

Southeast Asian Centre of Excellence



Transplantation of coral fragments without adhesives. Local participants are taught the basics of marine ecology and the rationale of reef restoration and rehabilitation (a). Selected participants do an actual transplantation on the reef (b). Newly attached *Porites cylindrica* fragments on a dead *P. cylindrica* bommie (c).

Community-based restoration: the Bolinao experience

Researchers from the GEF-Coral Reef Targeted Research & Capacity Building (CRTR) Program are working with local communities to restore live coral cover to the reefs of Bolinao, Pangasian in the northwestern Philippines by sharing low-cost reef restoration techniques.

Over the past two years, a series of training and practical sessions have been hosted by the CRTR Program's Southeast Asian Centre of Excellence (CoE) to educate community members on these techniques, which have emerged as a result of scientific research in the region over the past four years.

As a result, local people are implementing the techniques and restoring the reef by transplanting coral fragments into degraded reefs in the area, and watching the coral regenerate.

Successful restoration inspires outreach

The Restoration & Remediation Working Group (RRWG) of the CRTR Program and the EU-funded REEFRES project have been actively testing reef restoration techniques in Bolinao on the Lingayen Gulf since 2005. These include the direct transplantation of coral fragments to natural reef substrates, standardised artificial substrates and coral nursery rearing.

In one successful experiment, 3-4 cm long fragments of the branching coral *Porites cylindrica*, were attached to dead coral substrates using adhesives in an attempt to restore live coral cover in the experimental plots.



Fishers in the Lingayen Gulf depend on a healthy reef. Photo: Hazel Trebilco

This inspired an idea to attempt to bring back to life several dead *P. cylindrica* bommies in Bolinao using fragments from the same species, which had not shown any signs of recovery since widespread coral bleaching occurred in 1998.

The idea was expanded further to involve the major stakeholders of the reef – the coastal residents of Bolinao.

The Coral Reef Targeted Research & Capacity Building for Management Program (CRTR) is a leading international coral reef research initiative that provides a coordinated approach to credible, factual and scientifically-proven knowledge for improved coral reef management.

The CRTR Program is a proactive research and capacity building partnership that aims to lay the foundation in filling crucial knowledge gaps in the core research areas of Coral Bleaching, Connectivity, Coral Diseases, Coral Restoration and Remediation, Remote Sensing and Modeling and Decision Support.

Each of these research areas are facilitated by Working Groups underpinned by the skills of many of the world's leading coral reef researchers. The CRTR also supports four Centres of Excellence in priority regions, serving as important regional centres for building confidence and skills in research, training and capacity building.

The CRTR Program is a partnership between the Global Environment Facility, the World Bank, The University of Queensland (Australia), the United States National Oceanic and Atmospheric Administration (NOAA) and approximately 50 research institutes and other third parties around the world.

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Involving communities

Several activities were carried out by both the RRWG and the REEFRES projects to share the techniques they had developed with local residents in 2008-2009.



Community volunteers transplant coral using low cost methods, with goggles as their only equipment

The goal was to train participants in coral restoration using the simplest and cheapest methods available, including the wedging of coral fragments in rock holes and crevices and, at the same time, instilling the concept of using sustainable and non-destructive sources of transplant material.

These methods involved no costly materials or scuba equipment, and provided a hands-on experience for the participants.

The use of coral rescue stations was also taught to highlight the significance of having non-destructive ways of sourcing fragments for reef restoration purposes.

CRRR researchers training community members were aware of two major communication challenges. The first was teaching restoration in a way that could be understood by non-scientists, particularly given the language barriers – for example Filipino does not have equivalents for English scientific terms such as 'ecosystem' and 'food chain'. Education levels in the group also varied considerably.



Community volunteers trained and ready to transplant coral

The second challenge was preventing restoration 'tragedies', brought about by misinformed enthusiasm and misguided intentions about restoring the reef. It is no use restoring degraded reefs if healthy corals are damaged in the process. Researchers were also extremely concerned that participants would get the impression that reef restoration is the panacea for all the issues facing coral reefs which is clearly not the case.

Hands-on learning

Seventy people, including high school students, science teachers, village officials, volunteer overseers of village-level Marine Protected Areas, and fishers attended the first training session in April 2008.

The two-day program involved lectures on coral biology, ecology and the basics of restoration. Some participants learned for the first time that corals or *burak bato* (literally, rock flowers) are living organisms that grow, reproduce and die. Fifteen participants aged 18 to over 60 were selected to become the first group of coral transplantation trainees. Volunteers were briefed on important aspects of the activity including:



Fragments of coral grow on underwater rescue stations, ready for transplantation

- There are different ways to transplant corals, and not all methods are suitable for all situations
- Only some corals are suitable for transplantation to particular environments
- The target restoration sites (dead coral bommies of *P. cylindrica*) have not recovered naturally for years
- The transplant material (4-5 cm fragments of *P. cylindrica*) was prepared from 'corals of opportunity' ie fragments found on the reef floor that would otherwise have died from burial in the sediment
- The correct method of attachment – simple wedging of fragments on rock holes and crevices.

Under supervision, the volunteers planted 600 fragments on selected dead bommies using no equipment other than goggles, and no adhesives. The objective of this exercise was to find out how much success could be achieved by the lowest cost restoration option.



The next generation learns about the importance of keeping reefs healthy

This same group of volunteers returned the following September to further develop their transplantation skills. The objective for this second session was to introduce the concept of sustainable sources of transplant material. Participants were shown video clips (see www.gefcoral.org, video image library) of how the materials were collected from both 'corals of opportunity' and fragments harvested from corals growing as a result of the previous activity. This clearly demonstrated that coral transplantation can be sustainable and need not cause damage to existing reefs.

Prior to the transplantation activity, participants swam over the previous transplant sites to note which fragments had attached successfully to the reef and begun to grow. This enabled participants to improve their coral-wedging skills. They then transplanted 1600 additional fragments.

A third training session was held in November 2008 aimed at representatives from various village-managed Marine Protected Areas. The focus of this activity was the use of 'coral rescue stations' – table-like platforms onto which coral fragments could be tied and reared in preparation for future transplantation to the reef. Participants had the opportunity to design their own coral rescue stations from available materials such as old fishing nets and bamboo poles. Participants were shown how to identify and collect 'corals of opportunity' and how to clean and trim the coral fragments ready for transplanting. Again only very basic equipment was used.

Ongoing reef restoration

Subsequent restoration activities with the Bolinao communities in 2009 have continued to highlight sustainable sources of coral transplants, with participants being taught how to transplant species other than *P. cylindrica* using a variety of low-cost methods, such as wedging, the use of cement and stabilising transplants using bamboo sticks.

Supervised participants have also used coral fragments on marked patches of bare reef or to establish new colonies on the rescue stations as future sources of transplant material. On their own initiative, some have also set up new types of coral nurseries using materials that they brought with them to the field.

At one site, the RRWG Israeli researchers brought several hundred coral fragments that have been growing on rope nurseries in Bolinao and, with the help of locals, transplanted these back to the reef.

In a few more months, the transplants from the 2008 transplantation will be large enough to take fragments from for use in future transplantation activities.

Results for the reef

The transplanted corals are being monitored quarterly by RRWG staff for attachment and growth. As of September 2009, an average of 50% the 17-month old and 12-month old transplants from the April 2008 and September 2008 activities, respectively, have self-attached to the reef substrate and have nearly doubled in size. Furthermore, the observed diversity and abundance of reef fish in the transplanted plots have been recorded to be higher than those on control plots (undisturbed dead coral substrates). Willingness among the stakeholders to participate in coral transplantation efforts remain high yet the initiative to undertake such activities by themselves remains to be seen, since getting to the reef sites still involves some cost (eg, gasoline for boats, lost time that could have otherwise been spent fishing). For human effort to be sustainable, some logistical support (eg, from the local government) would be advantageous until such a time that tangible results of their intervention (increased fish catch, tourism-related income) would provide them with enough incentive to continue with the work using their own resources.



Figure 5. Setting up of coral rescue stations. Participants are taught how to fabricate coral rescue stations (a), clean and trim collected coral fragments (b) and secure fragments to rescue stations (c).



Fishermen of the Lingayen Gulf. Photo: Hazel Trebilco

Coral reefs under threat

Reefs in the Lingayen Gulf area of the Philippines face a number of issues that impact on their health. These include:

- destructive and illegal fishing practices
- pollution primarily from intensive mariculture
- sewage
- siltation
- ineffective enforcement of laws to protect reefs
- bleaching caused by higher sea temperatures.

Restoration is only one part of the solution for ensuring a sustainable future for these reefs. Integrated approaches and actions are required.

Further Information

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About the Centre of Excellence



Bolinao Marine Laboratory, part of the Southeast Asian CoE, has strong connections with the community of the Lingayen Gulf.

Based at the Marine Science Institute at the University of the Philippines in Quezon City, and at the Bolinao Marine Laboratory in northwestern Philippines, the CRTR Program's Southeast Asian Centre of Excellence (CoE) is a hub for coral reef studies in the region. The Bolinao Marine Laboratory is situated 275km northwest of Manila at Cape Bolinao, Pangasinan Province, on the western side of the mouth of the Lingayen Gulf in Luzon Island.

The CoE is comprised of a number of leading internationally recognised researchers and scholars who are working in the CRTR's scientific Working Groups for Coral Remediation & Restoration, Modelling & Decision Support Remote Sensing and in local research projects within the Philippines.

The CoE would like to acknowledge all those who have assisted in this project, in particular Rommi Dizon and Patrick Cabaitan.

