RESTORATION PROJECT IN OUTRIGGER KONOTTA MALDIVES

The coral project in Konotta started last December (2015) with few structures and a stone pile made up of concrete blocks, both arranged and placed close to the arrival jetty of the island, at 3-4m depth. The pride of this beginning were the materials used: all recycled materials, that we founded on the island. In fact, the metal structures came from the landscaping team, normally these structures are used as tree support; while the concrete blocks were sunken (left after building construction) exactly in front of the arrival jetty. So, we gave them the chance to become perfect substrate for our coral fragments and future settles.

The coral fragments have been always collected from the sea bottom (NO TAKE FRAGS from healthy colonies). We collected different species of fragments (*Acropora spp., Porites spp., Lobophyllia spp, Pocillopora spp..)* with different growth rate, this due to a setup of "no-mono species" frames, but also to try as much is possible to maintain the same morphology of the natural reef. The corals, at the beginning were attached by cable tie on the metal structures.

At the beginning of January 2016, we deployed a "bed-frame" under the water villa jetty (west side of the island). The idea of the selected area was to give a "visual chance" to the Guests (without getting into the water) by staying on the jetty, they could see how a coral restoration project works. The area is almost bare, there are only few corals blocks, but despite this aspect it is really suitable for the first stage of life (nursery) of many fish, squid, octopus, etc. So, we were aware of the fact that working in that area was really challenging for coral restoration. Because it is really shallow, only 1.8-2 m when high tide, and the waves sometimes are really huge with also strong current. But, by observing the few corals present in the area, we were optimistic and confident that also our corals could tolerate those stresses. For this reason and to avoid outstanding stress to the coral fragments, we collected frags from really shallow area of our House reef. Then we secured them on concrete bases by cable tie or underwater glue or directly on the metal structure.

At conclusion of a three days training workshop for OKM and Best Dives (BDM) staff (Jan 16) about Coral Restoration with practical session (diving: fragments collection and replacement) and theory lessons (explanation of the methods and techniques used), we sunk other two structures under the water villa jetty and a pyramid in front of the waters sport (SW side island). The Pyramid, now at 5m depth, was the only structure, we "planted" on land; we attached, in fact, the frags with the involvement of Guests, OKM and BDM staff.

After this experience, we decided to "become social" with a Facebook page: **Konotta Regeneration Project,** where we are updating all the info about the project, the activities and events on the island.

Since the launch of the project for all the guests visiting us in Konotta, we are offering evening presentation on Wednesday and Saturday at the diving center (now will be at the new Ozone Lounge, see pic below), to understand and know the Coral Project.

All the frames around the island, after the deployment were constantly monitoring with coral growth measurements and algae removal. Moreover, because the project is not only focused on coral regrowth, but also on the survey of other stresses that can compromise the ecosystem; we were (and still) keeping under control the amount of coral predators as: COTS (Crown of thrown Starfish) and Drupella snail. In Konotta, the issue with those predators was not so important and

damaging, at least for COTS, respect other Maldivian islands and atolls; while the action of Drupella was and is still more threating for our reef.

The conditions for coral growth were optimal till second half of March, when Maldives started to face sea temperature increase (31*C +) and Coral bleaching. We observed this "sad condition" from April and in three weeks a lot of corals in the reef turned to white or were so stressed to appear with fluorescent colors. During all the bleaching event we monitored, weekly, the progress on the reef (with a bleaching monitoring transect, protocol suggest by IUCN Maldives). On our frames, the biggest impact we observed on the bed frames in the lagoon under the water villa jetty, with 90% mortality, but also on the other frames many corals passed away. For all those months with high fragility for the reef, we invited the guests, to be more aware and approach the ecosystem in a more responsible way (i.e. high recommendation to put sunscreen in wide advance before entering the water).

From April till August the coral project stayed in "standby", we really couldn't do much: no new fragments were attached on the structures, just observed the changing underwater and removed dead fragments from all the frames. What we organized/planned in that period were different activities for Guests and Host as: clean up, documentary or movie night, presentation with some educational games, competition, training etc., we also celebrated special environment Days as:

*22nd April Earth Day

*Konotta for the Earth (4 days' celebration in June) including: Environment Day (5th with the local school in Gadhdhoo, Gaafu atoll), Ozone Day (6th) and World Ocean Day (8th).

*3rd July International Plastic Bag Free Day

* 14th July Shark Awareness

* 16th July Padi Women' Day

When the temperature started to drop down at the end of June, we were confident that the reef could recover easily, but was not like the expectations. The reef surrounded Konotta, was full of *Acropora* spp. (branching corals), that due to their fast growing feature, they couldn't fight enough against the warm wave, while the massive corals (*Lobophyllia, Porites* etc.), although some of them bleached many recover quite fast. The result of the bleaching event is still heartbreaking: involved so many corals: the reef has changed a lot!

In August, we decide to re-launch the coral project, by relocating the frames: we placed all deeper (from 7 till 17m, only the pyramid at 5m stays in the same position) and in the SW side of the island (more easy to monitor all the frames after we placed them all close by). The re-launch that involved primarily the Guests, was also an opportunity to introduce a different frags' attachment method. The idea, in fact, is to slightly eliminate the plastic from the project. Therefore, what we introduced are coconut ropes. The method is easily applicable and the result from a simple unroll of a rope' mash is a sort of "corals necklace" that we could secured on the frames by wire. The natural material from one side results resistant also underwater, but on the other hand is a suitable substrate for algae. Anyway, with constant cleaning the corals are growing healthy.

For the celebration of Outrigger Resort Founder' Day, we also deployed a "O" frame with corals attached by coconut ropes.

In October, after the visit in Konotta of the "Coral Doctors", BDM' partner in the coral project (aquarists from Deutsches Meeresmuseum of Stralsund), they introduced a different technique, widely used in aquarium: nail and zip tie. What we did, was hammering nails on some bare corals block (without creating any new substrate but just use the one available underwater) and later attach frags by cable tie. The aim of this method is to increase the biodiversity and give a chance to the fish to hide and live between the nails; while enhance the possibility for the corals to attach on the substrate. At the end, with Guests' interactions during October-November a total of 3 frames have been deployed, where the frags were secured also by using wire coated with soy plastic.

The "wire& soy-plastic" is in experimental stage, but is giving the right results. The corals after few weeks started to deposit on top of it new tissue.

Last December (2016), we celebrated the "1st Konotta Regeneration Project Anniversary" with two event that saw involved Host in "Adopt a Coral" and Guests with the decoration of a temporary UW Xmas tree.

Unfortunately, as already report before, the action of the coral predators is uncontrollable, especially for Drupella snails. In fact, many corals without distinction are being eaten alive. For this reason, till the population of these voracious predators is not again under control we won't plant other corals, otherwise our action will be vane. Luckily we are seeing in the reef many new small settle, the "super corals", that survive after the bleaching event and they are fundamental for the reef' recovery.

For 2017, we will continue to monitor the frames underwater and we would like to implement the project with other methods and try to restore the east side of the island (highest damage after bleaching event), by controlling also predators' population. The aim of the coral project is focused in understanding which methods can be more suitable for corals' growth, but also and most important point is the education and stimulation of people on the importance of coral reef ecosystem' conservation and restoration. For this, we will continue to propose evening presentation or workshops for Guests and Host.

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Attach 1: Konotta map – Actual Coral project location (front of Water Sport, red dot)-

Attach 2: Ozone Center for all the activities with the Guests.