



Snorkeling the brand new Aquabar Reef

Coral Reef CPR

After the restoration. We brought more than 400 corals into the new 115-foot (35-m) snorkel trail, and over 1,000 fishes are now using this area!

Think of the Maldives, and azure blue, gin-clear waters, white sand beaches, and unspoiled, vibrant atolls and reefs teeming with an abundance of corals, fishes, and other life come to mind. Until last April, this was accurate. A short swim from shore led to diverse coral reefs consisting of branching, table, foliaceous, and boulder coral species, dozens of sea anemones, sponges, and soft corals, spiny sea urchins, starfishes, and crabs. There were hundreds of colorful reef fishes darting among the coral branches and large predatory sharks, jacks, and groupers patrolling the water column.

Then a particularly severe El Niño in 2016 heated things up. Cloudless skies, an absence of wind, calm seas, and an abrupt shutdown of normal current patterns caused significant changes in seawater temperatures. With water temperatures of 86–87.8°F (30–31°C) persisting for the entire month of March, then rising to

91.4–95°F (33–35°C) in the shallow lagoonal waters, the corals turned stark white. A mass bleaching event was underway.

Coral death was swift. By May, most of the branching, table, and lettuce corals in the top 16 feet (5 m) had completely died. By August, their skeletons were covered in fleshy algae and cyanobacteria, and the fishes had begun to disappear. By November, these shallow lagoonal reefs were graveyards full of collapsing coral skeletons. Only a few of the hardest corals remained.

FRAG FATALITIES

At Anantara Dhigu, on South Malé Atoll, a once-famous snorkel area located just off Aquabar in 6.5–13 feet (2–4 m) of water suffered a fate similar to that of other areas. Dozens of visitors had supported an “adopt-a-coral” program to purchase metal (rebar) frames with coral



fragments attached. They were prominently displayed throughout the snorkel area to showcase conservation and educate guests about reef restoration. But by June 2016, every fragment that had been placed on the frames had died, algae blanketed the frames, and the metal was rusting. The surrounding reef had also died and was being buried under a moving wave of sand. Snorkelers who explored the area, discouraged by the lack of color and vibrancy, were quick to get out of the water.

Last month, we worked with Anantara Dhigu Resort to revitalize the area, providing a new education tool that showcased a flourishing coral reef accessible by a short swim from shore. We removed the algae-encrusted rusting frames, as well as other trash. We built a reef framework using dead coral skeletons from last year's event and coral rubble collected from the surrounding reef flat, raising the substrate above the moving sand. We then transported corals, sea anemones, soft corals, and other benthic animals, along with their associated fishes, into the site, creating a new reef.



We removed more than 80 old, rusting metal frames with dead corals from the water to restore the natural environment.

Our goal was to construct a coral reef using only invertebrates that had been rescued from other areas. Had we not collected them, all these corals and anemones would have died. We removed corals from sand extraction sites and from shallow water areas exposed at low tide,

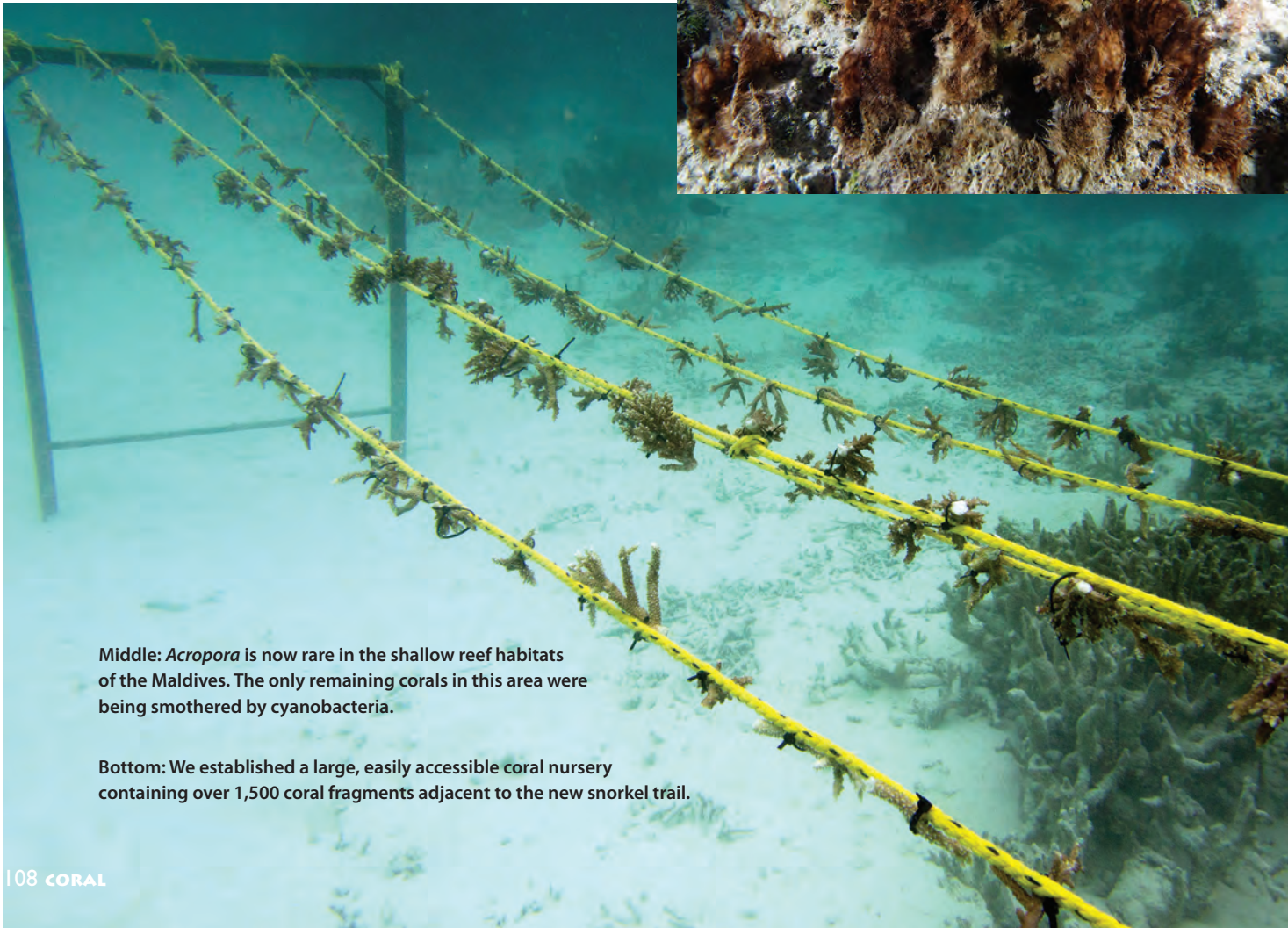
and corals that were being buried by sand, eaten by Crown of Thorns Starfish (*Acanthaster*) and coral-eating *Drupella* snails, or infected with diseases (e.g. White Syndrome).

We found Magnificent Sea Anemones (*Heteractis magnifica*) that had been transported from the reef by rough seas and deposited in sandy areas. We collected these, along with their associated clownfishes, and placed them among the coral rubble. Over several days, the anemones moved around until they found a preferred home and securely attached to a piece of rubble. We found several large Giant Clams that had been overturned and deposited in deep water; these were placed upright between boulder corals, facing the sunlight, once again. We found schools of Humbug Damselfish (*Dascyllus melanurus*) with large heads of Cauliflower Coral (*Pocillopora verrucosa* and *P. meandrina*), but they were infested with hundreds of *Drupella* and many of the bases of the branches had been consumed by the hungry snails. We painstakingly removed all the corallivorous snails before placing the corals on the trail.

Most of the staghorn corals throughout South Malé Atoll had died, but we found detached branches that were shaded under dead corals. They had survived the bleaching event, but were now infected with White Syndrome. We removed the diseased portions of the branches and secured them to existing dead corals using non-toxic underwater putty. And we found lots of “rolling stones.” These detached boulder corals were constantly being overturned and abraded by wave surge and



Before the restoration, this sight was familiar to snorkelers—a dead *Acropora* coral on a rusting metal frame.



Middle: *Acropora* is now rare in the shallow reef habitats of the Maldives. The only remaining corals in this area were being smothered by cyanobacteria.

Bottom: We established a large, easily accessible coral nursery containing over 1,500 coral fragments adjacent to the new snorkel trail.

had large lesions on their colony surfaces. We secured them to the reef with the living tissue facing upward. At the deep end of the snorkel trail we created a coral nursery that now contains over 1,300 small branches of *Acropora*. Representing over 25 species collected from a sand extraction site, these branches will be grown on ropes suspended in the water column for the next 18 months, then transplanted onto the reef.

FRESH START SUCCESS

Overall, we invested three weeks of hard labor, working from dawn to dusk, transporting rubble and living animals into the site. We used lift bags to move the larger boulders, some of which weighed upwards of 220 pounds (100 kg), and transported other corals and anemones in large plastic crates.

The biggest challenge was to keep the corals submerged while they were being transported. We created a snorkel trail that meanders along a 6.5- to 13-foot-deep (2-4 m) channel for 115 feet (35 m). It contains over 65 species of corals, sea anemones, soft corals, false corals, and sponges, along with *Tridacna* Giant Clams, sea urchins, starfishes, crabs, and molluscs. We brought in two species of anemonefish, Humbugs, and *Chromis*, but within a week over 50 species of fish had colonized the reef. There are now three cleaning stations hosted by *Labroides* wrasses that are visited every day by batfishes, dartfishes, rays, and jacks. Just before we left, we counted more than 1,000 small reef fishes on the reef, as well as an octopus, two species of stingray, and lobsters.

Shallow, nearshore lagoonal areas are critical nursery areas for reef fishes. Fishes require the structure of corals for protection, shelter, habitat, cleaning stations, and food. Without structure, fishes leave these areas and lo-



After the restoration: Branching *Acropora* provide critical habitat to hundreds of fish species. We rescued this colony from being buried by sand.

cal extinctions of species become highly likely. This snorkel trail is one example demonstrating that it is possible to rejuvenate an area without damaging surrounding reefs. It is now the only location around the resort that contains a high cover of living coral; other snorkeling sites were badly damaged by the bleaching in 2016, and less than 5 percent of the bottom is inhabited by live coral. It also contains a higher diversity of invertebrates than any snorkeling site that can be accessed from the resort by boat within 15 or 20 minutes. Due to its easy access, its proximity to shore, and its shallow water, it is suitable for all ages and swimming abilities. In short, this site illustrates what a healthy, complex coral reef should look like.

You can see how we built the snorkel trail on our Facebook page (Coral Reef CPR) and visit our website (www.coralreefcpr.org) to learn more and donate to our cause.



An unusual free-living *Goniopora* can be found on the snorkel trail.



After the restoration. We brought dozens of endemic Maldivian Anemonefish survivors into the snorkel trail.



CORAL



REEFSCAPE Inspirations

- Sea Spiders
- East African Fishes
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Chaetodon melapterus's eye is hidden under a black band.



Young *C. melapterus* pestering a Pyramid Butterflyfish looking for edible parasites.



Polyp nipper: This Arabian Butterflyfish is about to take a bite.

Breeder Matt Pedersen of Duluth, Minnesota, reports some encouraging experience keeping *C. melapterus*, starting with young adult fish and training them to eat prepared foods. "I am having success with Repashy's Spawn & Grow and Panta Rhei's Panta Nouri Polyp pellet food. A number of Asian aquarists have gotten them onto mashed feeds on the half shell. I have not observed them picking at other fishes, but this might be an artifact of aquarium behavior."

Overall, maintaining these fish is not easy, and I strongly advise against purchasing them unless you are

an experienced aquarist and willing to devote time to their feeding.



REFERENCES

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INTERNET

www.fishbase.org (December 2016)

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