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**Mangroves are unique ecosystems that protect our shorelines, sustain biodiversity and combat climate change. Simone Albanese interviews Lorenzo Mittiga, an underwater photographer and environmental educator now based in Bonaire, about his work with mangroves.**



Aerial view of the mangrove ecosystem at Lac Cai in Bonaire

# Mangroves

*Guardians of the Coast*

## Let's begin with the core issue. What is the importance of mangrove ecosystems?

Mangroves have a very important function! Like Posidonia seagrass meadows and coral reefs, mangroves function as a unified system that keeps tropical and subtropical coastal areas healthy, and I would

even say "alive". In particular, mangroves provide essential habitat for thousands of species, from fish to crustaceans and other organisms such as coelenterates and sponges—in the submerged part—and for many seabirds, insects and reptiles in the above-water part. Mangroves are considered the "nursery" for coral reef species.

In addition, mangroves stabilise the coastline, prevent erosion and protect the interior and the people living there from waves and storms. Mangroves also have an essential function, which is storing tonnes of CO<sub>2</sub> sequestered from the atmosphere. Mangroves and submerged grasslands sequester and store large





Invasive lionfish sheltering among mangrove roots, a new hunting ground for this voracious predator

amounts of “blue carbon” both in the plants themselves and in the underlying sediments.

Carbon is fundamental to all forms of life, and blue carbon derived from marine life is fundamental to the cycle of life itself. Today, ecosystems that are capable of storing blue carbon and slowly putting it back into circulation are recognised for their role in mitigating climate change.

Mangroves, therefore, play a key role in mitigating climate change. It is a pity that this has only recently been discovered and its absolute importance is only now being recognised. The world's remaining mangroves are concentrated in 750 regions around the tropical and subtropical belt

of the planet. Of these, only 40 locations, representing almost 70 percent of the mangroves still standing, store about three billion tonnes of CO<sub>2</sub>. The climate vulnerability of growing cities in these regions, from Miami in the United States to Mongla in Bangladesh, presents them with an opportunity to invest in their mangroves as a powerful and cost-effective solution to climate change.

### How can diving contribute to raising awareness of mangrove preservation?

Definitely through information. Many people don't know anything about mangroves; they barely realise they are plants. As

with corals, workshops and conferences should be organised in dive centres and beyond. The evolution of the modern diver today should focus on ocean conservation. By educating and involving more divers in local mangrove conservation projects, we can create battalions of volunteers ready to do whatever it takes to save their beloved oceans.

Diving, and especially recreational diving these days, is an incredible tool that brings many enthusiasts closer to caring for the sea. Here on Bonaire, the Caribbean island where I live, I have discovered a world behind ocean conservation. Divers want to care about something and feel useful to the environ-



Grey snapper (*Lutjanus griseus*) hunting silver fish in the mangroves



Silver baitfish finding shelter in the mangroves



A hermit crab (top left) "wearing" a conch shell crawls beneath the mangroves near a resting nurse shark, *Ginglymostoma cirratum* (right). Juvenile barracuda, *Sphyraena barracuda*, hunting baitfish (top right).



Yellowline arrow crab (*Stenorhynchus seticornis*) feeding

ment, but this needs to be addressed. Divers everywhere in the world have a huge potential for involvement in marine environmental conservation activities.

### Can divers contribute to the protection of mangroves and other marine ecosystems?

As I mentioned earlier, yes, divers can certainly contribute. In my own small way, when I teach underwater photography, I always make a point of connecting the lessons to the protection of the marine environment. I seize every opportunity to share key information and educate my

students not only about photography but also about the marine environment and the challenges it faces. I encourage them to participate in voluntary activities aimed at protecting coral reefs, mangroves and sea turtles and eradicating invasive species.

I also highlight how photography and videography are incredibly important tools for showing others the underwater world we explore and for gathering data and raising awareness. I believe it is now essential that dive operators begin to offer more activities that involve divers in environmental clean-ups, species monitoring and data collection. This not

only promotes awareness but also helps divers actively contribute to marine conservation.

### What are the main causes of the deterioration of this ecosystem?

Ignorance. There is a lack of awareness on the part of many people of how important the marine environment is for the health of the planet. Mangroves, in particular, are often not highly regarded. In fact, they are frequently seen as uninviting environments full of mud and mosquitoes, but they are anything but. This perception leads to their deforestation to make room for construction projects. By chang-

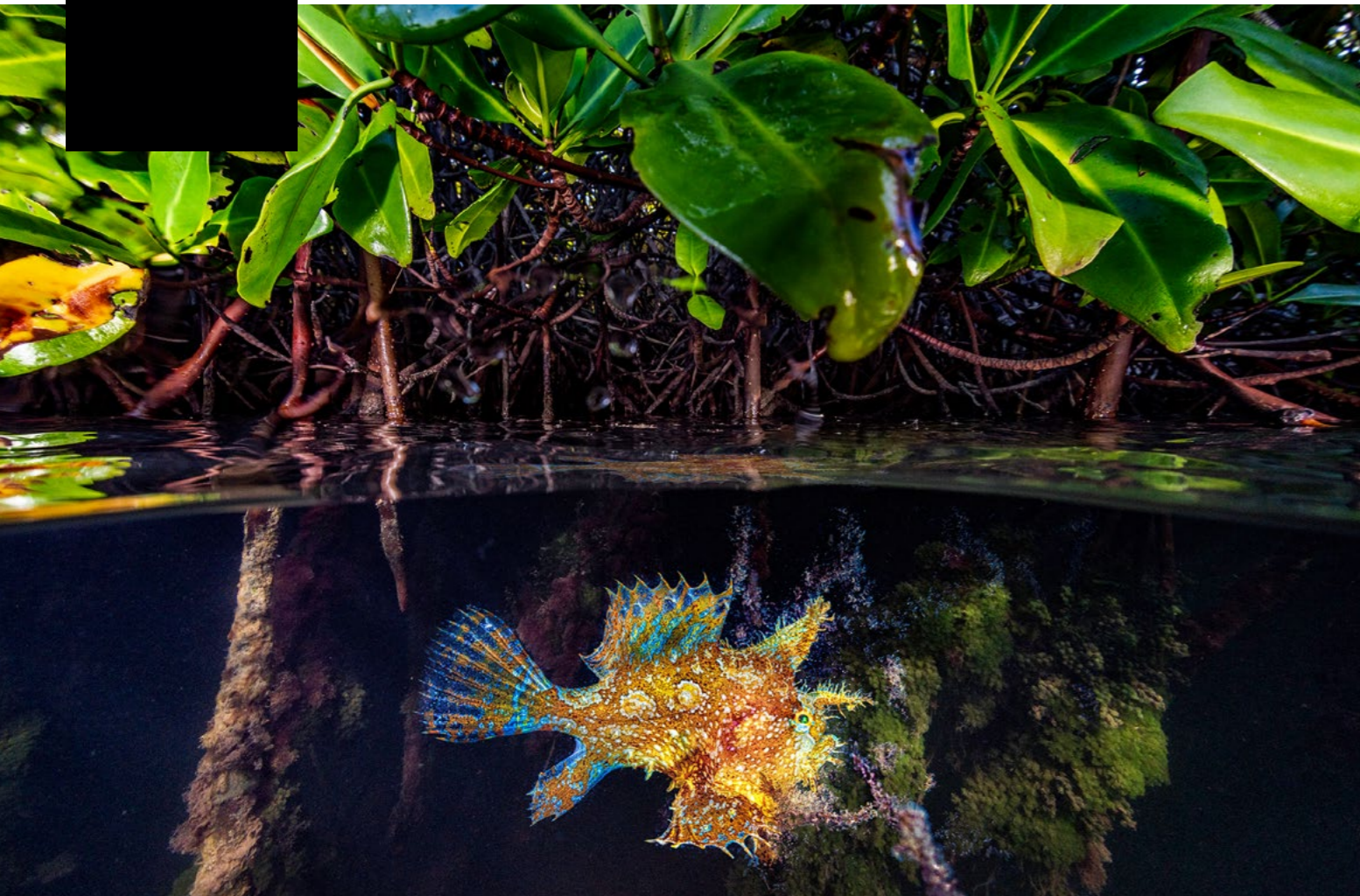


ing the flow of water inside, mangroves begin to suffer and deteriorate with disastrous consequences for the neighbouring reef.

**What initiatives and projects are currently underway to restore mangroves, and can they be replicated elsewhere in the world?**



A tiny sargassum frogfish, *Histrio histrio*, finds refuge in the mangroves after surviving a long journey attached to sargassum (below).



Snapper with sponges of various colours and shapes in the mangroves

Here in Bonaire, a mangrove restoration project has been ongoing for the past six years. It involves scientists, volunteers, local fishermen and marine park rangers. The main focus of this work is cleaning and reopening water channels between the mangrove islands to restore water flow and regenerate the inner mangroves, which have, by now, completely deteriorated.

This effort has certainly sparked the interest of many people on the island. The group leading the project, called Mangrove Maniacs, regularly recruits volunteers to participate in cleaning

and reopening the channels. They also organise presentations to share updates on their work and to educate the local community about the importance of preserving the mangroves. I personally join them to produce images and videos to raise awareness through storytelling.

Globally, there are now many mangrove restoration projects, each addressing specific local issues such as pollution, deforestation, degradation, invasive species and land loss. These efforts provide valuable blueprints for similar initiatives in other parts of the world, each one focused on

solving specific local problems: pollution, deforestation, deterioration, invasive species and land loss.

**Have you had any unique diving experiences or surprising discoveries related to mangroves? Can you share any anecdotes with us?**

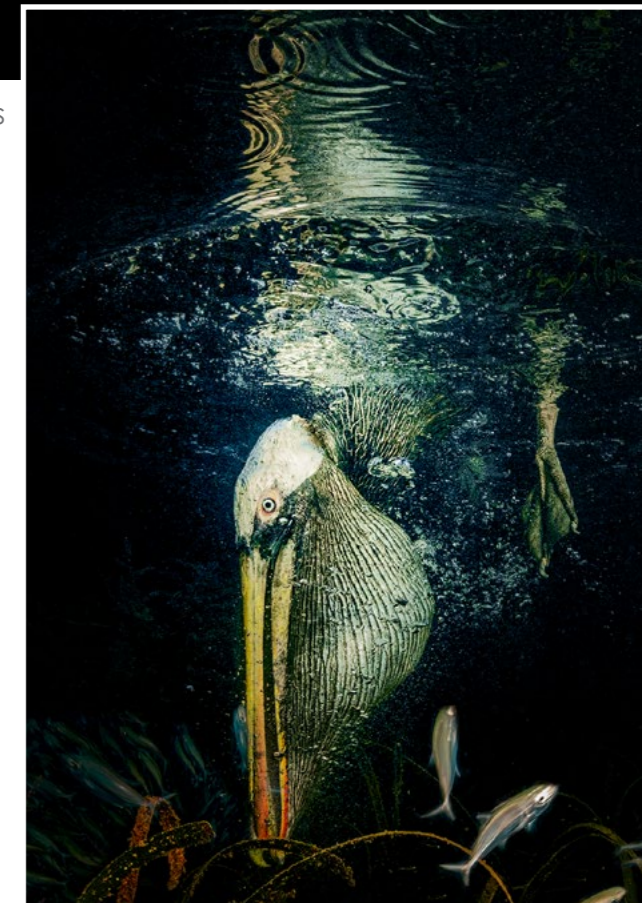
In 2019, I started producing photographic material for my own project on the mangroves of Bonaire, and it was from that moment that I realised the uniqueness of this ecosystem. During my explorations in Lac Bay, where the island's large mangrove forest resides,

I fanned for hours, for months every day, covering kilometres of forest, looking for photographic cues to tell the story of the underwater forest. Despite local sceptics telling me I would not find much, I stumbled upon unique and undocumented scenes.

I discovered an aggregation of nine adult nurse sharks (all females), which I monitored for months. I also found hundreds of young lobsters, about a year old, ready to leave the mangroves and migrate to the coral reef. I documented the arrival of invasive lionfish (*Pterois volitans*) in the mangroves for the

first time and encountered a tiny sargassum frogfish (*Histrio histrio*) that had survived a long journey attached to sargassum and found refuge in the mangroves. This discovery was remarkable because this species usually depends on sargassum to survive, yet the mangroves provided an alternative habitat.

I continue to find species that have never been reported in Bonaire's mangroves. Sharing these discoveries has helped to raise local awareness of the value of these ecosystems. Since 2019, I have also been documenting the work of Mangrove



Pelican hunting fish in the mangroves



Maniacs, capturing their restoration efforts through images that I have published worldwide.

### Tell us about the Stories from the Sea project and your collaboration with Aqualung.

For a few years now, I have been one of Aqualung's Ocean Ambassadors, and I am very proud of it, as collaborating with this very important and huge brand of global diving allows me to be supported with excellent



Rainbow parrotfish, *Scarus guacamaia* (above). Symbiotic sea anemone, *Exaiptasia diaphana* (right and far left). A variety of Bryozoa encrusted on mangrove prop roots (left).

dive equipment in my work as a marine conservation photographer and underwater documentarian. At the end of last year, when I was offered the opportunity to narrate my work as part of Aqualung's Sea Stories project, I was really pleased. It reaffirmed to me the importance of conservation work and its dissemination in creating awareness among the public and perhaps pushing more people to actively participate in marine conservation, even with small actions.

I believe that Aqualung has fully grasped the goal to achieve, dedicating itself more and more to the protection of the marine environment by providing the public with easy-to-understand, high-quality information tools. I believe this project should

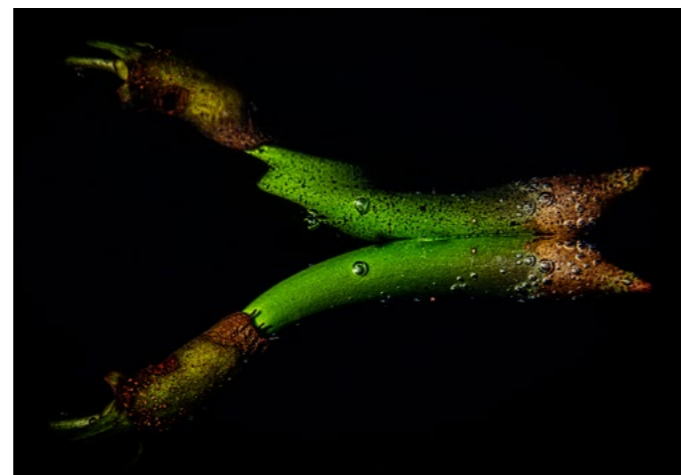
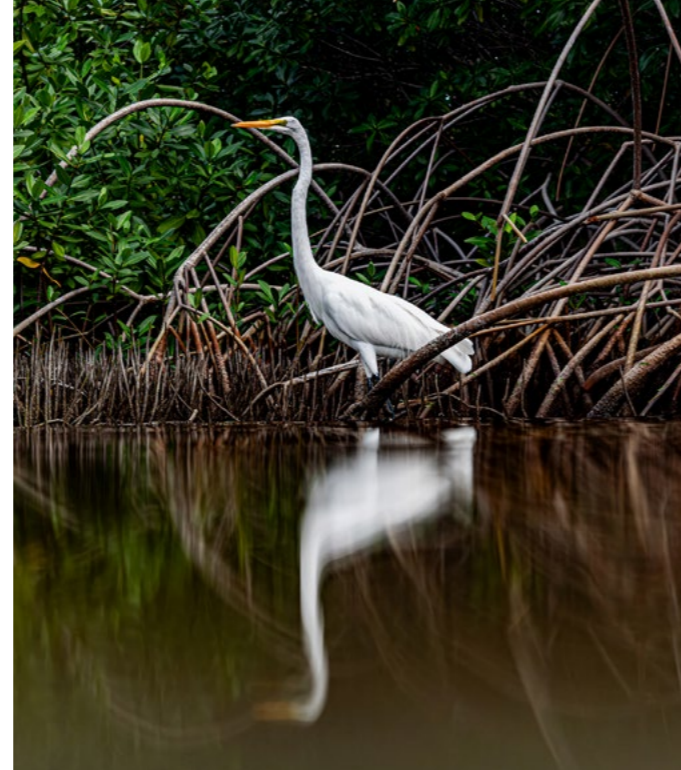
never end. We are just at the beginning, but it could certainly prove to be a way to communicate stories of the sea through those who experience the sea every day, like us Aqualung Ambassadors, in different locations and with different approaches. The ambassadors tell a little bit about themselves and their work, revealing the beauty of the sea but also the difficulties it faces today.

### What aspects of diving are most appealing to young people, and how can they be encouraged to care about marine habitat conservation?

I believe most young divers want to feel useful, be part of a team and contribute to marine conservation. Today's youth are much more aware of environmental issues than my generation or previous generations. I receive many requests from high school and university students eager to get involved in marine conservation. For many, taking a scuba diving course is their first step.

I reiterate that dive shops and dive centres should include marine conservation and information courses.





Left to right: An aggregation of juvenile Caribbean spiny lobster (*Panulirus argus*); White egret; Propagule—a mature mangrove seed—floating at surface; Upside-down jellyfish (*Cassiopea* sp.) moving in the mangroves.

They could collaborate with research centres or organisations running restoration projects. Here in Bonaire, every dive centre offers courses in coral restoration or the eradication of invasive lionfish. For mangroves and seagrass meadows, volunteers can get directly involved in local conservation projects.

Young people are drawn to diving and are often willing to pursue meaningful paths in their diving careers rather than focusing solely on recreational diving. Providing clear, professional and engaging environmental education will always resonate strongly with younger generations.

**What are the main threats to mangroves today?**

Excessive coastal development is the root cause of many problems. Mangroves, often viewed as swampy areas full of insects and rats, are being cut down instead of protected. I have even seen cases where private initiatives have removed entire sections of mangroves to gain more wind flow for apartments or to improve the view of the bay.

Altering the flow of water into or out of a mangrove system disrupts its delicate balance—something only nature can maintain if left undisturbed. Even small changes, such as the construction of a coastal road, can lead to the collapse of a mangrove ecosystem.

**What species can we expect to see on a dive in mangroves?**

You will find many species of coral reef fish, such as snappers, grunts, butterflyfish, damselfish, barracudas, lemon sharks, nurse sharks, rays, needlefish and hundreds more. There are also lobsters, blue crabs and many types of shrimp. Colourful sponges encrust the submerged roots, along with cnidarians and jellyfish, including the beautiful *Cassiopeia* (upside-down) jellyfish in a variety of colours. The list of species is long and diverse.

**Can you share any practical tips to reduce the environmental impact**

**of diving and promote responsible behaviour?**

Mangroves are extremely delicate environments and are best explored by snorkelling or freediving. Scuba bubbles can disturb the roots and the organisms living on them, and the shallow, muddy bottoms can quickly reduce visibility if movements are not careful.

Avoid entering dense root networks with scuba gear. Dives should be limited to the edges of mangroves, with no more than two divers at a time. Perfect buoyancy and gentle, slow fin movements are essential. Under no circumstances should the submerged roots be touched, as they host fragile—and sometimes stinging—organ-

isms. Always rely on an experienced local guide! If you are in Bonaire, feel free to contact me. ■

*Lorenzo Mittiga is an Italian marine biologist, Aqualung Ocean Ambassador and iLCP photographer/videographer specialising in underwater and wildlife imagery. His work has appeared in National Geographic and The New York Times. Based in Bonaire, he advocates for ocean conservation, earning him awards from organisations such as the Smithsonian and Ocean Geographic, and he has been published worldwide in international magazines. For more information, visit: [lorenzomittiga.com](http://lorenzomittiga.com). Or follow on Instagram @lorenzomittiga.*