Press :
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ON THE DOORSTEP OF TAMAN SARI RESORT, IN PEMUTERAN BAY BALI, LIES THE WORLD'S NEWEST, BIGGEST AND MOST RADICAL REEF SYSTEM.

THE MOST UNIQUE REEF SYSTEM IN SOUTH-EAST ASIA

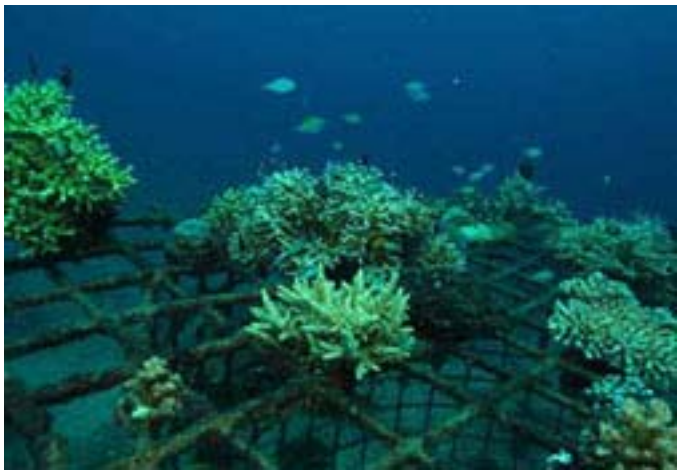
There are no other coral reefs quite like it and it is nothing like anything else you have seen before underwater. In the shallow bay 45 specially built steel contraptions in the shapes of caterpillars, Mexican hats, Eiffel towers, sugar loafs and tunnels are the rehabilitation platforms for broken corals. My first impression was that of an underwater educational theme park, a Disneyland coral reef, a new-age reef system! This unique reef system is the brain-child of scientists Professor Wolf Hilbertz and Dr Tom Goreau.

Artificial reef construction by means of mineral accretion, also known as "third generation" artificial reef systems (first reported in Asian Geographic in 2001), is a novel technology which uses electricity to "grow" limestone rock on artificial reef frames and increase growth rates of corals and other reef organisms. Two electrodes supplied with low-voltage direct current are submerged in seawater.

Electrolytic reactions at the cathode cause minerals naturally present in seawater to build up. At the same time a wide range of organisms on or near the growing substrate are affected by electrochemically-changed conditions, shifting their growth rates.

Stray or loose living corals are carefully collected from nearby destroyed reefs and transplanted onto the structures. They are attached with wires or wedged between steel bars. These coral bits are quickly cemented into place by the growing minerals forming over the structure's surface; the reefs are electronically charged to grow.

The Karang Lestari Project in Pemuteran first began in June 2000. It was the initiative of Yos Amerta of YOS DIVING when he met with Dr Goreau and Professor Hilbertz in Bangkok. The first structure was launched after the 2000 Coral Reef Symposium in Bali, fully funded by Yos and Pondok Sari Hotel, Pemuteran. In October 2002 the owner of Taman Sari hotel took interest in the project and an international workshop was organised to design and install more steel-structured nurseries. Using only local materials, local villagers and students, both Professor Hilbertz and Dr Goreau were on-hand and personally spearheaded the project as well as continuing to train and educate people and build and place the artificial reefs in Pemuteran Bay.



The success of the Pemuteran artificial reef project demonstrates how the effort and willingness of a few scientists, dive operators, resorts and the local people can help preserve the quality of our marine environment. The project is funded privately without any government or NGO support. At a recent National Coastal Zone Management Conference in Bali the Karang Lestari Pemuteran project was selected as the best coastal project in the country and recognised with a cash prize equivalent of US$500. Subsequently the success story was presented by Indonesia's Culture and Tourism Minister I Gede Ardika at the United Nations Preparatory Committee and Ministerial Meeting of the World Summit.

The reef restoration project is only one phase of a bigger overall plan. The time scope for the project is many years as coral grows slowly and releases spores only once a year to repopulate other areas. However, the technology ensures that the coral structures inside the project will stay healthy even in times of stress (such as the El Nino warming of the water experiences in 1998). One of the many bene.ts of the reef restoration project is that reef fish, schooling fish and many other marine life forms gravitate to the area. It is a fish nursery as well as a coral nursery, and thus is becoming an excellent snorkelling and dive site. We recommend that every diver serious about contributing to the well-being of our reef systems go and dive at this radical reef system in Bali and make a donation to the project.

PEMUTERAN ARTIFICIAL REEF PROJECT

KARANG LESTARI PEMUTERAN
BALI INDONESIA

AWARDS AND RECOGNITION

In May 2002 at the National Coastal Zone Management Conference on Bali, Karang Lestari Pemuteran was selected as the best coastal project in the country and recognized with a cash prize equivalent to US$500. In June 2002, Culture and Tourism Minister I Gede Ardika presented the project¹s success story at the United Nations Preparatory Committee & Ministerial Meeting of the World Summit, held in Bali in late May and early In July 2002, Dr. Klaus Topfler, Executive Director United Nations Environmental Program visited the project and gave his full support.

In August 2002, the project was presented by Dr Tom Goreau, President of the Global Coral Alliance and co-founder of the technology, in a report at the World Summit on Sustainable Development in South Africa.

In November 2002, Karang Lestari Pemuteran, was announced winner of SKAL International(the world's largest tourism and travel organization) their best practices global eco-tourism award for best underwater eco-tourism project in the world, presented in Cairns Australia and represented to Culture and Tourism Minister I Gede Ardika in December 2002 in Bali.

The judges commented the project was impressive, achieving success in a short time-span in reversing destruction and becoming a model for restoration of coral reefs in other parts of the world.

December 2002, Culture and Tourism Minister, visited the project along with Jakarta based Ambassadors andrepresentatives from 8 different countries.

January 2003, The Indonesian Minister for the Environment also visited the project and offered his full support and also agreed to write a letter of recommendation.

February 2003, Dr. Thomas Goreau met with Dr. Ketut Sugama (Director of Marine Research) in Jakarta to discuss expanding the reef and fisheries restoration projects.

March 2003, The Minister of Tourism Indonesia leads a group of other International Tourism Ministers and Delegates from ASEAN to visit the project.

May 2003, Balinese conservationist and eco-tourism expert I Gusti Agung Prana, owner of Taman Sari, was nominated to the United Nations Environmental Program for its prestigious Sasakawa Environmental Prize. The annul prize honors individuals who have distinguished themselves by making outstanding contributions to the management and protection of the environment. The nomination recognized Prana for his remarkable capabilities in advancing environmental awareness and promoting understanding between international scientists, conservationists, business owners, fishermen and community leaders.

October 2003, The Minister of Fisheries and Marine Affairs visits the project and releases 5000 hatchlings, as well as donating a high speed boat to the community marine security patrol.

October 2003, The Ministry of Culture and Tourism also donates a high speed boat to the community marine security patrol.

December 2003, A one hour documentary titled "**Reef Reborn**" about the project was produced by an international film team for New Zealand National Hertiage, and is now being distributed worldwide with great success.

January 2004, Great effort is required to expand research and training for large-scale application across Indonesia. Toward this goal, Karang Lestari has organized two workshops. In the most recent, January 2004, the majority of participants were Indonesian students attending Universities or working with local environmental conservation groups. Additionally, there were participants from Germany, Hungary, Italy, Britain and the US. Backgrounds included students of biology, marine biology, chemistry, oceanography, aquaculture, fisheries, forestry, literature, visual arts, veterinary science, civil law and marine conservation with non-profit community groups and fisheries. Students received lectures and hands-on training, and learned to design, build, deploy, maintain and repair coral reef and fisheries restoration projects. The results of two recent student research these on the project were presented. A full report is found at www.globalcoral.org

May 2004, Karang Lestari is presented the **KALAPATARU ADIPURA AWARD**, Indoneisa's most prestigious environmental award, presented to the village chief by the **PRESIDENT OF INDONESIA** in Jakarta.

January 2005, Karang Lestari is presented **ASEANTA's AWARD FOR EXCELLENCE FOR BEST CONSERVATION EFFORT**, in Kula Lumpur by the **Deputy Prime Minster of Malaysia**. (Entries were from all Asean countries including Japan, Korea and Australia.)

April 2005, Karang Lestari is presented **PATA's (Pacific Asia Travel Association) GOLD AWARD FOR BEST ENVIRONMENTAL PROJECT**, in Macau.

The **Biorock** technology being used in Karang Lestari is now being considered by Indonesian Government Officials to restore damaged reefs in large areas of North Sulawasi and tsunami destroyed reefs and eco-systems in North Sumatra.

Overview

The world¹s largest archipelago nation, with 17,502 islands, Indonesia is an important habitat and eco-balance center for marine life including corals. Indonesia possesses the richest assortment of coral species in the world (450 species) from fringe and barrier reefs to atolls and patch reefs. Estimates are that Indonesia¹s reefs cover 85,700 sq km, constituting 14 percent of the world¹s coral reefs.

However, today, only 6 percent of these reefs are in healthy condition. Destruction has come from human activities, such as dynamite and cyanide fishing, pollution, global warming, increased turbidity, over-exploitation and environmentally-unfriendly tourism.

Immediate economic gains do not offset the loss and destruction of reefs. Damaged coral reefs takes year to recover naturally. Protected artificial reef regeneration speeds nature¹s process in restoring coral growth and in even shorter order, providing a protected environment for fish regeneration. The Pemuteran Karang Lestari Coral Conservation project, off West Bali National Park, is Indonesia¹s first step in the right direction.

Introduction

Sustainable eco-tourism requires protection of natural beauty. Yet, conservation often conflicts with traditional resource users. For example, fish are more valuable when they can be viewed repeatedly by divers and snorkelers, versus their value as a single meal.

Pemuteran lies in the shadow of mountains to the south and to the north is Menjangen Island, famous for diving and nature treks. Pemuteran receives less rainfall than other island areas during rainy season and is too dry for rice cultivation. Its people traditionally live from the sea.

Pemuteran has the largest area of shallow coral reefs in Bali that are easily accessible, because the area is calm and free of strong currents and waves which affect most other parts of the island.

The spectacular coral reef growth near land made for a diving and snorkeling paradise. Because the area is furthest from the island¹s main tourism centers to the south, it was quiet and unspoiled. Hotels and dive shops were pioneered by Mr. Agung Prana and Mr. Chris Brown, respectively, who worked closely with the village to protect the area.

Pemuteran community declared that the reefs in front of the beach where most hotels are located, as protected no-fishing zones, for eco-tourism use only. Local fishermen banned bomb and cyanide reef fishing in Pemuteran Bay to preserve what was left of their resources. Through such conservation efforts, the healthy Pemuteran bank reefs drew increasing numbers of divers and snorkelers to view the coral gardens.

As a result of this protection, many other hotels and dive shops followed, making tourism earnings a major contributor to the local economy, in a region which previously had few cash-earning jobs economically poorest areas. The community quickly grasped the meaning of eco-tourism income, which had positive effects on lifestyle and health for local villagers.

To ensure conservation efforts continued, strong education, protection and regeneration programs were put into place, to sustain and grow tourism, with income flow directly to the villagers. And then the economic crisis befell Indonesia. Vigilance in enforcing fishing bans lapsed during the economic catastrophe of 1998.

Pemuteran¹s large sheltered bay, once surrounded by reefs teeming with fish was targeted by migration of whole communities of fishermen from neighboring Java and Madura islands, where their own fisheries had been wiped out by destructive over-exploitation. They brought their destructive bomb and cyanide fishingtechniques, steadily destroying almost all of Pemuteran's reefs. The bank reefs, once full of coral hickets and fish swarms, became piles of broken rubble, barren of fish. By the time the bombing and cyanide ban was reinstituted, the damage was done. Local fishermen now recognize the industry will not recover until the coral reef habitat can be restored.

Pemuteran Coral Conservation Project Karang Lestari Pemuteran

In the Pemuteran coral conservation project, hotels, dive shops, village fisher folk, scientists and conservationists united to protect and restore coral reefs and increase fishery resources, both for tourism and the local fishery economy.

The Karang Lestari Project began in June 2000, when Dr. Thomas Goreau and Professor Wolf Hilbertz, working with Yos Amerta and divers from Yos DiveShop, built the first coral nursery in front of Pondok Sari Hotel, Pemuteran.

In October 2002, an international workshop on design and construction of coral nursery was held at the site and three more nurseries were installed in front of the Sea Temple. In April 2001, 19 more coral nurseries were installed in front of Taman Sari hotel with assistance from Archipelago Dive Shop, and another nursery was added in front of Reef Seen Aquatics.

The project uses the Biorock (TM) method to increase coral growth rates, increasing reef fish density by providing fish with a suitable habitat. All of the nursery structures are located in the Pemuteran Coral Reef Protected Area. Corals transplanted onto the structures attract high densities of all type of fish. As a result of the dense swarms of fish in and around the coral nurseries, they have become the major focus of near shore diving and snorkeling. Spinner dolphins, which vacated the bay due to bomb fishing, last year returned to the site, where they are protected.

All corals used in the projects are broken pieces found on nearby reefs where they were damaged by rolling or falling. They would sooner or later die if not rescued and attached to the nursery structures, creating attractive snorkeling and diving trails. This has greatly enhanced marine life in the area.

In May 2002, seven new fish habitats were deployed in fishing grounds east of the protected area. Like the previous ones, these projects were constructed without any program funds, save a single workshop grant and small donations from area businesses, local hotels, dive shops and visitors.

News of the Karang Lestari project¹s success has spread rapidly through Bali¹s hotels, dive shops and villages, with requests for projects coming frequently. Funding is required for larger scale training to spread the projects. Students from Udayana and Bogor universities, Bali and Java respectively, have begun research programs on the project.

Technology

Low technology Mineral Accretion (Biorock TM) methods economies for coastal communities. Steel lattice bases, submerged in the sea and charged with a minimal electrical current generates natural limestone rock growth on the base, which increases growth rates of corals and other reef organisms. Corals on the mineral accretion structures, because of their higher growth rate and healthier metabolism, reproduce more quickly and prolifically, because of healthier metabolism. They become key to restocking the surrounding reefs.

The infrastructure for Mineral Accretion coral regeneration is so simple, that it can be replicated with very little skill or training, few materials and direct, alternate, solar or wave-generated electrical current.

As of November 2002, 38 Mineral Accretion coral nurseries spanning 222 meters were operating in the 2.4 hectare Pemuteran Village Protected area along 200 meters of coastline. Annually, these structures consume about 4 kw of electrical power.

Community Involvement

A community-based approach to conservation followed tourism-based businesses in Pemuteran. The project has been funded and staffed by voluntary efforts and modest donations.

This project has made it clear that restoring coral growth can bring fish back. Local fishermen see the schools of many kinds of fish attracted to the coral nurseries, as they pass over them en route to their fishing grounds miles off shore. There they spend the day searching for the few fish in a barren wasteland.

The fishermen are eager to see the coral nurseries expanded and fish habitat constructed in areas near their fishing grounds. They protect the projects and keep records of the fish caught in areas nearby as part of an experiment to improve the fisheries. They want fishermen from other areas to know what they are doing and why, and that they could do the same thing in their areas so they wouldn¹t have to fish at Pemuteran.

Besides the economic interest of improved subsistence fishing, the local villagers have taken the initiative to start up dolphin watching tours. With coral regeneration and fishing bans in the bay, spinner dolphins have returned in significant numbers. The village also retains rights to all snorkeling income from tourists. Both of these income alternatives, in a traditional fishing community, serve to reinforce their basic understanding that each fish has more value in the sea than in a net or on the end of a fishing line. Alternative income avenues are made available. Thus, they have become avid proponents of conservation and eco-tourism, for economic and environmental benefits.

The nursery structures already attract dense populations of juvenile reef fish, resting fish schools and fish that only shelter in live coral, as well as other marine organisms. Young fish of many species are attracted to thesites to metamorphosefrom larval stages into juveniles. Snappers use the structured to hide in the daytime, forming schools so dense that it is impossible to see the other side of the structure. Batfish are regular habitants. Damselfish and cleaning fish quickly establish territories.

These unusual underwater stations already are major tourist attractions. The Pemuteran pilot projects, the largest of their kind in the world, exceed the size of all other mineral accretion projects worldwide, combined.

Future Plans

Karang Lestari is the first step to restore as much as possible of Pemuteran¹s damaged reefs. More fishery projects are planned along the coast and fishermen are eager to educate colleagues from other areas about the new methods so that they can be applied in other own areas and prevent encroachment upon Pemuteran¹s fishing grounds. They are eager to change from hunting fish to farming them, and to secure sustainable fisheries and tourism attractions for future generations.

This only will be possible if the current pilot projects are expanded in scale to major fishing areas, the banks north of Pemuteran and beyond. Funding is sought to train fishermen to build large, solar-powered fish and coral nurseries on the banks as part of a long-term coral reef restoration program. Many locations around Bali already have requested project start-ups.

New research and training programs in coral reef restoration, mari-culture and ocean energy development could be started soon as part of a new Marine Research Center in the Biology and Environmental Sciences departments at Bali¹s Udayana University. A potential site for a research laboratory has been identified at Nusa Lembongan island, off Bali¹s southeastern coast. Support for these projects has been committed by the Indonesian Dive and Water Sports Federation, the Bali Tourism Association, the Governor of Bali and Indonesian ministries of Culture and Tourism, Environment, Marine Affairs and Fisheries.

Funding

Karang Lestari Pemuteran has been created, developed and managed on the thinnest of shoestring budgets. There has been no funding other than small private donations from private individuals and guests staying in Pemuteran and impressed with the work. Dr. Tom Goreau and Prof. Wolf Hilbertz have donated all their time, travel costs and many of the materials needed. Taman Sari Cottages has donated electricity as well as room and board for the principals during construction. Archipelago Dive has donated the use of diving equipment and boats.

The project is in need of further funding to allow it to move to the next stage. We desire to expand the local education of marine ecology and conservation as well as take the technology to the bank reefs and to other communities in Bali and Beyond.

Banking Details

If you feel to help in this very important endeavor please send your donation to the non profit organization as follows:

Bank Permata
Cabang Dewi Sartika
Denpasar Bali Indonesia
account Number 5801263455
Name : Yayasan karang lestari Pemuteran

We would like to inform you that any significant donation or help in establishing funding will be individually recognized by installing a stone plaque with the donators name and affiliation right onto one of the structures underwater, for all divers and snorklers to see.