



FINAL REPORT *(summary version)*

Enhancing the coral rehabilitation process via the natural recruitment technique in the Ha Long Bay, Natural World Heritage Site, Vietnam



Project leader: Nguyen Van Quan
PTES granted project 2007-2008

HAI PHONG, 2009



FINAL REPORT *(summary version)*

Enhancing the coral rehabilitation process via the natural recruitment technique in the Ha Long Bay, Natural World Heritage Site, Vietnam

Main participant:

Nguyen Van Quan, M.Sc (Project leader)
Nguyen Dang Ngai, M.Sc (Secretariat)
Pham Van Luong, M.Sc
Dang Hoai Nhon, M.Sc
Dam Duc Tien, Ph.D
Tran Quoc Hung, B.Sc
Dang Do Hung Viet, B.Sc
Vu Manh Hung, B.Sc
Nguyen The Hoang, B.Sc

Hai Phong, 2009

ACKNOWLEDGEMENT

This work has been funded by several organizations: the PTES foundation (People's Trust For Endangered Species) UK, the Institute of Marine Environment and Resources (IMER) and Ha Long Bay Management Department. On behalf of the project leader, I would like to express our thanks to all the efforts come from the donors to conserve our natural reefs in Ha Long Bay, Natural World Heritage Sites. Thanks to all the divers have spent hours underwater to deploy the substrate. We also records the golden supports come from National TV Broadcasting Channel VTV1, and journalists who care about our precious reefs in Ha Long Bay. We recommend this work as the results of all the valuable contributions of all the parties related.

I. Study site

A fieldtrip for deployment of the substrate that expect to encourage the recruitment of the coral larvae has been carried out in May 15th – May 30th 2007 according to the breeding season of coral in Ha Long – Cat Ba marine waters. Two types of substrate were selected such as clay bricks, clay roofs and cement panels. A total of 150 panels and 300 clay bricks and 300 clay roofs were deployed at 3 reef sites with the coordinate of: Long Chau: 20° 37'25"–109° 09'54" Coc Cheo: 20° 46'39"–107° 08'14" and Ang Du: 20° 47'31"–107° 08'23".

At each experimental reef sites we repeated the planted techniques as the previous project to put several coral fragments on the surface of the cement panels (20 panels each) with the purpose for enhancing the coral larvae recruitment to the panel's surface (according to the studies of Veron, the coral larvae tends to recruit into the adult colonies, 2004).

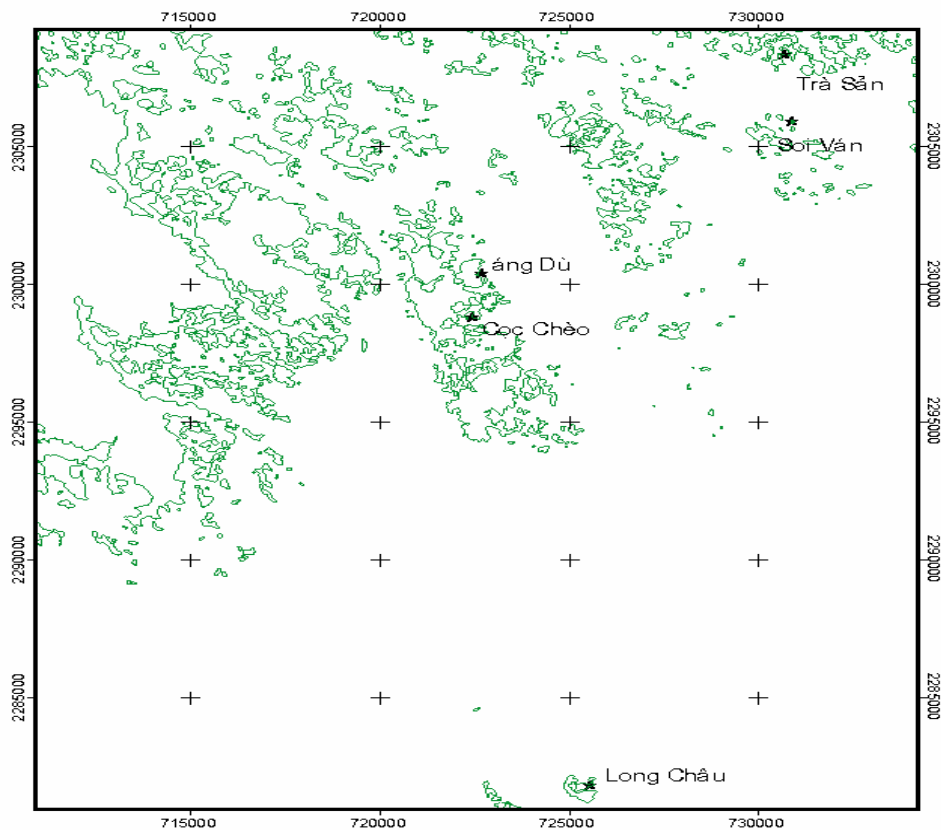


Figure 1. Experimental sites

II. Monitoring tasks

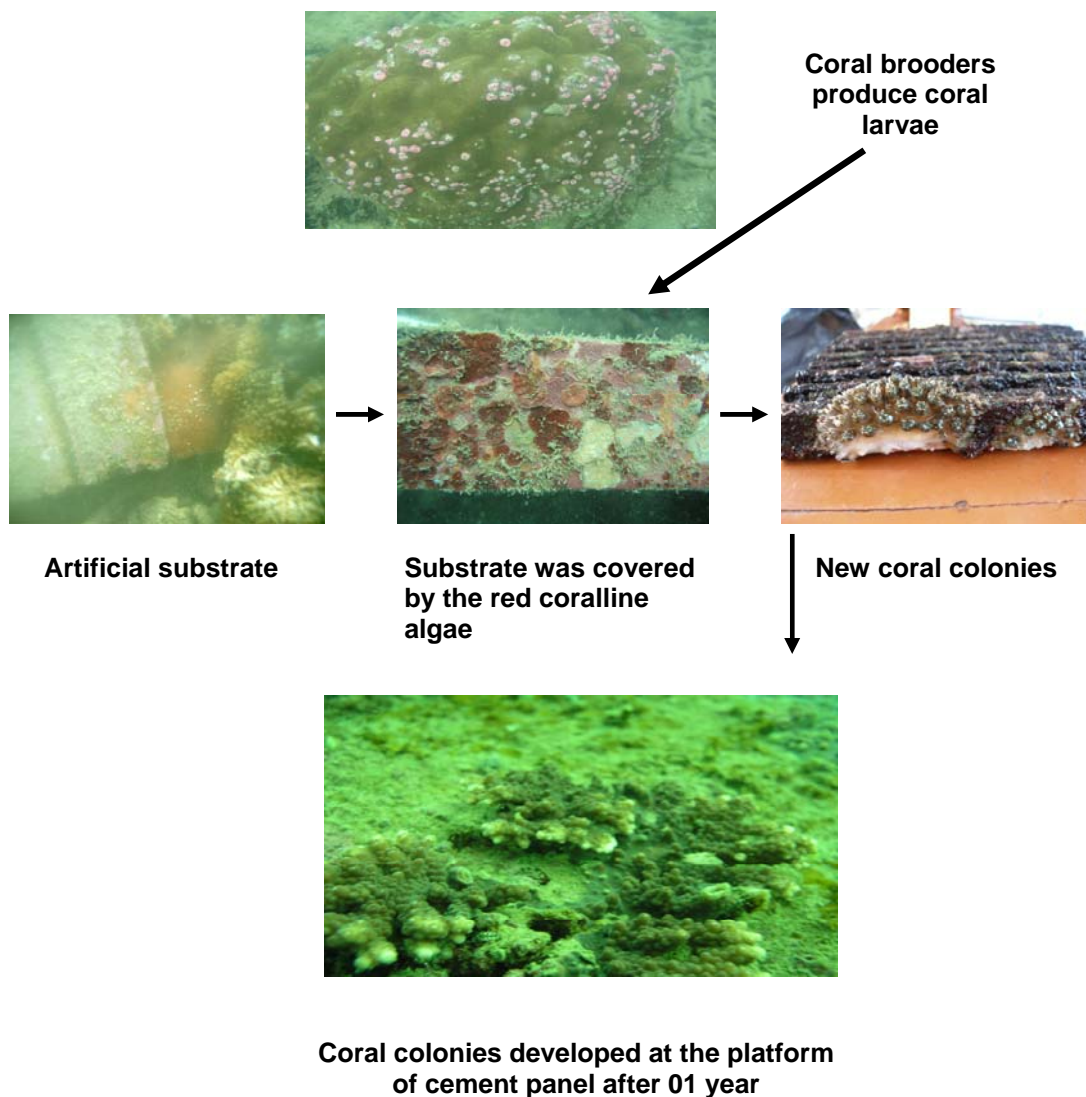
The monitoring works have been carried out following the quarterly period. There were total of 4 trips during 2007-2008: July 2007, August 2007, December 2007 and July 2008. All the biological parameters were measured including: (1) how did the deployed substrates change the color (relating to coral algae covered)? (2) Counting the number of new coral colonies found on the substrate, (3) Measuring the water quality at the field sites: salinity, pH, temperature, Tss, sediment..(4) Repeatedly monitor the transplantation sites from last project (phase I) funded by PTES in 2005-2006.

III. Results of study

Monitoring at the substrate deployed in 2007

- A field trip has been carried out since July 15th to August 1st at the sites deployed last May 2007. 30% of the substrate surface was covered by the red coralline algae. About 5% of the substrate found with the occurrence of the first coral colonies attached.

Scheme of the ecological regression at the field sites



- Last field survey was carried out in July 2008 at all the experimental sites with the results as following:

Table 1. Number of the new coral colonies found on the deployed substrate

No	Genera	Sampling sites		
		Coc Cheo	Ang Du	Long Chau
1	<i>Acropora</i>	8	36	
2	<i>Galaxea</i>	28		12
3	<i>Montipora</i>	1		
4	<i>Goniastrea</i>	2	4	2
5	<i>Lobophyllia</i>	4	6	
6	<i>Pectinia</i>	9		
7	<i>Podabacia</i>	9		
8	<i>Goniopora</i>			5
9	<i>Turbinaria</i>			9
10	<i>Pavona</i>		5	17
11	<i>Pachyseris</i>			4
12	<i>Porites</i>			4
13	<i>Echynophyllia</i>		8	1
		61	59	54

- Monitoring substrate deployed in 2005

A field trip has been carried out repeatedly in November 15th up to December 9th 2007 at the experimental sites and the sites of 2005's deployment. A total 70% of the substrate was covered by the red coralline algae and 40% of them with the new coral colonies developed. The results from sites in 2005's deployment by the physical transplantation method at Cong Do Island (the central Ha Long Bay site) figured out the positively results with the survival rate of 36-60%, depending on the source of the coral fragments (Table 2.)

Table 2. The survival rate of the coral colonies at the deployment sites (2005-2007)

No	Type of coral fragments	Survival rate
1	<i>Acropora</i> (branching coral)	40
2	<i>Porites</i> (massive coral)	50
3	<i>Goniopora</i> (massive coral)	60
4	<i>Galaxea</i> (encrusting coral)	36

The average of growth rate for the branching coral (*Acropora*) after 2 years deployment was 5cm/year and 15% of the diameter for the massive and encrusting coral colonies.



Coral branching colonies growth up after 2 year transplanting on the PVC Column



Massive coral colonies growth up after 2 year transplanting on the PVC Column



Surface of the reef ball after 2 year of transplanting work



Branching coral in good growing condition on the surface of reef ball



After 2 year of transplantation work, a spectacular underwater landscape was made and be the potential for the underwater eco-tourism in Ha Long Bay Natural World Heritage Site



Coral developed on the steel frames since 2005

IV. Discussion and future direction

Based on the results of study funded by PTES since 2005, it was considered that the physical transplantation of the coral fragments to the degraded reefs experienced several advantages such as:

- High recovery rate of the coral colonies at the transplanted sites
- Flexible movement of the substrate that assists to apply at the larger scale.
- Easily accept by the local community due to short term recovery of coral reefs at the degraded reef sites.
- Transplanted reef sites can be used as the potential sites for eco-diving activities.

Though, the physical transplanting methods face with several challenges such as high cost expenses for substrate designing, lack of coral fragments, labourous and time consuming. However these can be affordable if the natural coral recruitment methods can be applied at the same time. The research team highly recommends this study to the Ha Long Bay Management Board for further funding at the broader scale.

It is in need to carry out the future study on:

- Reef resilience capability under the anthropogenic and natural impacts
- Natural reproduction capacity of the reef building coral colonies at the study area (where it has a cold season)
- Natural recruitment processes of the coral larvae dispersal from natural ref. sites to the nearby degraded reefs.