

**YAYASAN KARANG LESTARI  
PEMUTERAN, BALI, INDONESIA**

**The world's biggest, best, and longest  
continuously run coral reef restoration project**

**SLIDE SHOW AT PRESENTATION OF  
THE**

**2012 EQUATOR AWARD FOR  
COMMUNITY-BASED DEVELOPMENT**

**JUNE 2012, RIO DE JANEIRO, BRAZIL**

• **PHOTOS BY RANI MORROW-WUIGK**

• **YAYASAN KARANG-LESTARI**

•

• **PRESENTED BY**

•

• **BAPAK AGUNG PRANA**

• **PRESIDENT, YAYASAN KARANG LESTARI**

• **&**

• **DR. THOMAS J. GOREAU**

• **SCIENTIFIC ADVISOR, YAYASAN KARANG  
LESTARI**



**Bali lies in the Coral Triangle, the most biodiverse region of the world's ocean.**



- **Bali is a small island with an ancient and deeply traditional culture, where village law is predominant. The fishing village of Pemuteran set up its own Pecalang Laut, or Sea Guardians, to enforce village laws preserving coral reefs and fisheries resources from destructive over-exploitation. On their own they set up a village-run marine protected area. The fisheries were in collapse at the time the project started.**



- **Maintenance and management is done by local trained staff, who are the world's first professional reef gardeners, hired by funds raised within the community to grow coral reefs and care for them.**





**POKMASWAS**  
**PECALANG SEGARA**  
**DESA PEMUTERAN**

BIO-ROCK  
Pemuteran Bali

BIO-ROCK CENTER  
DESA PEMUTERAN

Bali  
Bio-Rock  
The Blue Planet



- **The Yayasan Karang Lestari coral reef and fisheries restoration project is right in front of the beach. A traditional Balinese ceremony was held to bless a new coral restoration project, The Coral Goddess.**

# BUILDING A NEW REEF







POKMASWAS  
PEALANG SEGARA  
DESA PEMUTERAN

Blorok  
Pemuteran Bali

SPONSOR  
BABY CORAL

ROCK CENTER  
KARANG LESTARI

Blorok  
Training  
Workshop  
2010







- **A few weeks later the corals are starting to grow around the Coral Goddess, and a big school of snappers swarm around her. Corals are grown using Biorock® Technology to greatly increase coral settlement, growth, survival, and resistance to severe environmental stress, including high temperature.**







- **The Coral Goddess is powered by a solar panel and a windmill, which feed it a completely safe low current. This small current completely stops all rusting of the steel and grows solid limestone rock over it. The process was originally invented by the late architect Professor Wolf Hilbertz to produce building materials from the sea.**





**Biorock corals grow at record rates, typically 2-8 times faster than normal, allowing reefs to be kept alive under conditions that would kill them, and severely damaged reefs that have had no natural recovery to be restored in a few years.**

# MARINE ECOSYSTEM RESTORATION

- CORALS, OYSTERS, SEAGRASS, MARINE PLANTS, AND FISHES ALL HAVE MUCH HIGHER SETTLEMENT GROWTH AND SURVIVAL AND RESISTANCE TO ENVIRONMENTAL STRESS.
- WITHOUT RESTORING DAMAGED MARINE HABITAT, MARINE PROTECTED AREAS CAN'T WORK TO RESTORE COLLAPSED FISHERIES



# BEFORE, 2001

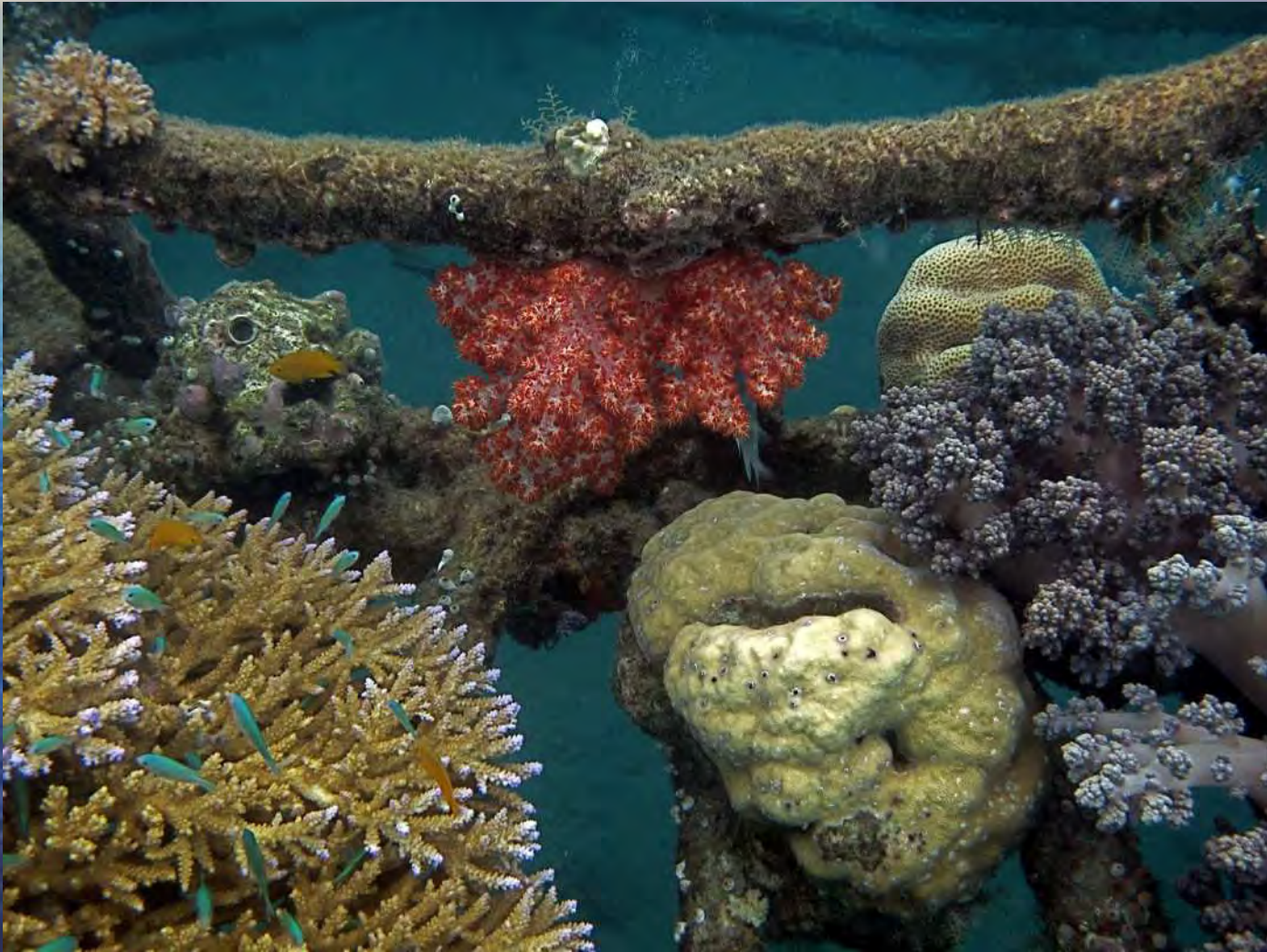


# AFTER, 2011





**All forms of marine life settle and grow on Biorock structures at extraordinary and accelerated rates.**





**The corals show exceptionally dense and perfect branching.**









**Corals grow at record rates,  
and we propagate them onto  
new structures.**





**The corals glow with bright colors. This coral was grown in a few years from a fragment the size of the small circle at top center.**





**Our goal is to grow every species to create Coral Arks to save coral reef ecosystems from extinction from global warming.**





**These soft corals, waving in the current, settled and grew spontaneously. The hard corals were transplanted from small naturally broken fragments rescued from dying on the reef.**





**These grey sponges settled and grew on their own.**





**Filter feeding animals migrate to the structures.**



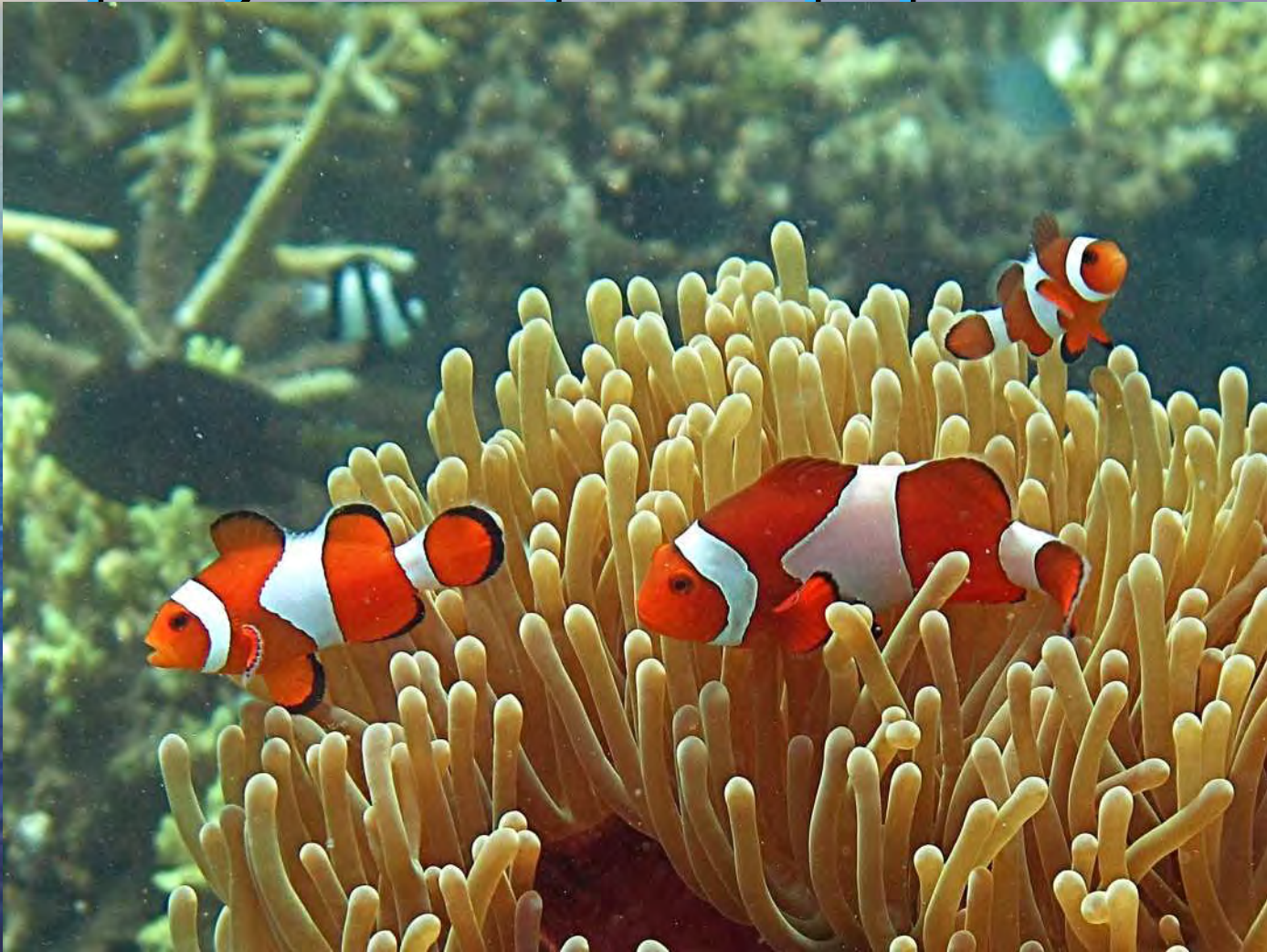


**When we began the project this area was nearly barren of corals and fishes, due to the impacts of global warming and destructive fishing practices by outsiders and locals.**





**Fishes are quickly attracted to the shelter and food Biorock reefs provide. We get around 6 times more fish than nearby reefs. Fishes rapidly build up their populations.**





**A variety of colorful fish make the project a very valuable ecotourism resource, creating jobs for the villagers.**





**Many brightly colored fish never leave the projects. Their populations have increased enormously.**





# Rabbitfish school around the projects.





**Razorfish swim head down,  
and all move together.**





# School of fusiliers.





# Fusiliers glow with electric colors.





**Spadefish were some of  
the first to move in.**



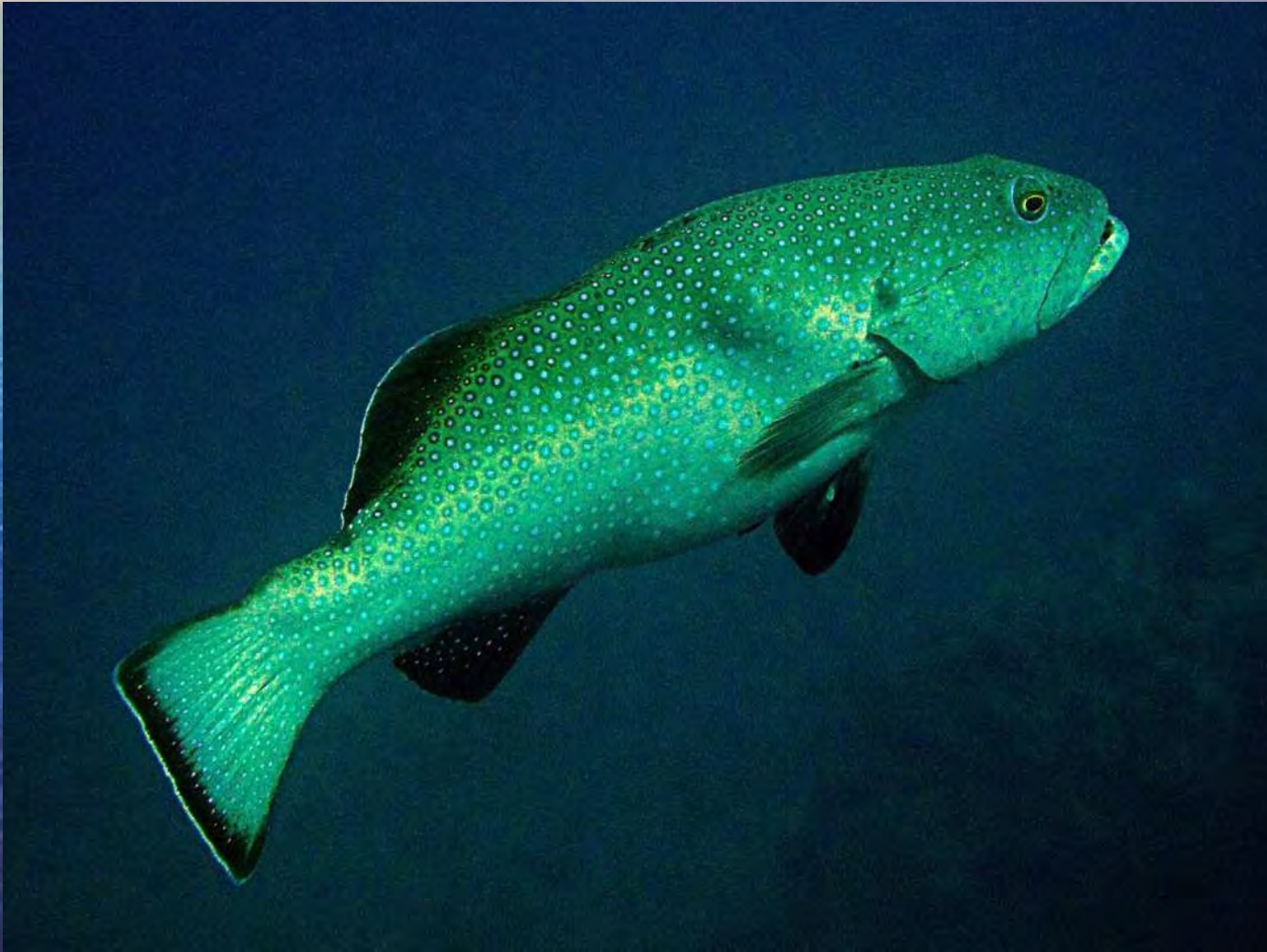


# Goatfish.





**We are restoring populations of  
big fish like groupers that have  
become rare.**





**Large Sweetlips hang  
around the project.**





**Barracuda. The entire food chain is represented on the projects.**





**Village schoolchildren come to the project to learn how to care for their marine life. Here Komang Astika, project manager, gives an Earth Day presentation.**





**High school students from Java come to learn about the project.**





**Indonesian university students do research projects. Here is a group from Bogor University in Java.**





# Students from Australia.





**And from as far away as remote  
and exotic New York City.**





- **Yayasan Karang Lestari is doing global outreach to inform other communities about innovative and underutilized technologies for sustainable development as part of The Green Disc: New Technologies for a New Future, produced by the UNCSD Small Island Developing States Partnership in New Sustainable Technologies.**



- **The 60 chapter 2<sup>nd</sup> Edition of The Green Disc is being launched at UNCSD in Rio de Janeiro in June 2012, aimed at global policy makers, funding agencies, students, and the public, to inform people about new technologies for sustainable development. These could solve many of our major environmental problems if we only used solutions already in hand.**



- **It covers renewable energy from waves, tidal currents, and biomass, waste recycling, water purification, ecosystem restoration, soil fertility restoration, carbon sequestration, shore protection, sustainable agriculture and mariculture technologies, etc. for economic and environmentally sound development and reversing global warming.**



- **The entire work will be free on the web at:**
- **<http://greenthindisc.com/>**



# **BENEFITS: FISHERIES**

- **LOCAL FISHERMEN SAY THE PROJECT HAS GREATLY INCREASED THE SIZE, ABUNDANCE, AND DIVERSITY OF FISH CATCHES IN SURROUNDING WATERS.**
- **INITIALLY THEY WERE WARY, THINKING IT WAS A WAY TO RESTRICT FISHING.**
- **NOW THEY STRONGLY SUPPORT THE PROJECT BECAUSE OF THE BENEFITS THAT THEY SEE**



# **BENEFITS: ECOTOURISM**

- **TOURISTS COME FROM ALL OVER THE WORLD TO SEE THE PROJECTS**
- **HALF OF THEM HAD HEARD BEFORE AND CAME FOR THAT REASON**
- **THEY COME BACK AGAIN AND AGAIN TO WATCH THE PROJECTS EVOLVE**
- **THEY TELL THEIR FRIENDS AND FAMILY**
- **THIS HAS CREATED ECOTOURISM JOBS FOR VILLAGERS**



# **BENEFITS: BIODIVERSITY**

- **A NEARLY BARREN REEF IS NOW LUSH WITH CORALS AND SWARMING WITH FISH**
- **THE CORALS ARE MUCH MORE RESISTANT TO HIGH TEMPERATURE AND SEDIMENT STRESSES**
- **VAST NUMBERS OF NEW CORALS HAVE SPONTANEOUSLY SETTLED**
- **OUR CORAL ARKS AIM TO PROTECT BIODIVERSITY FROM GLOBAL WARMING**



# **BENEFITS: CLIMATE CHANGE ADPATATION**

- WE ARE GROWING CORALS THAT ARE MUCH MORE RESISTANT TO GLOBAL WARMING, WITH 16-50 TIMES HIGHER SURVIVAL FOLLOWING HEAT SHOCK**
- GROWING BACK REEFS LETS US GROW BACK SEVERELY ERODING BEACHES AND ISLANDS THREATENED BY GLOBAL SEA LEVEL RISE**



# **BENEFITS: PRIDE AND SELF-RELIANCE**

- **This project has been done almost entirely with local resources, and we have never had major funding from the outside.**



# **BENEFITS: LEADERSHIP BY EXAMPLE**

- **We hope that every coastal community in Indonesia and around the world that has lost their coral reefs and fisheries will do what we are doing in Pemuteran to grow back and sustainably manage their own marine resources for their children's future.**



**Om shanti, shanti, shanti om!**

**Terima Kasih!**

**Thank you!**

**Muito obrigado!**