

## The Coral Reef Crisis

Tropical Coral Reefs represent one of the most biologically diverse ecosystems on Earth. But unfortunately Coral Reefs are today also one of the most endangered ecosystems on Earth. 70% of Coral Reefs are dying all over the world. In Southeast Asia even 80% of the reefs are at risk and over half (56%) are at high risk. Coral Reefs die for many reasons. The biggest short-term threats are destructive fishing methods, overfishing, sedimentation and pollution associated with coastal development. Mid- to long-term the change of global climate associated with rising water temperatures and the acidification of seawater is now the biggest threat.

When reefs die fish populations disappear, beaches wash away and land erodes from waves, fishermen lose their livelihoods, tourists find somewhere else to go, dive operators close and divemasters become jobless.

It doesn't look good for the Coral Reefs does it? But what can we do?

## Creating an Artificial Coral Reef

In Ekas Bay, South East Lombok, Indonesia with the eco-resort "Heaven on the Planet" we try to assess the effectiveness of the implementation of a nearly natural Artificial Reef as a method for the restoration and the relief of the valuable tropical Coral Reefs.

The deployment, as well as the monitoring of the Artificial Reef, is done on a low-cost basis to provide a suitable tool for implementation by the poor fishing villages around Ekas Bay to restore their over-used Coral Reefs.



*Over-used Coral Reef in Ekas Bay*

All species that grow on the man-made reef are growing naturally, with the reef providing the substrate and suitable habitat.

If the project is successful, the simple technology could be applied internationally as a tool for Coral Reef recovery and even be passed to poor fishing communities in developing countries.

## Deployment of the Artificial Reef

The Artificial Reef is deployed nearshore on a sandy sea bottom covered with seagrass in an area of low wave action and moderate currents between the "Heaven on the Planet" resort and Ekas village. The reef is made up of readily available limestone rocks quarried from the land. The rocks of 20 to 40 cm diameter are piled up into a pyramid structure with holes and crevices to provide the best natural substrate and habitat. Reef size is 3 x 3 meters and depth varies between 3.5 and 6 metres depending on the tide.



*Artificial Reef structure*

The nearby natural reefs are patchy and about 15 to 20 metres apart. The Bay has other more diverse reefs which may be the source of coral larvae and fish recruits.

## Monitoring of the Artificial Reef

The Artificial Reef is being monitored in periodic surveys for benthic communities and fish, in order to measure trends in population size and areal cover of species. Monitoring of the nearby patch reefs was also done for comparisons with the artificial reef structure.

The reef surveys are done by free diving and snorkeling by applying common methods of ecological coral reef monitoring.

### Evolution of the Artificial Reef after 2 weeks

Two weeks after the installation of the Artificial Reef structure, the reef was already completely covered with hairy macroalgae and had attracted some fish, including different species of Cardinal fish and even one Scorpion fish was hiding in the crevices of the reef.



*Red Firefish hiding in the crevices of the Artificial Reef*

### Evolution of the Artificial Reef after 1 month

Whithin one month, the macroalgae growing on the the Artificial Reef was slightly covered with fine sand on the lower lying parts of the reef structure. The number of Cardinal fish populating the reef increased and a few Scorpion fish inhabited the gaps in the reef structure. In addition, some Surgeon fish and Goat fish were found in the direct vicinity of the reef.



*Yellowfin Surgeon fish patrolling the Artificial Reef*

### Evolution of the Artificial Reef after 3 months

After three months, the macroalgae cover was interspersed with coralline algae encrusting the limestone rocks and small crustaceans inhabited the crevices of the Artificial Reef.



*Coralline algae encrusting the Artificial Reef and small crustaceans found shelter in the crevices*

Different Cardinal fish species became abundant and formed big aggregations, swimming in and around the reef structure. In addition to the species observed during the one-month survey, the reef was now accomodating some colourful reef fishes, like several Damsel fish species and one Butterfly fish. No such populations were observed on the nearby patch reefs. Further monitoring will be conducted in 2010. The project at this stage has been highly successful.



*Big Cardinal fish aggregation with several Damsel fish among them*

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