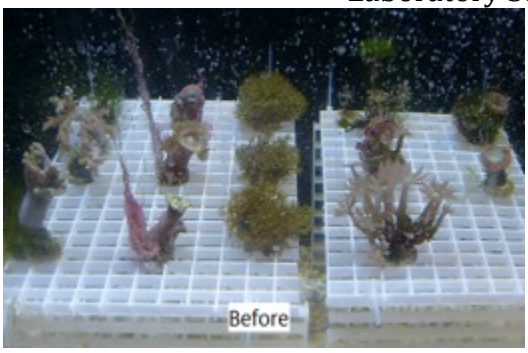
CORAL REEF AND FISHERIES RESTORATION FIELD TRIAL AT PUNTA DE MITA, NAYARIT, MEXICO

World Aquarium and its Conservation for the Oceans Foundation in conjunction with Technologico Nacional De Mexico, Instituto Technologico De Bahia De Banderas and Instituto Nacional de Pesca under the jurisdiction of SAGARPA (Secretary De Agricultura, Ganaderia, Desarrollo Rural Pesca Y Allmentacion) conducted a coral reef restoration field trial . This was implemented at Punta de Mita based upon recommendations made at an interagency meeting held in May, 2016 at the Instituto Technologico campus addressing the future of Islas Marietas National Park in consideration of a field demonstration of restoration technologies presented by Leonard Sonnenschein. On July 10, 2016, four sites were selected in the intertidal zone of Punta de Mita (NO CORAL AND SPARSE FISH LIFE WAS NOTED TO BE PRESENT). On August 17, 2016 these sites were assessed for physical and biological changes.

SITE DESCRIPTION: Site Two was one mile from Site One. Site Two was 100 meters into the ocean. Site Three and Site Four were the inland portion of Site Two. Site Three was in an undisturbed area. Site Four was subject to nearby runoff from the golf course.

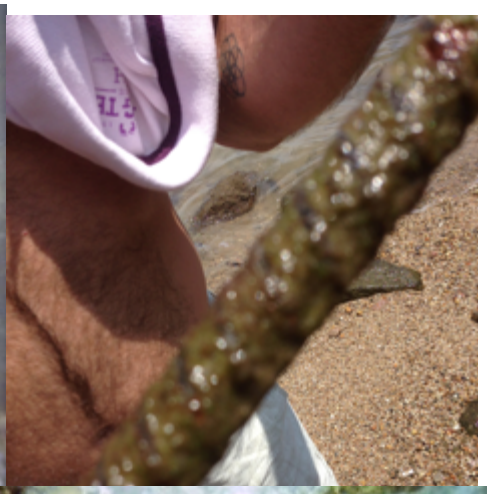
Previous Laboratory research
Laboratory Study at the World Aquarium

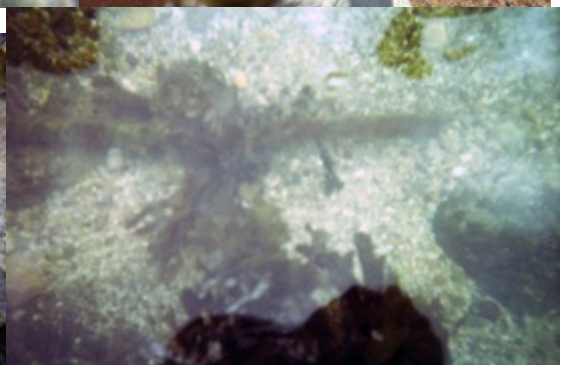



BEFORE **AFTER 3 WEEKS**

Site 1:

Within 10 meters from the beach inside of a rock encropment a single treated iron rod was placed in the sand with the top 75% exposed to moving water with the remaining portion buried in the sand and wedged under a rock to stabilize from the current.





BEFORE **AFTER 5 WEEKS**

Conclusion: after treatment the rod evidenced significant increase in green alga growth and red sponge and purple soft coral. The rock is thickly covered in living material after treatment.

AFTER 5 WEEKS

SAND SIDE **OCEAN EXPOSED SIDE at 5 WEEKS**

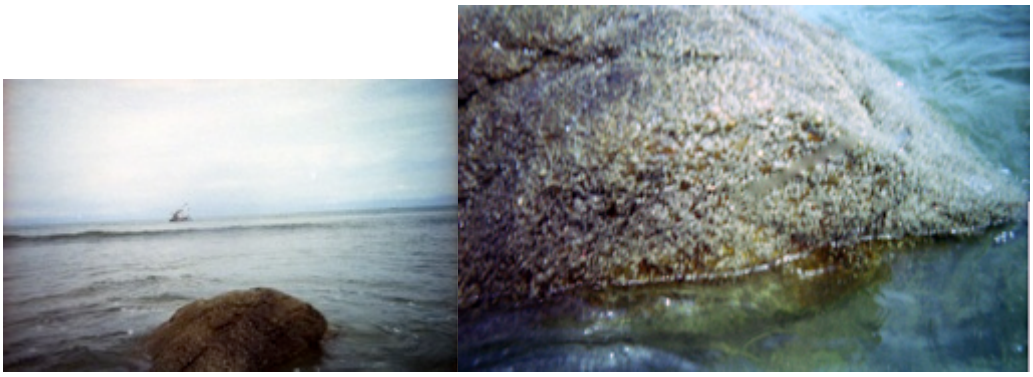
Conclusion: nearby rock to treated iron rod collected much thicker living material.

After 5 weeks of ocean exposure there was a complete coverage of the exposed side of the metal surface an average thickness of ¼ inch of species including sponges, alga, and soft corals. Nearby rocks became populated with similar species in a more stratified pattern. It was also noted the there were numerous crabs at the site at the 5 weeks measurement time, however no crabs were noted at the original placement time.

SAND SIDE **OCEAN EXPOSED SIDE**

Site 2:

Approx. 100 meters into the intertidal zone from the beach within a rock structure, 3 treated iron rods were placed to form a triangle around the rock structure. The rods were hammered into the sand at the base of the rock structure to secure affixment.



In deeper water the surrounded rock was covered with additional layers of aquatic life and compared to that of Site 1.

After 5 weeks the flat sided rods had less thickness of growth as compared to the round type of rod. At this deeper water placement the round rods had up to ½ inch of growth include strand type soft coral bryozoans (up to five inches long) that grew on the rod, and thicker settlements of sponges and soft corals and alga. Also it was noted there were much more numerous fish of various species that were not noted at time of original placement.

AFTER 5 WEEKS

Conclusion: Originally 1-2 fish per 100 meters was noted prior to treatment.
Numerous fish life has returned in the treated area, of various species representing an approximate 800 – 1,000% increase in fish population.

Site 3:
At the place where the beach meets the water a solution was placed to study the land-to--sea response to nutrient input and modulations for improvements in the ocean ecosystem. The solution used was composed of non toxic rare earth metals. No iron pole was used.

There we no changes noted after 5 weeks at this site. Plants were still brown.

Site 4:

Conclusion: The purpose of this treatment was to detoxify the water and demonstrate an ecosystem restoration. There were no corals at this site. The water became detoxified and plants turned green and healthy.

At the place where the beach meets the water, the solution was placed to see the land-to-sea response to nutrient input and modulations for improvements in the ocean ecosystem. The solution used was made of several naturally occurring, non toxic minerals and metals that are often a missing link in the proper equation for ocean health based on previous laboratory ecosystem studies.

After 5 weeks, though the water was significantly warmer than the deeper dwelling water at Site 2, there was greater greenness to the alga within the range of the solution dispersal. Also noted that there was creek runoff from the golf course that created a bubbly surface to the nearby water and the alga were more filamentous and had a brown gooey coating compared to the treated area alga. The water in the treated area had no bubbles. Therefore we conclude the treatment was detoxifying the pollution runoff from the golf course.

In conclusion, at 5 weeks into this experiment it was proven that treated iron rods had a significant effect upon coral restoration and ecosystem enhancement including bring corals and reef building inhabitants and fishes to an area which had been significantly altered by the effects of climate change and pollution. After recording the effects at 5 weeks and sharing findings with government officials it was determined that this study was a success and that further meetings with government, tourism, university, fisheries, and community representatives should be held immediately to determine the next steps toward implementation of this type of treatment on a larger scale throughout the Banderas Bay, Mexico.

Next steps, with sufficient support, we would build platforms in the ocean to extend and continue the study to cover the Banderas Bay. We expect within a year the living coral reef will return to extend ecosystem health to five areas where ecotourism can commence and fisheries can benefit from significantly enhanced fish populations.