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BACKGROUND

The first Biorock was installed on the House Reef of Lembeh resort in April 2007 initiated by two marine biologists, Katherina Kupchikova and Johan Thomas Benetsson who were working in Lembeh resort at that time. This project is being financed by Lembeh Divers who donate portion of revenue generated from House Reef and Mandarin guided dives. Biorock is the name for technology that uses electricity to create salt water electrolysis between anodes and Biorock which is set up as cathode. Due to electrolysis calcium carbonate (Aragonite) slowly forms around the cathode. It provides a cost-effective and sustainable method to accelerate coral growth and increase coral survival particularly in areas where environmental stress has affected existing reefs. And here at Lembeh resort we apply this technology to restore part of the House Reef in front of the resort. In addition to the electrical structures,non-electrical structures such as fish houses made from concrete blocks were installed in the House Reef to provide structural support for coral colonies.

BIOROCK:

Coral Conditions observed in July-August 2008:
Mortality very low, between 5-10% and primarily partial mortality. Overall the birocks are covered in algae (1-2mm) with partial calcium deposition spots, especially on Pagoda There are many tiny coral colonies that already settled naturally on the Biorocks!

Figure 1: Algae coveraged on biorock, 1-2mm, under there is a thin layer (less then 1mm) of calcium deposition.

Figure 2: Pagoda biorock with calcium deposition (white spots) on the metal construction.

Figure 3: Electrical: supply 12V, 20 Amps total for all biorocks

FISH HOUSES (CONCRETE BLOCKS):

The corals planted over 12 months ago on concrete blocks did not survive very well with average mortality over 80%. During July and August 2008 they were replaced with small coral colonies found in the sand by a volunteer working on the House Reef, Marine Biologist Olga Bondarenko. Overall over 300 new coral colonies were planted on concrete blocks around Biorock and Mandarine sites. So far these recently installed coral colonies show a good rate of survival (95%). The concrete blocks also became a home to damselfishes (*Dascyllus* spp., *Chromis* spp. and *Pomcentrus* spp.) and even giant cuttlefish was observed inside of the concrete blocks! There are a few natural coral recruits on concrete blocks however the visible number is presently very low (<10). Nevertheless this is still a good sign of concrete blocks suitability for coral recruits and with time the number of naturally settled coral colonies should increase

EXPERIMENT

Purpose:

Short term: To compare survival rate of coral transplants with electricity (Biorocks) and without (concrete blocks).

Long term: To provide scientific evidence that Biorock technology increases coral growth rate in disturbed areas of tropical coral reefs.

The experiment coral colonies were planted on 25-30 of July 2008. The small coral colonies of the same species (Acropora spp.) were picked in the shallow sand (area 3meters max) and transferred to Biorock and concrete blocks around the biorock area (depth 6-8 meters). In total 24 colonies were planted on Biorocks and 26 on concrete blocks to compare survival and growth rate. At the end of August 2008 all colonies were numbered with 2 color plastic tags and a photograph of each colony was taken. All photos are stored in the folder called “Experiment”. The experiment coral colonies on the Biorocks were numbered 1-24 and on the Concrete blocks 1-26.

Numbering system and size measurements

The required numbers (1-26) were coded using plastic tags of 2 colors (red and white) with punched wholes on them. The number of punched wholes in the white color tag was designed to represent first digit in the 2 digit number and the red color tags represented second digit.

Therefore the final number could be translated as follows

Final number=Number of wholes white *10 +number of wholes red (refer examples on Fig. 4&5)

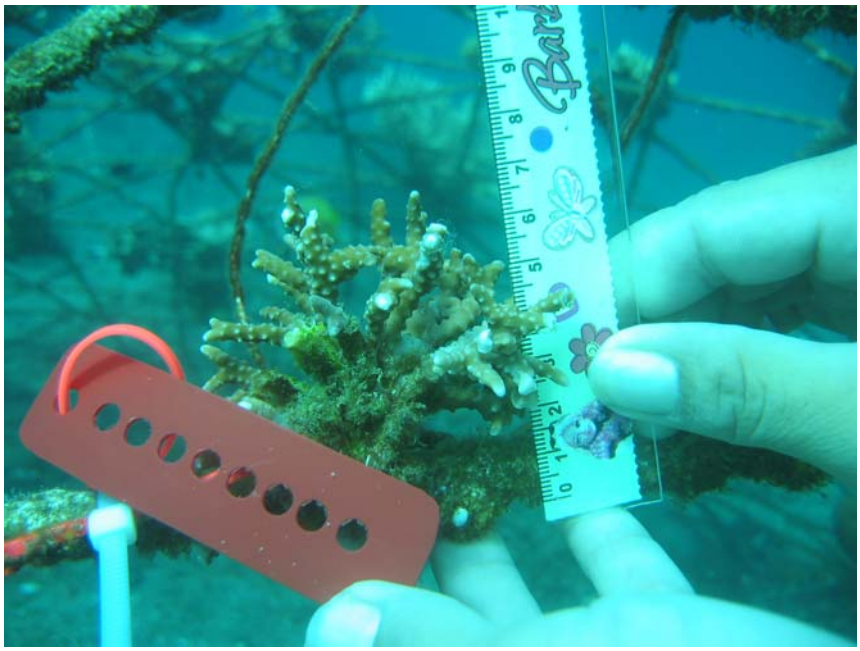

Figure 4: The coral colony on this photo was number 8. There is no white tag and there is a red tag with 8 wholes in it, thus 0*10+8=8

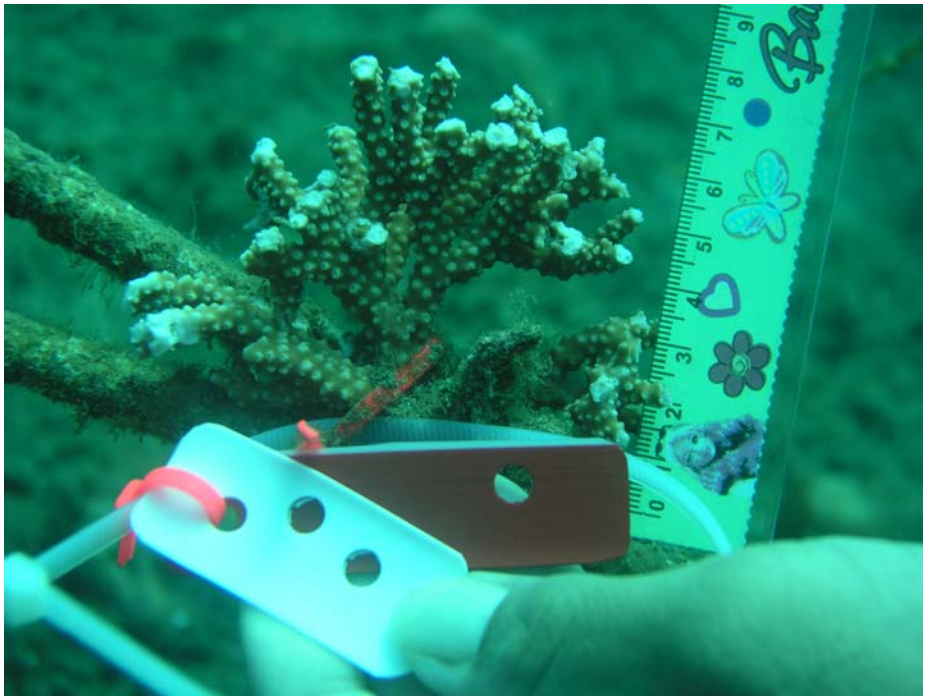

Figure 5: The coral colony on this photo was numbered as 21. There is a white tag with 2 wholes and there is a red tag with 1 whole, thus 2*10+1=21.

The size of each colony in the experiment can be estimated from the ruler visible on the photos. Although this method can not provide very precise estimation of the size of the colony it should be sufficient to make rough estimation about coral growth after 6-12 months. PS please excuse Barbie picture on the ruler, have to work with what is available ☺

RECOMMENDATIONS FOR FUTURE WORK:

1) **Every 6-12 months**. It is recommended to follow up on experiment every 6 months where photos should be taken using similar techniques described above.

2) **On-going** It is recommended to replace dead colonies on concrete blocks and biorocks with new colonies on on-going basis.

3) **On-going** To make sure that electrolysis is functional check cathode (biorocks) for bubbles

4) **Every 3-6 months** Monitor coral recruits on biorocks and concrete blocks. Document the number of newly recruited visible colonies.