

SEAFDEC INITIATIVES AND ACTIVITIES RELATED TO FISHERY RESOURCE ENHANCEMENT

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■ INTRODUCTION/BACKGROUND

Reference to/linkages with items of the Resolution and Plan of Action adopted at the 2001 Millennium Conferences. The quality of coastal and inshore ecosystems has deteriorated significantly as a result of continued and increasing human activities. These areas are critical to a broad range of aquatic organisms during their life cycles including spawning, nursery areas and feeding zones and many of these species are of economic importance. The areas serve as important sources of recruitment to, and the sustainability of, commercial fisheries. It is suggested that the productivity of these ecosystems can be enhanced through human intervention leading to improved livelihoods for coastal communities.

In many areas, the introduction of man-made structures, including artificial reefs, aquaculture facilities, breakwaters, stationary nets and jetties are shown to enhance local populations of aquatic organisms, provided that there are sufficient numbers of structures to have a significant and positive impact on ecosystem productivity and that they are integrated into coastal zone management regimes. These structures can enhance fisheries resources. To optimize the results of such initiatives, careful impact assessment and planning procedures are required.

Re-stocking may be an effective component in the enhancement of marine resources in inshore waters. Juveniles and seeds produced by hatcheries or collected from the wild and others areas will be removed rapidly from the ecosystem by destructive fishing gears such as push nets or small-mesh trawl nets. Furthermore, in order to retain the released stocks within the immediate vicinity and minimize losses through out-migration,

suitable habitat must be available to them. Therefore, habitat restoration and/or enhancement and establishment of exclusive fishing right may be necessary prerequisites for any marine restocking exercises.

Immediate action is required to prevent further loss of habitat and damage to fish stocks. A range of effective community-level mechanisms must be developed to assist fishers to restore habitats and rebuild stocks. These mechanisms are likely to be specific to different stocks and habitats. Habitat creation and the establishment of artificial reefs, the use of fish attraction devices and predator removal all has potential in the region.

■ CONCLUSION AND RECOMMENDATIONS FORM ASEAN-SEAFDEC MILLENIUM CONFERENCE, BANGKOK 2001

Conclusion

Considering current levels of degradation of aquatic environments within the ASEAN region, it is projected that the productivity of fisheries will decline. This in turn will lead to a reduced supply of fish and hence its level of contribution to local food security. Various strategies to enhance the resource base can be initiated by the countries in the region. Coastal areas, specifically the inshore waters, are highly important to the replenishment of aquatic resources. They provide critical habitat for spawning and nurseries for many species, particularly a large number of commercially important fish species. Government resource enhancement efforts should focus on:

- 1) integrated installation of artificial habitats in inshore water with careful pre-assessment of environment and socio-economic impact;

2) Re-stocking exercises with careful assessment of economic feasibility and environmental impact;

3) the establishment of Marine Parks to protect fragile ecosystems; and

4) develop management practices to effect seasonal closures of spawning areas in accordance with management requirements.

Recommendations

In order to enhance the fisheries resources the following recommendations are made:

1. Take measures to restore critical inshore habitats, which have been extensively degraded by various human activities.

2. Assess the feasibility and environmental impact of artificial reefs and other man-made structures in inshore waters with respect to resource enhancement and coastal zone management objectives.

3. Promote re-stocking activities (seed release programs) from hatchery-produced stocks and/or wild collected sources in areas where they are considered to be feasible, particular localities operating within a regime of rights-based fisheries.

4. Further encourage a culture-based fisheries program in inland waters where favourable exploitation patterns and traditional management mechanisms prevail.

5. Enhance marine engineering capabilities to address the physical constraints in the construction, installation and placement of resource enhancement structures.

6. Note that the implementation of rights-based fisheries, more specifically exclusive fishing rights, and the enhancement of inshore habitat by expanded ARs are prerequisites for the successful implementation of a re-stocking program.

7. Conduct research on the released species' potential recapture rate and impact on the ecosystem.

8. Ensure optimal recapture of the released stock through effective management measures, including predator control.

9. Develop marine parks in limited areas such as coral reefs to protect fragile

coastal ecosystems, given that the establishment of marine protected areas is not feasible in the region due to their negative social impacts and enforcement problems.

10. Promote the seasonal closure of specific areas to protect spawners and juveniles of certain commercial-valued species under rights-based fisheries management, as an alternative measure to marine protected areas.

RESOURCES ENHANCEMENT PROJECT OUTLINE

1. Objective

1. To optimize the use of inshore waters through resource enhancement programs.

2. To enhance the fisheries resources by artificial reefs, stationary fishing gear and aqua-culture facilities (e.g. oyster culture)

3. To assess the feasibility and environmental impact of artificial reefs, stationary fishing gear and aqua-culture facilities.

4. To enhance marine engineering of artificial reef construction and installation,

5. To developing human resources for the implementation of resource enhancement programs.

6. To promote right-based fisheries management concepts to local fishers.

2. Project Description

The program is composed of three main activities as;

Activities 1. Survey and data collection on environmental studies on Artificial Reefs, Set Net and Marine Cage Culture project site, (Chumphon Province, Thailand and Malaysia) in cooperation with Management of Sustainable Coastal Fisheries Program.

Activities 2. Workshop on Artificial Reefs and Stationary Fishing Gear (Set Net) Design and Construction and Marine Protected Area.

Activities 3. Preparatory work for Training Regional short-term Training Course

in Resource Enhancement Methodologies.

3. Proposed Activities

3.1. Survey and data collection on environmental studies on Artificial Reefs, Marine Cage Culture project site.

3.1.1 On site survey in Chumphon Province, Thailand

3.1.2 On site survey in Lankawi, Malaysia

3.1.3 Set net fishing introduction, Thailand

3.2. Workshop on Artificial Reefs and Stationary Fishing Gear (Set net) Design and Construction and Marine Protected Area.

3.3. Preparatory work for training Regional short-term Training Course in Resource Enhancement Methodologies.

3.4. Marine Ranching and Stock Enhancement.

3.5. Production of Extension Package on Resources Enhancement.

■ RESOURCES ENHANCEMENT PROJECT, ACHIEVEMENT 2002

TD in collaboration with ASEAN and SEAFDEC member countries conducted Resources Enhancement project in a selected member country as a case study. This project is designed to integrated installation of artificial habitats in inshore waters with careful pre-assessment of environmental and socio-economic impact.

In the year 2002, project proposal and planning as well as core working group were carry out. Review of existing Artificial Reefs and Resources Enhancement project in the ASEAN countries is under investigated. A TD technical staff was attended the Second International Symposium on Stock Enhancement and Sea Ranching, Kobe, February 2002 for project information collection. The identification of project site selection for artificial reefs study is under investigated and discussion for find out a suitable location with DOF Thailand. The area of Chumporn province southern part of Thailand was selected. Department of

Fisheries, Thailand propose to install artificial reefs at Chumporn around April 2003. The workshop on Artificial Reefs is plan to conduct during the end of 2002 at TD.

■ PROPOSED RESOURCES ENHANCEMENT PROGRAM FOR THE YEAR 2003

1. Survey and data collection on environmental studies on Artificial reefs, Set net and Marine cage culture project sites (*Jan. – Dec. 2003*).

1.1 On site survey in Chumporn, Thailand

1.2 On site survey in Lankawi, Malaysia

1.3 Set net fishing introduction

2. Workshop on artificial reefs and stationary fishing gear (Set net) design and construction and marine protected area. (In collaboration with AQD) (*Nov. 2003*).

3. Preparatory work for training regional short-term training course in Resources Enhancement Methodologies. (*Sep. 2003*).

4. Marine Ranching and Stock Enhancement (collaboration with AQD). (*Jan. - Dec. 2003*).

5. Production of extension package on Resources Enhancement. (*Jan. – Dec. 2003*).

Detail of propose resource enhancement project activities on 2003

Date	Activities	Venue
Feb. 2003	NOAA-SEAFDEC Workshop on Marine Protected Area	TD
17-21 Mar. 2003	Training/Workshop on Artificial Reefs and Stationary Fishing Gear (Set net) Design and Construction	TD
7-11 Apr. 2003	Environmental survey studies on Artificial Reefs, Set net and Marine Cage Culture project site	Chumporn Thailand
5-30 May 2003	Regional short-term Training Course in Resource Enhancement Methodologies.	TD
19-30 May 2003	Installation of Artificial Reefs	Chumporn Thailand
Jun.-Jul. 2003	Set net design and construction	TD
Aug. 2003	Environmental survey studies on Artificial Reefs, Set net and Marine Cage Culture project site. (3 months after installation)	Chumporn Thailand
Sep. 2003	Set Net installation	Chumporn Thailand
Nov. 2003	Environmental survey studies on Artificial Reefs, Set net and Marine Cage Culture project site (6 months after installation)	Chumporn Thailand
Apr.-Dec. 2003	Analysis of data of environmental condition and fishing operation	TD
Jan.-Dec. 2003	Production of Extension Package on Resources Enhancement	TD
Dec. 2003	Environmental survey studies on FADs in Langawee Island Malaysia (Joint Project with CBFM)	Langawee Island

Proposed items of environmental survey studies on Artificial Reefs project site

Oceanographic Survey

- Water Current, Speed/Direction (Current Meter)
- Water Quality, Oxygen, Neutrient (Water Sampling)
- Sedimentation (Smit McIntyre grap)

Fisheries Biology Survey

- Benthos (Smit McIntyre grap, Drege)
- Phytoplankton, Zooplankton (Plankton Net)
- Fish Larvae (Larvae Net)
- Hydro-acoustic survey (Echo-sounder)
- Fish species and behavior observation (Under-water camera)

Fishing Survey

- Trammel net
- Surface Gill Net
- Fish Trap
- Squid Trap
- Crab Trap
- Shrimp Trawl Net
- Trawl net

Fisheries Department of Thailand Artificial Reefs Project for 2003

Project Number : 46-16-07

Location : Moo 2, Banborsamrong, Pakklong Village, Pratew District, Chumporn Province

Area : 1.0 x 1.0 kilometer

Water Depth : 11.0-16.0 meter

Bottom : Muddy sand

Dist. From Shore : 4.9-5.8 kilometer

Material : Concrete 1.5x1.5x1.5 meter, 875 pieces

Position : A. Lat. 10-49.00 N, Long. 99-28.85 E

B. Lat. 10-49.00 N, Long. 99-29.35 E

C. Lat. 10-48.50 N, Long. 99-28.70 E

D. Lat. 10-48.50 N, Long. 99-28.20 E

Budget : 3,000,000.- Baht

Project Number : 46-16-08

Location : Moo 6, Bonrai, Pakklong Village, Pratew District, Chumporn Province

Area : 0.5x2.0 kilometer

Water Depth : 9.5-11.0 meter

Bottom : Muddy sand

Dist. From Shore : 3.0-4.5 kilometer

Material : Concrete 1.5x1.5x1.5 meter, 875 pieces

Position : A. Lat. 10-48.20 N, Long. 99-28.05 E

B. Lat. 10-48.20 N, Long. 99-28.30 E

C. Lat. 10-47.20 N, Long. 99-27.00 E

D. Lat. 10-47.20 N, Long. 99-26.75

Budget : 3,000,000.- Baht



Figure 1. Concrete box type artificial reefs

ANNEX I

Views of National Seminar on Resource Enhancement

Issues	Views of National Seminar
➤ Releasing hatchery reared juveniles into natural habitat	
Malaysia	Very much welcome but doubtful of its success, unless fishers are given the responsibility to manage by area
Thailand	Protection should be expanded Spawning ground in the management framework
➤ Inadequate or absence of baseline data	
Indonesia	- Need a technical study on the availability of seed - Inventory program in each area
Malaysia	Decline in demersal as well as other important resource was supported
• What major species has severely declined in the selected area and what is the catch history of the species?	
Cambodia	Slipper lobsters, Silver pomfret fishes, Grouper fishes, Dugong, Mud crab, Shark, Sea-cucumber and other invertebrate that live in Coral Reef.
Malaysia	It is very difficult to ascertain. Request study to be conducted by the authority
Myanmar	Brood stock industry is to be set up. Brood stock management technology is to be imparted in the regions.
Philippines	- Needs further research and proper transfer of technology to end-users
Thailand	High demand from fishers of grouper fry for cage culture. High price for lobster, abalone and pomfret for export and domestic consumption
Vietnam	Some high-value shrimp species (black-tiger shrimp..., molluscs (pearl oyster, abalone,...))
• Where can spawners of the desired species be caught and what is the status of the technology to breed them in captivity?	
Cambodia	Slipper lobsters, Silver pomfret fishes, Grouper fishes, Dugong, Mud crab, Shark, Sea-cucumber and other invertebrate that live in Coral Reef.
Indonesia	Inventory program in term of finding-out the local specific species
Malaysia	Need to identify species
Philippines	Strengthening of the National Stock Assessment Program
Vietnam	Inshore area of Vietnam, above mentioned kinds are caught. Current breeding technology for sea fishes and other species (excluded shrimp) is limited
• Others?	
Cambodia	Have no experience and technology for breeding of marine species
➤ No available guidelines on release strategies	
Thailand	Standard effective guideline should be established
• How can the critical number and stage for stocking to make an impact be determined?	
Cambodia	Have no experiences
Indonesia	Need a guidance and extension program to introduce and understanding by the local community
Malaysia	Need to identify species and area for stocking
Vietnam	Initial number is qualitative. It's necessary to have study program
➤ Impact of release on the local fish stock	
Thailand	MCS for Pollution from rivers to sea should be seriously implemented
Vietnam	Initial number and inadequate
• What information is available on the use and impact of the desired species for stock enhancement in other areas?	

Vietnam	Initial number and inadequate
	<ul style="list-style-type: none"> • What information is available on the use and impact of the desired species for stock enhancement in other area?
Cambodia	Have no research studies and other in vestigation to proof. So we should be studies and research fisheries biology of fishes that going to release.
Indonesia	<ul style="list-style-type: none"> - Need a guidance and extension program to introduce and understanding by the local community - Regular meeting with the representative of institutions involve should be conducted.
Philippine	Conduct impact studies of the desired species
➤ Impact on biodiversity	
Malaysia	Not well understood
	<ul style="list-style-type: none"> • What studies have been made on possible effect of hatchery-bred stocks on the biodiversity and on the genetic structure of the local stock?
Cambodia	Have no research have been done
Indonesia	The study's result should be published and informed to the local level
Malaysia	Only aware that certain species have become extinct or disappeared over time
Philippines	Study the long-term effects on biodiversity and genetic structure
Vietnam	It's necessary to study immediately
➤ Cost and benefits	
	<ul style="list-style-type: none"> • How much will the stocking program cost and how will the benefits be measured?
Cambodia	Have no research or other study done but we Should be studies on: <ul style="list-style-type: none"> - Natural stock - Biology - Socio-economic and fisheries economic
Indonesia	Stocking program should also be carried out by the user in order to maintain the resources from extinction by fishing
Malaysia	Need to identify species
Philippines	Aquaculture concern
Vietnam	Releasing shrimp seed available 2 Mill USD/1Bill... Seed P5 and mollusk seeds (pearl oyster, abalone,...), sea horse, milk fis, sea turtle and fresh water fish species (cap fish, pilatia, big head fish, cat fish, black grass fish,
➤ Responsibility over stock enhancement	
Malaysia	Supportive but needs assistance in monitoring and surveillance
	<ul style="list-style-type: none"> • How can the stock enhancement activities be privatized in conjunction with rights-based fisheries?
Cambodia	In order to improve stock enhancement we should be strengthening on exercise of fisheries law and enforcement of fisheries management
Indonesia	The local government through the community might play the role in term of enhancing the resources
Philippines	Aquaculture concern
Vietnam	Government need to regulate appropriate fishing time and location Hatchery and Nursery Center have responsibility to release a certain proportion of hatchery reared juveniles into natural habitant and to contribute to resource recreating Fund. Enhancement of educating, communication to response new resources recreating Government support partly to these activities

• Others?	
Indonesia	- Customary law could be used to maintain the stock - The traditional fishing gear should be identified and inventory
Use of AR (conventional and non conventional) as a tool of fisheries management	
Myanmar	AR to be introduced in near future. AR should be major components in coast fisheries management activities
Vietnam	It's necessary to implement some experiments
Are AR cost effective in managing fisheries?	
Cambodia	Artificial Reefs cost are more effectiveness in managing fisheries
Indonesia	- Need move justification on the coral's trade - Need an inventory program on the coral reef area in Indonesian waters
Malaysia	Cost effective in terms of income, but not in management
Philippines	<ul style="list-style-type: none"> • Useful if management plan is formulated • Establishment of ARs should be made with a management plan
Thailand	Local community ownership of ARs should protect the damage of ARs. There are problems on evaluation due to too many ARs have been installed
How useful are AR in preventing trawlers and push netters operating in the coastal waters?	
Cambodia	Artificial Reefs are useful in preventing trawlers and push netters operation in the prohibit area
Indonesia	- All fishing gear (trawls modification) should be banned - Guarantee that trawler only operates in the right area.
Malaysia	Very useful
Myanmar	Although AR are not yet implemented in our waters, most of the fishermen, especially drift users and long line users, believe that AR will be preventing trawlers and push netters, which operating in the coastal waters and destroyed their nets and their livelihood very often. Because of these fishing vessels, not only fishing gears of small-scale fishermen are destroyed but also natural habitats and juveniles of fish and shrimp are destroyed. For this reasons small-scale fishermen from the coastal areas have suggested to implement AR for fisheries management
Philippines	ARs are deterrent to trawling and push netters
Thailand	No technical evaluation on this aspect to prove its useful
Vietnam	Well preventing bottom trawlers in coastal waters
• How are the location and number of ARs determined to rationalize their use?	
Cambodia	Artificial Reefs are useful in preventing trawlers and push netters operation in the prohibit area.
Malaysia	Currently no guidelines. Hence need guidelines to avoid conflicts.
Myanmar	Technology cooperation and technology transfer from the ASEAN-SEAFDEC countries, which have good experience and technology in this field, are needed to implement ARs successfully in the future
Philippine	<ul style="list-style-type: none"> • LGUs to strictly follow the guidelines and enact municipal ordinance to legitimize Ars
Thailand	Control/management the fisheries in ARs should be considered to prevent over fishing
• Is present legislative framework and support adequate to establish and manage AR?	
Indonesia	- Need a strong coordination among the institutions involved - Participating the stake holder in Artificial reef program
Thailand	No, the legislative framework and support should be settle and should be responsible by the Local Community Organizations

• Others?	
Thailand	The use of ARs for tourism will be one incentive for local people in taking care of their ARs.
➤ Engineering capabilities for the deployment of AR	
• Is present knowledge and skill in design and construction adequate?	
Cambodia	None but we should be train them
Indonesia	- Another program, e.g. awareness program should also be considered as a part of Artificial reef program - Personal capability and skill should be considered, while using the new technology
Myanmar	Technology cooperation and technology transfer from ASEAN-SEAFDEC member countries and International organizations is needed
Philippines	• Adequate, however there is a need to provide guidelines re:establishment
Thailand	It is very important to improve the structure of ARs in corresponding to the environment and resource nature Local technology e.g. mussel farm can be used as ARs, it is proved to be one of the resource enhancement and being use as management tool.
Vietnam	Can follow and meet demand of knowledge and skill in the region