

ARTIFICIAL REEF INSTALLATION IN THE SOUTHERN GULF OF THAILAND

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■ INTRODUCTION

Thailand is situated in the Southeast Asian Peninsula. It is bounded by Myanmar in the north and west, Laos in the north and northeast, Cambodia in the east and Malaysia in the south with area of 513,155 km.² The coastline of Thailand is separated by the Malay Peninsula into two parts, one is the Gulf of Thailand that connects to the Pacific Ocean and the other connects to the Andaman Sea. The total coastline is about 2,625 km.

The Gulf of Thailand extends northwest from the southern part of the South China Sea. It is bordered by the coasts of Vietnam, Cambodia and Thailand on the east, by the coast of Thailand on the north and west, and by a line drawn from the Thai-Malaysia border to the tip of Cape Camau of Vietnam on the south. It is approximately 835 km long on the northwest axis. The maximum width is approximately 555 km. The mouth of the Gulf, as indicated by the above mentioned line, is about 370 km wide. The Gulf of Thailand covers an area of approximately 350,000 km.² Being a part of the Sunda Shelf, the Gulf is relatively shallow, with a mean depth of approximately 45 m and a maximum depth of approximately 80 m.

The Southern Gulf of Thailand are in 4 provinces areas as followed : Nakhon si thammarat, Songkhla, Pattani and Narathiwat. In these areas, there are some problems concerning about illegal fishing, and also regulations that are imposed but weak enforced. There is conflict among different groups of fishermen in using the same fishing ground. as well. Department of fisheries has considered many measurement strategies for more effective management. The artificial

reefs to protect illegal trawlers and motorized push net fishing near shore and enrich fishery resources in coastal area have been initiated for many years and achieved very well outcome. Furthermore, their objectives are also for fisheries enhancement and coastal zone rehabilitation. The 2 projects regarding the artificial reefs in these areas are: the artificial reef installation project and coastal resources rehabilitation project under the Royal Initiation of Her Majesty the Queen in Pattani and Narathiwat province.

■ ARTIFICIAL REEF INSTALLATION PROJECT

In the Southern Gulf of Thailand, since 1983, the national institute of coastal aquaculture in Songkhla province had installed artificial reefs for the experiment in front of the institute. After that, thousands of artificial reefs have been constructed along the coast of the Southern Gulf of Thailand, 555 kilometers in coastline. The artificial reefs installation in 4 provinces, Nakhon si thammarat, Songkhla, Pattani and Narathiwat during 1983 – 2004 had been done for 64 sites in total and the budget of 206 million Baht has been used. (Table 1). The materials used for constructing artificial reefs were tire, concrete pipe, and dice block.

Table 1 Number of sites and budget of artificial reefs installation project during 1983 – 2004 in the Southern Gulf of Thailand.

Province	Year	Number of sites	Budget (million Baht)
Nakhon si thammarat	1986 - 2004	19	70.0
Songkhla	1983 - 2004	18	72.5
Pattani	1985 - 2004	21	37.5
Narathiwat	1989 - 2004	6	27.0
Total		64	206.0

■ COASTAL RESOURCES REHABILITATION PROJECT UNDER THE ROYAL INITIATION OF HER MAJESTY THE QUEEN IN PATTANI AND NARATHIWAT PROVINCE

The Coastal Resources Project in Pattani and Narathiwat Provinces was conceived as a result of Her Majesty's attention being drawn to the plight of local fishermen who informed her the dangerous decline in marine resources. When people's hardships were brought to the attention of His Majesty, of consultation, it was agreed that the key of a sustainable solution was to bring fertility back to the sea through the rehabilitation of marine resources.

To increase marine life, it was decided to create a habitat for nurturing tiny creatures by providing artificial reefs. Department of Fisheries, the organization in charging of this royal project, addressed this through a joint strategy that saw a revamp of the management of coastal fisheries, and implementation of a coastal resources rehabilitation program. Since October 2002, the artificial reefs installed along the coasts of Pattani and Narathiwat province was composed 208 covered goods wagon and 707 concrete pipes donated, respectively, by The state railway of Thailand and department of highway. This was the first project in Thailand that the covered goods wagons were used to make artificial reefs.

Before being submerged, all of the rolling stocks were completely cleaned to remove oil and grease and other elements that

might harm to environmentally. The wheel bogies were removed and the doors were fixed in an open position. At the depth of 26 to 30 meters of sea water, these sanitized goods wagons were arranged in five groups, each group consisting of 41-42 vans and was 11-12 kilometers far from the coastline of Pattani province. There were placed in the areas that was agree by the local fishermen. The concrete pipes, meanwhile, were installed in the area which was 9.5 kilometers far from the coastline of Narathiwat province.

In year 2003 and 2004, the 100 and 300 covered goods wagons were installed along the coastline of Pattani and Narathiwat province respectively, as well as the 11,545 disc blocks. (Figure 1). And also, were installed too. Three types of materials are showed as Figure 2. During 2002 – 2004, the artificial reef construction in 2 provinces was done in 32 sites and used 41.0 million Baht at. budget. (Table 2)

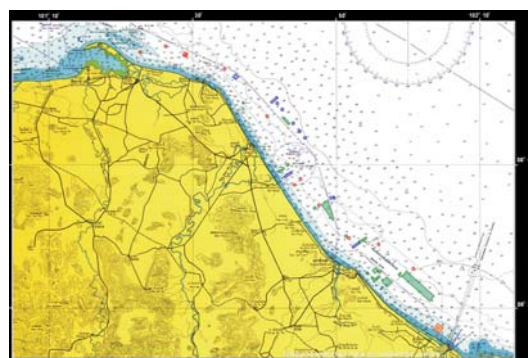


Figure 1 Map of the area of coastal resources rehabilitation project under the Royal Initiation of Her Majesty the Queen in Pattani and Narathiwat province



Figure 2a. Materials used for the installation of artificial reef, covered goods wagon



Province	Year	Number of sites	Budget (Million Baht)
Pattani	2002 – 2004	20	15.0
Narathiwat	2002 - 2004	12	26.0
Total	3	32	41.0

Figure 2b. Materials used for the installation of artificial reef, disc block



Figure 2c. Materials used for the installation of artificial reef, concrete pipe

Table 2 Number of sites and budget of coastal resources rehabilitation project during 2002 – 2004 in Pattani and Narathiwat province.

■ **THE RESULTS OF ARTIFICIAL REEF INSTALLATION**

After the artificial reefs installation, in the first two years, the surveys have been conducted to follow up the results of the installation. It was found that the objects were not much covered by sand and also there were a lot of fish coming in the areas which all were 64 species in the second year. (Table 3). It was observed that some of the fish were big and never found in those areas before. The appearances of artificial reefs are shown in figure 3-5.

Table 3 Water quality, appearances of artificial reefs and number of fish species in artificial reef installation area.

Title	After installation	
	1 st year	2 nd year
Water quality	normal	normal
Appearance of artificial reefs		
Disc block	5-10 cm was covered by sand	
Concrete pipe	10-20 cm was covered by sand	
Covered goods wagon	no sand covered	
Fish species		
Disc block	24	50
Concrete pipe	23	33
Covered goods wagon	15	43
Total fish species	38	64



Figure 3a Underwater communities on covered goods wagons.

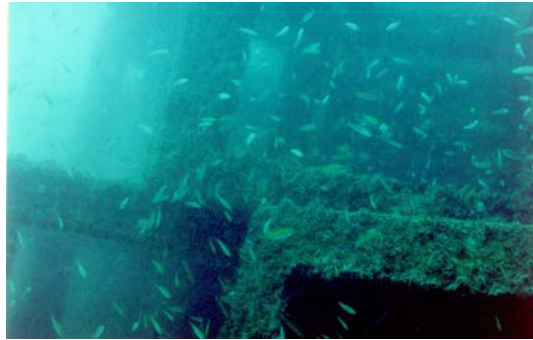


Figure 4a Underwater communities on disc blocks.

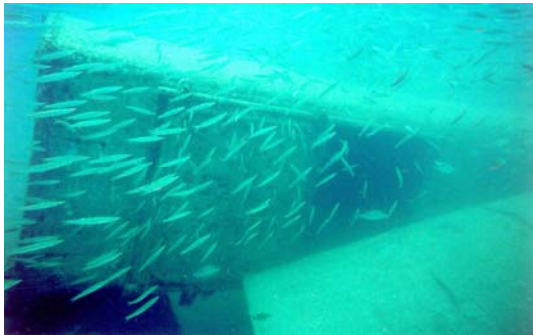


Figure 3b Underwater communities on covered goods wagons.



Figure 4b Underwater communities on disc blocks.



Figure 3c Underwater communities on covered goods wagons.



Figure 4c Underwater communities on disc blocks.

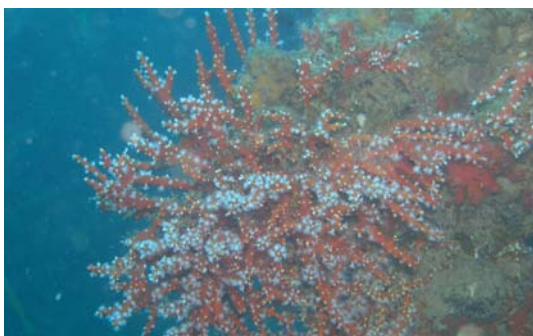


Figure 3d Underwater communities on covered goods wagons.



Figure 4d Underwater communities on disc blocks.



Figure 5a Underwater communities on concrete pipes.



Figure 5b Underwater communities on concrete pipes.



Figure 5c Underwater communities on concrete pipes.



Figure 5d Underwater communities on

The research had been conducted to determine the catch rate (CPUE) and average income. The results showed that the CPUE and average income from 6 main fishing gears commonly used in the project area i.e. trammel net, crab gill net, whiting gill net, squid trap, hook and line and mackerel gill net were increasing. (Table 4) Most of the small scale fishermen who live in the project area have good attitude to artificial reef installation.

Table 4 catch rate (kg/trip) and average income from fisheries activities operated in the artificial reef installation area.

Title	After installation	
	1 st year	2 nd year
CPUE (kg/trip)		
Trammel net	5.7	7.1
Crab gill net	13.5	17.9
Whiting gill net	20.8	26.0
Squid trap	18.5	20.0
Hook and line	7.9	14.5
Mackerel gill net	17.0	23.0
Average income (Baht)		
Per day	613	772
Per month	12272	15440
Per year	73629	92640

■ CONCLUSION

The artificial reef installation in the Southern Gulf of Thailand used three types of materials which are: covered goods wagon, disc block and concrete pipe. After the installation, water quality in this area was still normal. The total number of fish species in the second year was 64 species. The catch rate (CPUE) of all small scale fishing gears from operated in the artificial reef installation area were increasing. It made high income for fisheries households.

The artificial reef installation project would be a long term engagement, which is expected to play a key role in future fisheries development of the Southern Gulf of Thailand.