Coral Rescue Exchange: In-Situ Coral Rescue Approaches

Roatan, Honduras

June 11th- 18th

REPORT

Photo: Francesca DeWeerdt

Contents

Executive summary

1. Caribbean coral reefs are facing rapid decline due to climate change, human stressors, and the unprecedented impact of stony coral tissue loss disease (SCTLD), which has spread across 28 countries and territories in the region.

2. A cost-effective coral rescue alternative that Caribbean Reef managers are focusing on is Assisted sexual fertilization of species susceptible to SCTLD. This technique consists of collecting gametes from stony corals during spawning events and rearing them on site in floating structures called coral-rearing in-situ basins (CRIBS). Coral larvae settle on substrates and are later planted on the reef. This technique is cost-effective, requires minimal personnel, and can restore the reef on a larger scale than fragmentation. It also enhances genetic diversity and temperature resilience.

3. Following feedback from our network and interest from managers to learn more about this coral rescue approach, a Coral Rescue Exchange on in-situ coral rescue approaches focusing on assisted sexual fertilization was held in Roatan, Honduras. The exchange was hosted by MPA Connect's partner, the Roatan Marine Park (RMP), and MPA Managers, Government representatives, and dive sector representatives from Barbados, Dominica, and Grenada.

4. The objective of the exchange was to enhance the capacity of Caribbean coral reef managers and conservation practitioners in implementing larval propagation and in-situ coral nurseries as a coral rescue method to mitigate the impact of stony coral tissue loss disease (SCTLD) on vulnerable coral species in the region.

5. During this one-week exchange, participants received training on all the steps to monitor coral spawning and implementing an assisted fertilization event in their countries using Coral In-situ rearing basins. Participants highlighted the usefulness of the training as it provided detailed information provided by experienced coral rescue practitioners like the Roatan Marine Park.

6. Participants also received presentations on how to create and validate their prediction calendars and how to plan their coral rescue efforts using MPA Connect's Planning Canvas. The participants identified funding and human resources as challenges to successfully implementing their efforts.

Introduction

Caribbean coral reefs are declining rapidly due to climate change, human stressors, and infectious diseases. Although disease is a common occurrence in coral reefs, a disease called stony coral tissue loss disease (SCTLD) has had an unprecedented effect in the Caribbean. This disease first started in 2014 in Florida, and as of July 2023, it had been confirmed in 28 countries and territories in the Caribbean region. At MPA Connect's peer-to-peer learning exchange about SCTLD, held in Key West in 2019, coral reef managers learned how to identify, monitor, and treat corals affected by SCTLD. Countries in the region stepped up to the challenge to monitor and report on SCTLD regionally, to treat corals, and to involve their local communities and stakeholders in responding to the disease.

However, as the threat of SCTLD is still imminent, managers are looking at different approaches to rescuing corals on their reefs, depending on their objectives and needs. A ninth peer-to-peer exchange took place on September 26, 2022, to aid coral reef managers and conservation experts in planning and conducting the rescue of coral species that are vulnerable to SCTLD. This regional peer-to-peer learning exchange was held at the Ocean Reef Club in Key Largo in conjunction with the Reef Futures conference and was attended by 43 coral reef managers and practitioners representing 15 Caribbean countries and territories.

One of the approaches discussed in this learning exchange was larval propagation and in-situ coral nurseries. This coral rescue method involves the collection and assisted fertilization of coral gametes in the field. As coral reefs enter the endemic phase of SCTLD, the presence of healthy colonies with reproductive capacity becomes both scarce and geographically isolated. This approach offers low-tech and low-cost alternatives for MPA Managers to address these threats.

Based on participants feedback and desire for further training, we hosted a Coral Rescue Exchange on in-situ coral rescue approaches focusing on assisted sexual fertilization in Roatan, Honduras. The exchange was hosted by MPA Connect's partner, the Roatan Marine Park (RMP), and MPA Managers, Government representatives, and dive sector representatives from Barbados, Dominica, and Grenada. Below, you can find the list of participants:

Name	Organization	Country	Email
Ajhanii Miller	Barbados Blue Dive	Barbados	Ajhanii1997@gmail.com
Shoneé Howell	Coastal Zone Management Unit, Ministry of the Environment	Barbados	showell@gov.bb
Simon Walsh	Soufriere-Scott's Head Marine Reserve	Dominica	simondwalsh@gmail.com
Christine Finney	Eco-Dive Grenada	Grenada	divefinney@gmail.com
Eduardo Avila	SECORE	Mexico	e.avilapech@secore.org
Francis Lean	Roatan Marine Park	Honduras	Francis.lean@roatanmarinepark.org

Andrea Godoy	Roatan Marine Park	Honduras	Andrea.godoy@roatanmarinepark.org
Carolina Rojas	Roatan Marine Park	Honduras	Carolina.rojas@roatanmarinepark.org
Gabriela Ochoa	GCFI/ MPA Connect	Honduras	Gaby.ochoa@gfci.org

Figure 1. Participants of the Coral Rescue Exchange from left to right, in the back Ajhanii Miller, Simon Walsh, Eduardo Avila, Shonee Howell, Andrea Godoy, Christine Finney. In the front Valerie Gilbert (Dive shop staff) and Carolina Rojas. Photo: G. Ochoa

Objective:

The objective of the exchange was to enhance the capacity of Caribbean coral reef managers and conservation practitioners in implementing larval propagation and in-situ coral nurseries as a coral rescue method to mitigate the impact of stony coral tissue loss disease (SCTLD) on vulnerable coral species in the region.

About the Exchange

Meeting the MPA Connect Partners

The Coral Rescue exchange provided a unique opportunity for conservation practitioners, government sector and dive operators to share experiences on coral rescue approaches focusing coral spawning, assisted fertilization and larval rearing using Coral Rearing In-Situ Basins (CRIBS). Prior to the field activities participants shared information on their current coral rescue efforts.

Barbados

Ajhanni Miller from Barbados Blue mentioned that their dive shop offers the PADI Coral Reef First Aid Specialist course. Additionally, they are actively engaged in conservation initiatives that address both solid waste management and coral restoration.

Shonee Howell (Fig. 2) shared information about the Coastal Zone Management Unit (CZMU) and their efforts in Coral Rescue. Notably, they conducted an Ex-Situ Pilot Project back in 2016. This project involved the use of recirculating closed systems and artificial sea water to facilitate asexual propagation using mounting tiles. The species that were reared as part of this project include APAL, *Porites porites*, and *Pseudodiploria strigosa* (PSTR).

In terms of in situ restoration, CZMU has been focusing on asexual coral restoration using trees specifically for ACER. They have conducted some monitoring of coral spawning from 2009 to 2017. During this time, they observed OANN, *Orbicella faveolata,* and APAL spawn. Although they would like to expand their work with these susceptible species, they understand that they need to have a regulatory framework that will enable more people to get involved.

Figure 2. Shonee Howell from the CZMU in Barbados presenting on their current and future coral spawning efforts. Photo credit: G. Ochoa

Dominica

In Dominica, they have focused on in-situ coral rescue. Simon Walsh and his team have conducted extensive intervention activities using Base2b and Amoxicillin. They have treated over 8,000 colonies! Additionally, they have rescued *Meandrina meandrites* (MMEA) and DCYL colonies and suspended them in the water

column in coral trees. He has experienced mortality in the trees, but overall, many corals continue to be healthy. It is important to note that colonies on trees are often treated for SCTLD lesions.

They recently began monitoring coral spawning, focusing on *Diploria labyrinthiformis* (DLAB), in May of this year and observed spawning in four colonies. They will continue monitoring this species in June and July as well. Their plans include expanding their fragmentation efforts to include more species susceptible to SCTLD and the building of a coral rescue facility that can house some of the colonies currently in the trees.

Grenada

Christine Finney, owner of Eco Dive Grenada, shared that prior to the COVID-19 pandemic there were better working relationships with MPA Managers in Grenada as well as good capacity for management and enforcement. Unfortunately, after the pandemic MPAs in Grenada are understaffed and there is little support for coral restoration or coral rescue activities. They currently have a small nursery made of A-frames located near Grand Anse Beach. Through her diveshop they offer monthly cleaning dives and the PADI Coral Reef First Aid Specialist course. This is a distinctive specialty dive certification program designed to give student divers the opportunity to gain experience about coral growth and actively participate in the building of coral nurseries in Grenada.

Honduras

The Roatan Marine Park (RMP) has been focusing exclusively on in-situ coral rescue. They currently have the largest coral nursery in the country, housing 40 trees with fragments of *Acropora palmata* (APAL), *A. cervicornis* (ACER), and *A. prolifera* (APRO). They also created a Coral Rescue Certification, through which trained dive operators can offer coral restoration courses to their customers. A percentage of the course fees are donated to the RMP. These courses also support the organization in maintaining their nursery trees and constantly out planting fragments in the reef.

In 2021, they began their coral spawning monitoring to validate their prediction Calendar with support of SECORE and dive operators. They have validated five coral species and will be focusing on APAL and ACER this year. In 2022, they conducted their first assisted fertilization using CRIBS and focusing *on Orbicella annularis* (OANN). Although the collection and fertilization were successful, the larvae unfortunately did not settle on the substrates.

In the future they hope to build a coral spawning lab facility that will enable them to expand the number of species they can reproduce, especially those who are not successfully reared in CRIBs like OANN and *Dendrogyra cylindrus* (DCYL).

In the Field

- During the field component of the coral rescue exchange, the RMP worked alongside the MPA connect partners to demonstrate all the steps to conduct a successful assisted fertilization event. One of the first steps was the assembly and installation of the CRIB. The CRIB is made of specialized PVC like that of white-water rafting. The structure was assembled with everyone's participation, demonstrating the proper assembly of the PVC structure that supports the CRIB base and the correct way to inflate the nursery without causing damage. After assembly, the CRIB was anchored

at the chosen site for coral larval rearing, placed within Half Moon Bay due to its good water quality, optimal depth, easy access, and limited waves. Concurrently, a group of RMP volunteers collected substrates or seeding materials from Cordelia Bank.

- The substrates collected needed to be cleaned before their use in fertilization. During the time the substrates are conditioned, macro algae might also grow together with crustose coralline algae. The cleaning removes only macroalgae and predators which might cause coral larvae to not settle on the substrates. Once cleaned these were places in crates inside the CRIB.

Figure 3a. Simon Walsh assembling the CRIB PVC frame and CRIB inflatable structure.

3b. Exchange participants transporting the CRIB to its destination at Half Moon Bay. Photo: Roatan Marine Park

- The laboratory was prepared with MPA Connect partners and SECORE, to demonstrate proper sterilization for the equipment before use. The seawater used for fertilization was also filtered and stored in an AC room to maintain a temperature of approximately 27 C. This was a key step to demonstrate to partners how easy it can be to set up a field lab to conduct fertilization and run them through the list of materials and equipment.

- Coral spawning monitoring began the 10th night after the full moon, and on the 11th night after the full moon, the DLAB colonies spawned. A total of sixteen coral colonies were tagged, and approximately 10 colonies spawned. The RMP team and partners collected gametes from eight different colonies. The gametes were transported to RMP's laboratory, and the fertilization process began. This process takes time and patience due to each coral species-specific fertilization timing, but for this species, it was quick. Once the embryos reached approximately 90% fertilization, they were transported to the CRIB.

- In the following day, the participants also received hands on experience building collection nets and coral fragmentation by visiting the RMP coral nursery trees.

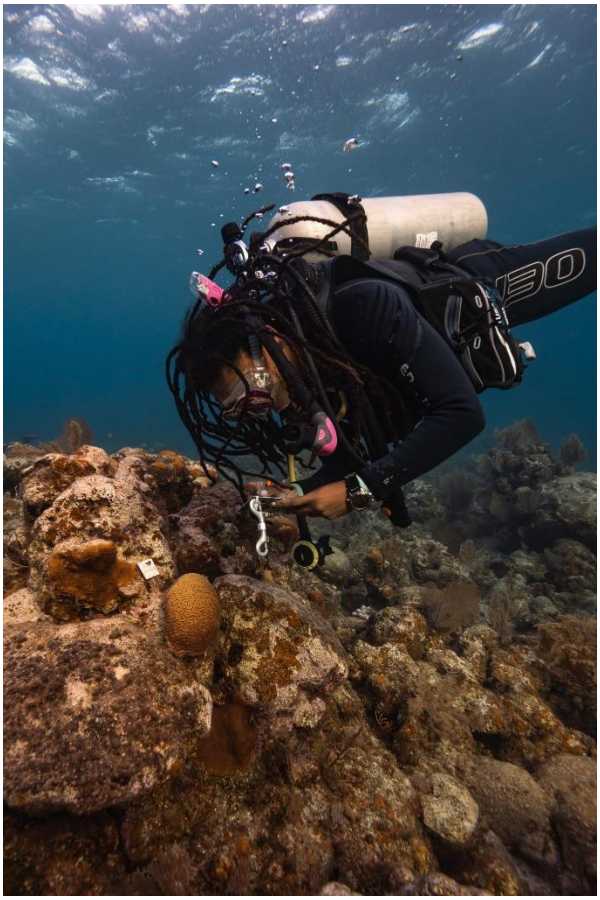


Figure 4. Shonee Howell observing a DLAB colony and collecting data. Photo: Francesca DeWeerdt

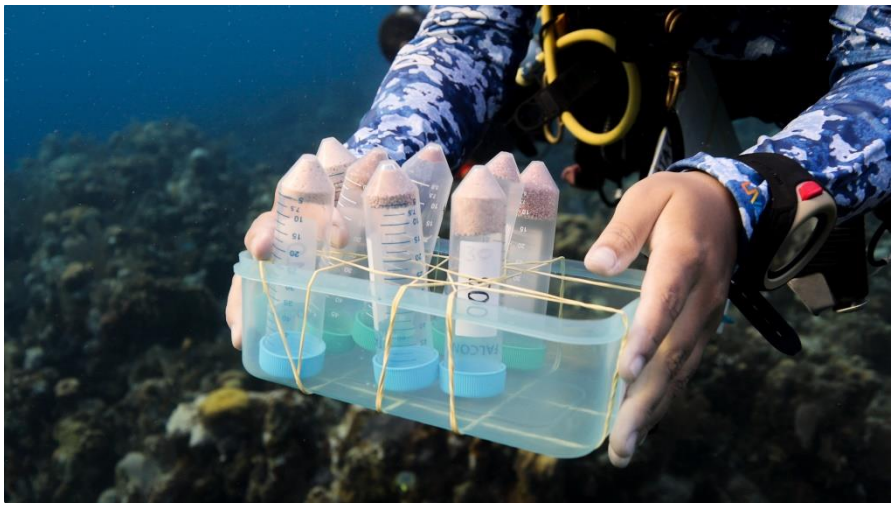


Figure 5. Collection vials and gametes. Photo: Francesca DeWeerdt

Coral Rescue Planning and Final Impressions

- During the exchange, the participants had the opportunity to gain experience from both the RMP and SECORE staff all the planning steps to begin their coral spawning monitoring and assisted fertilization efforts. This included a review of current prediction calendars, including the RMP's calendar, to enable them to begin monitoring upon their return home.

- A key step of the exchange was completing the MPA Connect Planning Canvas for each of their countries. This tool was developed for MPA Connect's ninth peer-to-peer learning exchange, hosted in Key Largo in 2022. The planning canvas served to highlight key elements in the planning process to help managers map the implementation needs for the assisted fertilization efforts. It also helped managers think about the possible challenges they might encounter and how to overcome them. Each planning canvas can be found in Annex 1.

- The main challenges reported by participants in the planning canvas to begin their coral rescue activities were funding and human resources.

- After having conducted all the field activities, participants mentioned they were relieved that there were very few equipment requirements to conduct assisted fertilizations. However, they did mention that it did require coordination and human resources.

- All participants mentioned they were impressed with not only the research program at RMP but also how seamlessly the organization has managed to incorporate different stakeholders and sustainable financing initiatives into their efforts. A summary of each Canvas and next steps can be found below:

Barbados:

Their overall goal of their coral rescue is to restore species affected by SCTLD. They hope to be able to implement assisted sexual fertilization and focus on ex-situ coral rescue. Their specific goals for the upcoming year are to validate their prediction calendar and procure necessary equipment for assisted sexual fertilization, including CRIBs.

Challenges include securing funds, permitting, and human resources. Resources available to them include staff (dive shop staff and boats).

Focus species: *Dendrogyra cylindrus, Orbicella annularis, Doploria labyrinthisformis*

Next steps:

- Begin fundraising for coral restoration activities, equipment, and procure permits.
- Create alliances with institutions that have experience in in-situ and ex-situ coral rescue.
- Collaborate with the Roatan Marine Park and the Hilton Hotel.
- Create a Coral Restoration Plan/Framework for Barbados.

Grenada:

In Grenada, their overarching goal is to create an annual plan to implement coral restoration and rescue activities. They aim to implement techniques learned in the coral rescue exchange, such as assisted sexual fertilization. They will also upscale their fragmentation efforts with Acropora species. Their specific actions include creating and validating a prediction calendar, documenting, and collecting data regarding SCTLD spread and species affected.

Their challenges include a lack of support from fisheries, non-functioning MPAs, and a lack of management, as well as continued anchorage damage from boats within the MPA.

Focus species: *Colpophyllia natans, Pseudodiploria strigosa, Diploria labyrinthiformis, and Montastrea cavernosa*

Next steps:

- Attempt to monitor Diploria labyrinthiformis in the next upcoming event (July 2023) and prepare to validate a calendar in 2024.
- Create a plan for 2024 for coral rescue activities in Grenada.
- Collaborate with the RMP, MPA Connect, and Fisheries Dept.
- Document the spread and species affected by SCTLD.

Dominica:

Their overall goal for their coral rescue efforts is to restore species density and diversity, with a specific focus on species susceptible to SCTLD. They hope to be able to implement assisted sexual fertilization, house susceptible species in coral trees in-situ, and continue their intervention and

rescue activities, such as topical antibiotic treatment and rescuing endemic corals. Their specific goals are threefold: (1) in the short term, they will continue to rescue endemic corals and treat corals with SCTLD; (2) in the medium term, they hope to implement assisted sexual fertilization activities in-situ; and (3) in the long term, they aim to upscale their outplanting of susceptible species.

Their challenges include securing funds, obtaining permits, a lack of technical capacity, and a shortage of human resources. Resources available to them include staff (dive shop staff), volunteers, and boats.

Focus species: *Dendrogyra cylindrus, Meandrina meandrites, Colpophyllia natans, Pseudodiploria strigosa, Montastrea cavernosa*

Next steps:

- Continue monitoring coral spawning and validating their prediction calendar.
- Employ a media person and an MPA Manager.
- Empower wardens to join monitoring and intervention activities.
- Begin fundraising for coral restoration activities.
- Create alliances with institutions that have experience in in-situ and ex-situ coral rescue.
- Collaborate with the Roatan Marine Park, MPA Connect, Nature Island, REZDM, GIZ, Oceans Forward, and the Fisheries Department.

<u>Roatan:</u>

Roatan's overarching goal is to restore the populations of species susceptible to SCTLD using assisted sexual fertilization techniques, both in-situ and ex-situ. They have conducted one assisted sexual fertilization event with *Orbicella annularis* using CRIBS. Their specific goals for this year and the upcoming year are to continue validating their prediction calendar for susceptible species, *A. palmata*, and *A. cervicornis*. Additionally, they plan to conduct two more fertilization events using CRIBs.

Their challenges include securing funds, obtaining permits, and acquiring human resources. Since 2021, they have been unable to acquire a permit for their ex-situ spawning facility.

Focus species: *Dendrogyra cylindrus, Colpophyllia natans, Pseudodiploria strigosa, Acropora palmata, Acropora cervicornis*

Next steps:

- Continue monitoring coral spawning and validating their prediction calendar, incorporating Acropora species.
- Acquire permits for their ex-situ facility; they are currently waiting for a CORDAP grant that would fund all the facility's needs, including equipment and installation.
- Create capacities in the country for coral restoration through assisted sexual fertilization.
- Begin micro fragmentation activities using in-situ coral trees.
- Collaborate with the California Academy of Science, SECORE, and the University of Miami.

Follow- up Actions

1. After the learning exchange a coral rescue WhatsApp group was created and continues to be used to provide immediate support to the participants questions regarding in-situ coral rescue.
2. Three participants from the exchange joined the Caribbean Cooperation Team's July meeting to share their lessons learned and experience during their time in Roatan.
3. Participants from Dominica and Grenada monitored grooved brain coral during the month of July.

Participant evaluation of coral rescue exchange

At the end of the exchange on Coral Rescue: In-Situ Coral Rescue Approaches, the workshop participants were asked to complete an evaluation form. This contained a mixture of open and closed-ended questions intended to evaluate the perceived usefulness, impact, and quality of the workshop. A total of four questionnaires were completed by the participants.

Key findings from the evaluation were:

1. All participants (100%) would recommend the workshop to other marine natural resource managers.
2. All the participants (100%) reported that the exchange contributed significantly to their information on in-situ coral rescue approaches.
3. All the participants reported that they learned something that they will apply in their work or their future decisions. However, they also reported that they foresaw obstacles that might hinder their ability to implement coral rescue initiatives. The obstacles included issues with permits, financing, site logistics, their country's legal framework and government support.
4. All participants (100%) reported that they desire further training. Topics suggested for further training and follow-up include technical assistance on the rearing of boulder corals (1 mention); micro fragmentation, stony coral trees and out planting of *Meandrina meandrites, Colpophyllia natans* and *Pseudodiploria strigosa*; photomosaics/photogrammetry (1 mention); spawning calendar validation (2 mentions); acquiring the equipment needed for in-situ fertilization (1 mention).
5. The facilitators were rated very highly, with 100% of the respondents rating all of them as excellent.
6. Comments or suggestions about the exchange visit included:

"Best way I could have spent this week, without question."

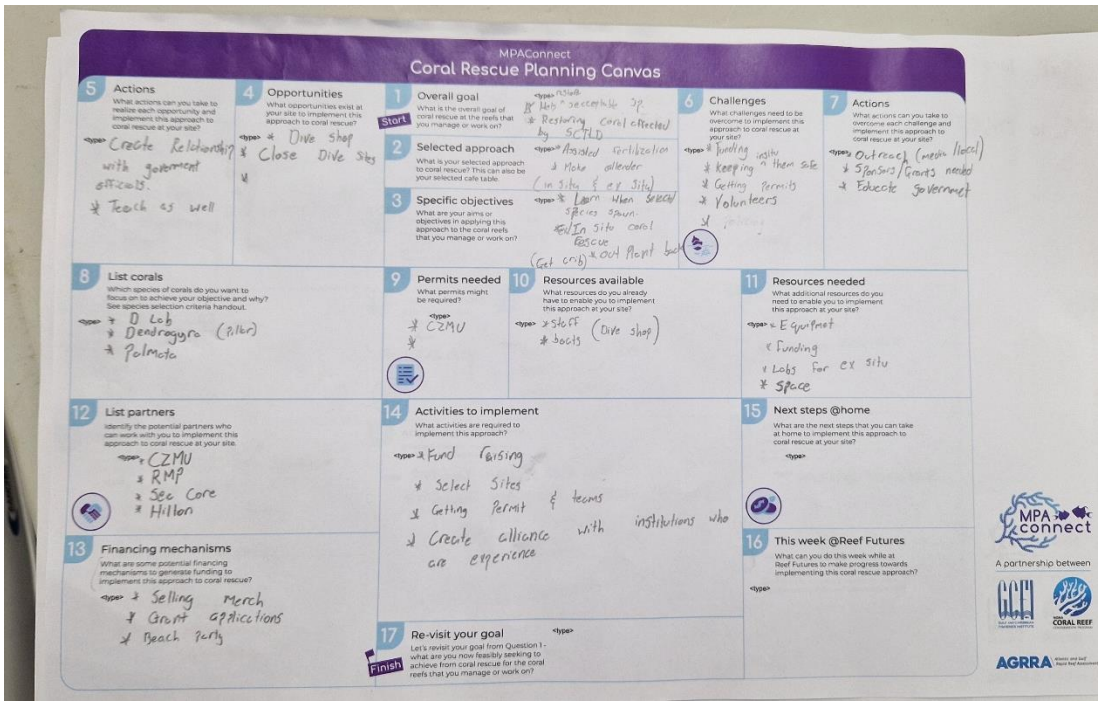
"Everything was well planned. However, more people to clean substrates would be nice."

"The team that delivered the materials and facilitated the exchange were fantastic. All information was delivered in a digestible manner and the small group allowed for everyone to be heavily engaged in the planned activities."

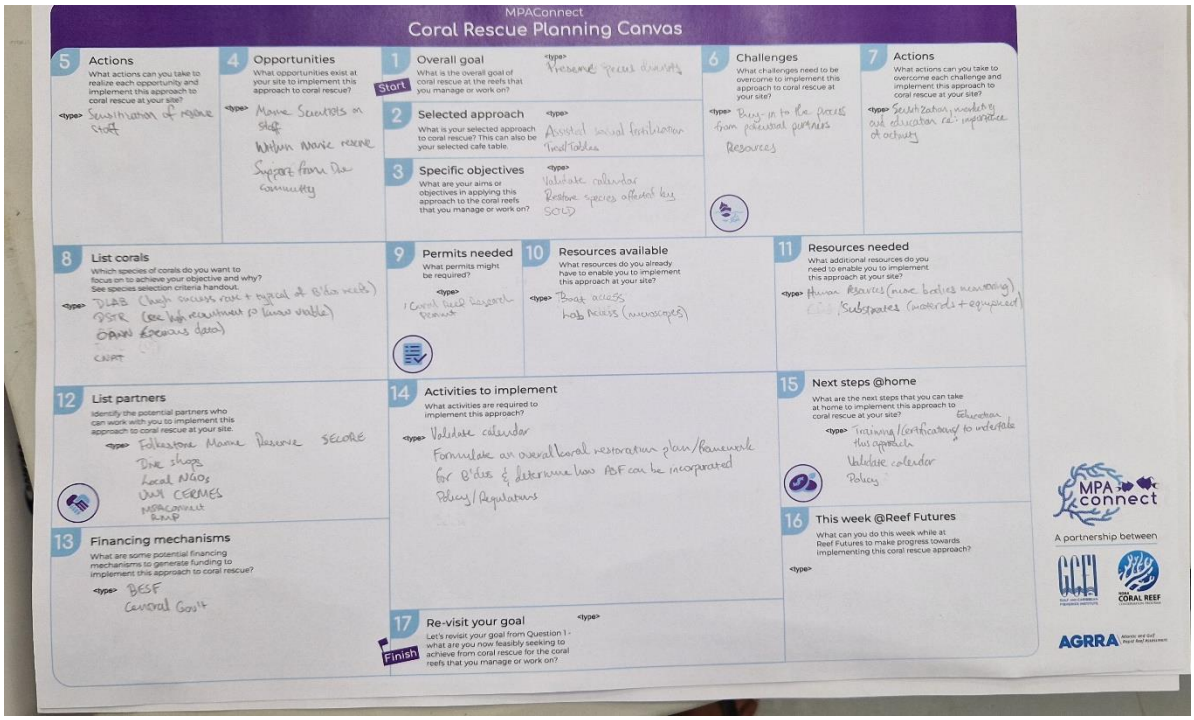
"Bringing together passionate people to share their stories and challenges and opportunities is a huge eye opener. Some days I genuinely appreciated the situation at home and sometimes I was depressed but the challenges, but I was always inspired."

Annex 1.

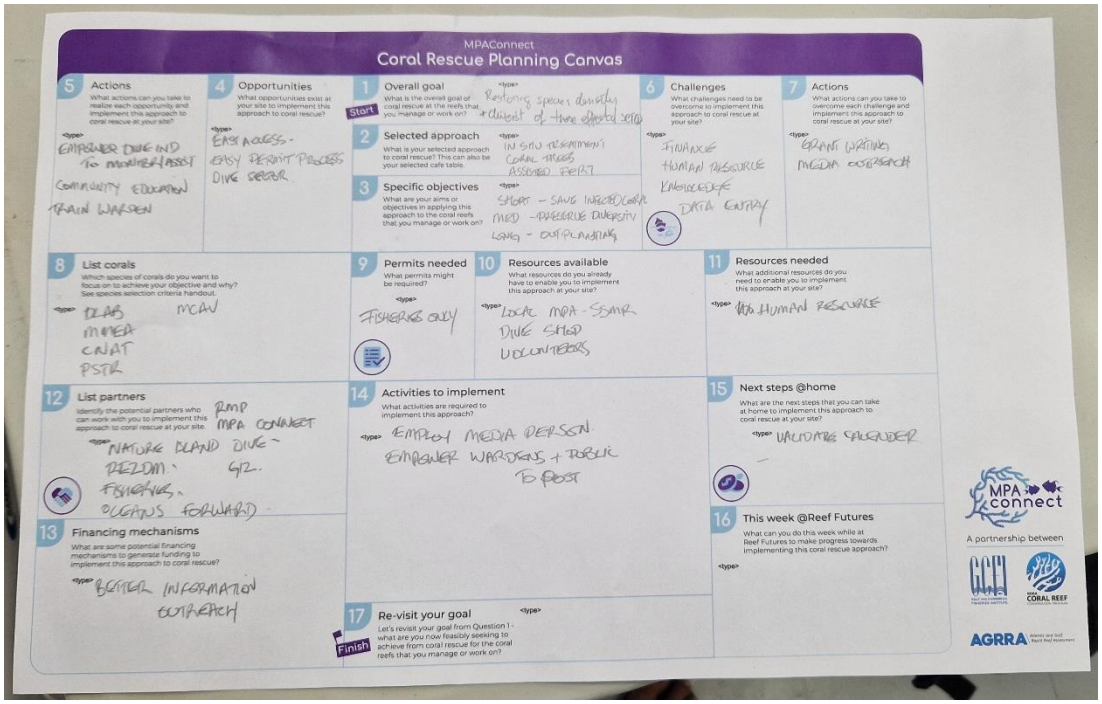
- Barbados Planning Canvas (Ajhanii Miller)



- Barbados Planning Canvas (Shonee Howell)



- Dominica Planning Canvas



- Grenada Planning Canvas