

Innovative Artificial Reef Structures “IntelliReefs” to Improve Denuded Coral Reefs

Beginning of February 2020, the Ocean Science Team of Reef Life Foundation was on Sint Maarten to assess and research the 14 month performance of the ‘IntelliReefs’ artificial reef substrates which were developed to enhance coral and fish growth; deployed as a premier in St Maarten waters in the end of 2018. The team which collaborates with the Nature Foundation St Maarten was funded by the Waitt Institute, conducted several research and monitoring dives on the ‘coral enhancing’ structures in the Marine Protected Area and on sites around the island. The researchers discovered coral settlement varieties, important coral contributors and highly diverse marine species on the Oceanite substrates. In the coming weeks, samples and monitoring films will be analysed in detail to determine species composition and abundance on these substrates.

The Ocean Science Team consisted of marine biologists, coral scientists, photographers and videographers, storytellers and staff of the Sint Maarten Nature Foundation. They were also locally supported by Pelican Peak, the Scuba Shop, and Dianne Smith, whose catamaran Random Wind, brought all the expedition teams to the dive sites on 29th of January. The scuba shop provided dive equipment and assistance for the team and they experienced the beautiful views and adrenaline

rushing zipline of Pelican Peak. *“We are grateful for our local support in order to improve the resilience of our coral reefs”* stated Melanie Meijer zu Schlochtern, Manager of the Nature Foundation. *“I was very excited to see the amount of life on the IntelliReefs in such a short time, including young coral colonies. Working with an incredible, dedicated team from the Nature Foundation and Reef Life Foundation inspires hope and sparks my imagination as an Art Reef designer”* stated Colleen Flanigan part of the Ocean Science Team for the Reef Life Foundation.

In the last couple of years, the coral reefs on Sint Maarten have been deteriorating quickly due to diseases and storms, the reefs were already extremely threatened as pollution, large amounts of waste water input into the ocean, overfishing and rising ocean temperatures are destroying coral reefs. *“If we do not have corals, many tourists will choose to enjoy their vacation somewhere else, causing large losses in income for St Maarten, loss of jobs and an average decrease in wealth and access to medical care, increasing poverty. Besides the importance to tourism, coral reefs are critical to protect us from storms and swells and are the home to many different fishes and marine life species, including the species we love to have on our menu, such as snapper and lobster. Therefore we are honored to have these structures and their performance being tested on St.*

Maarten,” explained Melanie Meijer zu Schlochtern. The Reef Life Restoration (RLR) nano-engineered reef habitats, called ‘IntelliReefs’, are using environmentally sustainable minerals as a specific coral species growth substrates, mimicking the complex composition of natural coral reefs. Biocompatible and highly diverse surface textures and formulations on and within these substrates are designed to function like established coral, including small holes where fertilized coral larvae can attach, be protected and grow to reproductive stage adulthood. These smart coral substrates are being designed to survive extreme weather, increased sedimentation levels, and changes to the broader ecosystem.

“After diving on the Sint Maarten IntelliReefs and conducting surveys of the structures, our initial observations and results indicate that they support an incredible diversity of life. Their porous design provides more surface area per square meter of reef material for settlement and protects early life stages of important reef-building organisms like corals. We were amazed to see wild coral recruits settling on one of our structures after only 14 months. Our preliminary results suggest that IntelliReefs can increase biodiversity of reef organisms even in very small areas and provide refuges to important fish and invertebrate species on degraded reefs,” specified Emily Harris Reef Life Marine Biology Lead.



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The vision of the 'IntelliReefs' project is to deploy these smart substrates on reefs worldwide and use these technologies to protect and recover coral and biodiverse marine creature populations around the world, as many of the world's scientists feel that entire reef populations will have to be moved to cooler waters, Reef Life structures can serve as "Living Shorelines" wave protection as well as individual boat mooring surrounds to prevent further damage to the reefs from anchoring. The mooring habitat technology comes at a time when certain European Union countries are outlawing boat anchors except in proper mooring stations, so this system could globally contribute millions of sustainable boat mooring coral, fish, oyster and marine plant eco-habitats.

"What have I learned from Coral Reef systems? Healthy reefs are interdependent and take time to develop. I love the way the IntelliReefs initiative represents a win win for tourism, government and conservation. It is a long term collaboration with wins for the environment, marine protected areas and the local economy. After 7 years of development, 14 month pilot test, and a week of diving repeatedly on the three sites in St Maarten, it's clear to me that diverse marine life appreciates this Oceanite substrate. Every inch is covered in life. Most exciting are the recruits of mustard hill coral that are growing from the spawning event. Personally, I was honored to be tentacled by an octopus living in the heart of the IntelliReefs substrate, superior at attracting diverse biological growth to every nook and cranny. There are many more experiments we need to do to optimize the architecture and substrate, but for now,

I'm thrilled to have a tested material that supports diverse biological growth," said Ian Kellet Reef Life Global Project Lead.

"Reef Life Foundation supports global efforts being made to further marine protected areas: MPA expansion and effectiveness, as well as saving coral reef creatures great and small; and we hope to reinforce this by continued scientific development of coastal and oceanic solutions to the ravages of climate change" concluded Melody Brenna, Reef Life Foundation Director.

To learn more about IntelliReefs: Substrates for Super Corals, check out:
www.reeflifefoundation.org/intellireefs.

In order to assist to save St Maarten 's reefs, support by donating to www.naturefoundation.sxm.org/donate **and the "Gift A Reef" project:**
www.reeflifefoundation.org/donate.

Local Support provided by:
THE SCUBA SHOP:
www.thescubashop.net,

Pikes Peak Zipline Tours:
<https://pelicanpeaksxm.com/>

Random Wind Charters, St. Maarten:
<https://randomwind.com/>

Initial Reef Deployment with Nature Foundation:
<https://vimeo.com/325568580>



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