

CARIBBEAN CORAL RESTORATION ROAD MAPS

ADVANCING CORAL REEF RECOVERY THROUGH COLLABORATION AND CONNECTIVITY

Regional Peer-to-Peer Learning Exchange

June 9-14, 2024 - Key West, Florida

A portfolio of country-based coral restoration

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A PORTFOLIO OF CARIBBEAN CORAL RESTORATION

Welcome Everyone!

We are pleased you are joining us for this Regional Peer-to-Peer Learning Exchange on Developing Caribbean Coral Restoration Roadmaps for Marine Protected Areas.

This Portfolio contains an informal collection of country-based coral restoration summaries kindly provided by each of you. Thank you for your thoughtful contributions. This draft “living document” was designed to help foster collaboration and camaraderie among us. Please take a moment, dive in, and learn more about your Caribbean peers and their coral rescue efforts.

Your expertise will play an important role in guiding coral restoration planning in Marine Protected Areas (MPA), especially following the impacts of stony coral tissue loss disease (SCTLD) and coral bleaching.

The Caribbean Restoration Roadmap Initiative is a partnership between the Atlantic Gulf Rapid Reef Assessment Program (AGRRA) and MPACONnect, with support from the Coral Research & Development Accelerator Platform (CORDAP). This exciting new Initiative aims to advance coral reef recovery locally and regionally by developing science-based and management-relevant restoration roadmaps; increasing coral recovery technical expertise; and expanding rescue efforts in the Caribbean.

Our objectives include:

- Increase coral populations and improve reef ecosystem function
- Develop science-based and management-relevant Restoration Roadmaps with MPAS
- Share and increase coral recovery technical expertise
- Synergize and catalyze restoration efforts in the Caribbean to increase recovery potential

In addition to our June Meeting, and in collaboration with our Coral Restoration Advisory Team, this three-year Initiative will also provide additional opportunities including:

- Learning exchanges: Be a mentor, meet a mentor
- Technical trainings: Online and field courses
- Coral rescue planning: Develop action plans, share expertise
- Recovery potential: Locally focused, regionally important
- Small grants program: Planning and implementation

For more information on the Caribbean Restoration Roadmap Initiative, please see the attached summary.

We look forward to your valuable contributions this week and the positive impact we can collectively make on advancing coral reef recovery efforts in the Caribbean.

With best regards,
Patricia Kramer, Emma Doyle & the Coral Restoration Advisory Team



Patricia Kramer is a marine scientist and program director for Ocean Research & Education Foundation's AGRRA Program. Her research has included deep-sea ecology, tropical marine ecosystems, and endangered species recovery, where she has strived to merge scientific understanding with applied conservation. Patricia is passionate about finding creative solutions to protect our oceans and inspiring others.



Judy Lang remembers Caribbean reefs when abundant corals competed with each other, fleshy algae were scarce, and before most of their *Acropora* and *Diadema* succumbed to disease. Having co-created its original protocol in 1997, she still volunteers with AGRRA as it assumes new roles in response to the new challenges.



Lynnette Roth graduated with her Masters Degree from Florida Institute of Technology, specializing in Coral Ecology. She has been working in marine conservation for the past 13 years, first with the Caribbean Program of the Nature Conservancy and now with AGRRA. She specializes in data management and Geographic Information Systems (GIS).



Shirley Gun, the executive administrator for AGRRA, is from England and after a career in the corporate world of banking and computer consulting in London and Miami, moved to the Florida Keys where she transitioned into environmental conservation with The Nature Conservancy, GCFI and ORE/AGRRA. She enjoys using her organizational and administrative skills to help support their missions.



Emma Doyle is a coastal zone management specialist who has worked in Latin America and the Caribbean for nearly 20 years. Emma is coordinator of MPAConnect, a learning network of some 39 Caribbean marine protected area managers in 18 countries and territories in partnership with the Gulf and Caribbean Fisheries Institute and NOAA's Coral Reef Conservation Program. Emma provides leadership to MPAConnect's capacity building and networking activities.



Dana Wusinich-Mendez is the Atlantic and Caribbean Management Team Lead for NOAA's Coral Reef Conservation Program. Dana has been working with NOAA for over 20 years to support the efforts of coral reef resource managers in Florida, Puerto Rico, and the U.S. Virgin Islands and to build capacity for the effective management of marine protected areas in the Wider Caribbean region.



Gabriela Ochoa is a Honduran marine biologist and conservationist with over 10 years of experience working in the non-profit organizations such as the Roatan Marine Park and MarAlliance. She currently works with MPAConnect and is pursuing her PhD. She is passionate about making a difference in the conservation of marine ecosystems and their inhabitants while supporting the next generation of future marine leaders in Honduras.

Elvira Alvarado is a marine biologist and Executive Director of the Fundación ECOMARES. She has been studying coral reef ecosystem since 1984 and recently retired as Professor of Ecology. She has been leading coral larval propagation efforts in Colombia since 2018, but started coral restoration (transplants, fragmentation) and sexual reproduction studies in corals since 1992, working at the Universidad Jorge Tadeo Lozano.



Anastazia Banaszak, originally from Australia, is a research professor of the Coralium Lab in Puerto Morelos / National Autonomous University of Mexico. Her research includes understanding the reproductive biology and ecology of corals, applying this knowledge to low-cost coral restoration programs and expanding technical expertise throughout the Caribbean region. She is helping develop a Regional Caribbean Coral Spawning Database



Dr. Michelle Dennis is a board certified veterinary anatomic pathologist and Associate Professor at the University of Tennessee. Her research has focused on comparative pathology and investigation of natural disease with a special interest in aquatic wildlife, including addressing disease in corals, spiny lobster, sea urchins, freshwater mussels, perinatal hawksbill and leatherback sea turtles, and Antillean manatees.



Art Gleason is an Associate Scientist at the University of Miami, with a research focus on remote sensing and underwater landscape mosaics. Through a Pew Fellowship, he is providing scientific knowledge to help practitioners better understand the performance of various restoration approaches and develop more effective reef conservation strategies.



Simon Walsh is the Director of Coral Habitat Restoration at Oceans Forward and Project Manager at Resilient Dominica. As a dive shop owner and scuba diver of 35 years with >10,000 dives, he became involved with coral restoration after the arrival of SCTLD. He maintains in-situ coral rescue nurseries, is testing novel ways to reduce bleach stress, and has recently embarked on building Dominica's first land-based rescue facility



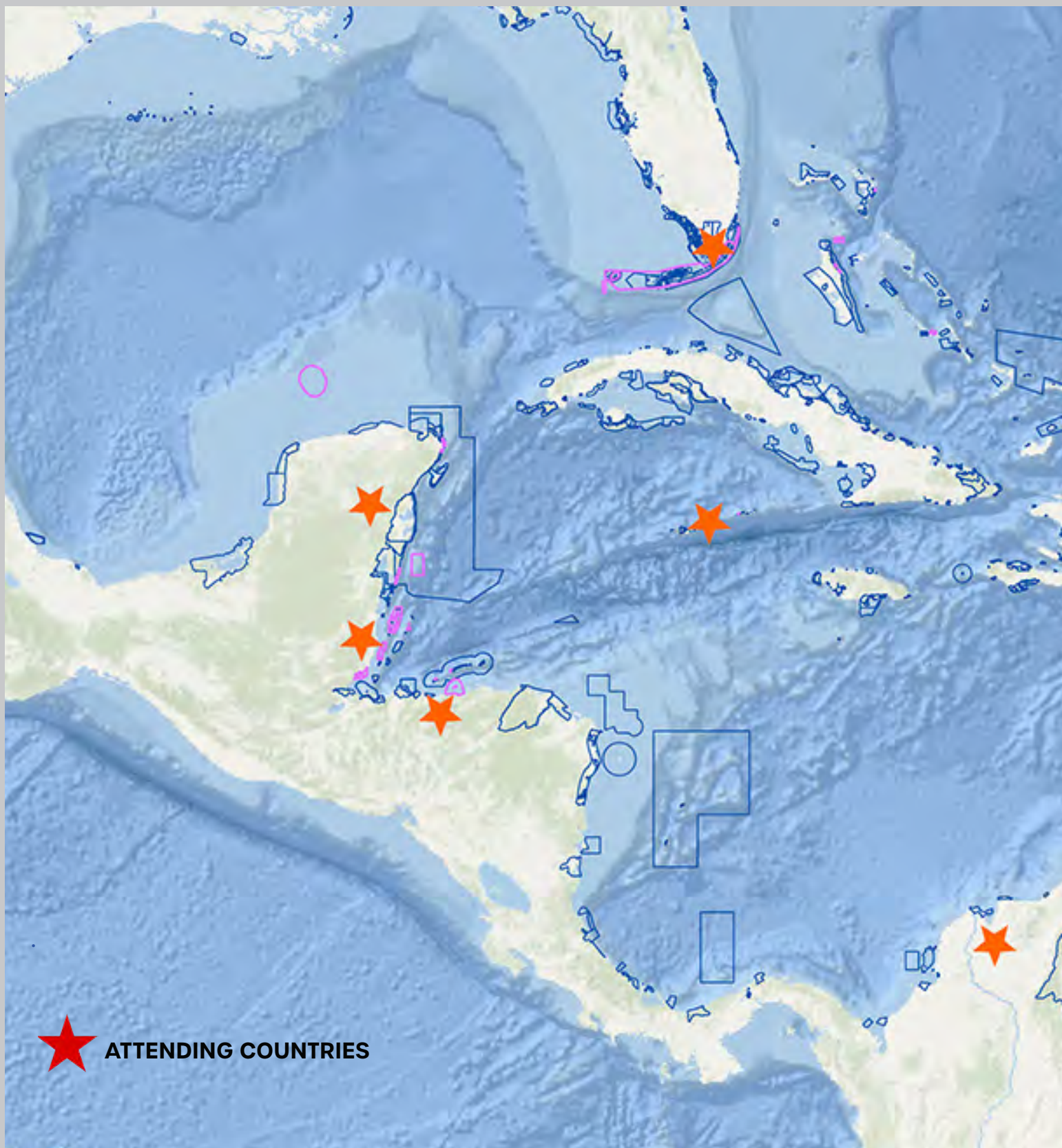
Stacey Williams is co-founder and Scientific Director of the Institute for Socio-Ecological Research. Stacey and her team are at the forefront of pioneering coral reef restoration initiatives in Puerto Rico by establishing the first-ever land-based nurseries for corals, urchins, and herbivorous crabs. She is dedicated to advancing scientific knowledge and implementing practical solutions to protect and enhance coral reef ecosystems.



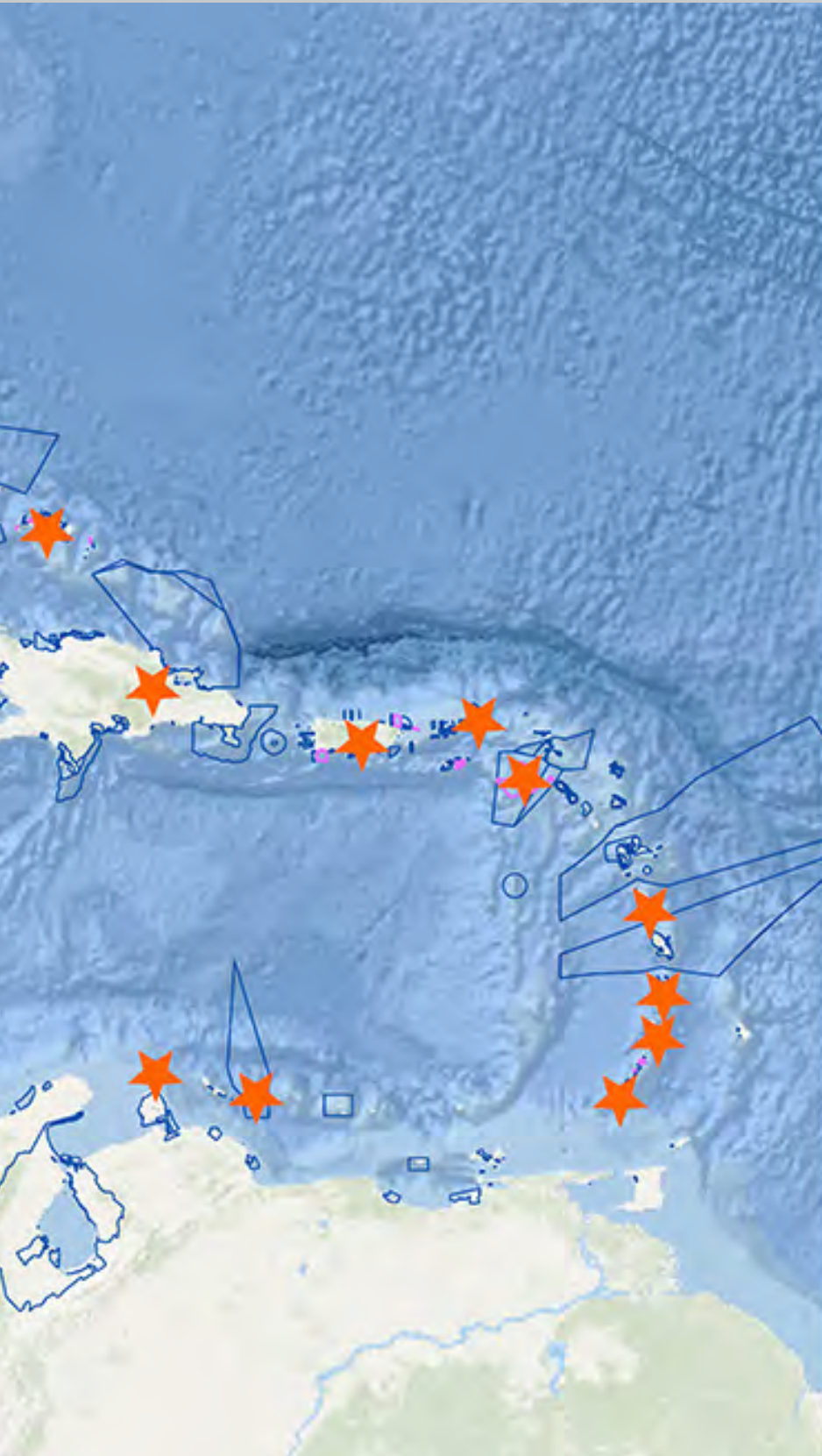
Alizee Zimmermann is the Executive Director of The Turks & Caicos Reef Fund (TCRF). She has led response efforts for stony coral tissue loss disease (SCTLD), coral rescue and restoration, and has started the first coral biobank in the Turks and Caicos. She is passionate about working together to keep coral conservation momentum going in the region.



DEVELOPING CORAL RESTORAT



RESTORATION ROAD MAPS



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Developing Coral Restoration Roadmaps for Caribbean Marine Protected Areas

June 9th – 14th, 2024

Florida Keys Eco-Discovery Center, Key West, Florida

Welcome Everyone!

Goals: Together create Restoration Road Maps to guide coral restoration in the Caribbean. Our Coral Restoration Advisory Team of experts and mentors will provide insights and assistance on designing and implementing rescue and recovery efforts.

Outcomes:

- Site specific restoration planning and technical assistance on rescue and recovery priorities
- Draft Restoration Roadmaps for individual MPAs and Caribbean vision
- Strategies and next steps for restoration technical trainings, planning, and implementation
- Share lessons learned with the MPAConnect Network and restoration practitioners
- Increased collaboration to catalyze recovery efforts in the region

Schedule

June 9: Arrive in Key West/ Check in (varies) / Welcome Social (Schooner Wharf -7pm)

June 10 Day 1:

- Restoration approaches and lessons learned
- Restoration road map planning

June 11 Day 2: ONE on ONE restoration guidance

- Guiding coral rescue with monitoring data
- Large-area imaging of coral reefs for monitoring and restoration
- Sexual coral reproduction and best practices
- Asexual coral propagation and herbivore propagation (Ecosystem-based restoration)
- Fundamentals of invertebrate disease investigations & Managing Closed land-based systems

June 12 Day 3:

- Planning for future risk and climate vulnerability
- Grounding coral restoration planning into MPA sustainable financing
- Developing Roadmaps
- Field trip & Activities: Mote Marine Lab

June 13 Day 4:

- Integrating Restoration into MPA management
- Restoration Roadmap next steps (Participant Presentations)
- Regional restoration priorities and opportunities

June 14 Day 5: Depart Key West



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Day 1 AGENDA: Restoration Techniques & Road Map Planning (Step 1)

(subject to change)

7:00 – 8:00	Group Breakfast at Hotel
8:00 – 8:30	Travel to Meeting Room
8:45 – 9:30	Welcome/Introductions, CORDAP Project Overview, Meeting Goals Patricia Kramer/ Lynnette Roth
9:30 – 9:45	Status of Caribbean Reefs Judy Lang
9:45 – 10:00	Recapping Management Capacity for Coral Restoration in the MPA Network Dana Wusinich-Mendez & Gaby Ochoa
10:00 – 10:50	Restoration Advisory Team Presentations: Part 1 <ul style="list-style-type: none"> Guiding coral rescue with monitoring data Judy Lang, Patricia Kramer, & Lynnette Roth Sexual coral reproduction & best practices (30min) Anastazia Banaszak, Rita Sellares, Elvira Alvarado
10:50 – 11:00	Break
11:00 – 12:00	Advisory Team Presentations: Part 2 <ul style="list-style-type: none"> Approaches to improving coral survival Stacey Williams Herbivore restoration Jason Spadaro Land based (ex-situ) closed systems: Bio-banks Alizee Zimmermann
12:00 – 1:00	Lunch Break (provided)
1:00 – 2:00	Coral Rescue Nurseries Panel Discussion Simon Walsh, Stacey Williams, Alizee Zimmermann, Rita Sellares, Anastazia Banaszak, Elvira Alvarado
2:00 – 2:40	Advisory Team Presentations: Part 3 <ul style="list-style-type: none"> Fundamentals of invertebrate disease investigations Michelle Dennis Large-area imaging of coral reefs for monitoring and restoration Art Gleason
2:40 – 3:15	Roadmap Overview & Activities Patricia Kramer/Lynnette Roth
3:15 – 3:30	Break
3:30 – 4:00	Case Example: Mission: Iconic Reefs (Florida Keys) Sarah Fangman, Florida Keys National Marine Sanctuary
4:00 – 4:30	Setting Goals for Restoration planning Team advisors/Participants
4:30 – 5:00	Group Share Patricia Kramer
7:00	Group Dinner – Kaya Island Eats



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Day 2 AGENDA: Restoration Techniques & planning (Steps 2 & 3)

One on one restoration guidance

6:30 – 8:00	Breakfast on your own
8:00 – 8:30	Travel to Meeting Room
8:30 – 9:00	Welcome / Identifying Restoration Sites (case examples) Stacey Williams , Rita Sellares / Team advisors
9:00 – 10:00	Prioritizing Sites and Species Selection Team advisors/Participants
10:00 – 10:15	Coral Rescue Café – one on one restoration guidance (rotate through Café) Patricia Kramer & Lynnette Roth <ol style="list-style-type: none"> Guiding coral rescue with monitoring data Judy Lang, Patricia Kramer, Lynnette Roth Large-area imaging of coral reefs for monitoring and restoration Art Gleason Sexual coral reproduction (spawning calendar, larval propagation) Rita Sellares, Elvira Alvarado Asexual coral propagation and herbivore propagation (urchins, crabs) Stacey Williams, Simon Walsh, Jason Spadaro Fundamentals of invertebrate disease investigations & Managing Closed land-based systems Michelle Dennis & Alizee Zimmermann Work on Roadmaps
10:15 – 11:00	Round 1
11:00 – 11:45	Round 2
11:45 – 12:00	Work on Roadmaps Team Advisors /Participants
12:00 – 1:00	Lunch Break
1:00 – 1:45	Round 3
1:45 – 2:30	Round 4
2:30 – 3:15	Round 5
3:15 – 3:30	Break
3:30 – 4:15	Round 6
4:15 – 5:00	Group Discussion, Meeting wrap-up, review of Day 3 agenda
Evening	Dinner on your own



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Day 3 AGENDA: Develop Restoration Action Plan (Step 4) & Field Trip

6:30 – 8:00	Breakfast on your own
8:00 – 8:30	Travel to Meeting Room
8:30 – 8:45	Welcome, review of agenda Patricia Kramer & Lynnette Roth
8:45 – 9:30	Planning for future risk and climate vulnerability (case examples) Judy Lang , Simon Walsh , Rita Sellares , Team Advisors
9:30 – 10:00	Grounding coral restoration planning into MPA sustainable financing Emma Doyle , Dana Wusinich-Mendez & Gaby Ochoa & Team advisors
10:00 – 10:15	Break
10:15 – 12:00	Work on Roadmaps: Advisory Team available for questions/guidance
	<ul style="list-style-type: none"> • Review your Goals & Geographic Focus • Review Site & Coral Selection • Review Intervention Options • Review Management Considerations/ budgets • Synthesize into an Action Plan
12:00 – 1:00	Lunch Break & Travel to Mote Marine Lab
1:00 – 4:00	Mote Marine Lab Tour
4:00 – 5:00	Depart Mote Marine Lab
Evening	Dinner on your own



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Day 4 AGENDA: Integrating Restoration & Management Restoration Country Presentations Regional Collaboration

6:30 – 8:00	Breakfast on your own
8:00 – 8:30	Travel to Meeting Room
8:30 – 9:00	Welcome Patricia Kramer & Lynnette Roth
9:00 – 10:00	Integrating Restoration into MPA management- Panel Discussion Dana Wusinich-Mendez & Gaby Ochoa
10:00 – 10:15	Break
10:15 – 10:30	Introduction to Country Presentations Patricia Kramer & Judy Lang
10:30 – 12:00	Restoration Roadmap Presentations (10min each, 5min discussion)
	<ul style="list-style-type: none"> Aruba: Sietske Belize: Alicia/Kevin Bonaire: Danielle BVI: Argel Cayman: Croy Dominica: Zethra
12:00 – 1:00	Lunch Break
1:00 – 3:00	Restoration Roadmap Presentations cont. (10min each, 5min discussion)
	<ul style="list-style-type: none"> Grenada: Christine Honduras: Martha/Andrea Mexico: Christian Saba: Camille St. Lucia: Makeba TCI: Rebecca SVG: Sheldon Colombia: Elvira Dominican Rep: Rita
3:00 – 3:15	Break
3:15 – 4:00	Regional Collaboration
4:00 – 4:30	Restoration Roadmaps: Next steps Patricia Kramer, Lynnette Roth
4:30 – 5:00	Closing presentation
7:00	Group Dinner: Salutes on the Beach





ARUBA

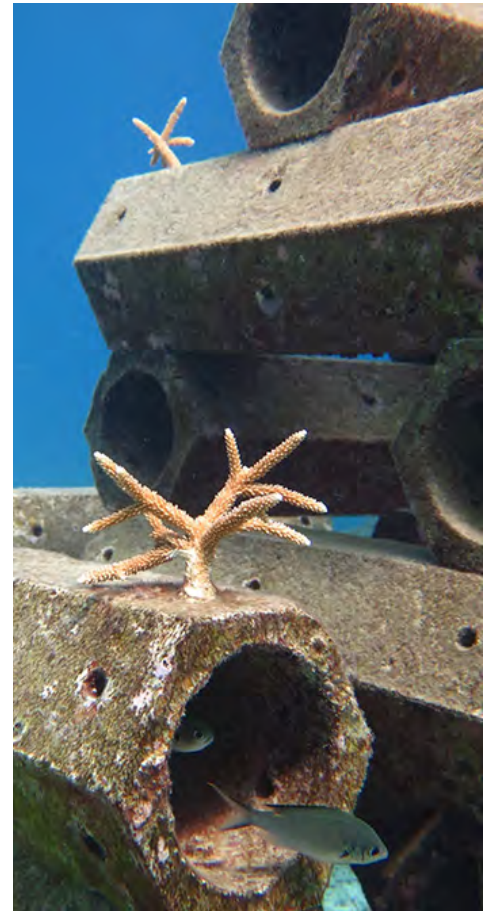
Aruba possesses a large diversity of habitat types. A continuous forereef extends along much of the Leeward and Windward coast. Along the Leeward coast it tends to only be interrupted by channels between barrier islands. Mixed bottom habitats vary from little hard bottom (<10%) to significant hardbottom (>50%). These habitats are comprised of a marl matrix (unconsolidated sedimentary rock) more often than patches of hard bottom with patches of sand. These habitats are extensive, especially between the Western lighthouse and Surfside beach (Vermeij et al, 2019).

Inside the barrier reef complex and along the flats extending along much of the entire leeward side of the island are complex soft bottom habitats. Here, all types of native seagrass beds are found which can be locally dominant around Aruba. These habitats can also be dominated by invasive seagrass (*Halophila stipulacea*), macroalgae and cyanobacteria. The coverage of submerged aquatic vegetation varies from dense canopies and patches to sparsely covered flats and patches (Vermeij et al, 2019).



ARUBA

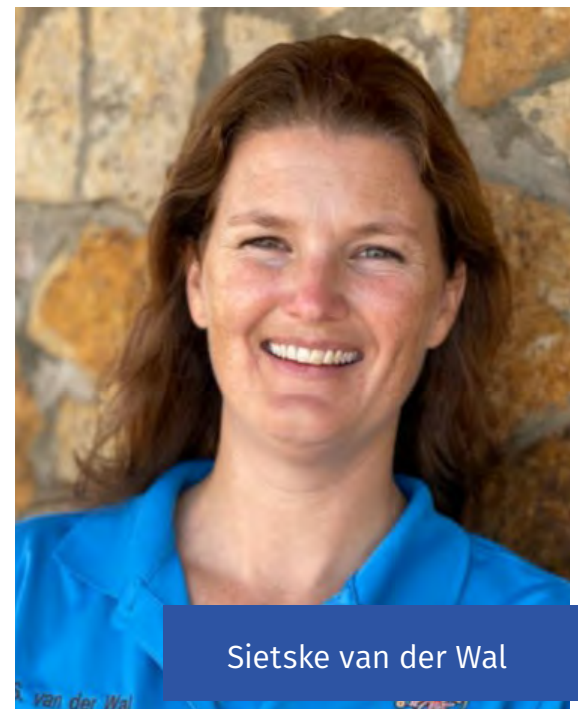
Earthstar Geographics



Aruba's marine park, Parke Marino Aruba, consists of 4 MPAs. Each MPA covers the marine coastal area extending 2 km out to sea. The total surface area of these MPAs is 6020 hectares, which is 0.2% of Aruba's territorial waters.

Management activities to address threats include fundamental conservation: Borders and zoning, Rules and regulations, Managing pressures and threats mitigation, Sustainable visitor recreation management, Nature protection and the enforcement of protection measures, Environmental and biodiversity monitoring and evaluation, Sustainable Natural Resource Management (SNRM), and Climate Change Adaptation.

Sietske van der Wal is the interim Marine Park Manager in Aruba. She was born and raised in Aruba. A marine biologist, she has been passionate about marine conservation since a very young age. She works together with Natasha Silva, Chief Conservation Officer Aruba Conservation Foundation (ACF).



Sietske van der Wal

PARKE MARINO ARUBA

ARUBA

Aruba's coral reefs are under significant stress from both natural and human-induced factors. Coral cover in Aruba is naturally low due to the high abundance of sandy areas, which limits the available benthic space for coral growth. Over the past few decades, hard coral cover throughout the Caribbean, including Aruba, has been declining due to large-scale disturbances such as coral bleaching, white-band disease, and the die-off of sea urchin populations. Local stressors like coastal water pollution and eutrophication further exacerbate this decline. A significant recent threat to Aruba's coral reefs is the outbreak of stony coral tissue loss disease (SCTLD), first reported in December 2022. This disease has affected several key reef-building coral species, including *Montastraea cavernosa*,



Orbicella annularis, and *Orbicella faveolata*.

Coral restoration is part of 'Turning the Tide' EU RESEMBID program funded collaborative project (ACF, Wageningen University & Research, ScubbleBubbles Foundation and University of Aruba). This project is piloting 2 different artificial reef systems in the Aruban waters, combined with in-situ cultivation and outplanting of *Acropora cervicornis* on the structures. Reefs are monitored regularly following GCRMN guidelines.

The primary goals of coral restoration include:

- Ecological Restoration
- Maintain Biodiversity
- Reef Resilience Building
- Ecosystem Services Restoration (as a natural result of previous goals)
- Climate Change Mitigation
- Educational Outreach

The priority needs to enhance our coral restoration efforts:

- Additional funding
- Assistance on research & monitoring, particularly to identify best strategies and locations
- Training/expertise – to be able to develop the best strategies adapted to local context
- Communication & advocacy – to reduce cumulative threats and achieve more with restorative interventions



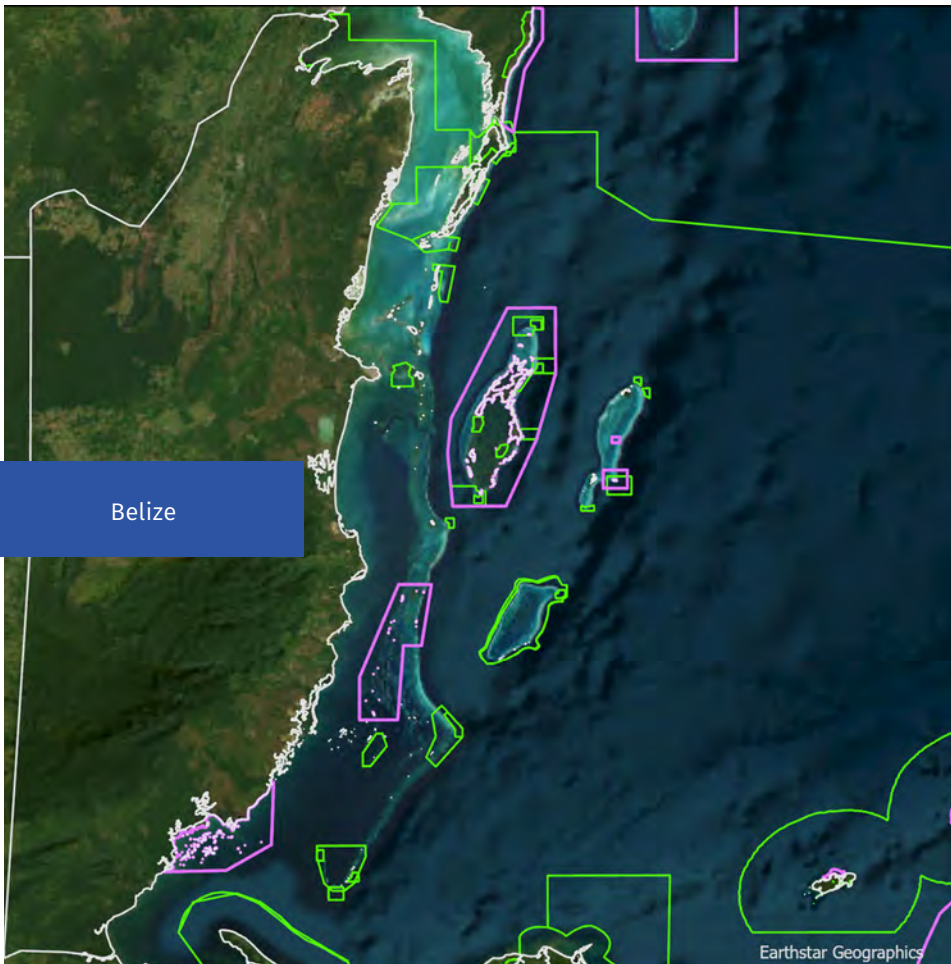


BELIZE

Belize has a wide array of reefs. It is known for the Belize Barrier Reef System, a World Heritage Site and the second largest Barrier Reef in the world, which is 190 miles long and makes up the largest portion of the Mesoamerican Barrier Reef System. Belize is also home to 3 of the 4 atolls found in this region and numerous fringing and patch reefs. The Great Blue Hole can be found on the Lighthouse Reef Atoll. The Belize Barrier Reef is home to 70 species of corals, 36 species of soft corals and numerous fish and invertebrates.

According to the Healthy Reefs Report Card of 2022 the health of Belize's Coral Reef Index has been

in decline from a 3.0 to 2.0 which is a fair to poor. The 2024 Report Card is still under review however since the data collection for the 2024 report card Belize has experience a mass bleaching event in 2023 with up to 83% bleaching occurring in some sites. Many corals perished during this event and stock taking is yet to be done to note survivors. Data collected in March 2024 has showed us that many corals affected by bleaching did recover showing as much as 77% recovery in some areas. The species most affected were *Agaricia agaricites*, *Orbicella annularis*, *Porites astreoides* and *Agaricia tenuifolia*.



There are 14 MPAs and 7 High Protection for Biodiversity Zones designated in Belize. There are 4 MPAConnect Sites in Belize – TAMR, HMC&BHNM, SWCMR and PHMR. Shape files have been created for all areas with the boundaries of these MPAs. Threats to our reefs include climate change, bleaching events, SCTLD, water quality, marine debris / microplastics, and poor water quality from sewage disposal. Management activities to address threats include Coral Restoration, working with TNC to try and determine Super Reefs in Belize, and working with partners to advocate for identifying and mapping of resilient corals

Mrs. Alicia Eck-Nunez is a Fisheries Officer at the Belize Fisheries Department currently holding the post of Coordinator Ecosystem-based Management Unit. She has been working with the Belize Fisheries Department for the past 21 years. She is responsible for the integrated overall management of the marine reserves, in Belize, through liaising with the managers and staff at the respective sites.



Alicia Eck-Nunez

BELIZE BARRIER REEF SYSTEM, A WORLD HERITAGE SITE

BELIZE

Belize has a National Restoration Policy and is in the process of developing a National Coral Restoration Plan. There is also the Coral Reef Replenishment Manual which we have adopted and Fragments of Hope (FoH) developed and uses (both documents attached). The SECORE method was also tested but this is not included in the manual. The Belize Fisheries Department works closely with organizations such as Fragments of Hope, UB ERI, TASA etc when work on restoration occurs. Permits for restoration work is vetted and approved through the Fisheries Department with recommendations from the National Coral Reef Monitoring Network.



TASA has discussed their response below about the Parametric Insurance. The primary goals of coral restoration include Ecological Restoration, Maintain Biodiversity, Reef Resilience Building, Ecosystem Services Restoration, and Climate Change Mitigation.

The primary goals of coral restoration include:

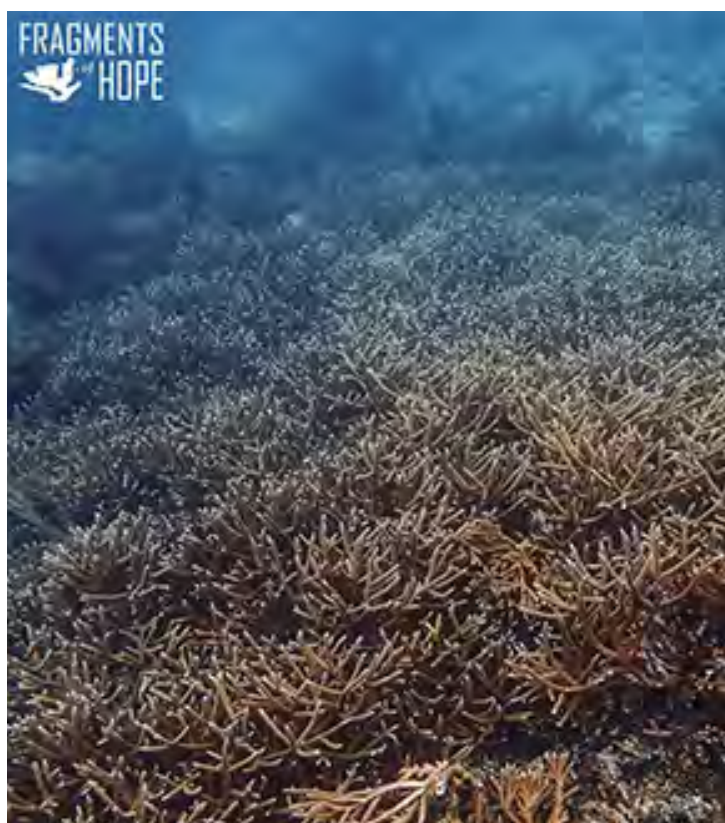
a) Goals: Continue to build reef resilience by mapping and identifying survivors of the Coral Bleaching event of 2023, start getting data on spawning of other coral spp besides acroporids.

b) Needs: Mapping exercises with image acquisition, processing and annotating with long term funding of 5- 10 years.

c) Opportunities: Knowledge Exchange, increased trained Belizeans in data analysis, mapping, drone Ortho mosaics skills, image acquisitions, integrating these needs into UB & Galen curricula, setting up labs for genetics testing (long term) and mosaics processing, existing already are large long term data sets to learn from and build on- in terms of 'jump starting' natural reef recovery processes

The priority needs to enhance our coral restoration efforts:

- Additional funding
- Assistance on research & monitoring, particularly to identify best strategies and locations
- Training/expertise – to be able to develop the best strategies adapted to local context
- Communication & advocacy – to reduce cumulative threats and achieve more with restorative interventions





TURNEFFE ATOLL - BELIZE

Turneffe Atoll is surrounded with Patch Reefs, Back Reefs, Shallow Forereefs, Deep Forereefs, Promontories. Spurs and grooves on the eastern wall and gentle slope on the western wall.

The Marine Reserve includes the best developed and richest atoll structure in the Mesoamerican reef region, and includes significant reef lining the Atoll walls, and a sheltered inner lagoon with shallow waters, mangroves and cayes that provide a wide range of reef conditions that support assemblages of regionally important ecosystems and several species of global conservation concern, among them the critically endangered staghorn and

elkhorn corals (*Acropora cervicornis* and *Acropora palmata*), hawksbill turtle (*Eretmochelys imbricata*) and goliath grouper (*Epinephelus itajara*). The area also protects the endangered green turtle (*Chelonia mydas*) and vulnerable loggerhead (*Caretta caretta*) and maintains a small population of the endangered Antillean manatee (*Trichechus manatus manatus*), a sub-species of the West Indian manatee, as well as bottlenose dolphin. TAMR is important in its contribution towards the regional viability of important commercial species, including the Caribbean spiny lobster (*Panulirus argus*) and queen conch (*Lobatus (Strombus) gigas*). The mangroves of the cayes, mangrove channels

Turnelle Atoll - Belize



and back reef flats are also important for sport fish species, and as nursery areas for many commercial marine species of economic importance, contributing to local coastal economies. – TAMR Management Plan, Turneffe Atoll Marine Reserve 2023-2027.

The 2022 Healthy Reefs Report Card revealed a decline in Belize's Reef Health Index from 3.0 to 2.0, indicating a shift from fair to poor conditions. Despite a 1% increase in coral cover, there was a decrease in species composition, possibly due to the loss of larger boulder and brain corals to SCTLD.

Kevin Novelo, Conservation Science Manager at Turneffe Atoll Sustainability Association (TASA). Passionate about helping to bridge the gap between community and conservation through adaptive management initiatives.



Kevin Novelo

TURNEFFE ATOLL MARINE RESERVE

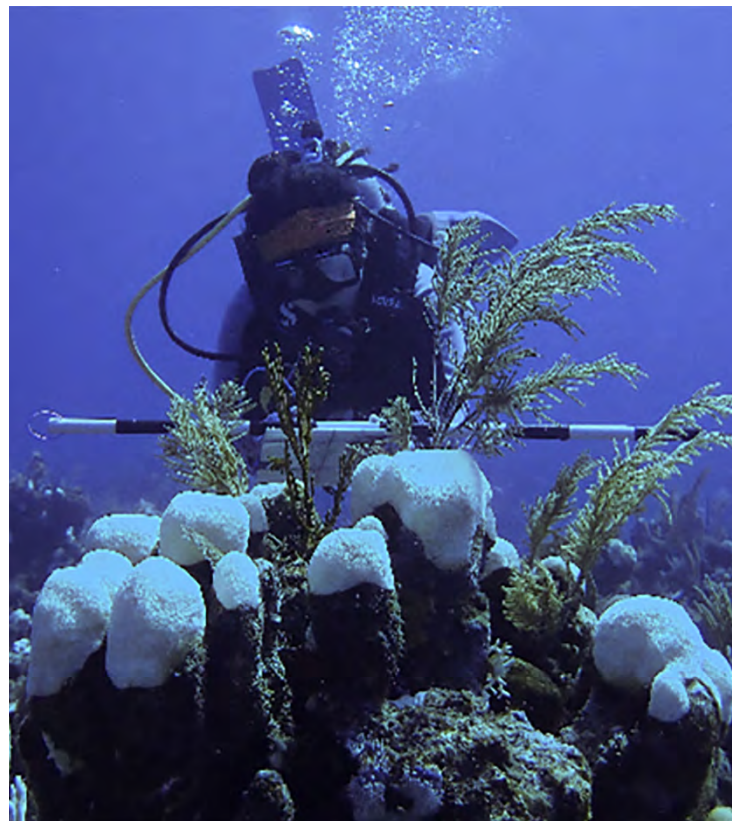
Current restoration activities include:

- Parametric insurance: Structured to offer a payout for the immediate recovery and restoration of the insured reef system, such as TAMR, in case of a hurricane impact. The funding comes from the Mesoamerican Reef Fund (MAR Fund) and WTW's Climate and Resilience Hub, along with co-funding from the Insu Resilience Solutions Fund. Following Hurricane Lisa's passage over TAMR on November 2, 2022, a Category 1 storm that caused significant damage to Belize City, the Mesoamerica Reef Insurance Program for Belize was triggered, resulting in the first payout.



- Coral Post storm assessments: Funded by the Parametric Insurance payout, the assessments were conducted promptly after Hurricane Lisa passed. These rapid assessments played a vital role in pinpointing the most impacted areas, locating nursery sites, and identifying areas requiring restoration.

- Coral Restoration efforts: Following the post-storm evaluations and utilizing funds from the parametric insurance payout, TASA initiated the relocation and out planting of coral fragments gathered at two locations in the southwest of the atoll. Regrettably, the majority of these fragments and corals perished due to the severe coral bleaching incident in 2023.



•Coral Bleaching Surveys: In August 2023, after receiving a sea surface temperature warning from NOAA, TASA partnered with the Coastal Zone Management Authority & Institute (CZMAI) to carry out coral bleaching surveys at nine locations in the TAMR. The Great Barrier Reef Foundation (GBRF) provided financial support for this collaboration.

•Workshops/trainings: The Adaptive Management Program is committed to enhancing its staff capacity.

- Coral Fragmentation: The Conservation Science Officer took part in a coral fragmentation workshop organized by Fragments of Hope in April 2024.
- AGRRA training: Three AMP staff members and one Tourism staff member are now certified to conduct fish and/or benthos surveys after completing AGRRA training.
- Coral ID training: All AMP staff have received training in coral identification.
- Coral spawning initiatives in partnership with UB ERI: TASA, in collaboration with UB ERI and Secore, provided training to a team from both organizations on coral spawning surveys and sexual reproduction. In July of this year, the team will work together to conduct coral spawning surveys for *Diploria labyrinthiformis*.

Coral Assessments and ground truthing: TASA and UB ERI will collaborate to perform coral assessments and ground truthing at 40 sites in TAMR, funded by the parametric insurance payout and GBRF funds.





BONAIRE

Bonaire is surrounded by a fringing coral reef, located very close to shore. Coral can be found between 0 and 60 meters (~195ft) depth, though they are most abundant between 6 and 30 meters (20-100ft). There are no reef flats, only reef slopes. Coral cover is (relatively) high, with estimates ranging from 46.8% to 12%. No current benthic habitat maps exist, though I have attached a GIS-file of one done in 1985. Since then, we estimate that the hard coral cover has declined by ~50%, especially in the shallows. Currently, the reef contains a lot of *Orbicella* spp. and there are several healthy *Acropora* spp. stands, both 'artificial' (from restoration efforts) and 'wild'.

Bonaire's corals live on the edge of the thermal

tolerance – our average SST is 27°C (80°F). This means that we are subject to yearly bleaching events, though mortality is usually low. Notable exceptions to this were the worldwide bleaching events in 2010 and in 2023 that both resulted in a decline of ~10% (rough estimate for 2023). Since 2023, stony coral tissue loss disease is present on the reefs. Antibiotic treatments began on select reefs in late 2023 and early 2024, and have been showing promising results. Fish metrics vary. We have a very healthy parrotfish biomass, but very low predator biomass. Barracudas are declining in abundance and size, big groupers and snappers have vanished, and sharks are rarely sighted. Commercial fishing pressure has shifted from reef to pelagics, though barracuda are often still part of the catch.



Bonaire

Earthstar Geographics



PHOTO CREDIT: @M.DRABIK

Bonaire has 1 marine park, the Bonaire National Marine Park (BNMP) which surrounds the entire island up to 60 meters depth or 75 meters out from the highwater line (whichever lies further out). The BNMP covers ~27 km², but it's legislative protections stretch beyond its borders to the edge of our Territorial Waters (12 nautical miles). The BNMP contains two no-fishing zones, 2 dive reserves, and a number of snorkel fishing zones. It encompasses reefs, mangroves, and seagrass fields, as well as the island of Klein Bonaire. The entirety of the BNMP is an MPACoast site.

My name is Danielle de Kool, I have been working at STINAPA as the marine park ecology advisor since March 2024. I was born and raised on Aruba, studied marine ecology in the Netherlands, and have been living on Bonaire since October 2022. My background is in fisheries, though I'm loving the wide range of subjects I'm currently dealing with on a day-to-day basis as well.



Danielle de Kool

BONAIRE NATIONAL MARINE PARK

Aside from yearly returning high nutrient influx from rainwater runoff, in general nutrient concentrations are elevated year-round. Water quality sampling took place every other week at several locations around the island but has been paused pending funding. We expect to pick this up again in the summer. Previous results indicate that dissolved inorganic nitrogen levels are regularly at or above threshold levels.

STINAPA is currently focusing on addressing threats from sargassum, stony coral tissue loss disease and bleaching. Terrestrial threats to our reefs come in the form of water quality, unregulated coastal

development, and we are beginning to look at use pressure as well.

Management Activities to address these threats include a) *Sargassum*- satellite tracking; removal of landed *Sargassum*; b) SCTLD- disease monitoring; antibiotic treatments; resilience monitoring; c) Bleaching- temperature loggers around the island; bleaching monitoring (% incidence), mortality; d) Unregulated coastal development- working with local government on permitting and enforcement; e) Climate resilience project- to mitigate climate change impacts; f) Lac pa Semper- project focused on seagrass restoration in Lac Bay and Coral Restoration.



Current restoration activities on Bonaire are focused on seagrass, mangroves, corals and queen conch. Of these four, only conch and seagrass are being handled directly by STINAPA. The other two are done by a third party in name of STINAPA (mangroves – Mangrove Maniacs; corals – Reef Renewal Foundation Bonaire). RRFB began with *Acropora* spp. and has since began including slow-growing species in their nurseries. They use both fragmentation and larval propagation, with the purpose to increase the reef's resilience.

The primary goals of coral restoration include:

Our future coral rescue and restoration efforts include:

a) Goals: The long-term goal is to have a (semi-) functional reef and to keep it that way as long as we can.

b) Needs: Both technical and financial support would be necessary.

c) Opportunities: Our corals have already shown to be resilient (passive restoration by Acroporid). We want to give them a better fighting chance through novel techniques and coral-specific R&D

The priority needs to enhance our coral restoration efforts:

Our priority needs to enhance our coral restoration efforts include funding, training expertise, equipment, etc. STINAPA is a team of 50 people, and only 16 of those are working full-time for the Marine Park. Between regular day-to-day tasks, there is little time left for the team to trial solutions or to learn how to apply new techniques or new equipment through experimentation.





BRITISH VIRGIN ISLANDS

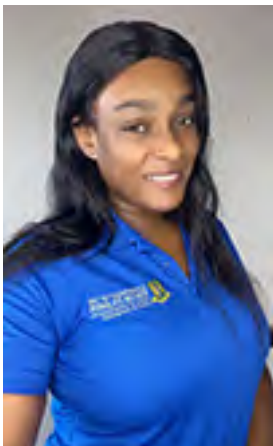
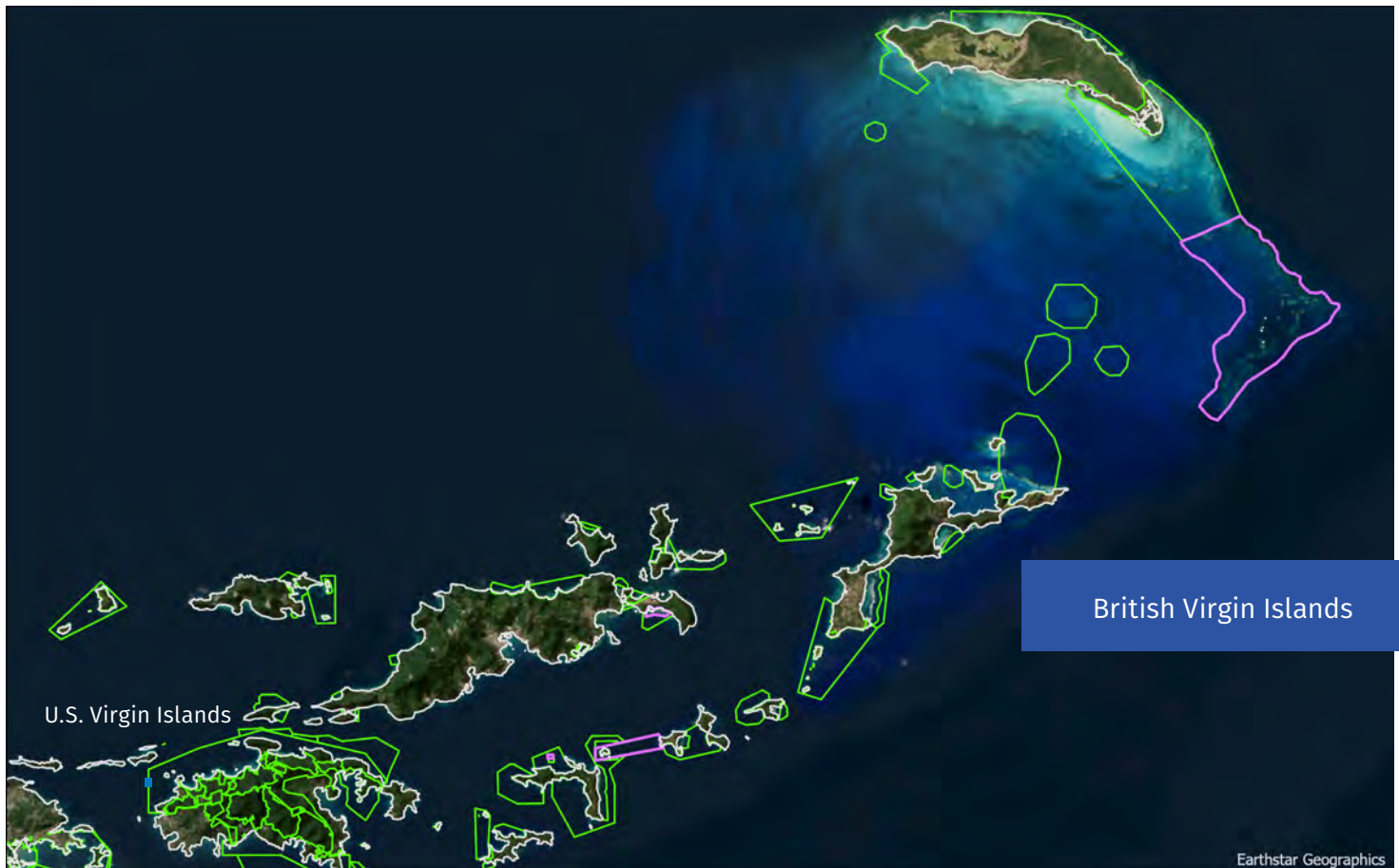
The British Virgin Islands (BVI) has a mixture of high complexity reefs, composed on stony corals (*Orbicella* sp., *Acropora* etc) and low complexity reefs composed of weedy species. Over the years, the coral cover has deteriorated due to various anthropogenic (anchor damage, sewage, pollution etc) and natural events (climate change). While megafauna populate the areas where coral once thrived. Despite this, surveys show high volumes of recruitment rate and low abundance of middle to large size coral species. Most recent coral decline contributed from Stony Coral Tissue Loss Disease (May 2020) with additional stress from the 2023 bleaching event.

Corals have been severely impacted by SCTLD and most recently the 2023 bleaching event. Coral

communities shifting from a high complexity reef to low complexity reefs with high abundance of fleshy algae. Abundant coral species dominating the reefs shifted from *Orbicella* sp. to *Porites astreoides* and Starlet species. Grazing species are poor on reefs.

The Fisheries Protected areas are scattered across the Virgin Islands. These 14 sites are unique in its own rights. It's a no take zone that's strictly for marine conservation and protection.

The Marine Protected Area is scattered across 20-80 ft of water near the island of Salt Island in the Virgin Islands. It's the reminisce of the Royal Mail Streamer, "Rhône" which sank from a hurricane in 1867. The shipwreck is home to various marine life and encrusting corals whilst providing a home to a variety of reef fish. It's also a popular dive site.

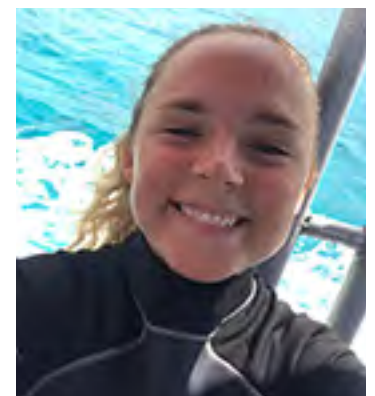


Argel Horton

Ms. **Argel Horton** is an Environment Officer at the Ministry of Environment Natural Resources and Climate Change with the portfolio responsible for coastal zone management and biodiversity conservation. Ms Horton provides her knowledge in reviewing research applications, environmental impact assessments and seabed applications. Ms. Horton is also the point contact for the Virgin Islands for CITES management. During the introduction of stony coral tissue loss disease in 2020, Ms. Horton lead, educate and trained dive operators and volunteers to combat SCTLD.

My name is **Amy Morrison** and I am the marine biologist for Beyond The Reef, a marine conservation non-profit in the British Virgin Islands. I am from the beautiful country of Scotland and completed a BSc in Marine Biology at the University of Aberdeen, before moving to Mexico for my divemaster then England for my MSc Tropical Marine Biology at the University of Essex.

Amy Morrison



Threats to the reef include: Climate Change, groundings/ anchor damage, excess nutrients (sewage), anoxic environments caused from decaying *Sargassum* in shallow coastal areas, overfishing, coastal development/sedimentation.

Current restoration activities include:

Coral nurseries

The Virgin Islands previously established 10 coral nurseries which had from pvc pipes and monofilaments. Corals on the trees were corals of opportunity (*Acropora* sp.) which was gathered from a grounding event and was placed onto the trees. As the corals grow in size, it would be clipped, leaving 3 inches of fragment onto the coral tree for new growth to occur. In 2017 the trees were uprooted due to the passing of hurricane Irma. This product was done by the Association of Reef Keepers in partnership with The Nature Conservancy and the

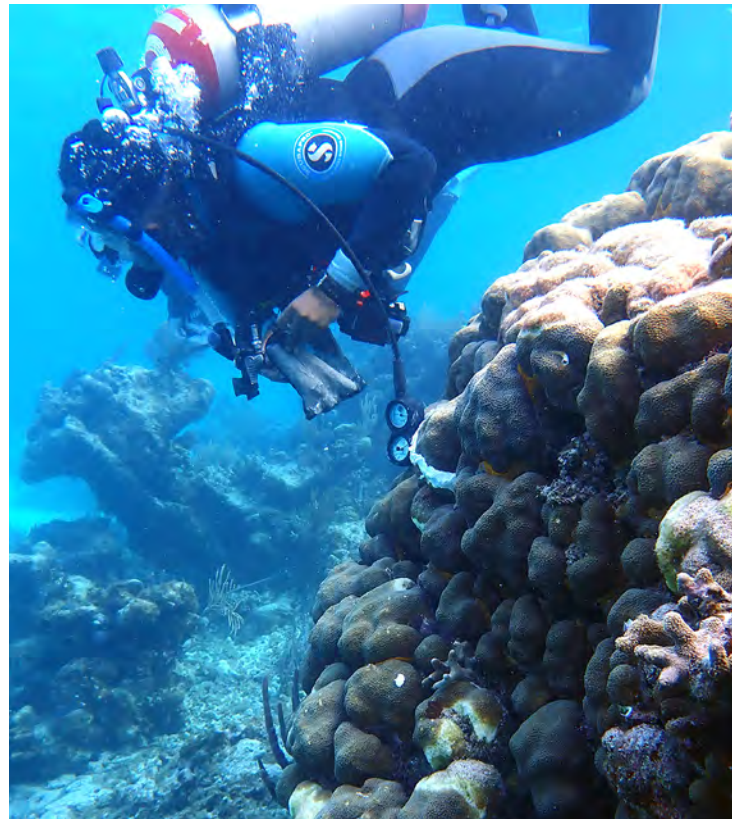
Conservation and Fisheries Department. There are currently two newly installed coral nurseries. This product was continued by the Association of Reef Keepers in partnership with Coral Restoration Foundation and Blue Force.

3D printed reef

Installed January 2024 by Rreefs. The lego-styled printed structure is made of clay bricks to create complex habitats. The bricks were printed in Switzerland and shipped to the Virgin Islands. Funding for this product was done thanks to Institute Le Rosey.

Artificial reefs

Various structures has been converted to artificial reefs in the Virgin Islands. Some are ships which were stripped of hazardous materials and oils and sank to their new destinations. Others were converted into art and is now encrusted corals,



sponges, tunicates and other marine life. Project was done and funded by Beyond the Reef.

Beyond The Reef has created three large scale artificial reef systems out of hurricane damaged vessels and planes that have gone on to become vibrant coral reef sites and popular diving destinations. Previously we have assisted BVI Association of Reef Keepers (ARK) with coral nursery installations. In recent months Beyond The Reef have assisted ARK and Rrreefs, a Swiss based restoration organisation, with installation of a 3D-printed clay brick artificial reef. We also supported the BVI National Parks Trust in transplanting corals in preparation for a marina expansion.

Our future restoration goals include:

- a) Goals: Establish a full assessment of the status of our marine environment (corals, fish and invertebrate) and establish their effectiveness. Establish restoration efforts for corals, and grazers in heavily degraded areas. Re-evaluate legislations and protected areas.
- b) needs- funding, capacity to carry out work
- c) Opportunities – engage interest with up and coming interested scientist and connect/ nature them with nature. Partner with local NGOs/ stakeholders with similar interests, building capacity for all.

Our priority needs to enhance our coral restoration efforts include funding, training expertise, and equipment.





CAYMAN ISLANDS

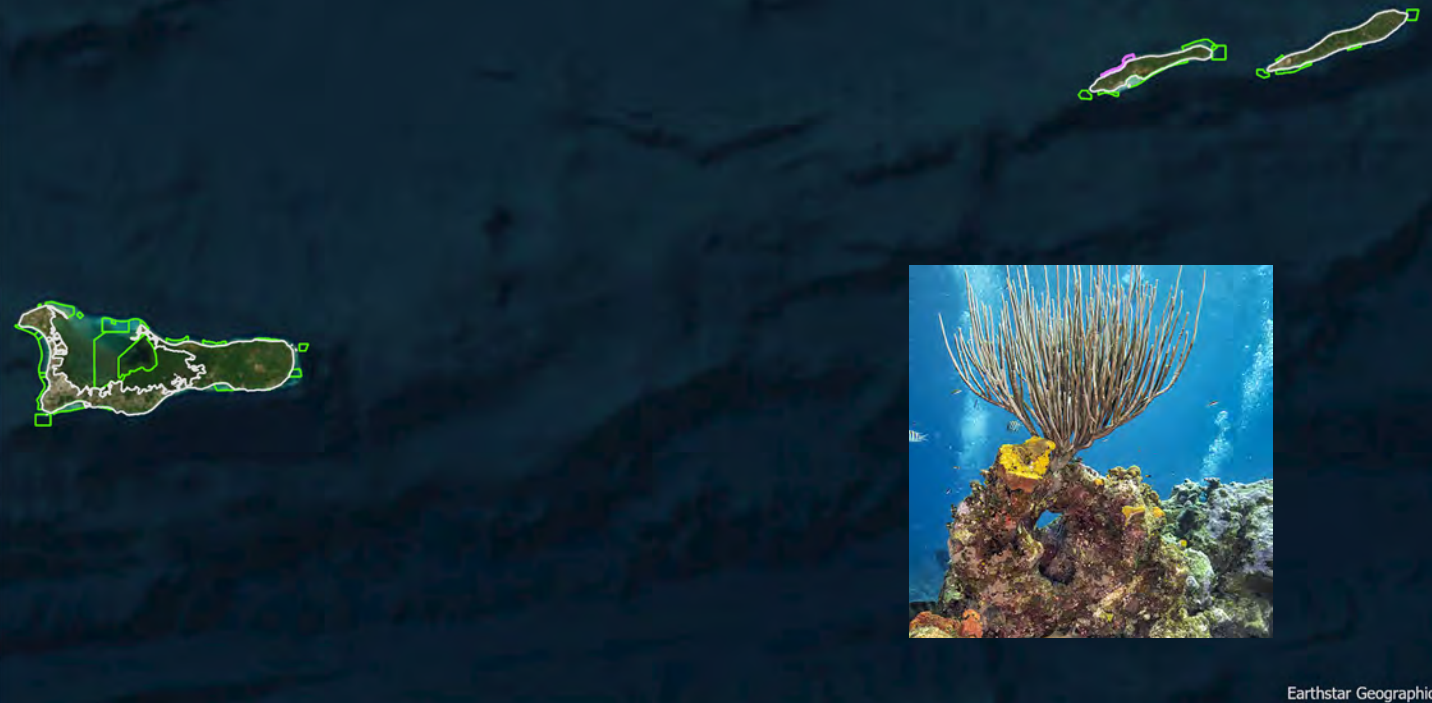
The structure of Caymanian coral reefs, primarily constituted by 41.03 km² of “spur and groove” formations spread across the three islands, with Grand Cayman (GCM), Little Cayman (LC) and Cayman Brac (CB). They differ significantly in topographical rugosity based on the exposure of the coast. The south-easterly approach of storms and fair-weather wave fields results in three margin types: a high energy exposed-windward eastern and southern coast; a semi-exposed, moderate energy north coastline; and a low energy leeward western coastline, found only in GCM.

These islands have two very distinct reef terraces: the shallow terrace reef (5-10 meters) associated

with two environments, lagoons and a fringing-rubble reef complex (predominantly GCM and LC), and a deep terrace reef (15-25 meters), plunging vertically to abyssal depths. With the exception of Bloody Bay in LC, a small < 4km section of reef where the deep terrace is missing, the shallow terrace extends out to the deep terrace before plummeting vertically to abyssal depths as shallow as 3.5 meters.

The reefs of the Cayman Islands are dominated by submarine topography, much like other islands in the region. All three islands have a narrow reef-shelf measuring 1.5 km maximum in width and

CAYMAN ISLANDS



are as narrow as 200 m at some locations; the total shelf area for GCM, LC and CB is 49.4 km², 18.81 km² and CB 20.72 km² respectively. The coral community structure is dominated by massive corals such as *Orbicella annularis*, *Orbicella faveolata*, *Montastraea cavernosa*, and *Orbicella franksi* on the deep terrace reefs. A total of 48 of the known 65 species of corals in the Caribbean are found in the Cayman Islands (C. McCoy).

DR CROY MCCOY
SENIOR RESEARCH OFFICER (MRU)

DR. Croy manages the Marine Resources Unit which monitors native marine species, our fisheries, coral reefs, seagrass and mangrove systems for health and threats. He coordinates the Coral Reef Monitoring Programme, along with other marine monitoring and research programmes to ensure changes in the general ecology of our marine and coastal environments are detected and these environments can be safeguarded.



Croy Mcoy is Research Manager in the Department of Environment, Cayman Islands. He monitors native marine species, fisheries, coral reefs, seagrass and mangrove systems. He coordinates the Coral Reef Monitoring Programme, along with other marine monitoring and research programmes to ensure changes in the general ecology of our marine and coastal environments are detected and these environments can be safeguarded.

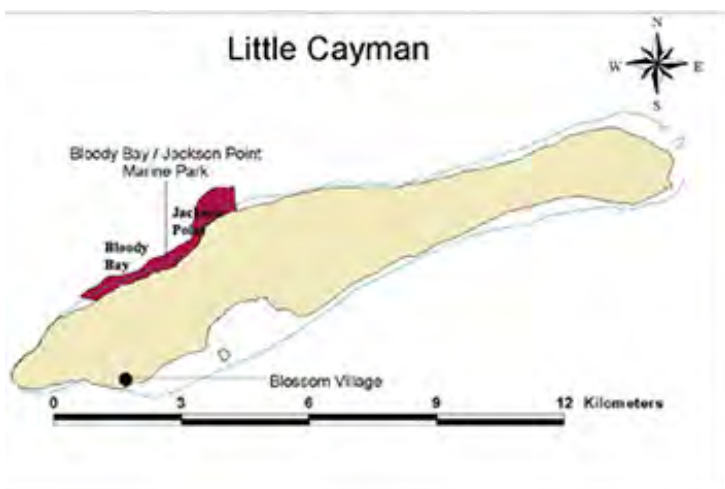
Unprecedented ecological changes are occurring on coral reefs here in the Cayman Islands, more so Grand Cayman-post SCTLD. A general trend of coral decline/algae dominance has been occurring since the 1970's and is still happening to date. In 1994 (Ghiold et al 1994, The Natural History and

Biogeography of CI) put our shallow reefs coral cover at ~29% and deep reefs at 33%. GCM 2023-Now ~ 8/10% , sister islands (CB & LC) at ~21% average (some sites higher/lower). In 1997, a site (The Meadows) located within the MPA Connect selected MPA; the coral cover was documented to be ~52%. In 2024 The Meadows site was documented to have 26.5% coral cover. Of course with some sites higher/lower in the MPA-connect MPA. In 1997- across all islands (data pooled: N=30) was ~25%, now ~10/12 % (2024)

Threats include over-development, climate change pollution from deep well injection and septic systems, invasive species, damage to reefs by boat anchors and divers. The Cayman Islands has



an extensive and holistically integrated system of marine protected areas in our nearshore waters (<150ft deep) where most of our coral reef use is focused, e.g., fishing & diving. This protects the reef community from overfishing, which has been seen to cause cascading degradation of reefs regionally and globally. One significant management activity to address threats included increasing no-take from ~15 % of shelf area in 1986 to >40% in 2019. Since 1978, all the corals in the Cayman Islands have been completely protected from take or damage. This was further supported by the implementation of our MPA system in 1986 with increased fines (500k).



*Bloody Bay is in
the MPAConnect Network.*

Future restoration needs include:

- 1) Ex-Site Coral Spawning Lab (privately funded)
- 2) Expand Ex-situ coral spawning Lab with raceways/grow-out facility
- 3) Shared expertise with experts in the coral restoration industry
- 4) Access to latest expertise/techniques/technology

Current restoration activities include:

Private & Govt. coral nurseries: In-situ / ex-situ: Boulder and branching corals.

Affiliation with Baker's Lab (University of Miami)

Collaboration with other BOTs on coral reef management & restoration, sharing ideas and mitigating/solving the various issues we face with coral reefs via The Joint Nature Conservancy ommittee (JNCC- UK based)

REEF Renewal (NGO-GCM)

Dive Resorts- Coral gardening of Acroporids / branching corals



Luis Alfredo Cardona Montañez©Riagad Photography

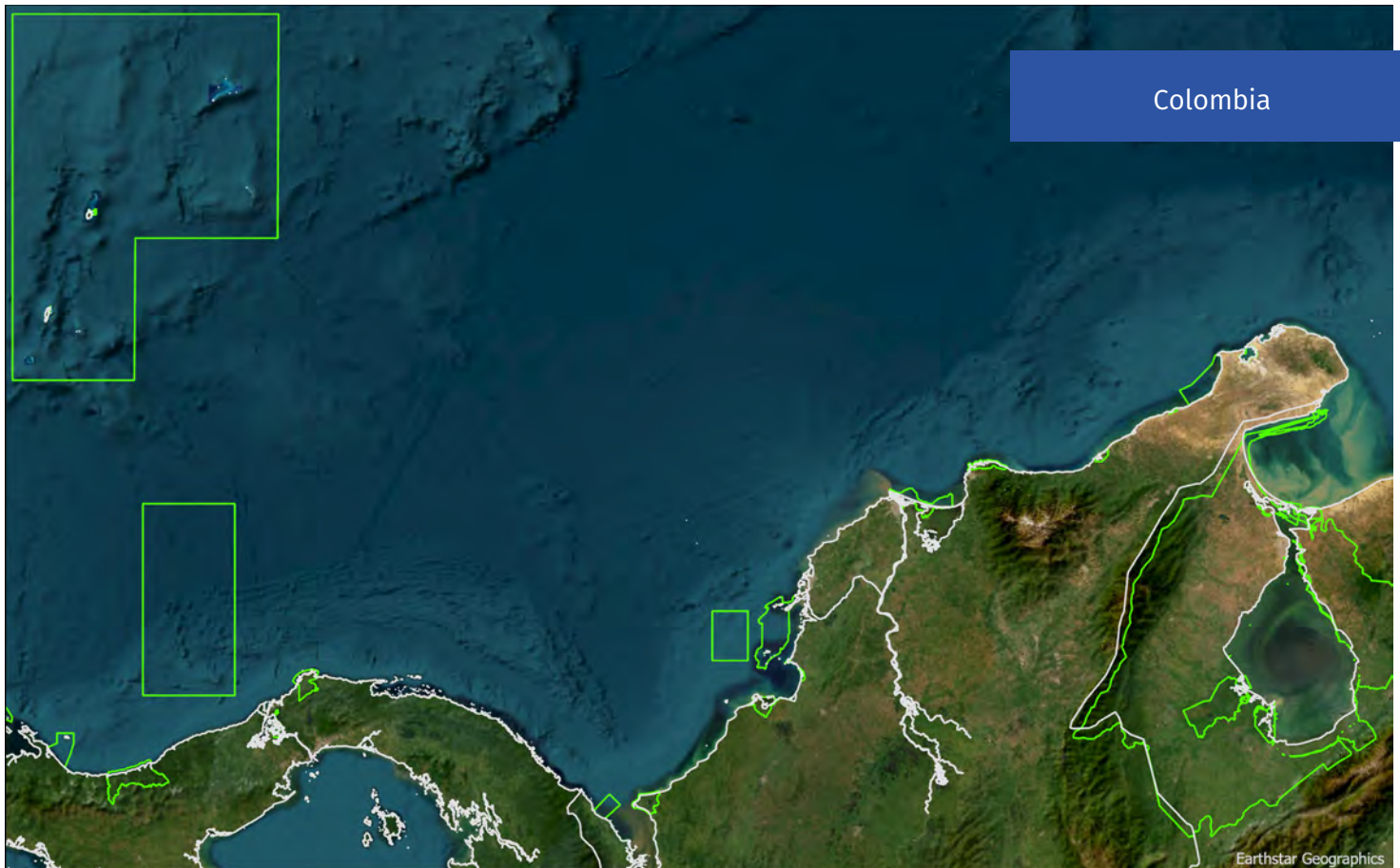
COLOMBIA

In San Andres (97,5 km²) and Parque Corales del Rosario (145,3 km²) we have barrier reef, fringing reefs, and patch reefs. In Tayrona Park we have fringing reefs and patch reefs (9,3 km²), (Diaz et al. 2000). Of Colombia's Marine Protected Areas, nine have coral reefs. The largest is the Seaflower MPA.

This is a Biosphere Reserve with 180 000 km² of marine area and has the third longest coral reef barrier in the world and with 76.5% of the coral reefs of Colombia (825 km² of coral reef area). The other MAPs 8 are within National Natural Parks (6 in the Caribbean and 2 in the Pacific), and all but one (Acandí) are within the National Natural Park System (see RUNAP files for GIS Shape files). Acandí is under the category of Fauna Sanctuary. Rosario and San Bernardo National Park (PNNCRSB) has an

area of 200 km² of coral reefs and Tayrona (PNNT) 6.7 km² (CARDIQUE ..2016, Diaz et al 2000). Here is a link to the coral reef areas in Colombia <https://areas-coralinas-de-colombia-invemar.hub.arcgis.com/pages/visor>

All are under the SAMP (Subsystem of Marine Protected Areas) which forms part of the SINAP (National System of Protected Areas) under the Ministry of the Environment. The goals for all are: 1. Ensure the continuity of natural ecological and evolutionary processes to maintain biological diversity; 2. Guarantee the supply of environmental goods and services essential for human well-being; 3. Guarantee the permanence of the natural environment, or some of its components, as a foundation for the maintenance of the country's



Colombia

cultural diversity and the social appreciation of nature.

According to studies of INVEMAR (Gomez-Lopez et al., 2023, DOI: <https://n2t.net/ark:/81239/m97t49>) the Condition and Trend Index of the continental Colombian coral reefs (ICTAC) show that 22% are in good state of health, 56% are in regular state and 22% are in alert, while in the insular reefs (San Andres, Providencia, etc.) show that 43% are in good state, 20% are regular, 21% are in alert and 8% are in bad state, but this was before bleaching and the entrance of the SCTLD. T

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Elvira Alvarados is the Executive Director of the Fundación ECOMARES and is from Colombia. Marine Biologist, International Relations, and Diplomacy and, Doctor in Science - Biology. I have been looking into the coral reef ecosystem since 1984. Professor of ecology until last year when I retired. Leading coral larval propagation in Colombia in 2018, but started coral restoration (transplants, fragmentation) and sexual reproduction studies in corals since 1992 working at the Universidad Jorge Tadeo Lozano.



Elvira Alvarado

COLOMBIA

Threats and Management activities:

The main threats include bleaching (high temperatures for more than 8 weeks), diseases, especially SCTLD, chronic sedimentation (<http://dx.doi.org/10.1016/j.scitotenv.2016.02.140>), high concentration of nutrients, overfishing, hurricanes, dredging, disorganized tourism, exceeds carrying capacity, and coastal development. Management is challenging. In 1991 we got the government to stop dredging one of the three channels that affected PNNCRS. Many attempts to continue dredging occur in the Dique Channel to reduce maintenance costs of access channels for deep draft ships in the entrance to the Cartagena. For high temperatures,

we tried to deepen substrates with recruits, but temp was almost the same. Tourism related activities are affecting the reef and sustainable tourism needs to be addressed.

Current restoration activities

We have used sexual (larval propagation) and asexual (fragmentation, microfragmentation) methods for restoration purposes. We have worked with *Diploria labyrinthiformis*, *Colpophyllia natans*, *Pseudodiploria strigosa*, *Orbicella annularis*, *Orbicella faveolata*. For *Acropora cervicornis* and *A. palmata*, as we do not have many colonies, we have done some fragmentation, but in just few



*The Sunflower MPA is a
Biosphere Reserve with
180,000 km² of marine area.*

colonies. All species have been selected because of its vulnerable status. Our goal is to recover coral cover in deteriorated sites. Our primary goals include Ecological Restoration, Maintain Biodiversity, Reef Resilience Building, and Climate Change Mitigation

Our coral rescue and restoration future goals and needs include:

- Working to grow our coral larval propagation lab to have a coral rescue center in the continent (for now PNNCRSB) and in San Andres
- Work with spawners and brooders.
- Substrate stabilization
- Herbivores to help control macroalgae in natural sites and in larval propagation projects.
- Fundings for monitoring at least five years to verify restoration. Go further than “producing”. We need to maintain.
- Get permanent people to work with us.
- Funding... we capture funds with scientific projects. We have volunteers and we work with other groups that are involved in the need of the restoration via sexual recruits (diving schools).





DOMINICA

Coral reefs are found along the narrow, steep western shelf, and broader shallow east coast. The Northeast has the largest reef, Calibishie, but west coast reefs, especially between Batali and Mero, have higher coral cover, diversity, and structural framework. Most reefs are isolated not continuous, with at least 46 coral species. Reefs include shallow patch reefs of pencil (*Madracis auretenra*) or finger coral (*Porites porites*), fields of volcanic boulder rocks colonized by small corals, deep (5-40 m) fringing reefs of mountainous star coral, pencil or finger coral and remnant elkhorn (*Acropora palmata*). Very healthy and diverse sponge life with huge barrel sponges everywhere and tube and vase sponges giving our reefs a lot of color. Up until 2022 we had extremely healthy reefs

with very little signs of any disease. *Meandrina meandrites* (MMEA) was the dominant coral cover with large colonies and dozens of colonies on every pinnacle. Large healthy *Colpophyllia natans* (CNAT) colonies were common and *Porites astreoides* (PAST) covered everything. In the last 2 years we have lost 98% of MMEA, a lot of CNATs and *Montastrea cavernosa* (MCAV) so coral coverage has declined dramatically. However, our dive shop treatment program also has coral. In 2022, we had a 99% die off of *Diadema* and since then we have seen increased algae on all sites. The 2024 bleaching event then affected species that we have never seen bleach like PAST and *P. porites*. Mortality was the highest we have ever seen. With SCTLD and bleaching doing so much damage to our reefs it is



obvious that global threats outweigh the damage of local stressors. Soufriere-Scott's Head Marine Reserve (SSMR) is managed by Local Area Management Authority with members from tourism and fishery industries, local community and Fisheries Division. It includes coral reefs, seagrasses, wall reefs, deep water and currents and has diverse marine life such as corals, sponges, reef fish, pelagic fish, dolphins and whales. There are four multiple-use zones, including fisheries management. SSMR is part of the MPACoast Network.

On the local side we have threats like tropical storm wave damage and landslide sedimentation. Other threats include illegal spearfishing, fishing damage to sponges, and other forms of illegal fishing. Tourism is not on the level where it causes visible damage, but the sites most popular with cruise ship snorkelers need monitoring.

Zethra Baron is Fisheries Liaison Officer in the Ministry of Agriculture, Fisheries, Blue and Green Economy of Dominica, where she supports measures that preserve Dominica's marine environment. Zethra also serves as Zone officer for the Soufriere Scottshead Marine Reserve for the past nine years. Zethra is a marine enthusiast who grew up in a small coastal fishing community on the Atlantic coast of Dominica and is passionate about supporting the youth community in Dominica.



Zethra Baron

Coral rescue and restoration activities include:

- Stony Coral disease Treatment Program,
- Diadema settlement Project
- In situ Nursery for Stony Corals
- Ex Situ Tank System for Genetic preservation and eventual outplanting
- Reef Transit Photogrammetry on permanent markers
- Coral Tagging and Monitoring

Coral restoration efforts have been led by Simon Walsh, the Director of Coral Habitat Restoration at Oceans Forward and Project Manager at Resilient Dominica. The above has been funded by Private Donations, Oceans Forward, Resilient Dominica and Nature Island Dive, and recently AGRRA /Ocean Research Education and MPA Connect. Permissions and assistance has also been provided by the

Dominica Fisheries Division.

More details on In Situ Nursery here:

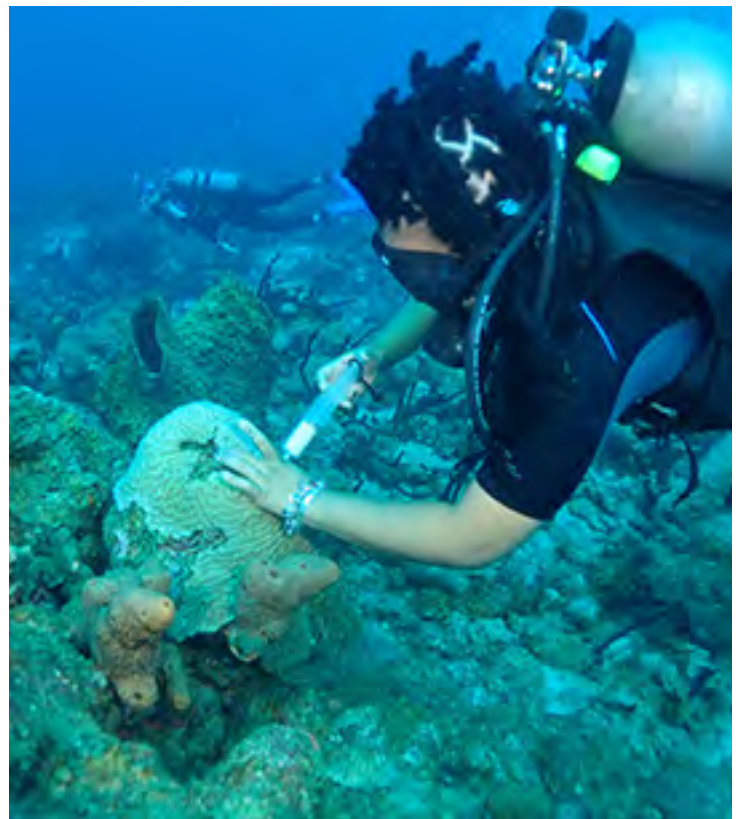
<https://public.tableau.com/app/profile/bingqian/viz/DominicaCoralRescueCenter-CoralRescueOverview/DominicaCoralRescueCenter>

The main restoration activities include:

- Ecological Restoration: Once the current main threats to the reef systems have subsided (SCTLD and bleaching), outplanting of stony corals from the ex-situ fragmentation project will begin.

Stony Coral disease Treatment Program,

- Diadema settlement Project
- In situ Nursery for Stony Corals
- Ex Situ Tank System for Genetic preservation and eventual outplanting
- Reef Transit Photogrammetry on permanent markers
- Coral Tagging and Monitoring



Our future restoration goals and needs include:

a) Goals: Surviving the 2024 anticipated bleaching event with a good selection of species and genotypes. Once that is accomplished to improve fragmentation to outplanting protocols and efforts.

b) Needs: Long-term funding for sustainable financial business planning, and Human Resource development for employment within the community.

*Soufriere-Scott's Head
Marine Reserve (SSMR) was
established in 1987.*





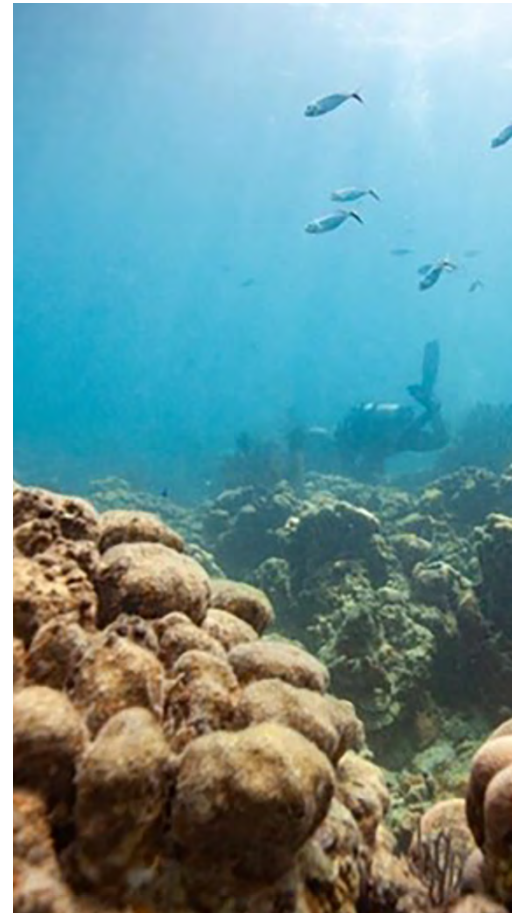
DOMINICAN REPUBLIC

The reefs from Saona Island to Catalina Island are fringing reefs, including reef patches, spur and grooves, and walls

Since FUNDEMAR started the coral reef monitoring program, southeastern Dominican Republic had some of the healthiest coral reefs in the country, highlighting the species diversity and coral cover in Catalina Island (60% of coral cover). After the arrival of SCTLTD in 2023 and the massive bleaching event in 2023, our reef sites have been greatly impacted,

losing 40-60% of coral cover in just 2 years.

FUNDEMAR along with other partners is comanager of the 2nd largest marine protected area in the country, The Southeastern Reefs Marine Sanctuary (SAMAR). SAMAR, is a natural reserve, with an area of 7862.52 km², where a robust monitoring and restoration plan is being implemented in partnership with Government, NGOs, private sector and science technology partners.



Also, we are part of the co-management council Marine Mammal Sanctuary Bank of Silver and Christmas, where most action have been focus on the humpback whale conservation, however in 2022 we conducted a reef monitoring on Silver Bank and these year we will implement it in Christmas Bank Threats to our reefs include high boat traffic, lack of implementation of regulations, overfishing, and climate change.



Rita Ines Sellares Blasco

Rita Ines Sellares Blasco, CEO of Dominican Foundation of Marine Studies (FUNDEMAR), with more than 20 years in the Dominican Republic working for marine and coastal conservation through: research; management; community integration/capacity building; building and implementing robust and permanent monitoring programs and science-based restoration programs.

REPORT FROM THE
DOMINICAN REPUBLIC

DOMINICAN REPUBLIC

We just finished the management plan of the area, and this will provide a high support to improve management in the area.

FUNDEMAR has two programs:

a.- Coral assisted sexual reproduction. Being able to produce half a million recruits /year of 7-8 species. Also we build year by year the spawning calendar.

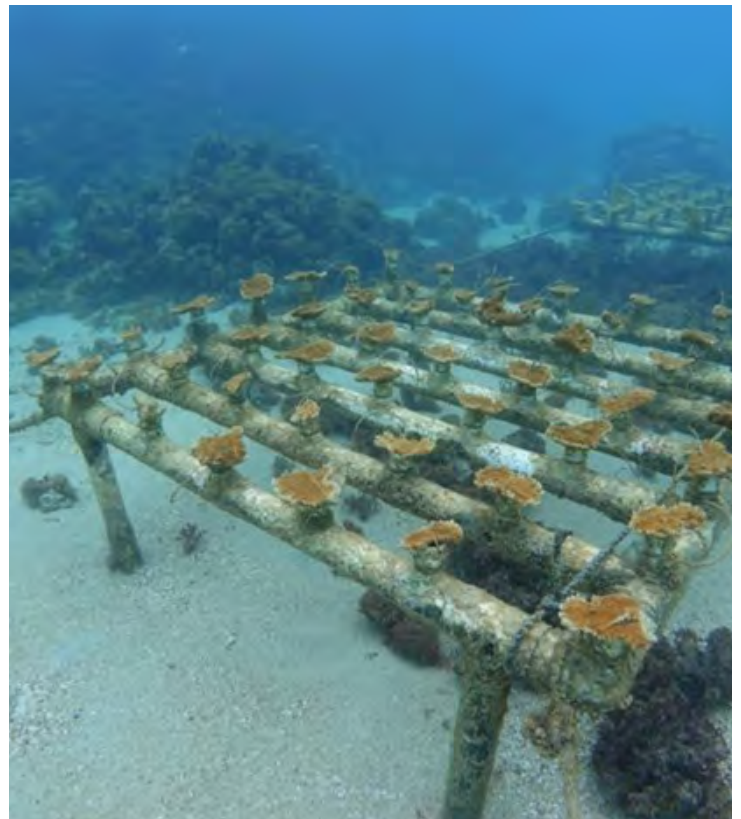
b- Nurseries: *Acropora cervicornis* nursery used as genetic bank, as a refuge for fish and other individuals, promotes larval connectivity, reduces stress over the diving sites, and we also use it for our gamete collection for assisted coral reproduction; *Acropora palmata* nursery, as a production nursery,



where we produce minifrags of a few centimeters to outplant into the reef.

We also use both nurseries to keep part of the sexual recruits, for their future reproduction. Our goal is to scale up coral monitoring and restoration with a focus on assisted sexual reproduction, creating more local capacity and expanding the efforts in a national level through the spawning network created.

We are building the new marine research center as part of the Marine Innovation Hub for the DR, a synergy of effort build along Fundación Grupo Punta Cana, TNC, Ocean Kind and other partners, to strength synergies among scientists, technology partners and scale coral conservation.





GRENADA

Molinere Beausejour Marine Protected Area (MBMPA)

Fringing reefs and patch reefs from shore with intermittent small seagrass beds. This is followed by sloping reef edges/shallow walls down to ~80-100 ft which are all within 200 ft from shore. The flat reef areas that sit between 10-30 feet have good sea plume and sea fan cover (image above from Flamingo Bay) mixed in with hard corals. MBMPA also is home to the Underwater Sculpture park. This MPA also includes 3 shipwrecks, multiple community groups, a river mouth, and plans for a jetty installation in Dragon Bay (middle of the MPA). Includes 20% of the dive sites and 95% of the snorkeling involved in the tourism product.

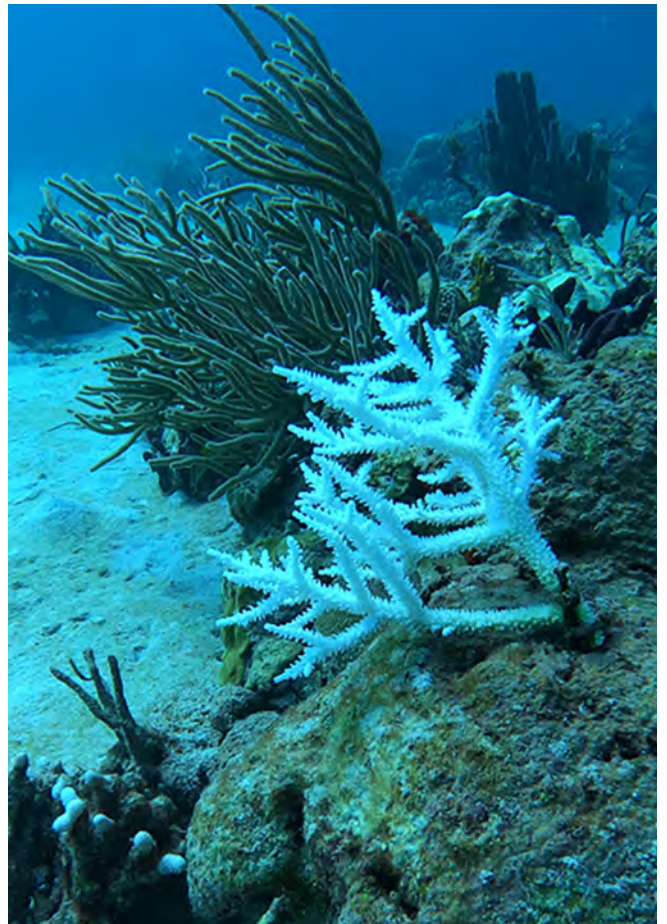
Grand Anse Marine Park (GAMPA)

Great diversity of reefs from shallow soft coral dominant reefs to deeper hard coral dominant reef

slopes, large shipwrecks, potential for stronger currents, location of 2 pre-existing GoG coral nurseries. This MPA once regulated (already legislated broadly) and launched will include 75% of dive sites used by the scuba industry. This area starts from the mouth of the main harbour of Grenada and is under Port Authority control for ship traffic etc which impacts anchorage areas and moorings possibilities.

MBMPA: Impacted by SCTLD and 2023 bleaching but reefs maintain decent coral cover and reduced algal cover in comparison to reefs closer to the **St George's harbour**. Bleaching 2024 is definitely a threat as systems are stressed. Government with the investment in 31 new sculptures in Nov 2023 are invested in restarting the MBMPA patrol system. Since December moorings have been installed in the park and there are daily patrols by observers/

Grenada



wardens who record activity and check moorings and maintain. Tourism is spearheading currently consultations to restart the payment system ASAP. For those of us who know the area we see degradation and change, particularly in the last few years with recent stressors including no fishing controls or patrols for anchoring etc.

GAMPA: Also heavily impacted by SCTLD and bleaching in 2023. The reef sites closest to the harbour of Grenada have more algal cover and less diversity. Reef quality however down by the airport point is much better and has even less algal cover in general than the sites of the MBMPA. Both MPA's are flanked with point sources of water quality concern including national dump site, sewage outfall pipes and watercourse runoff areas. This MPA includes some beautiful diving in mixed high multi-use areas.

Christine Finney- co-owner of Eco Dive and Freediving & Scuba Instructor. I'm an ocean-baby, grew up on the east coast of Canada in the tidal pools of New Brunswick and Nova Scotia. Went to McGill and from there got into tropical ecology via their Bellairs Research Institute in Barbados and then CERMES U.W.I. My graduate work was on zooxanthellae work around the 2005 bleaching event. I got into PADI recreational dive teaching during my thesis work in Barbados and blink, 20 years have gone by mixed with research, dive training, tourism, MPA's, opening dive shops and feeling blessed to be in this beautiful part of the world - now let's find the best ways to keep it that way! Happiest when underwater.



Christine Finney

GRENADA

Threats to reefs include:

- SST, bleaching and it's impact on reduced resilience for other pre-existing stressors
- SCTLD had a large impact over the past few years
- Land based pollution from sedimentation and nutrient loading.
- 2 sewage outfalls flanking the GAMPA. MBMPA is down current of the national landfill
- Anchoring and ship damage
- Over/uncontrolled fishing

Management Activities to address threats:

- MBMPA restarting presently to patrol to help reduce illegal anchoring, fishing

- Coast guard in discussion with Gov to support MBMPA

Current restoration activities include:

- *Acropora cervicornis* (ACER) nurseries A-Frame and trees active up until 2023 bleaching event where nurseries and outplants in 11 m of water saw ~ 100% mortality
- *Acropora palmata* (APAL) fragments of opportunity out planted bit deeper (from 2 m – 6/7 m), these survived the bleaching event but remained pale for months and recently suffered breakage in a swell event.
- Large anchor damage patch from SV Mandalay, corals shattered (*Orbicella* spp. (ORBI), *Pseudodiploria strigosa* (PSTR)) were replanted in hopes of frags growing together and reforming larger colonies. These suffered heavily from the bleaching event fall 2023



Next steps?

Yes please! What's the best focus given the heat our oceans are seeing? How do I best save our tiny amounts of remaining ACER in an in-situ setting? Ex situ currently not an option.

Our future coral rescue and restoration future goals and needs are:

- Structured plan for Grenada based MPA's that will enable us to help our reefs!! And (finally) proper permission to do restoration work & provide some 'official' standards
- Support from groups like this to show legitimacy and give support to the approach proposed (and seeking permission).
- Strategies on how best to deal with elevated water temps and prioritize needs/best use of resources. Species diversity protection over biomass?
- Help to make a plan! Motivation and structure to get back off the ground in a way that feels

more hopeful.

- corals shattered (*Orbicella* spp. (ORBI), *Pseudodiploria strigosa* (PSTR)) were replanted in hopes of frags growing together and reforming larger colonies. These suffered heavily from the bleaching event fall 2023
- Help to make a plan! Motivation and structure to get back off the ground in a way that feels more hopeful.

Our primary goals of coral restoration are Ecological Restoration, Maintain Biodiversity, Ecosystem Services Restoration, and Educational Outreach.





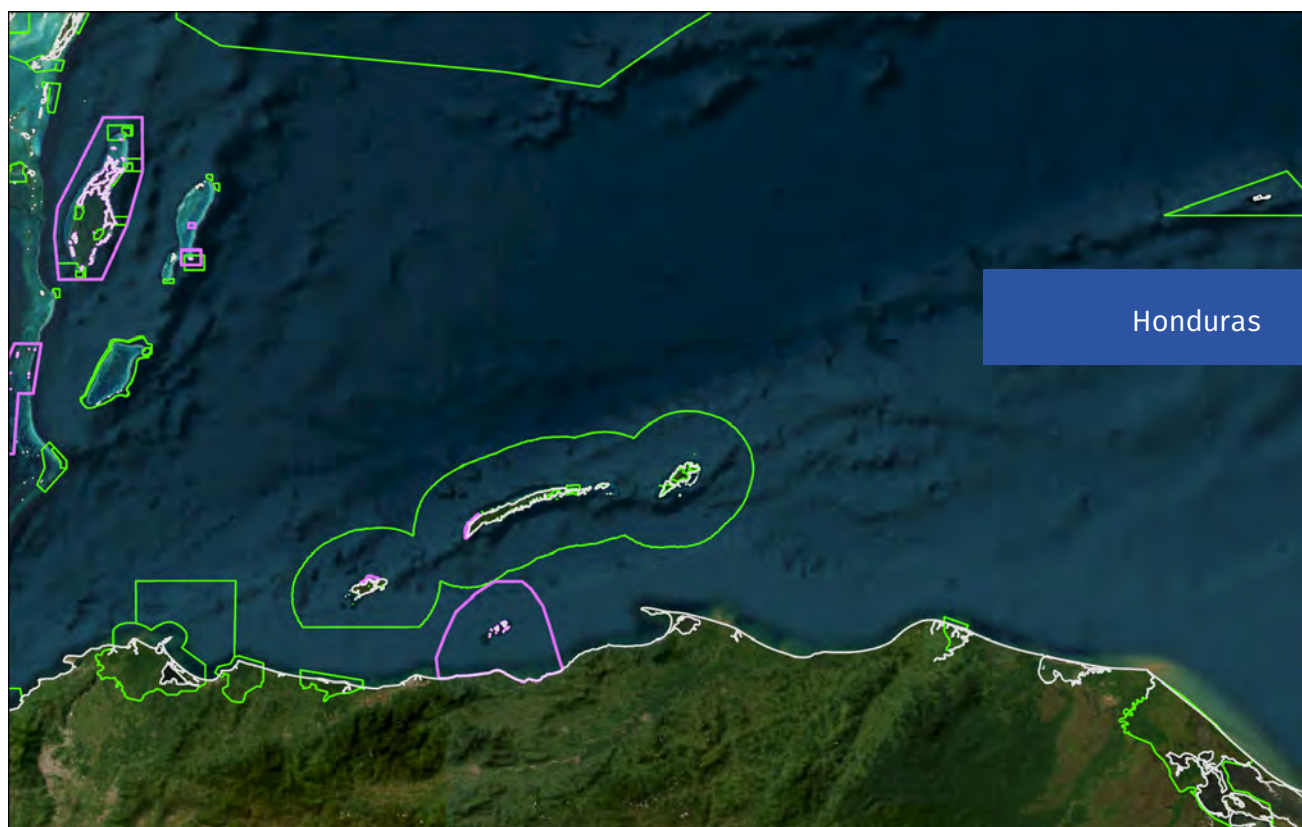
HONDURAS

The Bay Islands National Marine Park has highly diverse coral reefs with examples of almost all known morphologies. The variety of habitats made it possible to have rich and diverse flora and fauna. Peak biodiversity in coral communities can be found on external slopes between 10 and 20 meters deep, which is consistent with optimal light penetration and water flow conditions. However, coral reefs aren't found only in the shallow waters of the Bay Islands National Marine Park, coral formations exist deeper than 30 meters (mesophotic corals) which are found between 30 and 180 meters deep with hard corals (Scleractinians) present, although often dominated by other important benthic groups such as soft corals (Octocorallia), black coral (Anthipatharia), macroalgae, and sponges. A

variety of coral reefs, including abundant populations of *Acropora palmata* and *Agaricia* spp., are found along several areas of the Honduran coastline.

THE MAIN THREATS TO ARE REEFS ARE:

- Wastewater management systems do not work
- Deforestation and land use change (Sedimentation/Coastal Runoff)
- Unsustainable fisheries activities – not industrial, artisanal
- Urban development
- Invasive species (*Pterois* spp.), non-native raccoon overpopulation
- Solid waste management (plastics, landfill full)
- Diseases – stony coral tissue loss disease mainly
- Massive Bleaching Events – massive mortality
- Oil spills from small dive vessels
- Sargassum bloom
- Law enforcement, lack of political will, ineffective legislation



Honduras

Martha Medrano – Protected Areas Coordinator for the National Institute of Forest Conservation and Development, Protected Areas and Wildlife (ICF for its Spanish acronym). Biologist interested in marine conservation, for the past two years has been in charge of the management of four protected areas: (1) Bay Islands National Marine Park, Port Royal National Park, Guanaja III Forestry Reserve, and the Turtle Harbour Wildlife Refuge. She is also the president of the BINMP Technical Committee, PADI Advanced Open Water Diver, Rapid Reef Response Brigades Coordinator for the Bay Islands, experience in coral nursery maintenance and monitoring, participated in coral spawning monitoring dives with RMP

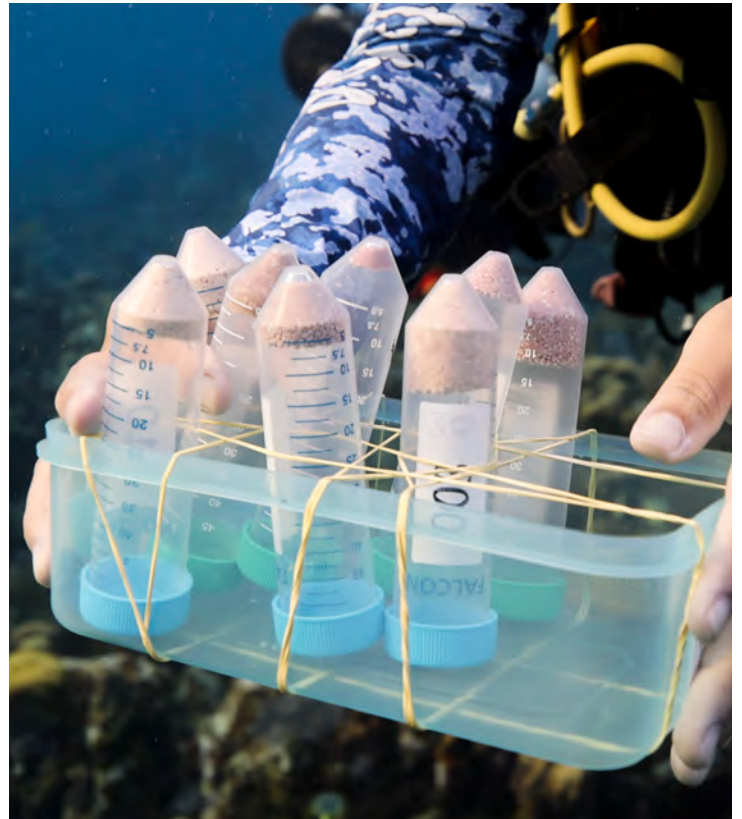


Andrea Godoy Mendoza – Program Manager for Roatan Marine Park, in charge of overseeing the organization's Research and Patrols programs. Biologist with over 5+ years' experience working in various MPAs around the country such as the Bay Islands National Marine Park (Utila for 2+ years; currently in Roatán for close to a year and a half) and the Cayos Cochinos Archipelago National Marine Monument (1+ year). PADI-certified Open Water SCUBA Instructor with over 1000+ dives all over the Caribbean. AGRRA-certified surveyor for Fish, member of the Bay Islands Rapid Reef Response Brigade, national representative and chairperson of the Mesoamerican Reef Restoration Network. Highly proficient in various innovative coral restoration techniques and approaches including asexual propagation (fragmentation and microfragmentation) and assisted sexual coral reproduction, as well as in managing coral restoration projects for marine conservation NGOs.

HONDURAS

There are three organizations within the BINMP that are actively working in reef restoration. These institutions are BICA (Roatan and Utila chapters), Roatan Institute for Marine Science (RIMS) and Roatan Marine Park (RMP). The methodology used is mainly asexual coral reproduction through fragmentation and in-situ nurseries (Christmas trees and tables) and efforts focused mostly on Acroporids and other branching species. In the last 3 years only, through collaborative efforts such as Coralmania and Coralpalooza, more than 3000 Acroporid fragments have been outplanted back on the reef. Most recently, both RMP and

RIMS have implemented microfragmentation as an innovative coral restoration technique to work with massive corals that saw their populations decimated after the devastating effects of SCTLD. Some of the species that are being propagated through this technique include *Diploria labyrinthiformis*, *Pseudodiploria strigosa*, *Colpophyllia natans*, *Montastraea cavernosa*, *Orbicella annularis*, *Orbicella faveolata*, etc. RMP currently has 5 trees dedicated to this technique and some of our microfragments have been in nursery environments for over 6 months at this point. It is our hope to be able to outplant soon but that is very dependent on water temperatures remaining stable, which we have been closely monitoring.



As of 2021, Roatán Marine Park – with guidance and support from SECORE International – has created the very first Coral Spawning Prediction Calendar for Honduras and has, to this day, managed to validate over 8 different coral species and narrow down to just a couple of days a month per species to observe spawning, collect gametes and perform assisted sexual fertilization efforts. The first ever assisted sexual fertilization effort in the country took place in September 2022 with *Orbicella faveolata* gametes, which was successful but unfortunately did not settle well in the CRIB. Since then, RMP has managed to continue collecting data pertaining to spawning windows in the Bay Islands (Roatán and Guanaja, now Cayos Cochinos a bit more recently) and conducting other

successful assisted sexual fertilization efforts in the Bay Islands. So far, with this technique we have been able to restore approximately 300m² of live tissue on the reef.

RMP has recently been implementing photogrammetry as means to monitor our prioritized restoration sites and have managed to produce 6+ photomosaics as baseline for some of these sites, as well as use the tools for other purposes.



Goals – biodiverse and resilient coral reefs, increase fragments/m² of live tissue back on the reef, qualified local technicians (installed capacity), technical and logistical support from international partners, ability to look for and apply for funding, etc.

Needs – funding, technical training, access to resources, upscaling of existing efforts on a larger scale (i.e. expand to the mainland), more involvement from local authorities with reef restoration and conservation efforts, a well-established legal framework for marine and coastal policies.

Opportunities – largest marine protected area in the country, economic development due to multiple activities (tourism, fishing, diving, science, etc.), our reefs can still recover (not fully lost), relatively high presence and involvement of key stakeholders in the area, capacity has already been installed, partnerships with supporting entities in marine conservation and management topics,



MEXICO

The Mexican Caribbean is part of the second most important barrier reef in the world and the first transboundary barrier reef. We found fringing reefs, isolated patches of corals, seagrass meadows, and gorgonians. There are unique reef sites such as “Cuevones”, in Cancún, which has been closed to all types of activities since 1998 because of a stranding and where important restoration actions have been carried out. Puerto Morelos is the largest patch of *Acropora palmata* in the Mesoamerican reef system and Cozumel, until before the fourth world bleaching event, was the healthiest place in the Mexican Caribbean. Likewise, Banco Chinchorro is a platform-type reef forming a ring of approximately

115 km in perimeter.

Based on the latest report on healthy reefs (2022), bad and critical sites are presented from the center to the south of the Mexican Caribbean. Only one site ranked ‘Very Good,’ in Cozumel. This site has been fully protected for decades. Cozumel has the highest fish biomass.

In the state of Quintana Roo there are 25 Protected Natural Areas of federal jurisdiction, covering an area of 7,440,546.41 hectares. The Mexican Caribbean is located on the coasts of the state of Quintana Roo where there are 9 Marine Protected Natural Areas, with an area of approximately 6,545,222.36 hectares.



Mexico

The main threats are increased water temperature (bleaching), emerging diseases (SCTLD), tropical storms (increased frequency and intensity), strandings, poor tourism practices, wastewater pollution, poaching, overload of visitors, exotic-invasive species (lionfish), and poorly planned coastal development.

Management activities to address these threats include: influencing public policies such as territorial planning, implementation of permanent coral restoration programs, strengthening supervision and surveillance, carrying out systematic monitoring of the condition of the reefs and monitoring of water quality, having mechanisms to encourage lionfish fishing, and conformation of community brigades for coral restoration and attention to post-storm damage.

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Jorge Christian Alva Basurto is a Specialist in cooperation projects at the National Commission of the Natural Protected Areas. His research has included studying coral reefs, fish, crustaceans, mangroves, seagrasses, ecosystem services, marine biodiversity, and the effects of climate change on Caribbean coral reef food webs.



Jorge Christian Alva Basurto

Coral restoration in MPAs

MPA: Costa Occidental de Isla Mujeres, Punta Cancún y Punta Nizuc.

Category: National Park

Project: Restauración Ecológica Integral de Arrecifes Coralinos en la Isla Cozumel

Species: *Acropora palmata*, *Acropora cervicornis*, *Orbicella annularis*, *Montastraea cavernosa*

Techniques: Fragmentation, microfragmentation, multipruning

Goals: Production of new colonies for reintroduction to the reefs with the greatest impact and damage.

Partners: Instituto Mexicano de Investigación en Pesca y Acuicultura Sustentables (IMIPAS) Puerto Morelos, prestadores de servicios turísticos, voluntarios locales, organizaciones de la sociedad civil.

MPA: Arrecife de Puerto Morelos

Category: National Park

Project: Restauración Ecológica de los Arrecifes Coralinos

Species: *Acropora* spp. *Orbicella* spp

Techniques: Collection of fragments of the species.

Goals: 2.3 hectáreas.

Partners: Brigadas comunitarias y Instituto Mexicano de Investigación en Pesca y Acuicultura Sustentables (IMIPAS) Puerto Morelos.

MPA: Arrecifes de Cozumel

Category: National Park

Project: Restauración Ecológica Integral de Arrecifes Coralinos en la Isla Cozumel

Species: *Acropora palmata* y *Acropora cervicornis*

Techniques: Asexual reproduction through assisted fragmentation and dispersal of fragments.

Goals: Sembrar, monitorear y mantener 500 fragmentos de coral en 6 sitios de restauración.

Partners: Colectivo Corales Vivos Cozumel, Instituto Mexicano de Investigación en Pesca y Acuicultura Sustentables (IMIPAS) Puerto Morelos, UNAM Puerto Morelos.

MPA: Arrecifes de Xcalak

Category: National Park

Project: Programa de Restauración de arrecifes.

Species: *Acropora palmata* y *Acropora cervicornis*



Techniques: Installation of grill-type nurseries, floating nurseries, and spider-type nurseries.

Goals: Rescue acroporid colonies.

Partners: Oceanus, A.C.

MPA: Banco Chinchorro

Category: Biosphere reserve

Project: Emergencia por presencia de la enfermedad "Síndrome Blanco" o SCTLD

Species: *Dendrogyra cylindrus* y *Meandrina meandrites*

Techniques: Relocation of fragments to isolated floating nurseries.

Goals: Rescue the largest number of living fragments of species highly vulnerable to Stony Coral Tissue Loss Disease (SCTLD).

Partners: MAR fund; Espacios Naturales y Desarrollo Sustentable.

Future priorities include:

Goals

- Increase the restored surface.
- Recover the ecological services provided by coral reefs.
- Attend sites affected by climatic and anthropic factors.
- Implement the Action Plan for massive bleaching events in Protected Natural Areas. PDF (draft).

Needs

- Financial and human resources to increase coral restoration efforts.
- Training in new restoration techniques.
- Equipment for diving equipment, boat engines and monitoring water quality.
- Increase the training of community brigades.
- Enable laboratories for the propagation of corals through sexual reproduction.

c) Opportunities

- Collaboration with other institutions.
- Integration of the public sector.



Figure 2 – A beautiful example of a *Acropora palmata* encrusting a volcanic bolder.
Credit: Alwin Hylkema



SABA

Saba National Marine Park, an 800 hectare (2,000 acres) protected area, was established in 1987 to safeguard the island's pristine coral reefs and the marine environment. The park extends from the high-tide mark to a depth of 60 meters (197 feet), circling the entire island. Figure 6.

The Saba Bank National Park is a vital submerged atoll, the largest in the Caribbean at 1,850 km². It holds unique ecological, socioeconomic, and cultural significance. Previously vulnerable to damage from international shipping, risks have been mitigated through PSSA status.

In Saba, there are only two "true" reefs. Most Saban reefs are based on volcanic boulders Figure 2 w that

have entered the ocean through erosion, igneous rock, or exist on large pinnacles created by volcanic activity, see Figure 3. The coral reefs of Saba have been monitored since the 1990s. During this period, coral coverage has dramatically decreased from 8-22% to just 2-3% by 2023

A key signature of a Saban reef is the depth at which *Acropora palmata* and *Acropora cervicornis* can be found. *Palmata* is known to grow at depths of 12 meters (39 feet) around the island, and the Saba bank. Hundreds to a thousand healthy colonies can be found here. Historically, large *cervicornis* fields could be found up to 30 meters (98 feet) deep. However, only a handful of *cervicornis* can be found around the island.



Saba
Conservation
Foundation

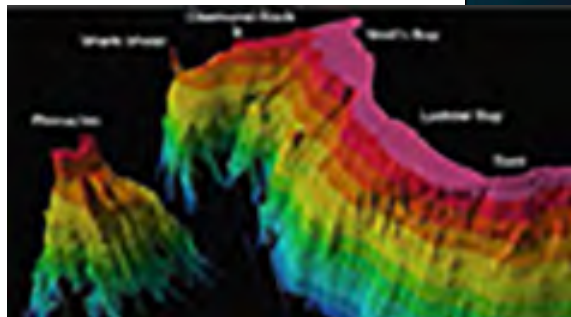
Camille Tuijnman, MSc.
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J. Credit:
Caren
Eckrich

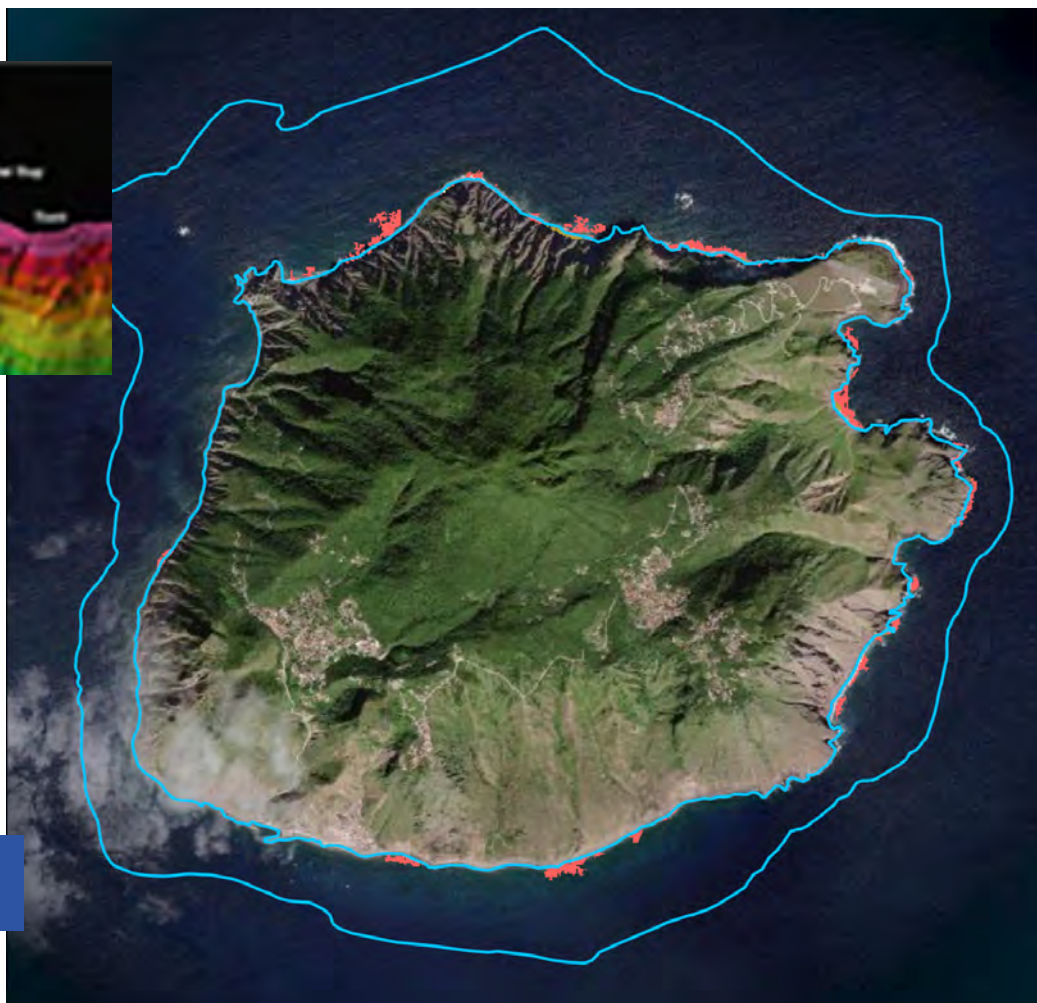
Camille Tuijnman

Hello, I am **Camille Tuijnman**, a Marine Park Officer at the Saba Conservation Foundation (SCF). My colleague Marijn van der Laan and I manage the Saba National Marine Park and coral nurseries, focusing on coral outplanting and restoration. This July, we will launch a major coral relocation project to conserve biodiversity.



This bathymetry of Saba shows the steepness of the sea floor in 10 meter (33 feet) intervals. Above: the pinnacles can be found around 30 meters (98 feet) depth. (Figure 3.)

SABA



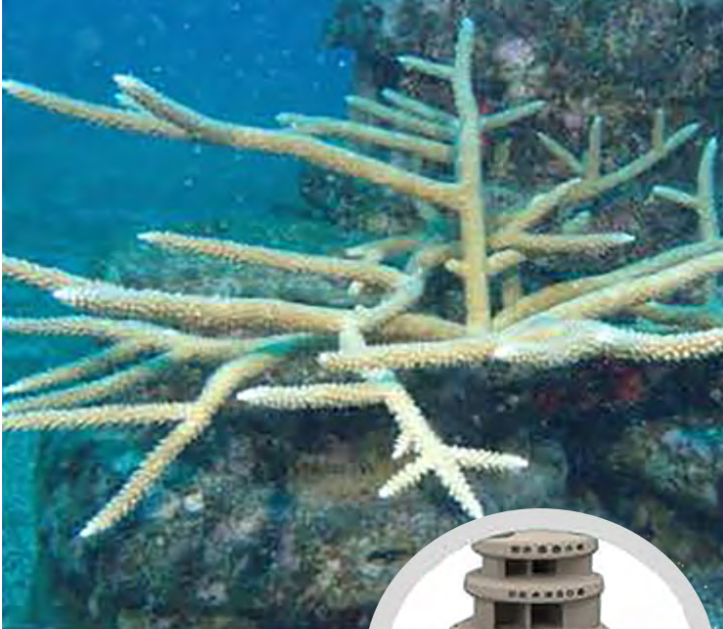
REPORT FROM SABA

This brings us to one of Saba's biggest challenges. Due to the greater depth, the growth rate of Saba corals is significantly lower. Consequently, relocation and restoration efforts are less effective, as the corals do not have sufficient time to rebound between natural disasters.

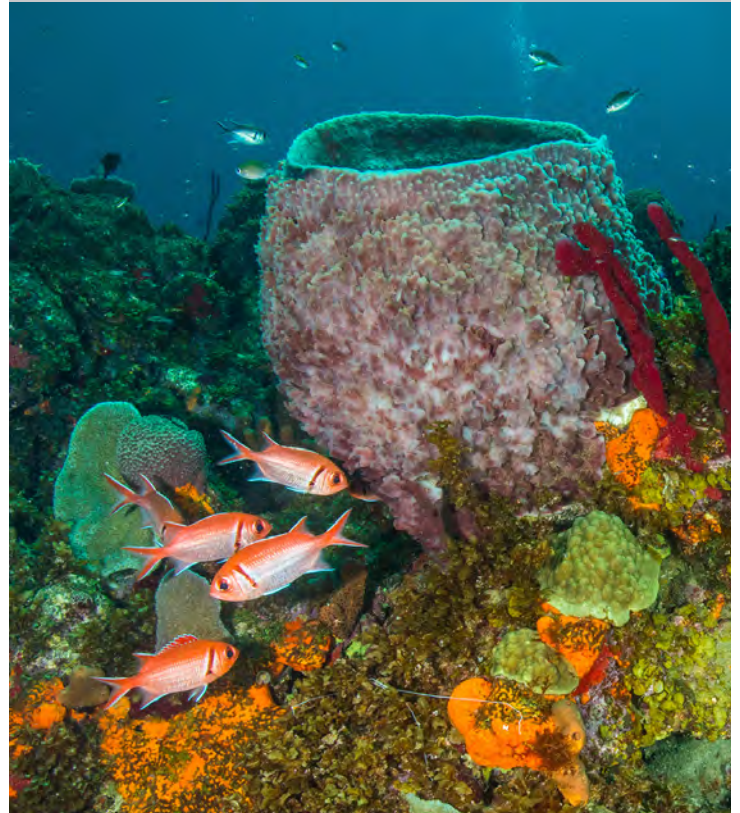
Another challenge is the increase in macro-algae growth on the reef. This growth surge is due to the decline in sea urchin populations during the early 1980s, over-fishing of herbivorous fish, and increased nutrient runoff.

Furthermore, island erosion leads to sedimentation and increased nutrient pollution, particularly on the island's west side. This calmer side is home to one of our nurseries, where sediment can linger on coral trees for up to a week.

Finally, the construction of a new harbor in 2025, see Figure 5 and Figure 6, will bring increased coastal development, including hotels and more roads, creating "highways" for nutrient runoff. To decrease runoff, the goat population on Saba is regulated by the government.



Cervicornis outplanted on a reef ball structure. Window: Example of reef ball structure. Credit: Alwin Hylkema.



An Environmental Impact Assessment (EIA) conducted in preparation for the harbor found that four red-list coral species—*Acropora cervicornis*, *Acropora palmata*, *Orbicella annularis*, and *Orbicella faveolata*—will need protection during construction. SCF has partnered with Coral Vita to relocate these corals to nurseries and for outplanting. However, the budget does not cover the relocation of other coral species.

Since 2016, SCF has maintained 22 coral trees divided over two nurseries. However, low capacity leads to infrequent outplanting and maintenance. The SCF has received funding from the NEPP coral restoration plan for coral restoration in 2024.

We hope to restore ecosystem services such as economic value through tourism and fisheries. We are looking to increase our capacity by hiring more staff experienced in coral restoration. This will require funding.

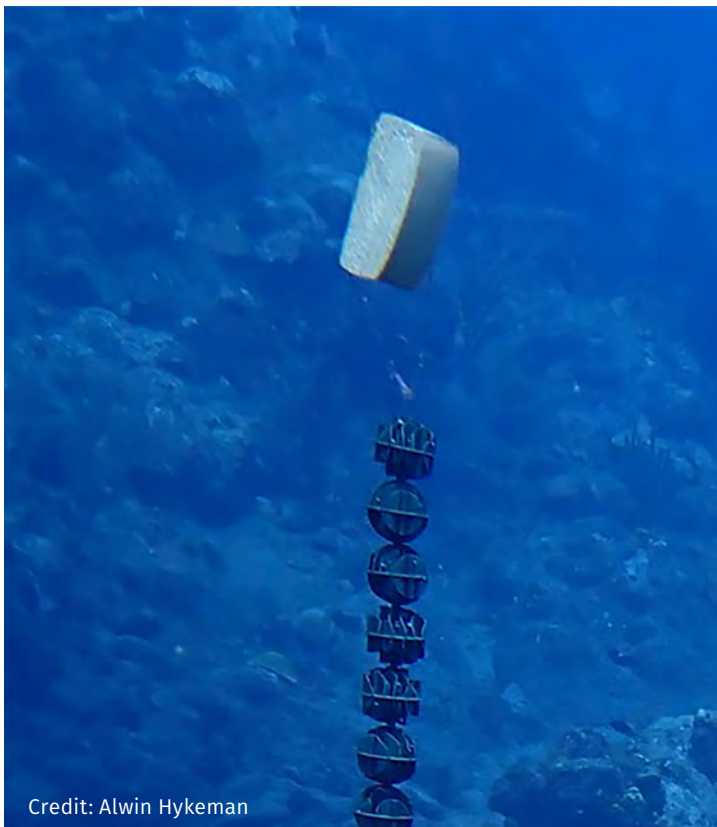


Figure 5 – Plans for the new harbor at Black Rocks, to be realized in 2025. This harbor will be located East from the original harbor Fort Bay. Credit:

Figure 6 – Zonation of the Saba Marine Park. Credit: Marijn van der Laan





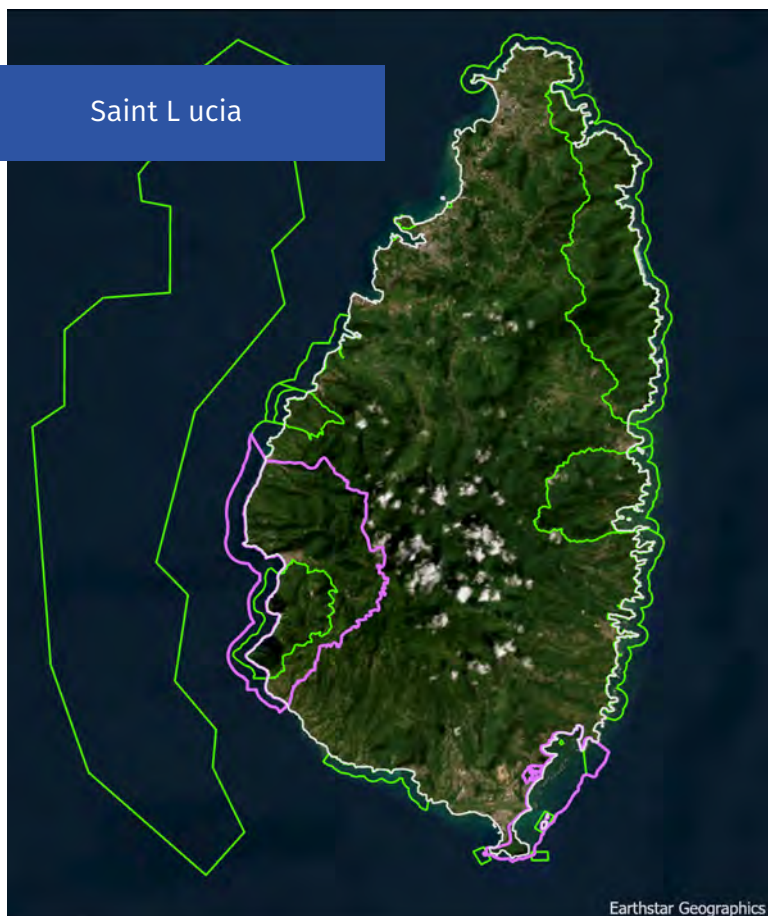
SAINT LUCIA

Saint Lucia is a volcanic island in the Eastern Caribbean surrounded by a narrow coastal shelf and diverse marine ecosystem. The west coast has a narrow shelf with shallow patch reefs, nearshore boulders with small corals, and steep slope wall reefs have high sponge and fish diversity. The east coast has a wide shallow shelf with reef flats and large population of *Acropora palmata* in the NE corner of the island. The south coast has patch reefs. The current status of most of the reefs is unknown. However, many of them are now either average/poor, mainly because of the combined impact of coral bleaching, SCTLD and reduction of herbivore populations (sea urchins and parrotfish)

over the last couple of years.

The main threats include marine pollution, especially near Soufriere, including poor waste management, household waste entering the bay, effluence from ships and recreational vessels, discarded and lost fishing gear, and potential effect of non-reef safe sunscreens in heavily tourist dominated areas. Disease and bleaching events have reduced species abundance and diversity on many reefs and it has been difficult for the habitats to improve due to additional stressors such as poor waste management, overcapacity of heavily tourism driven beaches and other unsustainable practices. Fishers target fish of varying sizes and

Saint Lucia



don't allow important species, such as parrotfish, the opportunity to regenerate. The fishing techniques utilized also damage the reefs

Management activities to address threats include:

- Seasonal closures to ensure that species are protected and allowed to reproduce
- Suggested rotation of tour operators including dive operators at the different recreation sites so as to reduce the stress that is placed on the ecosystems
- Mesh size limits for the fishing nets
- Spatial closures, namely Marine reserves and MMA (Soufriere)

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Two marine protected areas in Saint Lucia that are part of the MPACONnect Network include: Point Sable Environmental Protected Area (PSEPA) and Soufriere Marine Management Area (SMMA).

.....

My name is **Makeba Felix** and I am a Fisheries Biologist working in the Resource Management Unit of the Department of Fisheries in Saint Lucia (SLU). I have four (4) years of experience working in fisheries management and research in Saint Lucia.

Makeba Felix



Current restoration activities include:

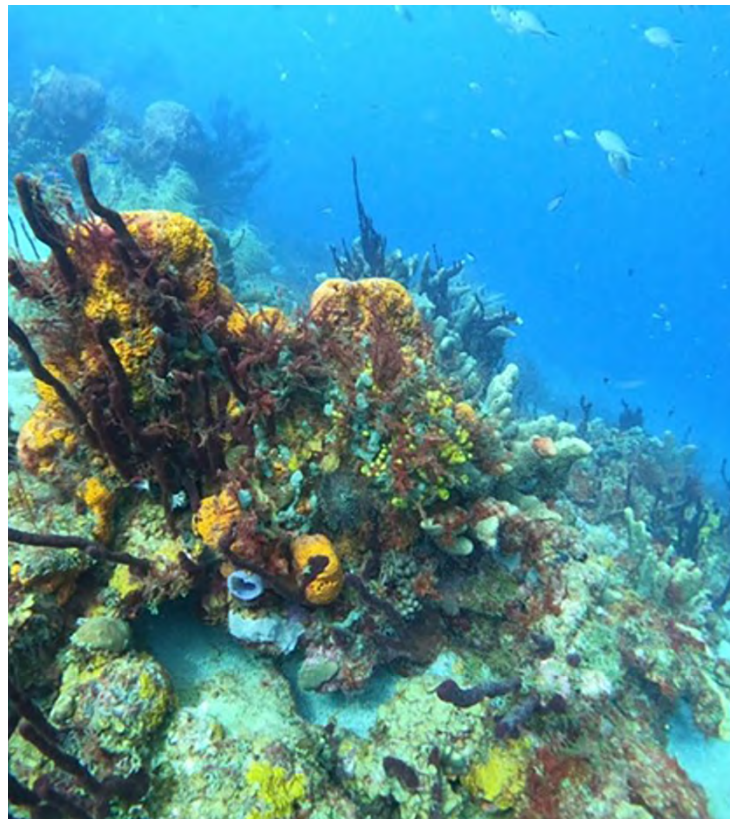
CLEAR Caribbean and Sandals Foundation

Coral Gardening and Restoration was first introduced to Saint Lucia in 2016 by The Centre for Livelihoods, Ecosystems, Energy, Adaptation and Resilience in the Caribbean Limited (CLEAR Caribbean Ltd.). CLEAR Caribbean Ltd., is represented in Saint Lucia by its Operations Director Newton Eristhee and Associate Chester Nathoniell who owns and operates Action Adventure Divers in Soufriere. Since 2016, this non-profit has worked with the Sandals Foundation to establish two prolific coral nurseries located within the Soufriere Marine Management Area (SMMA). In 2022, this work continues with the introduction of “Reef Spiders”, which are rebar structures covered in a layer of epoxy and sand. These structures allow Acroporid species to be outplanted over sandy patches in the reef. These have been implemented successfully within the Rchette Point Marine Reserve of the SMMA, near the “Bat Cave”. In

addition, CLEAR Caribbean Ltd. and the Sandals Foundation are developing a sustainable financing mechanism in the form of a PADI Distinctive Specialty in Coral Gardening, as well as the National Vocational Qualification in Coral Gardening and Restoration with the Technical and Vocational Education and Training (TVET) Council under the Disaster Vulnerability Reduction Project. These mechanisms will allow all stakeholders, including dive operators, fishers, community members and tourists to remain involved in the nursery and outplanting programmes. To date, several young adults from the Soufriere and Canaries area have been trained in scuba diving and coral restoration to develop a team of “Coral Gardeners” to ensure longevity of the project and continued benefits for the surrounding communities.

Anse Chastanet Coral Rehabilitation initiative

Divers from the hotel have established two small-scale coral nurseries that can provide several



healthy corals that can be outplanted to the nearby reefs. They have built 10 coral trees and chosen two different dive sites for establishing our coral nurseries. We set up 5 coral trees on Anse Chastanet Reef and 5 coral trees on Turtle Reef dive site (both in Soufriere). Funding is provided by the Resort, and I believe guests may donate. Period monitoring is done by the dive instructors on staff at the Resort's dive operation.

ANBAGLO (Eastern Caribbean Divers)

Saint Lucia Divers Association (ANBAGLO) has established 'The North Project' (2021), through which ten young adults from the Gros Islet area have been trained to PADI Rescue Divers by Donovan Brown, Eget Martyr and Judy Martyr. They have also been trained in the PADI Distinctive Specialty Reef Rescue Diver through Perry Institute for Marine Science. Through the North Project, a coral nursery was established at Cutty Cove, near Windjammer Landing Villa Beach Resort in August 2021. Some

outplanting of Staghorn Coral has been achieved at a nearby site with some success, however more work must be done to establish a sustainable financing method to ensure continuous management of this nursery. Coral Species: Staghorn and Elkhorn. Initial funding was received through grant funding and through the sale of the Reef Rescue Diver PADI Specialty.

Future coral restoration objectives are: Goals:

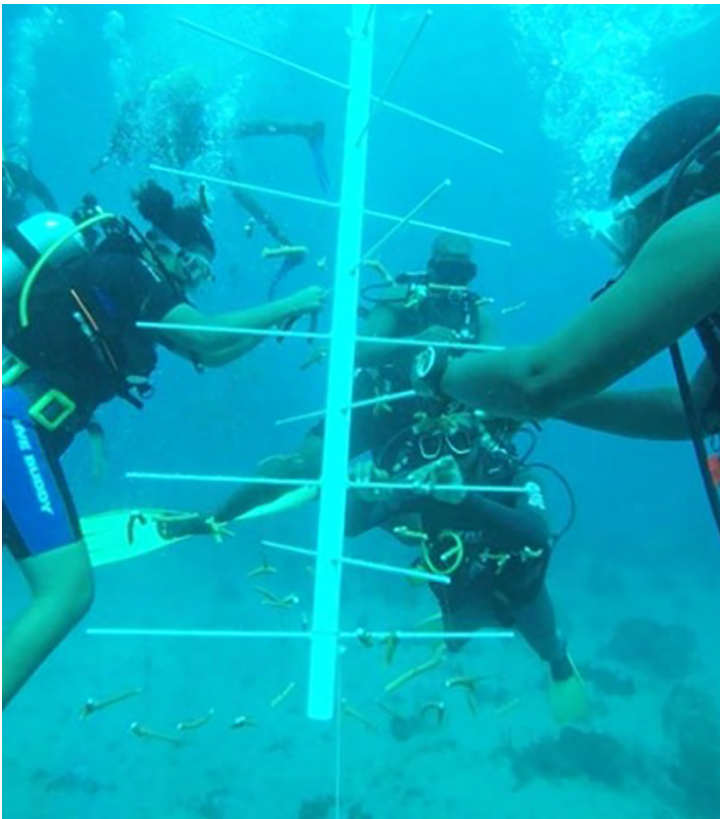
- Full establishment and operationalization of the Coral Enhancement Committee (CEC). This is an advisory body chaired by the DOF with the aim of harmonizing reef enhancement initiatives including coral restoration, established in 2024. This committee is in its very early stages and could like to create an application and reporting framework for coral reef enhancement initiatives as well as provide a network of skilled coral enhancement practitioners to guide decision making with regard to reef enhancement.
- Legislation and/or regulations regarding the establishment and operation of coral restoration initiatives including seeking formal permission and guidance on site selection and the harvest of wild coral colonies for restoration purposes (fragging).
- Set up of an on-land coral nursery as a repository and educational tool, exploring micro fragmentation and growth and restoration of stony coral species.

Needs

- Sustainable funding support
- Assistance with CEC application and reporting framework
- Training of persons in coral restoration for sites which need additional support.

Opportunities

- Creating an island wide network of coral restoration practitioners that can support each





Fringing Reef - Tobago Cays

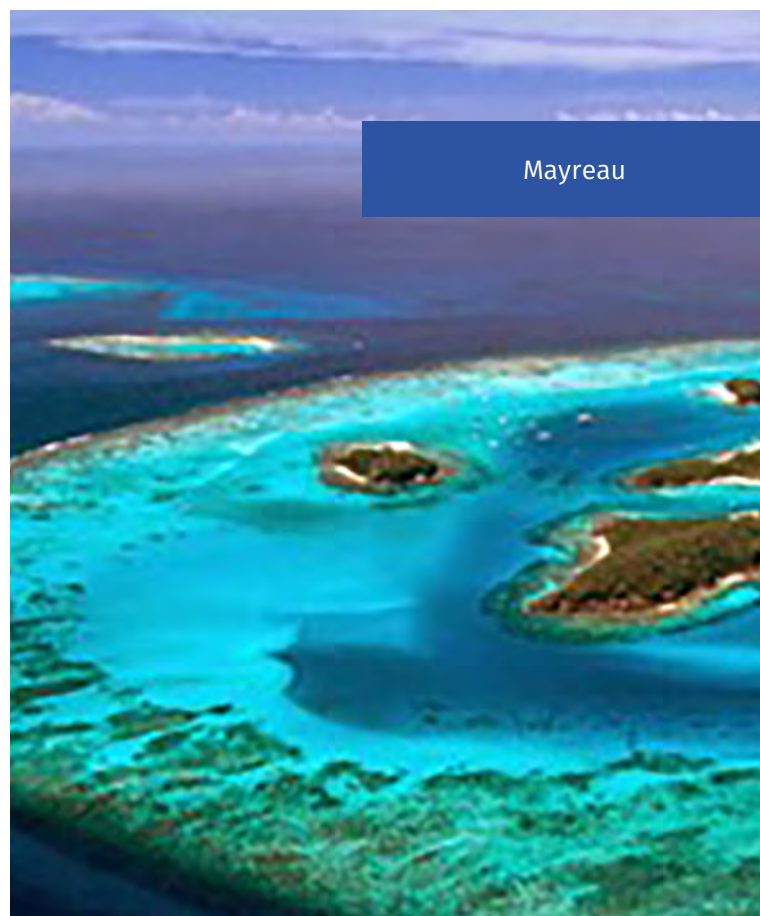
ST. VINCENT & THE GRENADINES

St. Vincent & the Grenadines, in the southern Eastern Caribbean, has 32 islands, with St. Vincent being the mainland and largest island. Other inhabited islands include Young Island, Bequia, Mustique, Canouan, Mayreau, Union Island, Palm Island and Petit St. Vincent.

There are many coral reef types, each provides important habitat. The western, leeward side of islands have a narrow shelf with shallow patch reefs or rock boulders encrusted with small corals and deeper reefs have steeper slopes, greater

coral cover; higher coral, gorgonian, sponge, and fish abundance. Along east coast, windward side of islands, there is higher wave energy, wider shelf, hardground or reef flats, low coral cover and diversity. Tobago Cays has many reef types such as fringing, patch, reef crest, and hardbottom. South Coast has large shallow elkhorn reef, deeper spurs with abundant finger and pencil corals.

The South Coast Marine Managed Area (SCMMA) is located along the south coast of mainland St.



Vincent. Initially designated in 1987 as a Marine Conservation Area, the South coast Marine Conservation Area (SCMCA) was one of ten specially protected marine conservation areas in St. Vincent and the Grenadines. Many reefs have had higher coral cover (25-60%) with Blue Lagoon having largest elkhorn stand. Cover has declined since 2008; high sedimentation a concern. Threats to coral reefs include coral bleaching, SCTLD, overfishing, white plague, recreational activities, unsustainable fishing practices, and grey pollution from commercial buildings etc.

I'm Sheldon Dasouza, a born Trinidadian to both Vincentian parents who went to Trinidad & Tobago during the Economic boom. I'm a holder of a City & Guild Certificate in Electrical Engineering, a BSC. Of Environmental Science in Water and Wastewater Management and Technology. Presently, employed with the Government of ST. Vincent and the Grenadines as a Senior Fisheries Assistant assigned to the Fisheries Services in the Ministry of Agriculture.



ST. VINCENT & THE GRENADINES

A co-management approach to governing and managing the South Coast Marine Managed Area (SCMA) is considered the most appropriate management approach to achieve the following desired strategic objectives:

1. Minimizing the negative pressures that were identified in the 2013 survey of the area¹.
2. To protect and enhance the ecosystems of the SCMMA
3. Generate sustainable social and economic benefits for all stakeholders in the SCMMA.

4. To provide recreational services which are compatible with the SCMMA value and rules.

5. To institutionalize a co-management framework to develop and control the various resources of the SCMMA in equitable and sustainable manner for the benefit of all stakeholders.

Current restoration activities include dives shops that have a nursery where they propagate staghorn and elkhorns fragments and out planting is done where corals were destroyed or died. The primary goals of coral restoration include:



- Ecological Restoration
- Maintain Biodiversity
- Reef Resilience Building
- Ecosystem Services Restoration
- Climate Change Mitigation

Our future goal is to restore live coral cover to an acceptable standard providing all benefits of a healthy reef (reef fishes, predatory fishes etc.). To enhance our restoration efforts, funding is needed for travel/accommodation, snorkeling gear, and compressors for filling air tanks.

For me, knowledge is power. From this workshop, I'm hoping to meet great people with information willing to share. How to create a roadmap illustrating the location, health and other information pertaining to reefs (abundant, health, etc), where I can return and utilize such information and incorporate it into our work here at the Fisheries Division and to create a network between participants.



Tobago Cays



TURKS & CAICOS

The Turks & Caicos Islands are comprised of 40 small islands and cays, 9 of which are inhabited. The Islands lay on 2 sandy banks, the Turks Bank and the Caicos Bank, both of which are bound by a fore reef or wall. Most (>99%) of our recreational SCUBA activities take place along this wall which can start as shallow as 9m and drop to a shelf as shallow as 30m or continue down to the abyss. The top of the wall often has spur and groove formations. On the Caicos Bank rests over 200 km of barrier and fringe reef and scattered patch-reefs. The Turks Bank possesses roughly 30 km of fringe and barrier reef and scattered patch-reefs and the largely submerged Mouchoir Bank.

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Our most recent coral reef monitoring took place in 2023 with GCRMN photoquadrat benthic method. Data analysis is still ongoing and we are planning to revert to the AGRRA method later this summer (2024). Prior to that, we conducted AGRRA based coral reef monitoring at 28 sites in 2019 (same year SCTLD arrived). Those survey sites showed live coral cover averaged at 12.59%, density of coral recruits (<2cm) was 1.92/m², *Diadema* were critically low (0.02 /m²), and fleshy macroalgae averaged 13.81%. Since the 2019 introduction of SCTLD within the TCI, we continue to observe tissue loss disease. TCI was also affected by the 2023 mass bleaching event. Both events impacted our corals and are anticipated to affect the reef health status.

Turks and Caicos



There are 21 Marine Protected Areas 21 sites, including National Parks, Nature Reserves, Sanctuaries, and Areas of Historical Interest. Three of the National Parks are MPAConnect sites Areas of Historical Interest. Threats include disease outbreaks, coastal development, land-based sources of pollution, tourism, illegal fishing, boat groundings, oil spill, and invasive species. Management activities to address threats include disease monitoring, treatment & restoration activity, coral bio-physical monitoring (AGRRA), enforcement patrol, and EIA processes.

Hello, my name is **Rebecca Hamel Pepin**. I'm an Environmental Officer for the Turks and Caicos Islands Government, Department of Environment & Coastal Resources (DECR). I'm a Canadian living in the Turks and Caicos, passionate about nature and the marine environment. I did a bachelor's degree in biology, a masters in Environment and a masters in International Ecology before moving to the island to pursue my dream of working as a marine biologist.



Rebecca Hamel Pepin

Current restoration activities include

Ex-situ coral nursery

1. Turks & Caicos Reef Fund (TCRF)
2. Response to SCTLD
3. Project started through John Ellerman Funding, continues through TCRF donations

In-situ *Acropora* nurseries and out-planting

1. Turks & Caicos Reef Fund (TCRF) and School for Field Studies (SFS)
2. To increase prevalence of *A. cervicornis* and *A. palmata* coral colonies
3. Use of “coral trees” and “washing-lines”
4. Project started through BEST 2.0 funding, continues through TCRF donations

Reef Balls

DECR, TCRF, MerAngel

Create artificial reefs for additional snorkel sites, coastal protection, coral transplanting and juvenile lobster habitat

Funded by private developers and Government funding

Coral rescue/transplant

DECR, TCRF, MerAngel

1. Relocate corals from coastal development direct impact sites. Reattach corals from boat grounding incidents
2. Funded by private developers, court fines and Government funding

Drone mapping of *Acropora* colonies on shallow water reef crests



Our future coral rescue and restoration include:

1. *Acropora* restoration on shallow-water reef crests
2. *Diadema antillarum* restoration
3. Upscaling ex-situ nurseries for future SCTLD impact restoration and genetic quarantine capacity
4. Restoration of SCTLD affected corals using larval propagation
5. Trial manual FMA removal

Our priority needs to enhance our coral restoration efforts include

1. Training in new techniques (*Diadema* husbandry; coral larval propagation; coral husbandry)
2. Funding for fieldwork to develop coral spawning calendar
3. Funding for expansion of ex-situ nurseries



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UNITED STATES & FLORIDA KEYS



Mission to Recover the Coral Reefs of the Florida Keys

The iconic coral reefs of the Florida Keys are the foundation of the vibrant regional economy that hosts 5 million visitors per year. North America's only barrier reef protects the island communities from catastrophic storm surge, while also supporting a world-renowned destination for diving, snorkeling, and fishing. However, decades of compounding stress from coral bleaching, coral disease, hurricanes, and high impact human use have significantly degraded the coral reefs. The United States is on the verge of losing a national treasure. Emergency action is required to keep Florida Keys coral reefs from collapsing beyond a point at which they can be restored and protect the economy that depends on them.

Restoration Strategy

NOAA and partners have developed a bold mission to restore seven ecologically and culturally significant coral reefs within Florida Keys National Marine Sanctuary. The selected restoration sites represent a diversity of habitats, support a range of human uses, span the full geographic range of the Florida Keys, and show a high probability of restoration success. The mission represents one of the largest investments ever undertaken in coral restoration.

Informed by years of research, successful trials, and expertise from scientists and restoration practitioners, this effort complements other regional management efforts and will result in resilient and regenerative coral reefs in the Florida Keys.





Coral reefs are dynamic ecosystems comprised of stony corals, soft corals, sponges, and algae.



Status quo

Current stony coral cover in the Florida Keys is around 2%, based on 2019 observations from Iconic Reef sites only. Historically, Florida Keys healthy reefs had about 30-40% coral cover.



Phase 1

Goal: Restore to 15% stony coral cover
Method: Restore elkhorn coral, a species susceptible to stony coral tissues loss disease. Restore star, brain, pillar, and staghorn corals, and introduce algae-grazing species.



Phase 2

Goal: Restore to 25% stony coral cover
Method: Restore more elkhorn, star, brain, pillar, staghorn, finger, and blade corals to increase reef biodiversity.

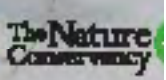
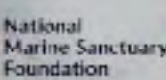
Mission: Iconic Reefs will proactively intervene with natural conditions by restoring a diversity of stony corals, reintroducing algae-grazing species to support coral health, and building community stewardship by engaging stakeholders in the continued maintenance and monitoring of the sites. Active restoration will begin immediately by scaling-up the propagation of quick growing elkhorn and staghorn coral species, rapidly returning structure to the reef. Research and development of restoration methods for the other stony coral species will occur simultaneously to support later phases. The need for additional infrastructure and personnel will also foster a new economic sector for the Florida Keys region, centered around this innovative effort.

Working Together

NOAA isn't in this alone. Our expanding network of world-renowned scientists, federal and state agencies, local restoration partners, and community stakeholders will promote a collaborative effort, so that everyone can make a meaningful contribution to **Mission: Iconic Reefs**.



Sarah Fangman is superintendent of Florida Keys National Marine Sanctuary, overseeing management and operations of a protected area covering 3,800 square miles. She has worked extensively in the Florida Keys conducting more than 600 dives in sanctuary waters. She was twice a saturation diver at the Aquarius Reef Base, an underwater research laboratory located off Key Largo.



CARRIBEAN CORAL RESTORATION ROAD MAPS



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