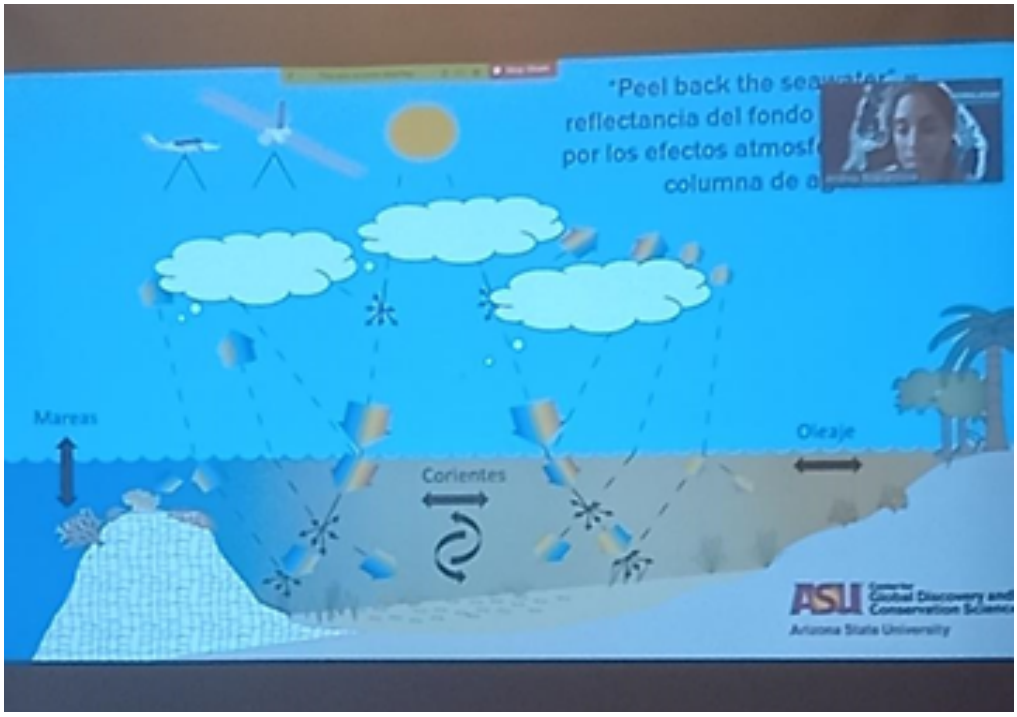


Allen's Coral Atlas and its application in the MBRS- Andrea Rivera Ph. D.

The Allen Coral Atlas is a global collaborative project to map corals with greater precision based on high spatial resolution satellite imagery (Planet dove, 3.7 m spatial resolution) and verification by local teams through georeferenced photographic quadrants. This world map has much higher precision than the one mostly used by UNEP-WCMC. The Allen Coral Atlas also seeks to propose both benthic classes (Coral / Alga, microalgae mats, seagrass, rich, gravel and sand), as well as geomorphological zones (slope, ridge, plain, reef lagoon, etc.).

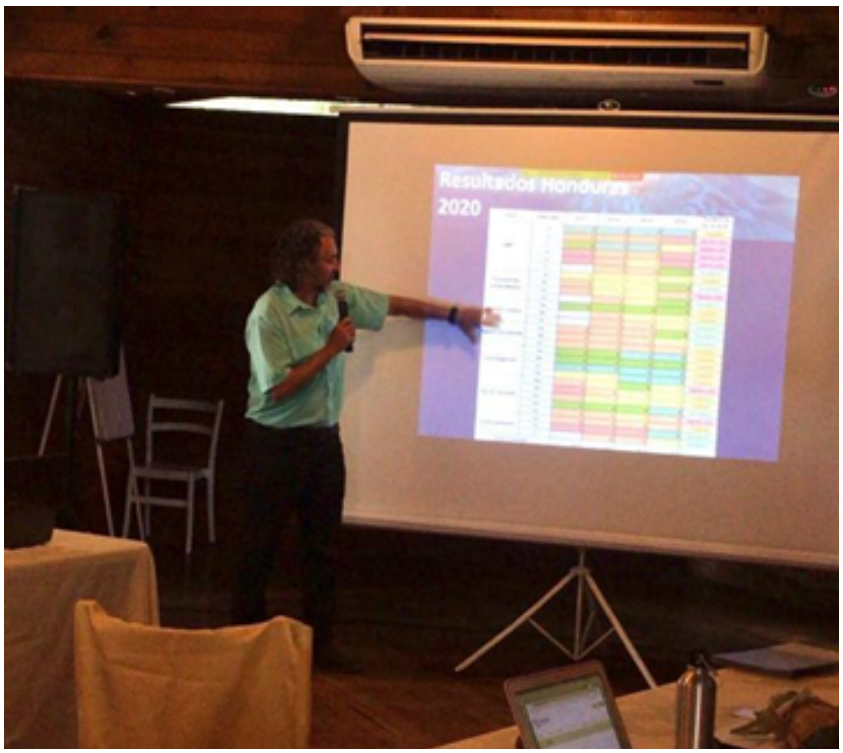
In early July the maps of the Mesoamerican Reef System (SAM) were published. In addition to reef mapping, the Allen Coral Atlas integrates other layers at a global level, for example, the bleaching alert (which occurs every 15) and turbidity (which occurs quarterly). Among the existing limitations of the Allen Coral Atlas, we have that at the reflectance level, algae and corals have similar values and cannot be separated, that in places with high turbidity, mapping or monitoring cannot be carried out. However, the Allen Coral Atlas is a powerful tool for large-scale socializing of knowledge about coral reefs to further their conservation. The map can be accessed through the following link: https://allencoralatlas.org/atlas/#4.06/21.6037/-81.0056



Presentation of the launch of Eco-Audit in March 2021- Ing. Ian Drysdale

The Healthy Reefs Initiative is a collaborative effort that generates and analyzes ecological data to assess changes in the Mesoamerican Reef System (MBRS), that promotes and disseminates indicators to guide management and decision-making, and that serves as a means of storage useful information for researchers and managers. Among its tools are the MBRS health status report and the EcoAudit, which is much less well known, but houses a large amount of information.

The progress report is a systematic multinational evaluation of the implementation of management actions recommended in the MBRS. The progress report has seven main themes: 1) Marine Protected Areas, 2) fisheries management, 3) coastal zone management, 4) sanitation and wastewater, 5) research and education, 6) private sector sustainability and 7) global marine issues. Each of these topics is described by a series of quantifiable indicators that add up to 28; through these indicators the score of the indicators can be scaled, to topics and to the state of progress by country. Honduras is currently making steady progress, with regular scores in each of the topics, with the exception of research and education. In this link you can find the progress report 2021: https://www.healthyreefs.org/cms/es/informe-de-avances/



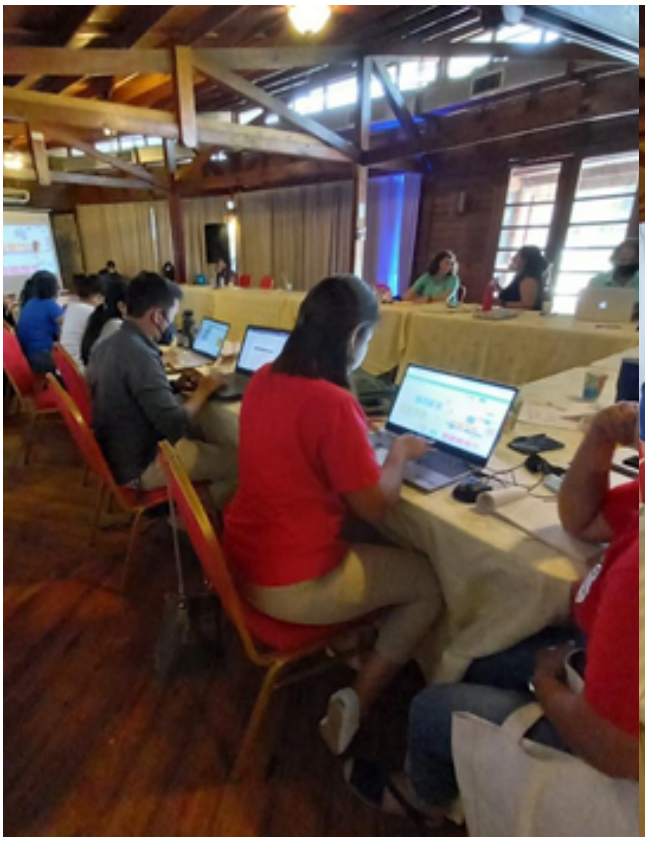
Challenges in marine research applied to the conservation of the MAR Region - Angela Randazzo Ph. D

Among the advances in the conservation of the MBRS are 1) strategic alliances from the local, regional, to the global level, 2) data collection and monitoring under the framework of the AGRRA platform, which is present in the region since 1998 and continues to expand and be updated, and 3) collaborative tools to promote coral reef management (maps, progress, and health reports).

The challenges in the conservation of the MBRS can be oriented towards promoting multidisciplinary research, using technological innovations at different scales (remote sensing, environmental DNA, automated digital monitoring methods based on “machine learning”), research based on the resilience of socio-economic systems. ecological (reduce stressors, manage feedback, learn from resilient systems and their ecological and social properties). The challenges in the conservation of the MBRS are related to the accumulation of local and global stressors, continuing with obsolete economic systems, and social systems with low governance, centralized hierarchical structures, with a lot of distrust, violence, and corruption. In this framework of progress, challenges and challenges is research for conservation in the MBRS.

Regional strategy for the Mesoamerican Reef Workshop

The main objective of the following activity was to brainstorm the work carried out in each MBRS country. Participants reflected on what the main problems are and what could be the next steps to follow to carry out collaborative research and conservation work in a collaborative way at the regional level. The tool used was Miró, a digital platform for all attendees to participate in real-time. The results can be found in the following link: https://miro.com/welcomeonboard/WDZuc3Vsa3dtZGQ3OTIzUnBqbFFIWWdXTmIwUnpwcE5QSHJ4Qk1nMlVLTjdmcTAyS1VvRmh6S0FMaFNHVFBTT3wzMDc0NDU3MzQ3NDk5NTA0MDc3?invite_link_id=554930335593).



Coral Restoration visit with the Roatan Marine Park

The RMP is an organization dedicated to the conservation of marine and coastal ecosystems, it co-manages the Bay Islands National Marine Park, the largest marine protected area in Honduras with approximately 650,000 hectares. One of its main projects in the research area is the coral reef restoration program. This are coral nurseries located in West End, Roatan and have more than 30 structures with different coral species in danger of extinction, mostly the staghorn coral (*Acropora cervicornis*) and elkhorn coral (*Acropora palmata*). After a couple of months of cleaning and caring for these structures, the coral fragments are large enough to be transplanted to the coral reefs in the area. This type of structure attracts marine diversity, especially fish, and during the dive several species of fish could be observed.

The presenters of the conference and organizing committee where invited by the RMP to collaborate in one of the maintenance dives of the coral nurseries. The activity began with a visit to the RMP office and a presentation given by the program coordinator Gabriela Ochoa. Then, the coordinator of the volunteer program, Grace Horborz, provided a workshop on how to participate in the coral nursery maintenance dives as well as bring awareness of the importance of this project to the Roatan community. Each participant was given a diving equipment and implements to clean the nurseries (brushes and sponges). In total, 7 structures were cleaned. In addition to the coral nurseries, the participants were able to visit areas were restored corals had been out planted.

Next steps: Mesoamerican Reef Researchers Network

This conference aimed to generate new knowledge among national and international organizations, in order to protect and conserve the Mesoamerican Reef, in which four countries participate: Mexico, Belize, Guatemala and Honduras. It is proposed to have follow-up meetings to continue the document generated in the workshop and generate new research and information, so that it can be shared with future researchers and conservationists.

Appendix

List of attendees: in- person modality

No.	Name	Age	Country	Organization	Position
1	Ana Hacohen	38 years	Guatemala	UVG	Researcher and professor
2	Angela Randazzo	36 years	Honduras	UMDI/SISAL	Post doctorate
3	Carolina E. Rojas Barahona	23 years	Honduras	Roatan Marine Park	Practicing
4	Carolina Montalvan	33 years	Honduras	Coastal Marine Research	Research assistant
5	Fernanda Lozano	29 years	Honduras	Roatan Marine Park	Head of Department
6	Grace Horborz Garcia	26 years	España	Roatan Marine Park	Volunteer coordinator
7	Hazel Araujo	26 years	Guatemala	Semillas del Océano	Coordinator of marine-coastal education
8	Ian Drysdale	45 years	Honduras	Arrecifes Saludables	Honduras Coordinator
9	Joseline Sacché	27 years	Guatemala	Semillas del Océano	Community action coordinator
10	Juan Carlos Carrasco	48 years	Honduras	Coastal Manne Research	Participant
11	Martha Medroso	25 years	Honduras	Mar Alliance	Practitioner University
12	Michelle Fernandez	43 years	Honduras	Zolitur	Marine environmental management
13	Nidia Ramos	31 years	Honduras	Alcaldía Roatán	Technical unit coordinator
14	Nikita Johnson	29 years	Honduras	BICA Roatan	Community development coordinator
15	Timna Varela	35 years	Honduras	Roatan Marine Park	Education and Outreach Coordinator
16	Viridiana Alvarado	37 years	México	Cinvestav	PhD student
17	Wilmer R. Calderón	26 years	Honduras	ICF	Technical
18	Zara Gifarro	31 years	Honduras	Roatan Marine Park	research coordinator
19	Zara Zuniga	25 years	Honduras	BICA Roatan	Research and monitoring program coordinator

Appendix

List of attendees: virtual modality

No.	Name	Country	Organization	Position	Email
1	Aldo Vargas	México	-	Professional	aldovargasperez@gmail.com
2	Alerick Pacay	Guatemala	Semillas del Océano	Board of Directors	alerick.pacay@gmail.com
3	Ana Velasquez	Honduras	ICF	Head of Wildlife	anavelasquez542@gmail.com
4	Andrea Izaguirre	Honduras	BICA Utila	Research and monitoring coordinator	andrea.izaguirre@bicainc.org
5	Andrea Rivera Sosa	México	Coral Reef Alliance	Professional	arivera@coral.org
6	Brian Fabian	Guatemala	Fundaeco	Aquaculture Technician	fabianbrian11@gmail.com
7	Cristobal Alvarado	México	-	Coastal community member	cristo.alvag59@gmail.com
8	Daniel Cardenas	México	-	Professional	megaplocky@gmail.com
9	David Chan	Polonia	-	Professional	dchanrod@gmail.com
10	David Jaen	Honduras	Mi Ambiente	Environmental Analyst	david_jaen@yahoo.com
11	David Penados	Guatemala	Fundaeco	Diver monitor / educator	penados85@gmail.com
12	Francisco Polanco	Guatemala	CICIMAR	College student	polancoenca@gmail.com
13	Gaby Alvarado	México	-	-	alvaradogabriela1992@gmail.com
14	Jennifer Erazo	Honduras	Firedrich Ebert Stiftung	Honduras program coordinator	jennierazo@gmail.com
15	Jenniffer Garcia	Guatemala	Fundaeco	Marine-coastal specialist	jenny-garcia92@gmail.com
16	Jenniffer Ortiz	Guatemala	Semillas del Océano	Research coordinator	jortiz@semillasdeloceano.org
17	Joost Lipman	Netherlands	Den Haag	-	lipman@hotmail.com
18	Jose O'Connor	Honduras	Secretaría de Recursos Naturales y Ambiente	Environmental technician	leninoconnor@yahoo.com
19	Maria Geovana Leon	México	-	Professional	geomar78@gmail.com
20	Milena Mérida	Guatemala	Semillas del Océano	Executive director	milena.merida@hotmail.com
21	Natali Cardenas	México	PPY	Professional	natalicardenaspalomo@gmail.com
22	Pamela Ortega	Honduras	Coral Reef Alliance	Director of programs	portega@coral.org
23	Rosa Alvarado	México	-	-	rosamalvaradoc@gmail.com
24	Skarleth Pineda	Honduras	Mi Ambiente	Environmental Analyst	spineda85miambiente@gmail.com
25	Sobeida Nuñez Rosa	Honduras	AMATELA	Director	nasasobe@gmail.com
26	Valeria Avila	Honduras	-	College student	valeestefania26@gmail.com
27	Victor Manuel Gudiel	Guatemala	-	Independent consultor	vgudielcorona@gmail.com
28	Vita Randazzo	Honduras	-	-	vita.randazzo@gmail.com
29	Zullete Andrade	México	Técnico académico	-	zullete@yahoo.com

Appendix

Agenda of the event

Hour	Activity
8:00 – 8:30	Registration of participants and delivery of materials
8:30 – 8:40	Welcome remarks by Joseline Sacché
8:40 – 9:00	Program Presentation: Rufford Small Grants by Alerick Pacay
9:00 – 9:25	Resilience of a reef of hope: the AMP Banco Cordelia by Ángela Randazzo (Honduras)
9:25 – 9:50	Stressors and reef condition of Tela, Honduras by Andrea Rivera (Honduras)
9:50 – 10:15	Baseline study of the ecological context of the Miskitos Cays: a tool for governance and long-term monitoring by Juan Carlos Carrasco (Honduras)
10:15 –10:35	Coffee break
10:35 –11:00	Building capacities for the detection and treatment of "SCTLD" in the Islas de la Bahía National Park, by Zara Guifarro (Honduras)
11:00 –11:25	Diversity and genetic structure of natural and restored populations of Acropora palmata and Acropora cervicornis in the North of the State of Quintana Roo by Viridiana Alvarado (Mexico)
11:25 –11:50	Phase changes towards sponge-dominated reefs in the Guatemalan Caribbean, by Hazel Araujo (Guatemala)
11:50 –12:15	Sustainable Management of the Whale Shark in the northern Mexican Caribbean by Natalí Cardenas (Mexico)
12:15 –12:40	Implementation of participatory management programs for the gathering of fishing information by Ana Hacohen (Guatemala)
12:40 –13:05	Community actions in favor of the conservation of coastal marine resources in MPAs of the Caribbean of Guatemala by Alerick Pacay (Guatemala)
13:05 –14:15	Lunch
14:15 –14:30	Allen's Coral Atlas and its application in SAM by Andrea Rivera
14:30 –14:45	Presentation of the launch of Eco-Audit in March 2021 by Ian Drysdale (Honduras)
14:45 –15:00	Reflections on advances, challenges and challenges in marine research applied to the conservation of the SEA by Ángela Randazzo
15:00 –16:30	Participatory activity
16:30 –17:00	Participatory conclusions and networking proposals by Ana Hacohen and Joseline Sacché
17:00 –17:30	Closing remarks and awarding of diplomas

Appendix
Conference attendees

CONFERENCIA RUFFORD SMALL GRANTS – ROATÁN 2021

No.	Nombre	Edad	País	Organización	Puesto	Firma
1.	Tirma Varela	35	Honduras	Roatán Marine Park	Education & Outreach Coordinator	
2.	Zoya Guifarro	31	Honduras	Roatan Marine Park	Research Coordinator	
3.	Victoriana Alvarado	37	Mexico	Cinvestav	Estudiante Doctorado	
4.	Joseline Sacché	27	Guatemala	Semillas del Océano	coordinadora de acción comunitaria	
5.	Ana Hayden	38	GUA	UVG	Investigadora Catedrática	
6.	Martha Medrano	25	Honduras	MarAlliance	Practicante Universitario	
7.	Michelle Fernandez	43	Honduras	Zoditur	Gestora Ambiental Marina	

CONFERENCIA RUFFORD SMALL GRANTS – ROATÁN 2021

No.	Nombre	Edad	País	Organización	Puesto	Firma
8.	Nidia Ramos	31	HN	Alcaldía/ Roatán	Coor. Unidad Técnica	
9.	Ángela Fandiño	36	HN	UMA, SISAL	Post Doc	
10.	Ian Drysdale	45	HN	Arrecifes Saludables	Coord. Honduras	
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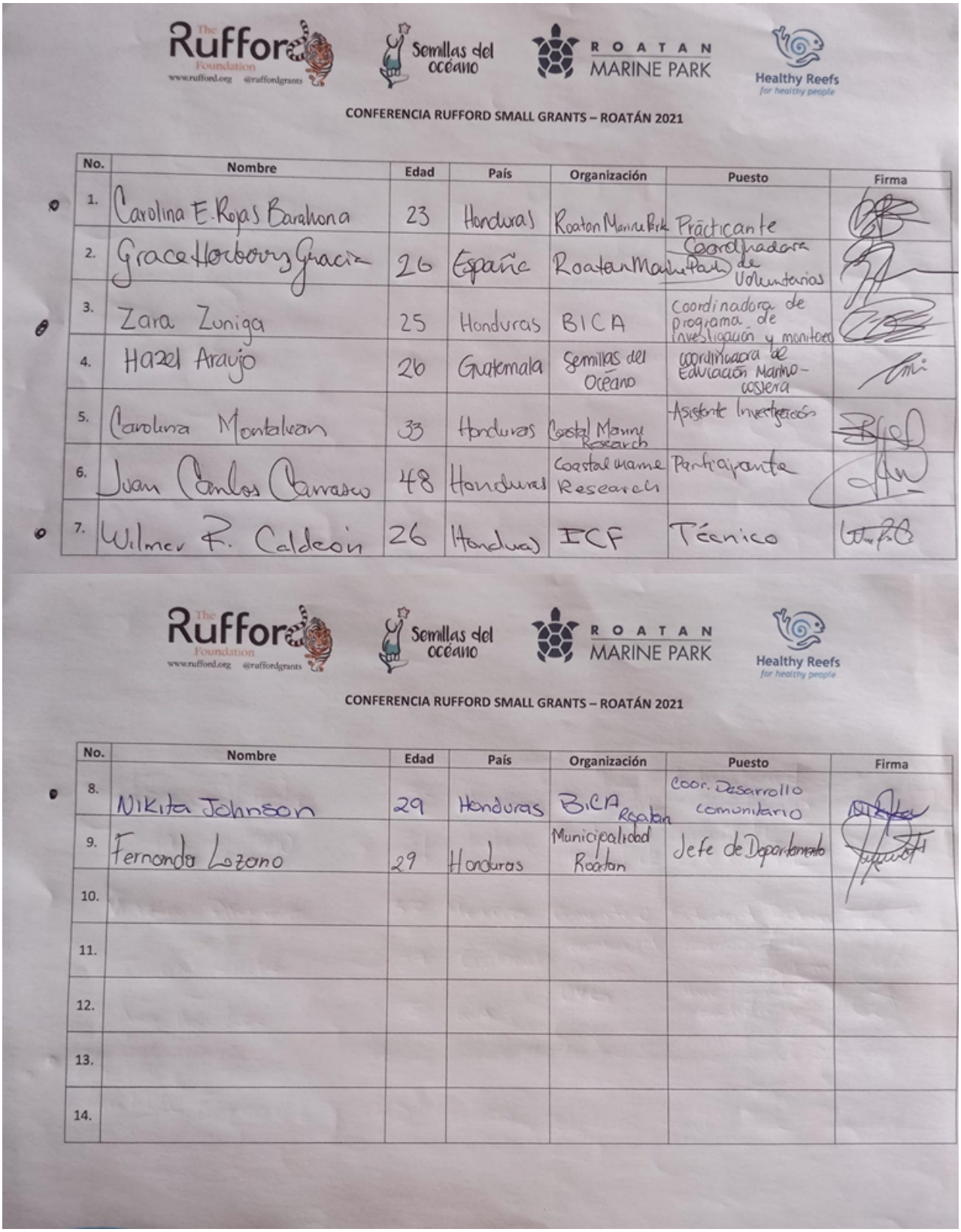
Appendix
Conference attendees



CONFERENCIA RUFFORD SMALL GRANTS – ROATÁN 2021

No.	Nombre	Edad	País	Organización	Puesto	Firma
1.	Carolina E. Rojas Barahona	23	Honduras	Roatan Marine Park	Practicante	
2.	Grace Horbury Gracia	26	España	Roatan Marine Park	Coordinadora de Voluntarios	
3.	Zara Zuniga	25	Honduras	BICA	Coordinadora de programa de investigación y monitoreo	
4.	Hazel Araujo	26	Guatemala	Semillas del Océano	coordinadora de Educación Marino-costera	
5.	Carolina Montalvan	33	Honduras	Coastal Marine Research	Asistente Investigación	
6.	Juan Carlos Carrasco	48	Honduras	Coastal Marine Research	Participante	
7.	Wilmer F. Caldeón	26	Honduras	ICF	Técnico	

CONFERENCIA RUFFORD SMALL GRANTS – ROATÁN 2021

No.	Nombre	Edad	País	Organización	Puesto	Firma
8.	Nikita Johnson	29	Honduras	BICA Roatan	Coor. Desarrollo comunitario	
9.	Fernanda Lozano	29	Honduras	Municipalidad Roatan	Jefe de Departamento	
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