Proceedings of the Regional Seminar on

INTEGRATED COASTAL RESOURCES MANAGEMENT APPROACH

in Southeast Asia :Review of the project ICRM-PL

Department of Fisheries Malaysia

Southeast Asian Fisheries Development Center

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Proceedings of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL 21-23 October 2008 Langkawi, Malaysia

The Training Department
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Foreword

Under the ASEAN-SEAFDEC collaborative mechanism arrangement and with funding support from the Japanese Trust Fund (JTF), the SEAFDEC Training Department has been implementing projects on coastal fisheries resources management starting in 2001 with the first pilot project in Pathew District, Chumphon Province, Thailand. Originally known as the Locally-based Coastal Fishery Management in Pathew District (LBCFM-PD), the project was renamed in 2005 as the Integrated Coastal Resources Management in Pathew District (ICRM-PD).

When tangible outcomes were achieved from the LBCFM-PD project, several SEAFDEC Member Countries proposed that the knowledge and experiences gained from the first project in Thailand should be transferred to other SEAFDEC Member Countries. Responding to such requests, SEAFDEC started the second pilot project in Pulau Langkawi, Malaysia in August 2003 with the collaboration of the Department of Fisheries Malaysia and other local agencies as project partners. This was initially called the Locally-based Coastal Resources Management in Pulau Langkawi (LBCRM-PL) from 2003 to 2006.

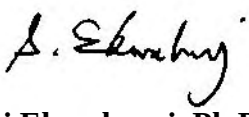
However, in December 2004, the operational area of LBCRM-PL was hit by a natural calamity, the famous Asian Tsunami. The project operation was thereafter changed to focus on rehabilitation of the fishing fleet which was almost totally devastated. Thus, the project tenure was extended until December 2007 to be able to undertake the objectives of the project as originally envisaged.

With this development, funding for the project from the Japanese Trust Fund was also changed starting in January 2005 from Trust Fund 1 to Trust Fund 4 with more emphasis on human resources development. This led to the shifting of the project title to Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL). Meanwhile, in November 2005, the third pilot project was also initiated in Sihanoukville, Cambodia as the Integrated Coastal Resources Management in Sihanoukville (ICRM-SV), from 2005 to 2009.

As the ICRM-PL project was completed towards the end of 2007, its progress during the four years and five months operation was reported during the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL held in Pulau Langkawi, Malaysia from 21 to 23 October 2008. In addition, the final project evaluation conducted in early 2008 by an outsourced consultant was also presented during the Regional Seminar. At this point in time, SEAFDEC wishes to acknowledge with much gratitude, the efforts made by the Department of Fisheries Malaysia in sustaining the implementation of the project activities after the involvement of SEAFDEC in the project was terminated in December 2007.

This publication provides a summary of the outcome of the Regional Seminar including the impacts of the LBCRM-PL/ICRM-PL project on the target communities and the achievements in line with the original project objectives. With the participation of the SEAFDEC Member Countries in the Seminar, it is expected that the lessons learned and the implications derived from the review of the LBCRM-PL/ICRM-PL could be reflected and incorporated in similar projects to be developed by the other countries in the Southeast Asian region.

SEAFDEC appreciates very much the assistance provided by the Department of Fisheries Malaysia and other collaborating partners of the LBCRM-PL/ICRM-PL project, during the conduct of the Regional Seminar. It is the desire of SEAFDEC that the outcome of the Seminar could be used in the formulation of similar projects by the other SEAFDEC Member Countries in order that sustainable management of the coastal resources could be achieved in the Southeast Asian region.



Siri Ekmaharaj, Ph.D.
Secretary-General of SEAFDEC and
Chief of the SEAFDEC Training Department

Preface

The SEAFDEC Training Department (SEAFDEC/TD) and the Department of Fisheries (DOF) Malaysia with other collaborating project partners co-organized the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL in Pulau Langkawi, Malaysia from 21 to 23 October 2008.

The Regional Seminar was aimed at discussing the achievements and outcomes of the LBCRM-PL/ICRM-PL project during its implementation in line with the original project concept; verifying the impacts of the project to the beneficiaries in terms of quantity as well as quality in the light of both facets of community development and sustainable fisheries resources management; evaluating the rationale, implications and prospects for the possible dissemination of the project concepts to other SEAFDEC Member Countries; and identifying the necessary follow-up actions to be undertaken by DOF Malaysia, SEAFDEC/TD and other collaborating local agencies.

The LBCRM-PL/ICRM-PL project was implemented in Kuala Teriang, Langkawi, Kedah State, Malaysia from 2003 to 2007. Six major activities were carried out, namely: (1) Baseline and Monitoring Survey; (2) Locally-based Fishery Resources Management; (3) Local Business Development; (4) Fishing and Vessel Repair Technology Improvement; (5) Enhancement of Human Resources Capacity Building and Participation; and (6) Rehabilitation and Enhancement of Coastal Resources.

The Report of the Regional Seminar with the adopted Conclusion and Recommendations is summarized in this publication while the reports on the six major activities and a number of sub-activities are also included. The Regional Seminar had offered the opportunities for SEAFDEC Member Countries other than Thailand, Malaysia and Cambodia, to consider the applicability of the community-based coastal fisheries resources management (CBRM) concept in their respective countries following the ICRM project approach.

SEAFDEC/TD and DOF Malaysia have learned lessons and gained valuable experiences from the application of the ICRM project approach in Kuala Teriang, Langkawi, Kedah State, Malaysia. For its part, the Kuala Teriang community has also benefited in terms of overall development in relation to increased awareness in CBRM and the holistic approach to fisheries management, and was exposed to the need for active participation in activities related to fisheries management and conservation including enforcement of rules and regulations. In addition, leadership and managerial capacities for CBRM and fisheries co-management were improved while local community voluntary work and participation in resources conservation was also enhanced.

The restructuring of the Fisheries Economic Group (KEN) into the Fishery Resources Management Community or KPSP boosted the active involvement of the members of KEN as well as the members of the Women's Economic Group (KEW) in community development and fisheries management to improve their livelihoods. The Fishery Resources Management Plan (FRMP) developed by the community was a major accomplishment of the ICRM-PL. The FRMP includes the agreed demarcation of the coastal fishing zone. The immediate adoption of the FRMP by the Government of Malaysia would confirm the empowerment of the community to manage their fisheries resources. Thus, with the official proclamation and subsequent adoption of the FRMP, the LBCRM-PL/ICRM-PL project had created a significant impact for the introduction of CBRM/ICRM and fisheries co-management on the local communities at Kuala Teriang and adjacent villages.

The Conclusion and Recommendations adopted during the Regional Seminar are important for SEAFDEC/TD and DOF Malaysia as well as the other collaborating partners, to consider when formulating future plans and programs related to ICRM more particularly in sustaining the activities of the ICRM-PL. The SEAFDEC Member Countries could also make use of the Seminar Conclusion and Recommendations as basis in the promotion of co-management and CBRM approaches in their respective countries. Eventually, it is expected that sustainable and responsible fisheries in the Southeast Asian region could be achieved

SEAFDEC/TD and DOF Malaysia

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INTRODUCTION

1. The Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL was co-organized by the SEAFDEC Training Department (SEAFDEC/TD) and the Department of Fisheries (DOF) Malaysia, to primarily review the impact of the ICRM-PL project and disseminate the modality of the project and its outcomes to the other SEAFDEC Member Countries. The Seminar was attended by representatives from Cambodia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand and Vietnam; representatives from DOF Malaysia including representatives from Kedah State Fisheries and other concerned agencies in Malaysia, i.e, the Fisheries Development Authority of Malaysia (LKIM), Fisheries Research Institute (FRI) of Penang, the Langkawi Development Authority (LADA), Drainage and Irrigation Department (JPS) of Kedah, Kedah Fisheries Association (NEKAD); representatives from KPSP (including representatives from KEN and KEW); and representatives from SEAFDEC/TD as well as from the SEAFDEC Secretariat. Representatives from the ICRM-PD (Thailand) and ICRM-SV (Cambodia) as well as the Consultant for the Final Project Evaluation of ICRM-PL also attended the Seminar.

2. The details of the Regional Seminar appear as **Annex 1** and the List of Participants appears as **Annex 2**.

3. The Project Leader of the SEAFDEC Project on Integrated Coastal Resources Management, *Mr. Seiichi Etoh*, welcomed the participants and observers to the Regional Seminar. He emphasized that the Seminar would review the achievements and outcomes of the project in Langkawi during its four and a half years of implementation. In addition, the participants would also have the chance to verify the impacts of the project activities to the beneficiaries from the point of view of community development and sustainable fishery resources management.

4. On behalf of SEAFDEC as co-organizer of the Regional Seminar, the Secretary-General of SEAFDEC and Chief of SEAFDEC/TD, *Dr. Siri Ekmaharaj* welcomed the participants to the Regional Seminar. He expounded on the tangible outcomes of the ICRM Project in Thailand, Malaysia and Cambodia, which have been highly appreciated by the other SEAFDEC Member Countries. He commended the efforts of the DOF Malaysia in fully supporting the implementation of the project activities specifically in the aspects of institution and human capacity building, which has enabled the newly formed managerial body, the KPSP to pursue the community-based fisheries resources management (CBRM) functions. He also thanked the DOF Malaysia for sustaining the implementation of the activities after the involvement of SEAFDEC in the project was phased out in 2007 and more particularly for co-organizing the Regional Seminar in Langkawi. His Statement appears as **Annex 3**.

5. On behalf of the host country of the ICRM-PL, the Director-General of DOF Malaysia, *Dató Junaidi bin Che Ayub* represented by *Mr. Theo Siong Wan*, Director of Kedah State Fisheries, welcomed the participants to the Regional Seminar and specifically to the legendary Pulau Langkawi. He mentioned that although the Seminar marked in a way, the end of the involvement of SEAFDEC in the project, future cooperation between SEAFDEC and DOF Malaysia could still be pursued specifically in ensuring the sustainability of the project. He commended SEAFDEC for implementing the ICRM project in Malaysia and also the project committees for their efforts that made the project operations successful. After extending his gratitude to SEAFDEC for co-organizing the Regional Seminar and specifically the various committees of DOF for the excellent arrangements of the Seminar, he declared the Regional Seminar open. The Opening Remarks of the Director-General of DOF Malaysia appears as **Annex 4**.

ADOPTION OF THE AGENDA

6. The Agenda which appears as **Annex 5** was adopted.

BACKGROUND OF THE ICRM PROJECTS AND THE SEMINAR

7. The Integrated Coastal Resources Management (ICRM) Project in the Southeast Asian Countries was started in Thailand and replicated in Malaysia and Cambodia with the main objectives of addressing the deterioration of livelihoods in coastal fishing communities resulting from over-exploitation of the fishery resources and the degradation of the coastal environments, and promoting the concept of community-based fishery resources management (CBRM). Specifically, the ICRM project aims to: (1) establish sustainable coastal resources management at the local level; (2) rehabilitate the coastal fishery resources; and (3) alleviate poverty in coastal fishing communities.

8. Under the ICRM approach, developing the capacity of the human resource empowers the local people in community development enabling them to manage the coastal resources and sustain development efforts. The systematic voluntary participation by the local people in a local body proactively strengthens community development and resource management. The people's participation and initiatives in creating job opportunities and in establishing local business ventures increase their source of accessible income thus, alleviating poverty and developing the economic base of the community.

9. The project in Langkawi, Kedah State, Malaysia started as the Locally-based Coastal Fisheries Resources Management in Pulau Langkawi (LBCRM-PL) from 2003 to 2004 under the Japanese Trust Fund (JTF)-1, and was later on renamed as the Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL) from 2005 to 2007 under JTF-4 with a revitalized focus on human resource development and capacity building. Although the implementation of the project in Langkawi was interrupted when the 2004 Tsunami devastated the project site in Kuala Teriang, with the efforts and commitment of the project's collaborating partners, the activities were resumed in 2005 in accordance with the original objectives of the project.

10. While the LBCRM-PL/ICRM-PL was in operation from 2003 to 2007, the progress during its four years and five months operation has always been reflected in the bi-annual progress reports prepared by SEAFDEC and submitted every six months to all concerned. Monitoring of the implementation of the project activities has also been done during the Steering Committee meetings held once a year at the project planning level and the Implementation Coordination Committee meetings convened quarterly at the project operational level. In addition, the final project evaluation of the project was conducted in early 2008 by an outsourced consultant and the evaluation report had been published.

11. Since the project has been completed as planned, its impacts on the target communities and the achievements should be summarized and reviewed with the participation of all concerned including representatives from the SEAFDEC Member Countries to ensure that lessons and implications derived from the review would be reflected and incorporated in similar projects that would be developed and implemented not only in Malaysia but also in other parts of the region. Thus, the Regional Seminar on "Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL" was conducted in Pulau Langkawi, Malaysia from 21 to 23 October 2008.

DESCRIPTION OF THE PROJECT APPROACH AND PROGRESS OF ICRM PROJECTS IN THAILAND AND CAMBODIA

12. The Project Leader of the Integrated Coastal Resources Management, *Mr. Seiichi Etoh*, explained the deployment of the ICRM Projects in the Southeast Asian countries which started in Thailand and replicated in Malaysia and Cambodia. With the main objective of addressing the deterioration of livelihoods in coastal fishing communities resulting from over-exploitation of the fishery resources and the degradation of the coastal environments, the concept of community-based fishery resources management (CBRM) is being promoted in the ICRM projects.

13. The SEAFDEC program on the Regionalization of the Code of Conduct for Responsible Fisheries (RCCRF), which was initiated since 1998, produced regional guidelines on responsible fishing operations, aquaculture development, fisheries post-harvest and trade, and fisheries management. In addition, the Supplementary Guidelines on Co-Management Using Group User Rights was later published to substantiate the regional guidelines on responsible fisheries management produced earlier. Guided by the RCCRF, SEAFDEC/TD collaborated with the Department of Fisheries (DOF) of Thailand for the implementation of the CBRM concept in Chumphon Province, Thailand.

14. Thus, the project on "Locally Based Coastal Fisheries Management in Pathew District (LBCFM-PD)" commenced in November 2001 in Chumphon Province, Thailand. The LBCFM-PD/ICRM-PD aimed to establish sustainable resource management at local level, rehabilitate the coastal resources, and alleviate poverty in coastal fishing communities. The project had implemented six main activities, namely: (1) Baseline Survey (biological, oceanographic and environment, fisheries, socio-economic); (2) Encourage and Extend Community-based Resource Management; (3) Encourage Local Business; (4) Enhance Human Resources Capability and Participation; (5) Develop Extension Methodologies and Strengthen the Extension System; and (6) Rehabilitate and Enhance the Coastal Resources.

15. Under the ASEAN-SEAFDEC collaborative mechanism, it was agreed that the knowledge and experience gained through the project operation in Thailand would be disseminated to the other SEAFDEC Member Countries through the SEAFDEC information and technology transfer mechanism.

16. With the tangible progress of LBCFM-PD/ICRM-PD, the other SEAFDEC Member Countries, namely: Malaysia, Brunei Darussalam, Indonesia, Cambodia and Myanmar proposed to the meetings of the SEAFDEC Program Committee their intentions to also initiate the CBRM approach in their respective countries. Responding to such requests, it was agreed that the 2nd and 3rd ICRM projects would be implemented in Malaysia and Cambodia, respectively. Thus commenced the ICRM-PL in Malaysia in August 2003 and the ICRM-SV in Cambodia in November 2005, in a bid to transfer the technologies based on the experiences gained and knowledge learned from the LBCFM-PD/ICRM-PD in Thailand.

17. After the end of the ICRM-PD, the Department of Fisheries (DOF) of Thailand through the Chumphon Marine Fisheries Research and Development Center (CMDEC) has continued supporting the activities which are now being sustained by the Pakklong Fishermen Group, a fishermen's group developed under the ICRM-PD which has already been registered with the Chumphon Provincial Cooperative Promotion Office.

18. Initiated in 2005, the ICRM-SV in Cambodia on the other hand is aimed at developing the capacity of local human resources to empower them to manage the coastal resources and boost community development, encouraging people's participation in community activities on voluntary basis, and alleviating poverty in the coastal fisheries communities. Six major activities were conducted in order to attain the objectives, these are: Baseline/Monitoring Survey (Fish landing data collection); Encourage and Extend Locally-based Fishery Resources Management; Promote Local Business; Enhance Human Resources Capacity and Participation; Rehabilitate and Enhance the Coastal Resources; and Develop Fishing/Fish Handling Technologies.

DESCRIPTION OF THE ICRM-PL PROJECT ACTIVITIES

19. The LCBRM-PL/ICRM-PL project which was initiated in August 2003 has conducted six major activities, namely: (1) Baseline and Monitoring Survey; (2) Locally-based Fishery Resources Management; (3) Local Business Development; (4) Fishing and Vessel Repair Technology Improvement; (5) Enhancement of Human Resources Capacity Building and Participation; and (6) Rehabilitation and Enhancement of the Coastal Resources. In order to review of the project activities under LCBRM-PL/ICRM-PL during its 4 1/2 years of implementation, the progress reports were presented during the Regional Seminar highlighting on the impacts of the respective activities and the expected follow-up actions after the termination of the project. The Chronology of the Project's Major Events is shown as **Annex 6**.

20. The involvement of SEAFDEC in the project was terminated in December 2007, and the project evaluation was carried in February 2008. Henceforth, the DOF Malaysia has sustained the activities of the project.

21. After the general discussion on the issues related to the outcomes of ICRM-PL and its impacts as well as the observations of the participants during the actual inspection of the project site and activities, the conclusion and recommendations of the Regional Seminar (***boxed***) were adopted.

I. Appropriateness of the approaches and resultant outcomes, and alternative suggestions

Activity 1: Baseline and Monitoring Surveys (socio-economic and marine biological surveys)

22. Under the ICRM-PL, baseline and socio-economic monitoring surveys were conducted in 2003 and before the termination of the project in 2006, respectively while the socio-economic changes during the implementation of the project were also monitored and documented. Through the surveys, the needs and problems of the fishing communities in the project site were identified and the environmental conditions of the fishing communities were assessed while the future plans to sustain the project were proposed.

23. Daily fish landing and marine resources monitoring surveys were also carried out throughout the project tenure except for the suspension of about eight months after the December 2004 Tsunami. The results of the surveys were analyzed and compiled jointly by the Fisheries Research Institute (FRI) in Penang and SEAFDEC/TD in Thailand.

Recommendation 1

Considering that baseline and monitoring surveys could be costly, these should be conducted with the full cooperation of the local fishers group and stakeholders as the results of the surveys are important as basis for information on the socio-economic and environmental profile of the project area supporting the ICRM activities. Since the information could serve as benchmark for assessing the changes in the project site resulting from the implementation of the ICRM project activities, data collected from the surveys should be disseminated to the stakeholders to raise their awareness on the impacts of the project on the socio-economic and environmental development of their communities.

Activity 2: Locally-based Fishery Resources Management

24. The community-based fisheries resource management (CBRM) approach was also promoted during the implementation of the ICRM-PL in Kuala Teriang, Pulau Langkawi. On many occasions, the fishermen in the project area had expressed their positive views that the volume of fish landing had evidently increased since the previous years, which they attributed to the effectiveness of the local enforcement activity.

Recommendation 2

In the promotion of the community-based fisheries resource management (CBRM) approach, the local people should be encouraged further to participate in community development activities to increase their awareness of the benefits that can be derived from the CBRM activities, and more particularly in continuously educating them on the impact of their voluntary participation in the protection, conservation and sustainable utilization of the resources to improve their livelihoods.

25. During the stakeholders' consultation in November 2006 in Alor Setar, Kedah, Malaysia, the draft of the Fishery Resources Management Plan (FRMP) was submitted to DOF for consideration and refinements of the legal context by the DOF legal advisors. The FRMP was then finalized and promulgated by the end of 2007. The FRMP, which was formulated to demonstrate the strong partnership among all stakeholders, includes as one of the main features, the demarcation of the community fishing zone, which was carried out in close consultation with all relevant stakeholders in order that the fishery resources in the zone are utilized in a sustainable manner.

Recommendation 3

The Fishery Resources Management Plan (FRMP) which has already been endorsed should be implemented as soon as possible.

26. Enforcement function is of utmost importance in the implementation of the CBRM activity. Thus, the Local Enforcement Unit (LEU) in the project operational area was established through the efforts of the DOF in collaboration with the Marine Enforcement Agency (MEA) of Malaysia. Enforcement Officers were then assigned to the project site in Kuala Teriang to monitor such information as the presence of illegal fishing boats in the project area. Once news on encroachment by illegal fishing boats is received, a patrol boat is dispatched to the site. Since this local enforcement system has been put in place and the news of such a control system has spread widely among the fishermen, encroachment by trawlers has not been reported.

Recommendation 4

For the sustainable implementation of the ICRM-PL, DOF Malaysia and the community should continue working closely together to mitigate the conflicts of the fishers inside and outside the project area by strengthening their main responsibility of monitoring, patrolling and surveillance of the project area from the encroaching fishers.

27. The crab bank was introduced as one of the CBRM approaches under the ICRM-PL following the model adopted by the ICRM-PD in Chumphon, Thailand. This activity had challenged the KEN after their study tour to Chumphon, Thailand in 2005. Having been impressed by the successful outcome of the crab bank scheme being carried out by the ICRM-PD project, the KEN tried to locate a possible site for crab cages. Since it was not possible to site the cages, it was agreed that the Japanese model for the crab bank as introduced also in Chumphon, Thailand that involves releasing the gravid crabs to the water after marking their carapace, would be initiated under the ICRM-PL. Since it does not require the construction and installation of cages, such system was finally adopted. Subsequently, the Crab Bank sub-group was organized and a training course on the crab bank scheme was conducted in June 2007.

Recommendation 5

A study to monitor the effectiveness of the crab bank (crab marking) should be continued.

Activity 3: Local Business Development

28. As part of the project's core activities, local business opportunities were developed for the women's groups. As for KEN (*Kumpulan Economi Nelayan*) or the Fishermen's Economic Group, some attempts were made to develop business opportunities but only retailing block ice, lubricating oil, minor engine spare parts, could be achieved. Therefore, main focus was placed on the women's group activity only for this has demonstrated the improved role of women in developing products that could increase their household's incomes. This was promoted through their official group known as *Kumpulan Economi Wanita* (KEW).

29. The DOF Malaysia and SEAFDEC/TD continued to provide assistance to KEW by training its members in basic accounting and bookkeeping procedures. This was aimed at ensuring that correct entries are made in the general ledger books such as the Product Ledger and the Material Ledger, which were introduced in June 2004 for the production of fish-based products by the KEW. During the training, simplified two ledger books, i.e. "Monthly Material Procurement Record" and "Monthly Production and Sales Record", modified as "user-friendly version" were introduced. Thus, records on production, purchasing of materials used and sales of the products have been correctly entered in the ledger books. The KEW has since then been producing a snacks product called "maruku" in addition to their major product which is the "ikan bilis".

Recommendation 6

The progress of the local business ventures of the KEN and KEW under KPSP should therefore be monitored through the use of selected indicators.

Activity 4: Enhancement of Human Resources Capacity Building and Participation

30. In the implementation of the ICRM-PL, particular emphasis had been placed on the human capacity development aspects while organizing and building the institutional capacity of the KPSP (KEN and KEW) were also promoted. Workshops (5 sessions), training courses (16) and study tours (3) were conducted to transfer new technologies and knowledge to the target groups, enhance the capability of the human resources, and expose them to occasions that enhance their motivation towards community development and the CBRM concept.

Recommendation 7

In addition to the enhancement of human resources and capacity building, public awareness and education of the community on fishery management and conservation should also be further promoted.

Recommendation 8

While improvement of fishing methods has been promoted through the human resource development activities, the main objective of such activities should not only emphasize on increasing fish catch but also emphasize on the possible reduction in fishing effort. Eco-friendly and energy-saving fishing methods should therefore also be promoted in the training activities.

31. Prior to the initiation of the project operation, KEN already existed and was responsible for the implementation of community-based activities more particularly related to economic activities. During the project operation, the capacity of KEN was strengthened and upgraded into a more comprehensive group to take care of integrated fisheries community projects. Thus, the Fishery Resources Management Community or the *Komuniti Pengurusan Sumber Perikanan* (KPSP) was established to take full charge of CBRM functions especially in developing and strengthening the livelihoods of the fishing communities throughout the country through cooperation, entrepreneurship, education and responsible fisheries resource management.

Recommendation 9

The DOF Malaysia should continue to maintain the momentum established and further develop the close rapport and communication with KPSP to ensure the sustainability of fisheries co-management and CBRM activities.

Activity 5: Rehabilitation and Enhancement of the Coastal Resources

32. Installation of artificial reefs (ARs) was conducted by both DOF and LKIM in order to rehabilitate the fishery habitat in the project area. After the site selection which was conducted by SEAFDEC/TD and DOF Thailand, about 800 cuboid shaped ARs were installed in about 5.7 nautical miles from Kuala Teriang fishing village. Near the ARs (about 400-500 m) four stationary Fish Aggregating Devices (FADs) made of bamboo poles and coconut fronds were fixed in the water substrate (depth of the water is about 32-33 m). Results of the observation of the bottom sediments indicated that the bottom characteristic in the area is muddy-sandy (about 81% clay and 4% silt). The direction of the current at near bottom was observed to move to the South or South-East. Thus, the module of the ARs was designed to be suitable for the soft bottom considering its high sinking rate by a pocking-pressure effect.

Recommendation 10

Monitoring and assessment of the fishery in the project area to study the effectiveness of ARs for resource enhancement should be continued, while the results should be documented and disseminated to all stakeholders.

33. In order to rehabilitate and enhance the coastal fishery resources in the project area, SEAFDEC/TD also installed ten sets of fish enhancement devices (FEDs). All the necessary materials to construct these units except anchors made of half-size used oil drums filled with concrete, were transported from SEAFDEC/TD to Langkawi and a training course on the fabrication of FEDs was conducted in March 2007. However, the installation did not produce the expected results not because of technical reasons and structural defects but was due to the destruction caused by the encroaching trawlers leaving the destroyed FED materials in the sea.

Recommendation 11

In the design of the ARs, physical, biological and chemical characteristics and other relevant factors such as monsoon, waves, sea current, etc. of the substrate and the water should be considered. In addition, the AR structure should be designed to suit the substrate and be able to stand on the substrate without sinking for a certain number of years.

34. A pre-installation survey for the FEDs was conducted jointly by SEAFDEC/TD and FRI in March 2007 at the two alternative proposed positions. Finally as proposed by KEN, it as agreed that the FEDs would be set in the surrounding area of the ARs installed by LKIM in 2003.

Recommendation 12

Considering that many AR and FED materials (e.g., nets, etc.) are strewn in the waters of the project area and while squid fishing is also practiced near the ARs, a study on the impact of ghost fishing on the fish resources of the ARs area should be initiated while monitoring of squid fishing with light lures could also be conducted.

35. Mangrove reforestation program is one of the feature activities of the KEN Kuala Teriang in conjunction with the Tsunami Rehabilitation and fishery resources enhancement activities. Thus, mangrove reforestation was carried out with the objective of improving the fish habitat and providing protection of the project area from high and strong waves. Supported financially and logistically by the Drainage and Irrigation Department (JPS) of Kedah State, 1500 mangrove saplings were planted in front of the bay of Kuala Teriang in December 2006 by some volunteers from the KEN. However, most of the mangrove saplings died during the monsoon season. While coordination among concerned bodies for the mangrove reforestation in the project area was promoted by the project, a movement to form a coordinating body consisting of the Forest Department, JPS, DOF, FRI, LADA and SEAFDEC/TD has been initiated.

Recommendation 13

In this regard, the coordinating body should monitor the mangrove reforestation for its effectiveness as wave-breaker, in coordination with the JPS.

Activity 6: Fishing and Vessel Repair Technology Improvement

36. Responding to the strong requests by the fishing communities, introduction of improved and eco-friendly fishing technologies were made through the conduct of training courses. The new technology in repairing wooden boats with fiber reinforced plastic (FRP) materials was introduced in the training courses in response to the strong needs of the fishing communities arising from the destruction of many fishing boats and facilities during the December 2004 Asian Tsunami.

37. As part of the project's experimental fishing activities, the Thai model of a collapsible crab trap was introduced in the project area in 2004. The KPSP has proposed to adopt this fishing gear since it is effective and environment-friendly. Thus, SEAFDEC/TD contributed 300 units of the Thai model collapsible crab traps to the KEN, specifically to also support the Crab Bank initiative as a number of live crabs are caught mainly by trap fishing.

II. Overall outcomes and impacts based on two aspects

Implementation of the CBRM concept and its awareness building among the stakeholders

38. From the implementation of the ICRM projects in Thailand, Malaysia and Cambodia, their respective governments have been provided with models for the possible dissemination of the CBRM concept to the other areas in their countries for the sustainable development of fisheries. As a rationale of the implementation of the CBRM concept, its applicability is tried in a certain country expecting that further expansion or dissemination of the technology is carried out to the other areas of the country by the responsible authorities.

Recommendation 14

Information dissemination should be further enhanced through publication of technical papers, non-technical papers, extension documents, flyers, brochures as well as through electronic media in order to produce much greater impact.

Contribution to the improvement of the living standards of the community, materially and spiritually

39. The beneficiaries of the project viewed that the implementation of ICRM-PL has led to the obvious reduction in the number of encroachment by trawlers because of the commitment by the community and the DOF Malaysia. They also indicated that through the ICRM-PL, their incomes have been improved and more particularly their household incomes have become encouraging. Some fishers in the project area reported the re-emergence of certain species which have long-disappeared from the waters in the project site. The beneficiaries are more convinced that by taking part in the management process, they had closer coordination and communication with the authorities, and are more united when it comes to coming up with decisions on what should be done in managing their fisheries resources.

III. Transfer of technologies

40. The ICRM project has been implemented in Thailand, Malaysia and Cambodia as pilot projects to demonstrate the practical applicability of the CBRM concept in local fishing communities in Southeast Asia. It is the original intention of SEAFDEC that the concept of CBRM is introduced through demonstration of the pilot project operation incorporating total community development. Such ICRM projects are therefore expected to snowball a model for dissemination of the CBRM concept in the region in order to achieve improvements not only in terms of increased fish production but also in the living conditions of the stakeholders. As envisaged, the knowledge learned and experience gained from the implementation of the ICRM projects in Thailand, Malaysia and Cambodia would be disseminated to the other countries in the Southeast Asian region.

Recommendation 15

As it may not be possible to introduce in totality the model of CBRM practiced in one country to another country, introduction and implementation of any model should take into consideration the local, historical, social, cultural, economic, and development situations of the country.

Recommendation 16

Specifically, since the project has been successfully implemented as a pilot scale project in Langkawi, Kedah State, Malaysia, lessons learned and experiences gained from this project could be echoed to other sites in the country and other countries in the region taking into consideration the specificities of the potential communities, to promote the CBRM concept.

IV. General Conclusion and Recommendations

41. The Kuala Teriang community has benefited in terms of overall development in relation to increased awareness in CBRM and the holistic approach to fisheries management and was exposed to the need for active participation in activities related to fisheries management and conservation including enforcement of rules and regulations. In addition, leadership and managerial capacities for CBRM and fisheries co-management were enhanced while local community voluntary work and participation in conservation was also improved through the various activities such as the formulation of FRMP, crab bank (crab marking), etc.

Recommendation 17

The step-by-step process of introducing co-management of fisheries and the CBRM at Kuala Teriang, Langkawi, Kedah State, Malaysia should be documented for use as a reference in the application of similar approach in other sites either in Malaysia or in other countries in the region.

Recommendation 18

Specifically, since the impact of the ICRM-PL project on coastal fisheries resources could not be fully assessed quantitatively because of some inadequacies of the data collected, a review and improvement in the sampling methodologies to be used should therefore be undertaken.

Recommendation 19

Since the KPSP may still not be fully ready to independently implement CBRM and manage the fishery, the DOF Malaysia should continue to play a lead role in the co-management of the fishery in Kuala Teriang. The Kuala Teriang community still needs to be guided and prepared to be able to start co-managing the fishery with the assistance of DOF Malaysia. The community could be empowered in stages to implement the CBRM measures to manage the fishery independently in the future.

42. Having been successfully implemented, the ICRM-PL project had created a significant impact specifically with regards to the introduction of CBRM/ICRM and fisheries co-management on the local communities at Kuala Teriang and adjacent villages.

Recommendation 20

Prospects for sustainability of relevant and related activities after the termination of this project are good, however, it is important that the FRMP should be implemented as soon as possible and that the DOF Malaysia should immediately initiate actions as stipulated in the FRMP.

Recommendation 21

SEAFDEC Member Countries should further support the promotion of co-management and CBRM based on the experience of ICRM-PL in Malaysia and other countries, aimed at developing sustainable and responsible fisheries. In addition, the human co-management and CBRM network created through the ICRM-PL project should be further developed and utilized to effectively introduce the CBRM approach in the region.

V. Others

43. For the sustainability of the ICRM-PL project activity, the KPSP is expected to continue the fishery resources management regime after the completion of the involvement of SEAFDEC/TD and DOF Malaysia in the project. As the managerial responsibility in the fishery resources management activity has eventually been shifted to the KPSP, the DOF Malaysia has to continue its involvement in the project activities more particularly in terms of supervision.

Recommendation 22

One dedicated Fisheries Officer from DOF Malaysia (or contract officer) should be stationed to the project site in addition to the Extension Officer for more effective implementation, monitoring and evaluation of the project.

Recommendation 23

Funding for the implementation of FRMP could be made available by DOF Malaysia and other parties involved in the promotion of coastal fisheries resource management and development.

Recommendation 24

The Fisheries Resources Management Division of DOF Malaysia should take a leading role in the implementation of the FRMP in further developing fisheries co-management and CBFM related activities in Malaysia.

44. Although the involvement of SEAFDEC in the ICRM-PL project in Langkawi, Kedah, Malaysia was already phased out since December 2007, the practical operation has been continued by the DOF Malaysia specifically in terms of institutional as well as human capacity building for the fishing community. This enabled the newly formed managerial body, the KPSP, to independently pursue the CBRM function in the project site in Kuala Teriang. Although its direct involvement has been completed, SEAFDEC has continued to monitor the development of the new managerial capacity in coastal resources management. Thus, SEAFDEC has continued to support the project within a very limited budget.

Recommendation 25

On the part of SEAFDEC, technical assistance to the project may be continued in the form of follow-up actions.

FOLLOW UP ACTIONS

45. During the discussions, the participants also suggested the following follow-up actions for the promotion of the ICRM-PL project in Malaysia as well as similar ICRM projects in other countries for the sustainable development of fisheries in Southeast Asia.

- Training courses (incorporating the concept of fisheries management), upgrading of skills and relevant human resource development programs including leadership training should be conducted;
- Exposure of KEW members to Good Hygienic Practices, Good Manufacturing Practices (GMP), and Standard Sanitary Operating Procedures (SSOP) to improve quality of their products should be conducted through training or observation study;
- Monitoring and evaluation of the economic returns of the activities of KEW should be continued by DOF Malaysia;
- Study tour to local CBRM project in Malaysia, e.g. *Tagal* in Sabah, should be conducted;
- Community voluntary work should be enhanced;
- Marker buoys should be installed to mark the ARs in the area for safety in navigation and fishing; and
- Monitoring and evaluation of the whole project should be conducted based on the main output of the ICRM-PL which includes the process of introducing co-management and CBRM.

FINDINGS AND RECOMMENDATIONS IN FINAL PROJECT EVALUATION

46. The final project evaluation was conducted in April-May 2008 by an outsourced consultant, and the report on the evaluation was published thereafter. In summary, the evaluation indicated that the project has been successfully implemented and that it had created a significant impact on the local communities at Kuala Teriang and adjacent villages.

VISIT TO THE PROJECT SITE

47. A visit to the project site was arranged by DOF Malaysia to observe the project facilities and activities in Kuala Teriang. During the visit, the participants were able to dialogue with the project's beneficiaries. Considering that the involvement of SEAFDEC/TD with the main project was terminated in December 2007, the activities have since then been continued by DOF Malaysia through the KPSP. The participants were also able to observe the continued activity particularly those that relate to the use of the facilities and equipment built during the project tenure. The general discussion with the KPSP and more particularly with the KEW members continued during the reception tendered by the KPSP for the participants in the Seminar.

a. The KPSP office

   Inspection of the facilities including the fish landing jetty and discussion with the KPSP committee members including the Crab Bank Sub-group, were carried out during the field trip.

b. The KEW fish processing yard

   Inspection of the KEW processing yard and discussion with the KEW committee members were also carried out, more particularly the samples of the products that were put on display for sale.

c. The mangrove plantation

   The participants also observed the mangrove plantation site and discussed with the members of the KPSP and JPS the status of the reforestation activity.

WINDING-UP DISCUSSION AND ADOPTION OF CONCLUSIONS AND RECOMMENDATIONS

48. After the winding-up discussions, the Conclusion and Recommendations of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL (***boxed)***, were adopted on 23 October 2008.

CLOSING OF THE SEMINAR

49. On behalf of the Director of Planning & International Division of the Department of Fisheries Malaysia, *Mr. Mohamed Shaupi Derahman*, *Mr. Abdul Razak Bin Latun* expressed his appreciation for the valuable contributions made by the participants and for their active participation in the Regional Seminar.

50. The Deputy Secretary-General of SEAFDEC and Japanese Trust Fund Manager, *Mr. Hideki Tsubata* thanked DOF Malaysia, the KPSP and the other collaborating agencies for their efforts in achieving tangible outcomes and achievements of the project. He encouraged the participants to make full use of the experiences gained from the Seminar for application of the CBRM approach in their respective countries. He closed the Seminar with a note reiterating that although the financial support from JTF has already been phased out, very limited funds may still be provided for some follow-up activities. His statement appears as **Annex 7**.

Annex 1

The Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL

Venue: Grand Continental Hotel, Langkawi, Malaysia
Date: 21-23 October 2008

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Background

Since 1998, SEAFDEC has conducted the Regionalization of the Code of Conduct for Responsible Fisheries (RCCRF) with emphasis on four thematic issues, i.e. fishing operations, aquaculture, fisheries management, and post-harvest processing and trade. Under the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) mechanism, the RCCRF placed Thailand as the first leading ASEAN country and the SEAFDEC Training Department (SEAFDEC/TD) as the leading implementing SEAFDEC Department for fisheries management projects. The first project to test the applicability of the regionalized Code of Conduct for Responsible Fisheries was started by SEAFDEC/TD in Pathew District, Chumphon Province, Thailand in November 2001 in collaboration with the Department of Fisheries (DOF) of Thailand. This was later on replicated in Kuala Teriang, Pulau Langkawi, Kedah State, Malaysia, and in Sihanoukville, Cambodia.

The ICRM Projects

In the first project in Pathew District, Chumphon Province, Thailand, SEAFDEC/TD and the DOF of Thailand served as the executing agencies. The project which had the tenure of five (5) years was originally known as the Locally Based Coastal Fishery Management in Pathew District (LBCFM-PD) but was later on changed in conjunction with the initiation of its second phase in January 2005, into the "Integrated Coastal Resources Management in Pathew District (ICRM-PD)". The project made substantial progress and came up with various tangible outcomes.

As a result, several SEAFDEC Member Countries; e.g. Malaysia, Indonesia, Brunei Darussalam, Cambodia, and Myanmar, proposed at the 4th ASEAN-SEAFDEC FCG Meeting in Myanmar in March 2002 and at the 25th Meeting of Program Committee (PCM) in Singapore in October 2002 that the knowledge and experiences gained through the first project in Thailand should be transferred to other SEAFDEC Member Countries.

Responding to such requests, the second project was started by SEAFDEC/TD in Langkawi, Malaysia in collaboration with the Department of Fisheries (DOF) Malaysia. After conducting the preparatory stages, the project originally known as the Locally Based Coastal Resources Management in Pulau Langkawi (LBCRM-PL) was initiated in August 2003 for an initial duration of two (2) years. On the 26th of December 2004, however, the project operational area was assaulted by the unexpected natural calamity – the tsunami. Thereafter, the project had inevitably changed its project orientation to rehabilitation of the fishing fleet. Reflecting this urgent need, the project tenure was extended for another 29 months until December 2007 in order to complete the originally envisaged goals.

While the implementation of the LBCRM-PL project was in progress, its funding source from the Japanese Trust Fund was changed from Trust Fund No. 1 to No. 4 starting in January 2005, with more emphasis on human resources development. This led to the change of the project title to "Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL)".

Similarly, a third project which was initiated in Sihanoukville, Cambodia in November 2005 was also known as the "Integrated Coastal Resources Management in Sihanoukville (ICRM-SV)". The ICRM-SV project has the duration of four years from November 2005. The respective time span of each ICRM project is shown in Table 1.

Table 1. Timeframe of the ICRM projects implementation

No	Component	Year								
		2001	2002	2003	2004	2005	2006	2007	2008	2009
1	Component 1: Thailand LBCFM-PD: 1st Phase (JTF - 1) ICRM-PD: 2nd Phase (JTF - 4)		←	—	→	←	—	→		
2	Component 1: Malaysia LBCRM-PL: 1st Phase (JTF - 1) ICRM-PL: 2nd Phase (JTF - 4)			←	—	→	←	—	→	
3	Component 2: Cambodia ICRM-SV (JTF - 4)					←	—	—	—	→

As the second component of the program, the LBCRM-PL/ICRM-PL project in Langkawi, Malaysia, was completed towards the end of 2007. The project's progress in the span of four years and five months has been reported in details in the biannual project progress reports submitted every six months since its inception. Based on the reports, the implementation of the project had been monitored during the Steering Committee meetings held once a year at the project planning level, and the Implementation Coordination Committee meetings convened every 3 to 4 months at the project operational level. In addition, the final project evaluation was conducted in early 2008 by an outsourced consultant and the report submitted had relevant recommendations.

The Regional Seminar

Upon the completion of the LBCRM-PL/ICRM-PL project, it was agreed that its impacts on the target communities and the project achievement in line with the original conceptual goals should be summarized and reviewed with the participation of concerned parties including representatives from the SEAFDEC Member Countries. This is to ensure that lessons learned and implications derived from the review would be reflected and incorporated in similar project operations to be developed and implemented not only in the other parts of Malaysia but also in other countries of the Southeast Asian region. Hence, this regional seminar on "Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL" was conducted with the objectives and agenda described below.

Objectives of the Regional Seminar

- To report on the achievement and outcome of the project during its over 4-year implementation and review its progress in line with the original project concept;
- To verify the impacts of the project activities to the beneficiaries in terms of quantity as well as quality in the light of both facets of community development as well as sustainable fishery resources management;
- To discuss its resultant rationale and implication in the dissemination of the project concept to other SEAFDEC Member Countries; and
- To identify the necessary follow-up actions to be undertaken by DOF Malaysia, SEAFDEC/TD and other collaborating local agencies.

Envisaged Outcomes of the Regional Seminar

- All data and information collected and analyzed during the project implementation are documented and presented;
- The project activities are thoroughly reviewed and its impacts to the beneficiaries verified;
- Through discussions, follow-up actions of the project to be undertaken by DOF Malaysia, SEAFDEC/TD and other local agencies are identified; and
- The seminar offers opportunities for SEAFDEC Member Countries other than Thailand, Malaysia and Cambodia, to consider the applicability of CBRM concept in their respective countries following the project approach.

Date and Venue of the Regional Seminar

Co-organized by SEAFDEC/TD and DOF Malaysia, the Regional Seminar was held at the Grand Continental Hotel, Langkawi, Malaysia from 21 to 23 October 2008.

The Participants

The invited participants have been working closely with coastal fishery resources management in their respective countries, with coastal fishery resources management as their profession; and since the seminar was conducted in English with no simultaneous translation to the Malay language, the designated participants surely had good command of the English language thus, were able to actively participate in the discussions. The following participants were invited to the seminar:

- Representatives from the SEAFDEC Member Countries working with their respective countries' coastal fishery resources management programs as part of their fisheries development plan, i.e., one representative each from Brunei Darussalam, Cambodia, Indonesia, Lao PRD, Myanmar, the Philippines, Thailand, and Vietnam (**Note**: no participants from Brunei Darussalam and Indonesia)
- Representatives from the host country, specifically from the DOF Malaysia, Kedah State and related agencies
- Leaders of the project operational teams in Thailand and Cambodia: 1 each from ICRM-PD and ICRM-SV
- The project core staff especially those who were directly involved in the practical operation of ICRM-PL at the site, i.e. SEAFDEC/TD, DOF Malaysia, LKIM, LADA, FRI, IPM, etc.
- Representatives from SEAFDEC Secretariat
- The Consultant for the final project evaluation
- Selected participants from NGOs

More than 50 participants attended the Regional Seminar.

Agenda and Timetable

21 October 2008

08.30 – 09.00	Registration
09.00 – 09.30	**Agenda 1:** Opening of the Seminar followed by commemorative photo session (DOF Malaysia)
09.30 – 09.50	*Coffee Break*
09.50 – 10.00	**Agenda 2:** Adoption of the Agenda (Chairperson: SEAFDEC)
10.00 – 10.30	**Agenda 3:** Background of the ICRM Projects and the Seminar (Chairperson: SEAFDEC)
10.30 – 12.00	**Agenda 4:** Description of the Project Approach and Progress of ICRM-PD (Thailand) and ICRM-SV (Cambodia) (Chairperson: SEAFDEC)
12.00 – 13.30	*Lunch*
13.30 – 14.00	**Agenda 5:** Description of the Project Activities (Chairperson: DOF Malaysia)
	1. Baseline and Monitoring Surveys
	a. Socio-economic Surveys
14.00 – 14.30	b. Daily Fish Landing Survey and Marine Biological Survey
14.30 – 15.00	2. Locally based fishery resources management
	a. Zoning Arrangement and Fishery Resources Management Plan
15.00 – 15.15	*Coffee Break*
15.15 – 15.45	b. Local Enforcement Activity
15.45 – 16.00	c. Crab bank
16.00 – 16.30	3. Local Business Development – Women's Group Activity
16.30 – 17.00	4. Fishing and Vessel Repair Technology Improvement
18.00	*Dinner hosted by the Director-General of DOF Malaysia*

22 October 2008

08.30 – 09.00 **Agenda 5** Cont'd (Chairperson – DOF Malaysia)

5. Enhancement of Human Resources Capacity Building and Participation

a. Organization of KEN/KPSP and its Institutional Capacity

09.00 – 09.20 b. Workshops, Training Courses and Study Tours

09.20 – 10.00 6. Rehabilitation and Enhancement of the Coastal Resources

a. Installation of ARs by LKIM and DOF

10.00 – 10.30 b. Installation of FEDs by SEAFDEC/TD

10.30 - 11.00 c. Mangrove Reforestation

11.00 – 11.15 *Coffee Break*

11.15 – 11.40 **Agenda 6:** Impact to the Communities – Beneficiaries' Views (Chairperson: SEAFDEC)

11.40 – 12.30 **Agenda 7:** Findings and Recommendations of the Final Project Evaluation (Chairperson: SEAFDEC)

12.30 – 14.00 *Lunch Break*

14.00 – 17.00 **Agenda 8:** Visit to the Project Site (DOF Malaysia)

18.30 *Dinner hosted by the Secretary-General of SEAFDEC*

23 October 2008

08.30 – 10.30 **Agenda 9:** Winding-up Discussion followed by Adoption of Conclusions and Recommendations (Chairperson: SEAFDEC)

10.30 – 10.45 *Coffee Break*

10.45 – 11.45 **Agenda 9** Cont'd

11.45 – 12.00 **Agenda 10**: Closing of the Regional Seminar (SEAFDEC)

12.00 *Lunch*

Discussion Materials and Working Documents

Doc. No.	Title of Document	Responsible Party
INF01	Prospectus	SEAFDEC/TD
INF02	Annotated Agenda	SEAFDEC/TD
INF03	List of Participants	SEAFDEC/TD
INF04	List of Documents	SEAFDEC/TD
REF01	Chronology of the Project Major Events	SEAFDEC/TD
REF02	Report of the Monitoring and Socio-economic Surveys in Kuala Teriang, Pulau Langkawi, Malaysia (August 2006)	SEAFDEC/TD
REF03	Marine Resources Monitoring in Pulau Langkawi, Malaysia (2004-2006)	SEAFDEC/TD
REF04	Report on Final Project Evaluation for ICRM-PL (May 2008)	SEAFDEC/TD
WP01	Background of Deployment of ICRM Projects in Southeast Asian Countries and the Regional Seminar	SEAFDEC/TD
WP02	Description of Project Approach and Progress – ICRM-PD, Thailand	DOF Thailand
WP03	Description of Project Approach and Progress – ICRM-SV, Cambodia	FiA Cambodia
WP04	Outcomes of the Baseline and Monitoring Socio-economic Surveys	SEAFDEC/TD
WP05	Marine Biological Survey – Status of Main Marine Species	FRI/DOF Malaysia

WP06	CBRM – Establishment of Zoning and Formulation of Fishery Resources Management Plan	DOF Malaysia
WP07	CBRM – Establishment and Embodiment of Local Enforcement Unit (LEU)	DOF Malaysia
WP08	Establishment and Management of Crab Bank System	DOF Malaysia
WP09	Local Business Development – Women's Group Activity	SEAFDEC/TD
WP10	Fishing and Vessel Repair Technology Improvement	SEAFDEC/TD
WP11	Human Capacity Building and Participation – Organization and Function of KEN and KPSP	DOF Malaysia
WP12	Human Capacity Building and Participation – Workshops, Training and Study Tours	SEAFDEC/TD
WP13	Resources Rehabilitation and Enhancement – Installation of ARs by LKIM	LKIM Malaysia
WP14	Resources Rehabilitation and Enhancement – Installation of ARs by DOF Malaysia	DOF Malaysia
WP 15	Resources Rehabilitation and Enhancement – Installation of FEDs by SEAFDEC/TD	SEAFDEC/TD
WP16	Resources Rehabilitation and Enhancement – Mangrove Reforestation	DOF, FRI & JPS Malaysia
WP 17	Beneficiaries' Views on the Impact of the Project Operation	KPSP Kuala Teriang/DOF Malaysia
WP18	Final Project Evaluation Report - Excerpt	Consultant

Funding

A major component of the expenses incurred during the conduct of the Regional Seminar was borne by SEAFDEC/TD under the Japanese Trust Fund - 4, while other expenses incurred locally such as cost of the venue, travel and accommodation costs for Malaysian participants, cost of the project site visit etc., were shouldered by DOF Malaysia under the cost-sharing arrangement.

Annex 2

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Annex 3

Statement

By *Dr. Siri Ekmaharaj*
Secretary-General, SEAFDEC

The Director of Kedah State Fisheries, Mr. Theo Siong Wan representing the Director General of Fisheries Malaysia, Dató Junaidi bin Che Ayub,
The Japanese Trust Fund Manager, Mr. Hideki Tsubata,
Distinguished guests and participants,
Ladies and gentlemen, a very pleasant good morning.

I am very pleased to be here and honored to welcome you to this Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia. For this three-day Seminar, we will review the achievements of the Project on Integrated Coastal Resources Management in Pulau Langkawi or ICRM-PL.

As we are all aware, starting in 1998 SEAFDEC developed Regional Guidelines on Responsible Fisheries with four major themes. These are on responsible fishing operations, aquaculture development, fisheries post-harvest and trade, and fisheries management. Following the Regional Guidelines on Responsible Fisheries Management, the Training Department was designated to take charge of the SEAFDEC coastal resources management program. With such development, the Department of Fisheries of Thailand agreed to collaborate with SEAFDEC in the implementation of the said program. Thus, the first project to introduce the Japanese model of a community-based fisheries resources management or CBRM system took off in Chumphon Province, Thailand in November 2001.

Since then, the project in Chumphon had produced tangible outcomes which were highly appreciated by the other SEAFDEC Member Countries. It was therefore proposed at the FCG Meeting in Myanmar in March 2002 and at the PCM in Singapore in October 2002 that the experiences and knowledge gained through the project in Chumphon should be transferred to other member countries. This could be done through the regional collaborative mechanism of SEAFDEC. Thus, several countries proposed to initiate the second project in their own countries. But as requested by DOF Malaysia, it was decided that the second project would take place in Malaysia. The project site offered was in Kuala Teriang, Langkawi. After pursuing the preparatory works, the project began its operation in August 2003. This was originally known as the project on Locally Based Coastal Resources Management in Pulau Langkawi.

The project had progressed on the right track producing substantial outputs until 26 December 2004 when the devastating tsunami hit the project site. As much as 60% of the fishing fleet in the project area was damaged and many houses were destroyed. The project orientation was therefore changed in the time being to rehabilitation of the fishing fleet. For such reason, SEAFDEC through the Japanese Trust Fund had to extend the project tenure for another 18 months up to December 2007. I was informed that the fishing activity has just recently been resumed to the status as it was before the tsunami. We thank DOF Malaysia for the tremendous efforts exerted during the rehabilitation, and also the other agencies and the NGOs. The hardships and difficulties that the fishermen in the communities had to suffer for the rehabilitation work is beyond my imagination. We really admire them for their efforts.

In the meantime, the 3rd project commenced in Sihanoukville, Cambodia in November 2005. This project was modeled after the projects in Chumphon, Thailand and Langkawi, Malaysia. It is the original intention of SEAFDEC that the concept of CBRM is introduced through demonstration of the pilot project operation incorporating total community development. Thereafter, this model would be disseminated to other fishing communities in the country through the national authorities and perhaps in all Southeast Asian countries.

Although the involvement SEAFDEC in this project here in Langkawi was already phased out since December 2007, the practical operation has been continued by the newly formed project management committee of DOF Malaysia. During this follow-up period, emphasis has been placed on institutional as well as human capacity building for the fishing community. This would enable the newly formed managerial body, the KPSP, to independently pursue the CBRM function. However, even if the direct involvement of SEAFDEC in this project has been completed, we still have the duty and responsibility to monitor the development of the new managerial capacity in coastal resources management. This is our baby which we created jointly with DOF Malaysia. So SEAFDEC will continue to support the project, although within a very limited budget.

Ladies and gentlemen, this is an occasion for us to review the outcomes of the four and a half years project operation of the ICRM-PL. Through the various presentations on the progress of its activities we can verify the project impacts as well as its achievements. I am sure we can derive useful conclusions and recommendations from this review for the application of similar approaches in other SEAFDEC Member Countries. Your inputs therefore are very important for the follow-up operation of the project.

As the Seminar goes on, I look forward to your full cooperation by taking active part in the discussions and giving views in the verification of the project achievements. We also expect your recommendations for the further development of community-based fishery resources management in the Southeast Asian countries.

Thank you very much and good day.

Annex 4

By *Dató Junaidi bin Che Ayub*

Opening Remarks

Director-General of DOF Malaysia

Delivered by *Mr. Theo Siong Wan*
Director of Kedah State Fisheries
Malaysia

Dr. Siri Ekmaharaj, Secretary-General of SEAFDEC,
Mr. Hideki Tsubata, Deputy Secretary-General of SEAFDEC,
Departmental Heads from Pulau Langkawi and Kedah State,
Senior Officers of the Department of Fisheries Malaysia,
Distinguished Guests and Participants,
Wakil-Wakil Nelayan (*Fishermens' representatives),*
Ladies and Gentlemen, Good Morning!

First and foremost, I would like to apologize on behalf of the Director-General of Fisheries Malaysia for not being here with all of you today to officiate the opening of this important seminar because he has to attend to an urgent matter. I hereby would like to read the text of the Opening remarks of Dato' Junaidi bin Che Ayub, Director General of Fisheries Malaysia.

Ladies and Gentlemen,

It is indeed an honor and pleasure for me to be invited to say a few words at the opening of this much anticipated regional seminar on Integrated Coastal Resources Management (ICRM) Approach in Southeast Asia: Review on the Langkawi Project. On behalf of the Department of Fisheries Malaysia, I wish to extend our warmest welcome to all distinguished participants to this legendary island. Langkawi has almost everything to offer ranging from its breathtaking rainforest canopy adventure to nature walks and all-night parties, and shopping of course. You may realize that the population in Malaysia and in particular Langkawi, are still in a festive mood celebrating Hari Raya, which is observed not only by Muslims but is celebrated by all Malaysians. Do ask your Malaysian colleagues what it is and join them if you have the chance. Enjoy exploring!

On a more serious note, I am personally glad that the Department of Fisheries Malaysia is given the honor to host this seminar right here in Langkawi where the said project has been implemented since 2003. My sincere gratitude also goes to SEAFDEC for co-hosting this auspicious seminar and I hope that may the effort of the project leader in particular, Mr Sei Etoh, bring continuous success to the implementation of the project.

The convening of this three-day seminar this week is viewed as timely as this marks the end of direct contribution by SEAFDEC to the project. Nevertheless, this should not cause any hindrance for possible future cooperation between SEAFDEC and DOF Malaysia to ensure sustainability of the project. It is acknowledged that, through this project, Malaysia has gained invaluable experience. Knowledge imparted by SEAFDEC over the past few years had benefited the community of Kuala Teriang at large. SEAFDEC's continuous support to similar future project engagements in Malaysia particularly, is welcomed as we envisage proceeding further from here.

Ladies and Gentlemen,

As we all know, community-based fisheries seeks to develop and implement new practices of sustainable fisheries management that are responsive to the scale of communities, their fisheries, and their social and economic structures and dynamics. A tool called "Community-Based Fisheries Management" is an approach where communities directly manage their own marine resources. This management style protects and sustains communities and resources alike. When applied more broadly, it is known as Community-Based Resource Management. Community-Based Management is already practiced worldwide, from Alaska to Thailand, from Mexico to New England.

Here in Malaysia, we are committed to join today's world, giving the community the opportunity to take part in this management process. We are in the incipient stage hence let us remind ourselves that the investment for human and institutional capacity building today might not bear fruit so quickly. Let us acknowledge that both the government and the community are in the long journey of learning process. There are, of course obstacles in one way or another despite the remarkable progress we have achieved. We regard this as challenges. Similarly we have to accept the fact that the degree of implementation progress and speediness will vary from one country to another. The planning and implementation of this management system will require the government to put rightly in place new legal, administrative and institutional arrangements at both national and community level to complement contemporary political, economic, social and cultural structures. Clearly, every level of the whole system has a role to play.

It is envisioned that this project shall be a ***melting pot*** for the next generations of fisher folks with an enhanced knowledge on what is term as "Sustainable Fisheries Management". Kuala Teriang is merely a launching pad to test whether or not an equal share of authority and responsibility can co-exist between the government and the community.

Ladies and Gentlemen;

Generally, the acceptance of the project by the community involved has widened substantially. In addition, the level of participation has also increased considerably. Community involvement in meetings and self-initiated mini projects had also been encouraging. The Crab Bank Project, for instance, had gained good participation not only within the project site, i.e. Kuala Teriang but also it has been extended to reach out to other fisher folks in many parts of Langkawi. One good reason to explain this is that the awareness of the community for sustainable fisheries has now been elevated to a new level. Most importantly, this is a healthy development as they recognize that resources conservation is no longer an exclusive business of the government. This responsibility should be instead, shouldered together.

After being for almost five (5) years off-the ground, the project had chalked continuous progress. The community involved, with the assistance of the DOF and SEAFDEC had successfully formulated the Fisheries Resources Management Plan for Kuala Teriang. The painstaking process that they had gone through to develop/craft the said plan was indeed a good lesson in itself. In the light to support the plan, the DOF is in the midst of finalizing a new regulation envisaged to enable and empower the community to manage a demarcated marine water body in Kuala Teriang. The regulation will be called Fisheries (Community-Based Fishery Resources Management Area) Regulation, made under the Fisheries Act 1985. Once promulgated, this regulation on coastal CBFM will indeed be the first of its kind in Malaysia.

It is our desire to introduce and implement similar projects on a wider scale elsewhere in the country, by withdrawing lessons learnt from the Langkawi project. It is therefore imperative to ensure that the Langkawi project maximizes success while minimizing errors in the light to convince others to follow its footsteps.

At this juncture, allow me to address the direct beneficiaries of Kuala Teriang in Bahasa Malaysia.

Saya ingin menyatakan rasa bangga dengan komitmen yang telah ditunjukkan oleh komuniti di Kuala Teriang khususnya, dan nelayan di kawasan lain amnya sepanjang pelaksanaan projek ini. Tuan-tuan telah turut menunjukkan sokongan dan penyertaan yang aktif, sudah tentu di bawah kepimpinan Ketua tuan-tuan, En Mahadir Ibrahim. Saya akui bahawa masih banyak lagi tanggungjawab dan

peranan Jabatan Perikanan Malaysia yang masih belum terlaksana dan saya yakin tuan-tuan masih menanti-nanti pelaksanaannya. Saya berharap tuan-tuan dapat bersabar kerana sesetengah proses, sebagai contoh, pewartaan kawasan memerlukan masa yang lebih panjang kerana ianya memerlukan penelitian mendalam di peringkat teknikal.

Ladies and Gentlemen,

I am impressed by the undivided support shown by the community in Kuala Teriang and other areas alike throughout the implementation of the project. You have shown your keen interest and active support and much is due to the able and good leadership of your very own Mr. Mahadir Ibrahim. I do realize that there are many other long awaited tasks that have yet to be accomplished. However, I hope that you can bear with this long process as certain processes such as the promulgation of the said regulation would require lengthy and meticulous technical work.

Ladies and Gentlemen,

Despite the skepticism by certain quarters during its launching in 2003 and amid the tsunami assault in 2004, the fishermen continued to give their endorsement to this project. Sea harvest was reported to be improving. Encroachments by trawlers were significantly reduced and this was due to the dedicated efforts of the Local Enforcement Unit.

Speaking of the economic component of the project, I am glad to know that the Women's Group had been exposed to a more appropriate practice of bookkeeping to assist them to be in a better position to manage their business. In relations to the research element, I feel that we should be doing more research in a coordinated manner. With all the experts and resources that we have within the Department of Fisheries, we pledge to give our level best in the future.

In this seminar, you will be enlightened, among others, on the lessons learned, experiences gained, issues and constraints being faced as well as the way forward in ensuring the project sustainability. Similarly, I would urge other countries, without hesitation to share their experiences, put forward thoughts and views, provide constructive comments and criticisms with a view to further improve future undertakings. I equally hope that, this seminar would reap the objectives as envisaged.

Ladies and Gentlemen:

I would like to take this opportunity to sincerely thank SEAFDEC, the working committee of the Department of Fisheries at all levels for their hard work and making this seminar a success. On this note, I take great pleasure in declaring "OPEN" the "Regional Seminar on Integrated Coastal Resources Management (ICRM) Approach in Southeast Asia: Review on Langkawi Project. I wish all of you very fruitful and rewarding deliberations.

Thank you.

Annex 5

Agenda

1. Opening of the Seminar
2. Adoption of the Agenda
3. Background of the ICRM projects and the Seminar
4. Description of the project approach and progress of ICRM project
   - Description of the project approach and progress of ICRM -PD, Thailand
   - Description of the project approach and progress of ICRM-SV, Cambodia
5. Description of the project activities
   - Base-line and monitoring surveys: Socio-economic survey
   - Base-line and monitoring surveys: Daily fish landing survey and marine biological survey
   - Locally based fishery resources management: Zoning arrangement and fishery resources management plan
   - Locally based fishery resources management: Local enforcement activity
   - Locally based fishery resources management: Crab bank
   - Local business development: Women's Group activity
   - Fishing and vessel repair technology improvement
   - Enhancement of human resources capacity building and participation: Organization of KEN/KPSP and its institutional capacity
   - Enhancement of human resources capacity building and participation: Workshops, training courses and study tours
   - Rehabilitation and enhancement of coastal resources: Installation of ARs by LKIM
   - Rehabilitation and enhancement of coastal resources: Installation of ARs by DOF Malaysia
   - Rehabilitation and enhancement of coastal resources: Installation of FEDs
   - Rehabilitation and enhancement of coastal resources: Mangrove reforestation
6. Impact to the communities: Beneficiaries' view
7. Findings and recommendations in Final Project Evaluation
8. Visit to the project site
9. Winding-up discussion followed by adoption of conclusions and recommendations
10. Closing of the Regional Seminar

Annex 6

Chronology of Major Events
ICRM-PL Project

2002

March 2002	:	Request to visit Kedah State to inspect similar project operations as LBCFM-PD at 4th FCG meeting in Myanmar
July 2002	:	Visit of TD team to Kedah State to inspect various pilot project sites
October 2002	:	Outline of proposed collaborative project presented at 25th PCM in Singapore was supported by the delegates of Thailand and Malaysia

2003

13-17 January 2003	:	Visit of TD team to Penang to discuss the outline of the collaborative project with the Director of Planning, DOF Malaysia
13-17 January 2003	:	Visit of TD team to Langkawi to inspect the proposed project site
January 2003	:	Action plan for the collaborative project formulated, from which the allocation of the Japanese Trust Fund was based
March 2003	:	Study tour to Kelantan and Terengganu States and Langkawi by SEAFDEC/TD and Chumphon DOF staff, where details on the project formulation between TD and DOF Malaysia was discussed
10-17 May 2003	:	*Study tour to Kota Bahru, Kelantan and Langkawi by TD team, Chumphon fishermen and CMDEC staff to investigate the project requirements*
16 June 2003	:	Tentative action plan and the Project Design Matrix prepared and submitted to DOF Malaysia
11 July 2003	:	1st SC meeting in Langkawi and the project framework was determined
17 August 2003	:	**Draft project document sent to DOF Malaysia, although the project operation actually started prior to endorsement of the Project Document (Prodoc)**
12-15 October 2003	:	Base-line socio-economic survey
20 October 2003	:	2nd SC meeting in Phuket and the Prodoc was endorsed
17-18 December 2003	:	Data and findings derived from the socio-economic survey were disseminated to the fishers during the Fishermen's Workshop in Hat Yai, Thailand
20 December 2003	:	Project was publicly opened during the Fishermen's Workshop

2004

10 February 2004	:	1st ICC/PIWG meeting in Langkawi, and Women's Group (KEW) was organized
30 March 2004	:	Training course in fish landing data collection exercise, the study in fishing gear improvement, and the study in marine engine
27 April 2004	:	Study tour by women's group to Chumphon
06 May 2004	:	2nd ICC/PIWG meeting in Langkawi
04-05 June 2004	:	Mechanical training course
14-17 June 2004	:	Experimental fishing in use of improved fishing gear

15-16 June 2004	:	Training course in bookkeeping and accounting for KEN/KEW
17 June 2004	:	3rd ICC/PIWG meeting in Langkawi
09-11 August 2004	:	Training course on introduction of improved fishing methods
11 August 2004	:	Zoning map was prepared and handed over to KEN for consultation
19-23 December 2004	:	Training and installation of FEDs
19-23 December 2004	:	2nd experimental fishing in Langkawi
23 December 2004	:	4th ICC/PIWG meeting in Langkawi
26 December 2004	**:**	**Tsunami assaulted and devastated the project site**

2005

04-06 January 2005	:	Site inspection by SEAFDEC/TD project leader to investigate the extent of damage by the tsunami, and discussion with DOF Malaysia on the reorientation of the project implementation
23 February 2005	:	Installation of 900 ARs by LKIM
01 March 2005	:	5th ICC meeting in Langkawi (both ICC and PIWG meetings were merged)
22 March 2005	:	1st zoning arrangement meeting among stakeholders
09-14 April 2005	:	Training course in product development for the women's group in IPM, Terengganu
27 April 2005	:	3rd SC meeting in Surat Thani combined with the study tour to ICRM-PD, Chumphon
23-26 May 2005	:	Training course in wooden boat repairing with FRP materials
27-29 June 2005	:	Study tour to observe the zoning arrangement in Chumphon by KEN
30 June 2005	:	2nd zoning arrangement meeting with stakeholders
02-04 August 2005	:	Fish landing data collection system was resumed after the Tsunami
16 August 2005	:	6th ICC meeting
15-17 August 2005	:	Fishermen's training course in CBRM including study tour to Penang
15-17 November 2005	:	Monitoring marine resources survey
17 November 2005		3rd zoning arrangement meeting with stakeholders
18 November 2005	:	Fishermen's workshop to review the activity on introduction of new or improved fishing methods
23-24 November 2005	:	Pre-installation survey for ARs/FEDs

2006

21 January 2006	:	10 units of ARs were installed by LKIM
07 March 2006	:	4th SC Meeting in Surat Thani, Thailand
07-09 March 2006	:	Fishermen's workshop to draft a fishery resources management plan
17 April 2006	:	7th ICC Meeting
08 May 2006	:	KEN/KEW Business Development Opportunity Workshop in Langkawi
18-20 July 2006	:	Monitoring socio-economic survey

14 September 2006	:	Preliminary meeting on Fisheries Management Plan at the DOF Headquarters in Kuala Lumpur
13-14 November 2006	:	General Stakeholders' Meeting on Fisheries Management Plan in Alor Setar
15 November 2006	:	8th ICC Meeting

2007

19 March 2007	:	Training course in construction of FEDs
20-21 March 2007	:	Pre-installation marine biological survey for FEDs
22 March 2007	:	5th SC Meeting in Langkawi
03-05 April 2007	:	Installation of 10 units of FEDs
03-05 April 2007	:	Training course in the users-friendly bookkeeping system for KEW
13 June 2007	:	Training course in management of Crab Bank and thereafter the crab bank scheme was put in practice
13 June 2007	:	Preliminary discussion on mangrove forestation with JPS, Forest Department and District DOF Office in Langkawi
18 July 2007	:	9th ICC meeting
4-5 September 2007	:	1st FED impact marine biological survey
05 September 2007	:	Fishers workshop on LEU function in Langkawi
11 December 2007	:	10th ICC meeting
31 December 2007	**:**	**ICRM-PL project was terminated and DOF Malaysia took over the operation with KPSP**

2008

01 March 2008	:	Final project evaluation by an outsourced consultant commenced
24 May 2008	:	Final project evaluation completed and the report was endorsed
19-20 June 2008	:	Monitoring the project's progress by SEAFDEC/TD team
21 June 2008	:	1st Regional Seminar Preparatory meeting in Hat Yai, Thailand
22 June 2008	:	6th SC meeting in Hat Yai, Thailand
03 September 2008	:	2nd Regional Seminar Preparatory meeting in Putrajaya, Malaysia
21-23 October 2008	**:**	**Regional Seminar on ICRM-PL in Langkawi**

Annex 7

Closing Remarks

By *Mr. Hideki Tsubata*
SEAFDEC Deputy Secretary General and
Japanese Trust Fund Manager

The Section Head of Sector Planning & International Division of the Department of Fisheries, Malaysia, Mr. Tuan Haji Ahmad Azahari bin Ahmad,
Distinguished guests and participants,
Ladies and gentlemen,
A very good day to one and all!

It is indeed a pleasure for me to be here to participate in this *Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia* where we reviewed the Project on Integrated Coastal Resources Management in Pulau Langkawi, Malaysia. I have listened intently to and participated in the discussions on the progress and the impact of this project. Before winding up this Seminar, I would like to say some words on behalf of one of the donors, the Trust Fund Program of the Government of Japan.

First of all, I would like to express my sincere appreciation to all of you for your active participation and deliberation in this Seminar. During the Seminar, I have noted the very impressive achievements of the various manifold activities of the project within the limited time frame.

As all of you are already aware, the project on Integrated Coastal Resources Management in Pulau Langkawi was pretty well and has been successfully implemented under the SEAFDEC and DOF Malaysia collaborative project framework, with valuable financial and in-kind contributions from various collaborating partners such as DOF Malaysia, the Fisheries Authority of Malaysia or LKIM, the Japanese Trust Fund and the Japanese Grassroots Project.

In specifically speaking, it is interesting to note that the project has had positive impacts not only to the target fisheries community but also to some neighboring fisheries communities in Langkawi. This has indeed resulted in the embodiment of community based fisheries resources management concept catalyzed by the newly established fisheries resources management community, the KPSP, especially after overcoming the formidable damages caused by the Tsunami in 2004.

Further, it is also impressive to learn that the women's group so much dedicated significant inputs to all the works of community development within the project framework. Their efforts led to the forming of a good group working spirit which is an essential factor in realizing the concept of community based fishery resources management.

Moreover, the project's impact has also been extended to the region. Similar approaches have been adopted in other SEAFDEC member countries like in Cambodia. It is the hope of the Japanese Trust Fund that the community based fishery resources management (CBRM) concept will be disseminated further in the Southeast Asian countries in similar manners based on the successful case studies conducted in Thailand, Malaysia and Cambodia, which is in fact the goal of the SEAFDEC aiming at further promotion of sustainable fisheries development in the Southeast Asian region.

Before we leave this seminar, I would wish to extend my sincere thanks to DOF Malaysia and other collaborating agencies for their dedicated contribution to the project. Without their support we would have not attained such tangible outcomes and achievements. Furthermore, we are still bound to look after the newly born body for a while.

In this regard, I would also wish to extend my appreciation to DOF Malaysia for its commitment to the further financial support to continue/sustain its project operations for another few years as the follow-up activities. Such effort will ensure the application of community based fisheries resources management (CBRM) takes root in the areas like mangrove reforestation.

We recognize the need to continue to support the follow-up activities hereafter and therefore Japan is considering the possibility of using the limited budget of the Japanese Trust Fund for this purpose in the next year.

Lastly, I hope that this regional seminar was completed to the full satisfaction of each participant. My wish is for all of you to make the best use of the knowledge and experiences gained through this seminar for future application of the CBRM approach in your respective areas and countries.

Thank you again for your participation in this seminar and TREMENDOUS EFFORTS RENDERED to this project so far BY DOF Malaysia and SEAFDEC/TD team. I wish all of you safe journey back home. Good day!

The Regional Seminar on ICRM-PL
Langkawi, Kedah State, Malaysia
21-23 October 2008

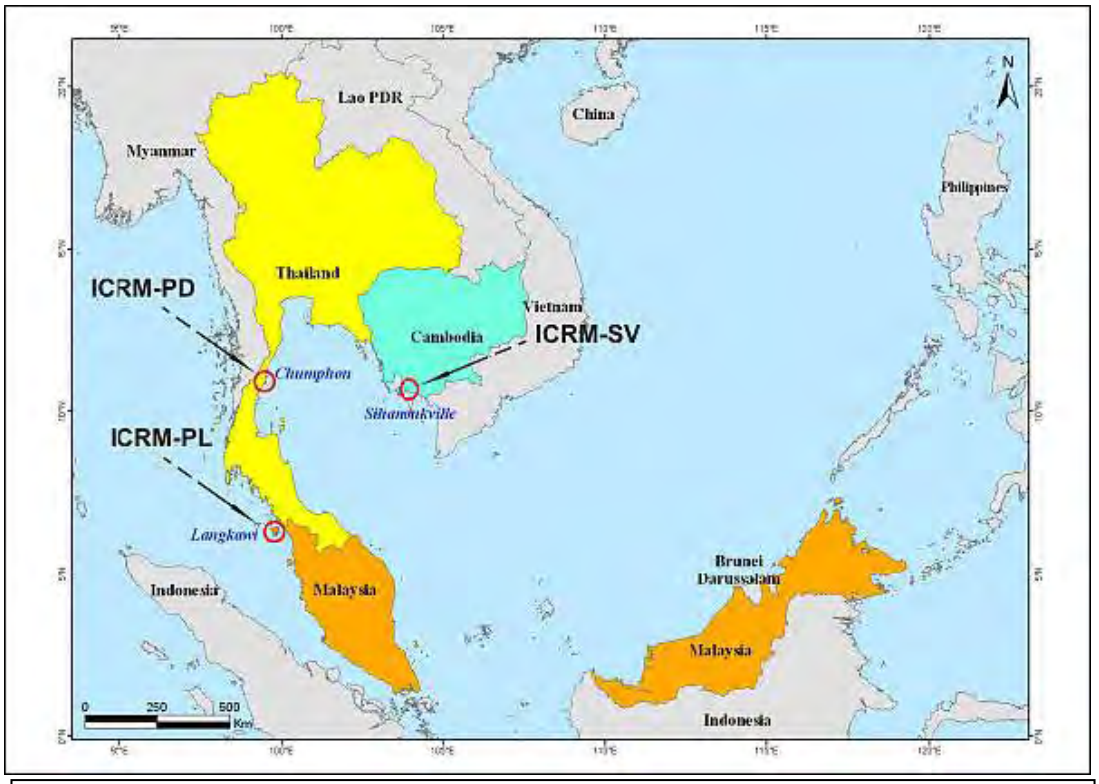
The Integrated Coastal Resources Management Approach in Southeast Asia

The deterioration of livelihood in coastal fishing communities resulting from the over-exploitation of fishery resources and degradation of the coastal environments has been a pivotal issue among fisheries policy makers in the Southeast Asian countries since the late 1990s. Discussions have therefore been centered on this theme in order to seek for applicable measures to improve and overcome the situation.

SEAFDEC has implemented the regionalization of the Code of Conduct for Responsible Fisheries (CCRF) and came up with regional guidelines on four major aspects, namely: responsible fishing operations, aquaculture development, fisheries post-harvest, and fisheries management. In another scenario, under the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) collaborative mechanism, Thailand has been designated the ASEAN Lead Country and the SEAFDEC Training Department (TD) as the Lead Department for the implementation of FCG activities related to fisheries management. Thus, in accordance with the efforts of SEAFDEC to promote the adoption in the ASEAN region of the Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fisheries Management, TD collaborated with the Department of Fisheries (DOF) of Thailand for the implementation of an integrated coastal resource management pilot project in Thailand.

Guided by the framework of the comprehensive development project of the Thai Royal Project Council and the community-based fishery resources management (CBRM) concept, the project on "Integrated Coastal Resources Management in Pathew District, Thailand (ICRM-PD)" was implemented in Pathew District, Chumphon Province. The successful implementation of the project in Thailand has been replicated in Malaysia and Cambodia, while the knowledge learned and experiences gained from the project implementation have been disseminated to the other ASEAN countries.

Following the CBRM concept and adopting it in the ASEAN setting, the Integrated Coastal Resources Management (ICRM) approach was implemented by SEAFDEC/TD in three pilot projects in Thailand, Malaysia, and Cambodia from 2001 to 2009. The main objectives of the ICRM projects are to: (1) establish sustainable coastal resources management at the local level; (2) rehabilitate the coastal fishery resources; and (3) alleviate poverty in coastal fishing communities. Specifically under the ICRM approach, developing the capacity of local human resource will empower the local people in community development enabling them to manage the coastal resources and sustain development efforts, while the systematic voluntary participation by the local people in a local body will proactively strengthen community development and resource management. Moreover, the people's participation in creating job opportunities and in establishing local businesses will increase their source of accessible income thus, alleviating poverty and developing the economic base of the community.



Map of Southeast Asia showing the ICRM pilot projects implemented by SEAFDEC under the FCG collaborative mechanism: ICRM-PD in Thailand; ICRM-PL in Malaysia; and ICRM-SV in Cambodia

Deployment of ICRM Projects in the Southeast Asian Countries

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Introduction

In most Southeast Asian countries, the deterioration of livelihoods in coastal fishing communities resulting from the over-exploitation of fishery resources and the degradation of coastal environments had became a pivotal concern for fishery policy makers that steered the relevant authorities to introduce some measures to improve the situation. One of the approaches recognized as appropriate was the introduction of the concept of community-based fisheries management (CBFM) within the framework of the devolution of coastal fisheries development and management.

Based on the SEAFDEC project on the Regionalization of the Code of Conduct for Responsible Fisheries and under the collaborative mechanism of the ASEAN-SEAFDEC Fisheries Consultative Group (FCG), Thailand was designated as the lead country for the SEAFDEC Member Countries and the SEAFDEC Training Department (SEAFDEC/TD) as the Lead SEAFDEC Department for activities related to fisheries management. Thus, SEAFDEC/TD collaborated with the Department of Fisheries (DOF) of Thailand in implementing a coastal resource management program. This led to the reformatting of an existing project proposal on coastal resource management for Chumpon Province prepared by DOF Thailand as it became a joint initiative with SEAFDEC/TD. It was further agreed that the knowledge and experience gained through the project operation in Thailand would be disseminated to the other SEAFDEC Member Countries through the technology transfer mechanism of SEAFDEC.

Locally Based Coastal Resources Management/Integrated Coastal Resources Management Project

Consequently, the five-year project on "Locally Based Coastal Fishery Management in Pathew District (LBCFM-PD)" commenced in November 2001 in Chumpon Province, Thailand with the overall objectives of: (1) establishing sustainable coastal resources management mechanism at the local level; (2) rehabilitating the coastal fishery resources; and (3) alleviating poverty in coastal fishing communities.

The LBCFM-PD project had produced tangible impact as acknowledged by the SEAFDEC Member Countries during the 4th SEAFDEC FCG Meeting in Myanmar in March 2002 and at the 25th SEAFDEC Program Committee Meeting in Singapore in October 2002. It was during the latter meeting that a recommendation was raised to impart the technologies including the experience and knowledge gained from the project LBCFM-PD to the other Member Countries. In this connection, the Committee Member for Malaysia offered Langkawi as a pilot site for the implementation of a similar approach to the LBCFM-PD project. Subsequently, SEAFDEC/TD missions to Langkawi were organized to look into the possibility of setting up a similar coastal fishery resources management and development project. Eventually, the second project on "Locally Based Coastal Resources Management – Pulau Langkawi (LBCRM–PL)" took off in August 2003 for a period of four years.

These two projects were jointly financed by their respective governments and the Japanese Trust Fund I Program in SEAFDEC through TD, and later reformulated to fit into the new thrust of the Japanese Trust Fund IV Program, which commenced in 2005 under the new program domain on "Capacity Building of Human Resources and Participation in Integrated Coastal Resources Management". Since this new program placed more emphasis on human resources development (HRD), the projects' titles were changed correspondingly into Integrated Coastal Resources Management in Pathew District (ICRM-PD) and Integrated Coastal Resources Management in Langkawi (ICRM-PL) to take into consideration the thrust of the new program, and eventually comprising the second phase of the project.

Meanwhile, further recommendations were put forward at the SEAFDEC Program Committee meetings (PCM) in 2003 and 2004 specifying that experiences and knowledge gained through these project operations should be transferred to other SEAFDEC Member Countries under the collaborative project approach. To this end, the other Member Countries expressed their intensions to initiate similar projects in their respective countries. Finally, it was decided that the 3rd project would take place in Cambodia taking into account the geographical advantage and the prioritized need of a CBRM approach in the country. The preliminary site survey was carried out in June 2004 to inspect the proposed site and to collect relevant data and information with regards to responsible community fisheries. Based on the findings and observations from the survey, a tentative work-plan was submitted to the 27th PCM held in December 2004 which was subsequently endorsed. Thus, steps were then taken to put the project forward and for the initiation of the actual activities in 2005. Eventually, the project commenced its operation on 11 November 2005 signaling its three-year tenure.

While the ICRM-PD project in Chumphon was terminated in December 2006, the ICRM-PL project in Langkawi, Malaysia had also progressed but was disrupted on 26 December 2004 when the devastating tsunami damaged the project operational area in Langkawi. Most fishing gear and boats were destroyed or lost, and the fish landing facilities were ruined. Thereafter, the project orientation was changed in order to focus on the rehabilitation of the area including repair of the fishing fleet. In order to pursue the remaining activities based on the original objective, the project for another three years until December 2007. With the main focus of the project activity in 2005 and 2006 placed on the rehabilitation of the fishing fleet and fishery facilities damaged by the tsunami, it was only toward the end of 2007 that the fishing activity had more or less resumed as it was in 2004 before the tsunami. Consequently, the project activities which have also normalized in early 2007 had to be terminated in December 2007 with the final project evaluation conducted in March 2008. Meanwhile, the project ICRM-SV in Sihanoukville, Cambodia, has been extended for another year until the end of 2009 to complete the on-going activities in connection with coastal fishery resources management practices following the community development approach.

The ICRM pilot projects implemented by SEAFDEC in Thailand (Pathew District, Chumphon Province: ICRM-PD), in Malaysia (Pulau Langkawi: ICRM-PL), and in Cambodia (Sihanoukville: ICRM-SV)

The timeframe of the implementation of the ICRM projects in Thailand, Malaysia and Cambodia focusing on the introduction of the CBRM concept to the Southeast Asian countries, is as shown in Table 1.

Table 1: Timeframe of ICRM implementation in Southeast Asia (2001-2009)

No	Component	Year								
		2001	2002	2003	2004	2005	2006	2007	2008	2009
1	Component 1: Thailand LBCFM-PD: 1st Phase (JTF - 1) ICRM-PD: 2nd Phase (JTF - 4)	←	—	—	—	→				
						←	—	→		
2	Component 1: Malaysia LBCRM-PL: 1st Phase (JTF - 1) ICRM-PL: 2nd Phase (JTF - 4)			←	—	→				
						←	—	—	→	
3	Component 2: Cambodia ICRM-SV (JTF - 4)						←	—	—	→

Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia

As the first component of the LBCRM/ICRM project, the LBCRM-PD/ICRM-PD in Chumphon Province, Thailand was completed in 2006. The project's progress in the span of five years and two months had been reported in detail in the respective biannual progress reports. To consolidate the reports, a review of the achievement of LBCRM-PD/ICRM-PD project and its impacts to the target fishing communities was conducted through the Regional Seminar on Integrated Coastal Resources Management in Southeast Asia: Lessons Learned through the Integrated Coastal Resources Management in Pathew District, Chumphon Province (ICRM-PD) in Chumphon, Thailand from 10 to 12 July 2007. The said Regional Seminar aimed to: (1) report on the achievement and outcome of the project during its 5-year implementation and review its progress in line with the original project concept; (2) verify the impacts of the concept to the beneficiaries from the project's activities in terms of quantity as well as quality considering both facets of community development as well as sustainable fishery resources management; (3) discuss the resultant rationale and implication in the dissemination of the project concept to other SEAFDEC Member Countries under component 2; and (4) identify the necessary follow-up actions to be undertaken by Thailand and other collaborating local agencies.

As a matter of policy in the implementation of the LBCRM/ICRM project, the final evaluation of each sub-project should be done by an external consultant. In the case of the LBCRM-PD/ICRM-PD project, the final project evaluation was conducted by Dr. Somsak Boromthanarat of the Coastal Resources Institute (CORIN) of Prince of Songkhla University, Hat Yai, Songkhla, Thailand. In his report, he commended the project design and objectives as such were able to address the core need of the fishers in the project site. He also noted that the project components, namely: baseline survey, CBRM supporting activities, local business development, human resources development, extension services, and resource enhancement were very relevant and directly contributed to the development of CBRM in the project site.

Moreover, during the Regional Seminar in Chumphon, the participants considered the outcomes of the project to be very substantial and conducive not only for the beneficiaries but also for the agencies which took over the operation of the project after the completion of the direct involvement by SEAFDEC/TD. The proceedings of the first Regional Seminar were compiled and published in September 2007.

Similarly, the second regional seminar on ICRM was organized in October 2008 in order to review the impacts made by the project operation to the fishing communities. Therefore, as a similar exercise the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL was held in Langkawi, Malaysia from 21 to 23 October 2008.

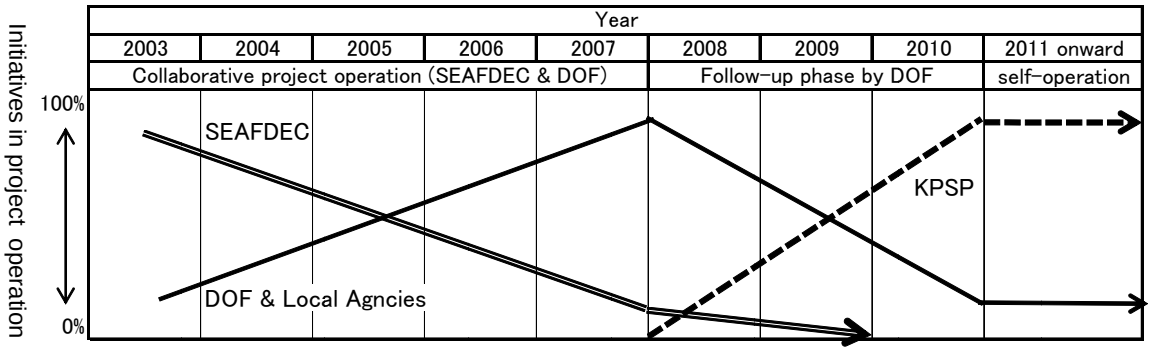
The Seminar in Langkawi was attended by the executive agencies involved in the ICRM-PL such as the DOF Malaysia and SEAFDEC/TD under the collaborative project operational scheme. In addition, representatives from the related agencies involved in the project operation, e.g. the Fisheries Development Authority of Malaysia (LKIM), Fishery Research Institute (FRI) in Penang, Fisheries Institute of Malaysia (IPM), State Fisheries Office in Kedah, Langkawi Development Authority (LADA), and Drainage and Irrigation Department in Langkawi (JPS) also showed their support. Moreover, the most important persons who attended the Seminar were the representatives from the fishermen's group, i.e. the Fishermen Economic Group (KEN) which was re-organized later into the Fishery Resources Management Community (KPSP) and Women Economic Group (KEW) as the priority beneficiaries of this project. The report of the final evaluation of ICRM-PL which was done by an outsourced consultant was also presented during the Regional Seminar.

The field trip to inspect the various activities in the project site in Kuala Teriang, Langkawi was also included in the Seminar in Langkawi. Although the project operation under the collaborative regime with DOF Malaysia and SEAFDEC/TD has been terminated, the main activities have been ongoing at the follow-up stage under the supervision of the DOF Malaysia and other related agencies including the Kuala Teriang Fishery Resources Management Community (KPSP), which has expanded its pivotal role in the planning and implementation of the project.

Sustainability of the ICRM-PL

In terms of the sustainability of the activities of the ICRM-PL, it was emphasized on various occasions that it is vital for the KPSP in particular, to continue this self-regulatory fishery resources management regime after the completion of the project initiatives by SEAFDEC/TD and DOF Malaysia. As seen in Fig. 1, the managerial responsibility in the fishery resources management activity introduced by the joint initiatives of SEAFDEC/TD and DOF Malaysia has been eventually shifted to the KPSP towards the end of the follow-up stage. However, it was also agreed that the DOF Malaysia should continue its involvement in this activity as the supervising and supporting agency even after completion of the follow-up stage.

Fig. 1. Initiatives and involvements in the project operation



Integrated Coastal Resources Management in Pathew District (ICRM-PD), Chumphon Province, Thailand

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Introduction

In 2001, The Southeast Asian Fisheries Development Center (SEAFDEC) through the SEAFDEC Training Department (SEAFDEC/TD) and the Department of Fisheries (DOF) of Thailand conducted the collaborative pilot project on coastal fishery resources management with the cooperation of local fishing communities and other stakeholders, community groups and local administrative authorities in Pathew District, Chumphon Province under the auspices of the Japanese Trust Fund 1 (JTF-1).

The Chumphon Marine Fisheries Research and Development Center (CMDEC) served as the core implementing counterpart group and the Chumphon Provincial and Pathew District Offices of Fisheries as the collaborating agencies. The purpose of the project was to establish a practical framework for locally-based coastal resource management by encouraging fishermen's participation. It was supported by the creation of alternative job opportunities in coastal fishing communities. The collaborative pilot project was initially named the "Locally Based Coastal Resources Management in Pathew District (LBCRM-PD)" which started in 2001 and ended in 2006. Along the way, this was changed to Integrated Coastal Resources Management in Pathew District (ICRM-PD) in 2004.

The project site covers an area of approximately 117 km^2 in Pakklong Sub-District, Pathew District, Chumphon Province. Pakklong Sub-District comprised seven villages with 879 households and a population of 4152 (**Fig. 1**). The rural community is engaged in capture fisheries, coastal aquaculture and agriculture. The various fishing gears used are the Indo-pacific mackerel gill net, squid cast nets with light luring, blue swimming crab gill nets, shrimp trammel net, mullet gill nets, anchovy falling net with light luring, collapsible crab trap and cuttlefish traps, and other kinds of small-scale fishing gear. For aquaculture, the fishers are engaged in fish cage culture and shrimp farming. Rubber, coconut and palm oil are the major income sources from agriculture.

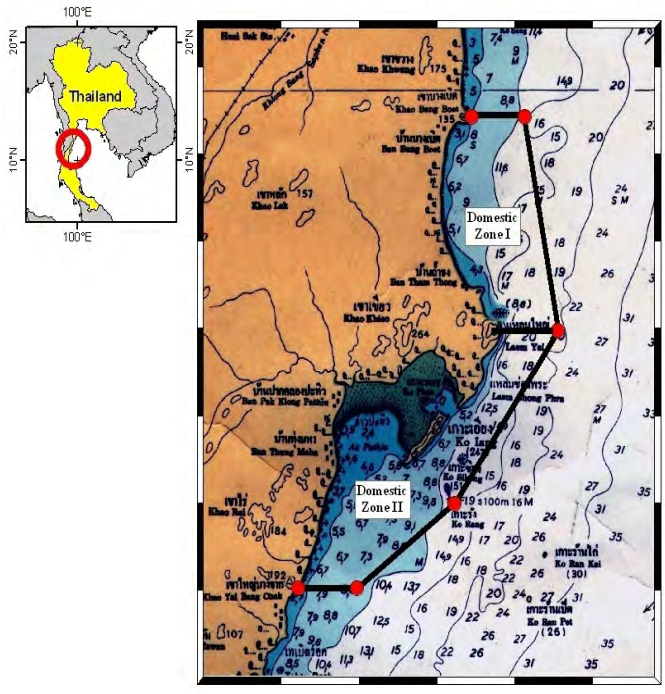

Fig. 1. Location of the project site

Overall Objectives of the LBCRM-PD/ICRM-PD project

The LBCRM-PD/ICRM-PD project in Chumphon Province, Thailand was mainly aimed at:

1. Establishing sustainable resource management at the local level;
2. Rehabilitating the coastal resources; and
3. Alleviating poverty in coastal fishing communities.

Activities of the LBCRM-PD/ICRM-PD Project

The six main activities implemented under the LBCRM-PD/ICRM-PD project were:

1. Baseline Survey

During the conduct of this activity, the participation of the resource users and stakeholders was promoted in order to obtain the necessary information and data for the establishment of sustainable coastal resource management and community development. The activity covered the following four major sub-activities (**Fig. 2**):

1.1 Biological Survey

The survey was done to monitor the output of the fishermen in terms of catch per unit effort (CPUE), identify the composition of the species caught, etc. The local people collected the data daily, which were then handed over to CMDEC for monthly analysis.

1.2 Oceanographic and Coastal Survey

This activity was initiated by SEAFDEC/TD, CMDEC and the Chumphon Marine Coastal Resource Research Center (CMCRRC), which were also involved in the survey, analysis and presentation of results, specifically those on the status of the coral reefs, sea grasses, and water quality in the project site.

1.3 Fishing Ground and Gear Survey

The survey aimed to monitor the fishing ground for each type of fishing gear and the seasonal changes of gears used by the Pakklong fishermen. The survey was conducted between January 2002 and September 2006 by SEAFDEC/TD.

1.4 Socio-economic Survey

The survey was conducted as a household survey in seven (7) villages of the project site in order to record the information into the database that could be utilized to develop an extension program and community development plans suitable for the target groups. The database was also used by the community in assessing the changes in the community in terms of number of households, population and occupation, and was later on referred to during the final evaluation of the project. The survey was conducted between 2002 and 2005 by SEAFDEC/TD and CMDEC.

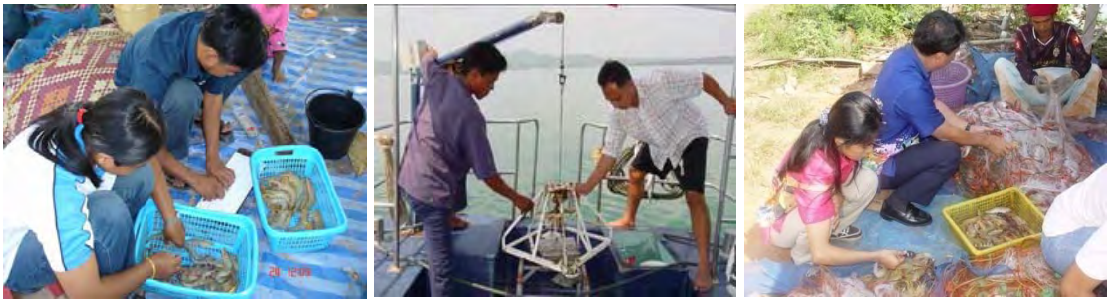

Fig. 2. Biological survey (left), oceanographic survey (center) and socio-economic survey (right)

2. Promoting and Extending Community-Based Resource Management

The project aimed to promote responsible fishing practices and aquaculture as well as encourage the fishers to participate in the monitoring, surveillance and control activities of the demarcated coastal zones. This was also intended to enhance the communities' capacity to advance fisheries management among themselves. Three sub-activities were conducted under this activity:

2.1 Zoning Arrangements

The project staff, fishermen, the Pakklong Sub-district Administrative Organization (Ao.Bo.To), and the stakeholders agreed to establish a maritime territorial zone in the project site. Thus, the project prohibited area was ratified on 4 October 2002 through the provincial mandate on the "Prohibition of some fishing gear to operate in the zoned area of Chumphon waters". This led to the banning of trawls, push nets and dredges from operating in the project area. Moreover, the aquaculture area in Tung Maha Bay was also divided into zoned areas (4 zones), namely: the cruising lane for fishing boats, fish cage culture area, shellfish culture area, and monsoon avoidance area (**Fig. 3**).

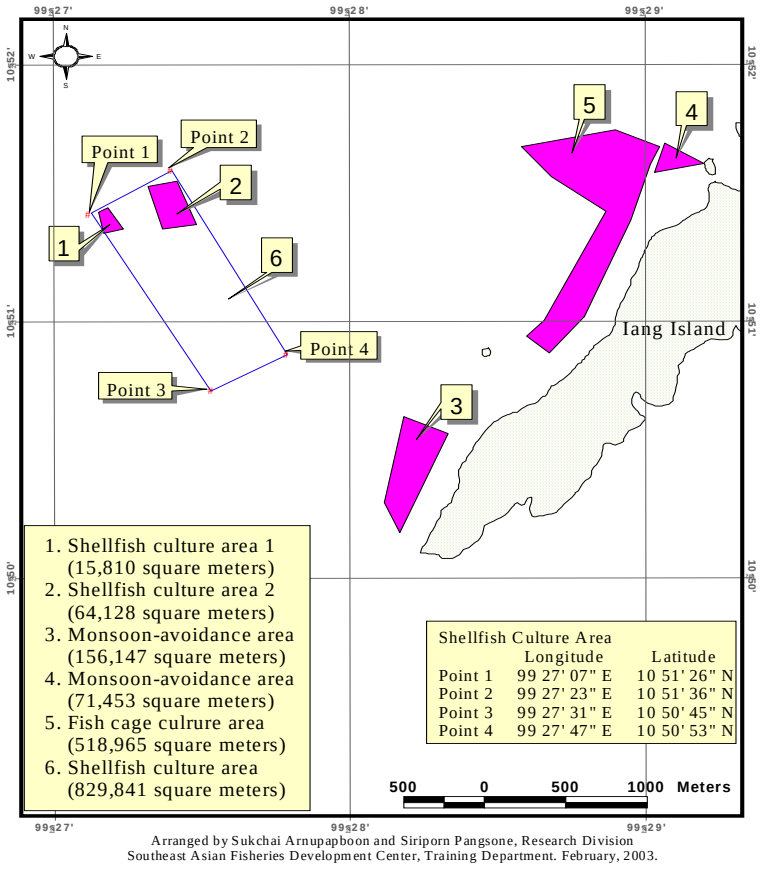

Fig. 3. Map of the zoned area

2.2 Crab Bank and Mesh-size Control for Crab Traps

Crab bank was used as a scheme to conserve the crab resources in the project area. The fishers addressed the decreasing catch of crab by depositing the gravid blue swimming crabs in the cages of the crab bank. The crabs are allowed to spawn in the cages after which they are sold to the local market. The profit from the sales of the crabs is divided to four parts: 50% as funds intended for loan of the group, 30% for the cage maintenance, 10% for the feeds of the crabs, and 10% for operating expenses.

In addition, the fishermen also changed the large mesh size of the bottom of the crab traps (from 1.25 inches to 2.5 inches), which was more effective as scientifically monitored by the CMDEC for one year (**Fig. 4**). The result showed an increasing trend in terms of

carapace size as well as total catch volume even if the data was yet marginal (**Table 1**). The enlarged mesh size resulted in higher benefits in terms of exploitation (**Fig. 5**). The rule of mesh size control was adopted by the fishers in the project area, where the fishers' motivation and morale have been very high. Now there are two crab bank systems adopted at the project site, the crab bank in cages and the Japanese system. The crab bank in cages is operated from March to September while the Japanese system is operated from October to February (monsoon season).

Fig. 4. Crab bank (left) and mesh size control (right)

Table 1. Catch of swimming crab from 2002 to 2006

Year	Average carapace length (cm)		Total catch (Ton/year)
	Male	Female	
2002	8.6	8.97	
2003	9.17	9.56	72.1
2004	9.55	10.01	87.6
2005	10.15	10.34	112.6
2006	10.39	10.62	142.6

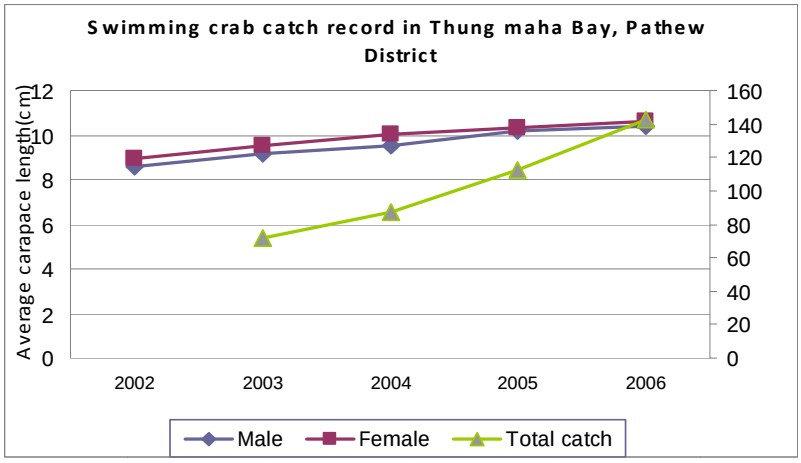

Fig. 5. Total catch of swimming crabs in Tung Maha Bay, Pathew District

2.3 Pakklong Fishermen Group (PFG)

The fishermen established the PFG, which has been registered with the Chumphon Provincial Cooperative Promotion Office with 108 fisher members. The main responsibilities of the PFG are to represent the fishermen in raising problems and discussions on how to solve fisheries problems with the government, find ways in promoting fisheries resource management and conservation, and patrol in the project site from illegal fisheries (**Fig. 6**). The PFG were also involved in three major activities of the project:

- Volunteer manpower for monitoring and surveillance of illegal fishing in the project area with the local enforcement officers participating in the efforts;
- Participate in fingerling releasing and mangrove reforestation activities; and
- Establish a saving – loan funds

Fig. 6. PFG meeting (left), fish releasing (center) and mangrove reforestation (right)

3. Promoting local business

In order to reduce over-dependence on the coastal resources, the project encourages and enhances local businesses aside from capture fisheries at the project site. The project also assists the fishers to increase their household incomes in two ways: by improving the technologies of handling, marketing and processing fisheries products; and creating alternative job opportunities inside and outside the fishing communities.

3.1 Improving the technologies of handling, marketing and processing fisheries products

The Project helped the fishers increase their income by improving technologies of handling, marketing and processing fisheries product, and by creating job opportunities aside from capture fisheries. The activities also support the “One Tambon One Product” (OTOP product) scheme that the Thai government has been promoting nationwide. In collaboration with the Pakklong Sub-district Administrative Organization (Ao.Bo.To) and other local agencies, the project provided the necessary technology and marketing information to the targeted people.

3.1.1 Fish Processing

Fish processing is being operated by the women’s group in village No. 1. The members comprised both the fishers and their housewives. Fish processing activity was a good alternative livelihood because adding value to the fish products could lead to better profit (**Fig. 7**). Production has been good in terms of fish processing, packing, marketing and accounting system that resulted in a smooth flow of their business.

3.1.2 Local Snack and Dried Flower Making

A group of women from village No.4 conducted some activities as alternative livelihoods such as processing of Pan Sep and Thong moun (local snacks), dried flower making, and selling groceries (**Fig. 7**).

However, the income of the members from this activity has been very low may be because they are generally fully engaged in the activities in rubber plantations and thus, could hardly afford to spare some of their time for the group work.

Fig. 7. Processed fish products (left) and production of local snack (right)

3.1.3 Batik painting

A group of women from village No. 6 produced various batik painted materials like cloths, shirts, T-shirts, bags, and handkerchiefs (**Fig. 8**). The members work for 3-4 hours a day after finishing their own work in the rubber plantations.

Fig. 8. Batik products by the Batik Painting Group

3.2 Creation of alternative job opportunities inside and outside the fishing communities

3.2.1 Babylonia Shell Culture

Babylonia shell culture was demonstrated in the project site (**Fig. 9**). The first experiment was conducted for 7 months from August 2005 to February 2006. The result was rather pessimistic with small growth of the shells after three (3) months of culture. The suspected cause was attributed to the unfavourable sea conditions when the monsoon season set in.

Fig. 9. Babylonia shell demonstration culture in the project site

The second experiment was conducted for 6 months from March to September 2006 during the calmer season, which was considered an improved way and incorporating the lessons learned from the first experiment. The result was still negative as seen in the economic calculation. This did not convince the PFG to pursue this venture in the future under the present production result as well as the marketing trend of the shells.

3.2.2 Fish Cage Culture with Artificial Feeds

This activity aimed to solve the problem on the use of trash fish caught from push net operations for fish feeds considering that push net operations have been prohibited in the project site. The CMDEC cooperated with fish farmers by demonstrating the use of artificial feeds for sea bass fish cage culture (**Fig. 10**). Although the growth rate of the fishes fed artificial feeds was rather low, the experiment could not be concluded as a failure due to the feeds but perhaps due to the water quality or culture technique adopted.

3.2.3 Swimming Crab Culture

The size of the blue swimming crabs caught from crab traps was smaller than marketable size. The crab trap fishermen and CMDEC agreed to conduct an experiment on crab culture in cages until the crabs reach marketable size (**Fig. 10**). Swimming crab culture was however did not attract the fishermen because more time must be spent to take care and observe the behavior of the crabs, and more particularly when the feeds given was not enough, the strong crabs eat the weak crabs during molting. The benefit was therefore not considered worthwhile.

Fig. 10. Fish cage culture with artificial feeds (left) and blue swimming crab culture (right)

4. Enhancing human resources capability and participation

Participatory training and educational courses were arranged to suit the needs of the target groups of trainees comprising the project staff, community leaders, fishers' group leaders, women's group leaders, and Ao.Bo.To council members. Preparation of the courses was part of the objectives of establishing and extending LBCFM as well as promoting local business ventures**.** Since 2002, training courses on the sustainable use of the coastal resources have been arranged for 150 students from five (5) schools near the project site every year.

5. Development of extension methodologies and strengthening the extension system

Extension services are necessary to develop the technologies and their methodologies. The text, manuals as well as any visual methods and materials produced from experiments through the extension and training activities have been prepared and promoted.

Leaflets, posters, newsletters and calendars were distributed to schools and communities (**Fig. 11**). Overall, 49 copies of published documents containing the results of the project's various activities were produced.

Fig. 11. Information materials on the project's activities and achievements

6. Rehabilitation and enhancement of the coastal resources

This activity was implemented by the DOF of Thailand, which had allocated a certain amount of budget for the installation of artificial reefs (ARs) around the demarcated coastal zones. Setting up of sustainable management and utilization of resources around the areas of the deployed ARs was also conducted as part of the target activity on releasing of fingerings.

6.1 Installation of Artificial Reefs (ARs) and Fish Enhancement Devices (FEDs)

The installation of ARs in the project area aimed to: 1) increase aquaculture production; 2) increase fishing ground; and 3) prevent illegal fishing activities such as the use of push nets. The DOF installed ARs at the project site from March to April 2004. Two batches of 1750 pieces of concrete cube frames, 1.5x1.5x1.5 m were installed at 12 m depth covering an area 2 km^2. In March 2007, ARs (675 pieces) were also installed in 1 km^2 area fronting the Ban Thung Maha Bay. In August 2005, SEAFDEC supported the purchase of materials and trained the fishermen on the construction of 10 units of fish enhancing devices (FEDs). The FEDs were installed around the ARs, however the FEDs were lost 6 months after installation. In July 2006, an experiment on the new design of FEDs was conducted (**Fig. 12**).

Since the FEDs design was observed to have some weak points, this was improved for more durability and effectiveness. The FEDs were installed between the groups of ARs, and four (4) months after installation, 4 units were lost and disappeared as observed in November 2006. The fishermen expected the FEDs were destroyed by trawl nets or damaged by strong winds and high waves during the monsoon season.

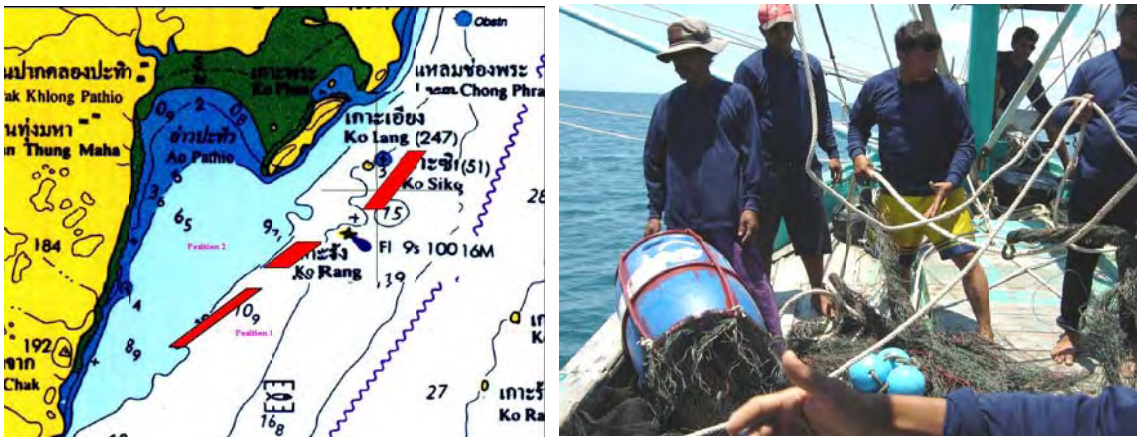

Fig. 12. Map of artificial reefs area (left) and FEDs constructed and installed by fishermen (right)

6.2 Release of Fingerings and Evaluation of Tagging Technique

The fry and fingerlings released through this activity were provided by the Chumphon Coastal Aquaculture Station. These include: 5,800,000 banana shrimp (size 1-2 cm), 3,000,000 tiger shrimp (size 1-2 cm), 161,000 sea bass (size 1-4 in), and 44,000 blue swimming crabs (size 4-6 cm). Releasing of fry and fingerlings was done by students, teachers, AoBoTo, fishermen, villagers, staff of CMDEC and SEAFDEC/TD since 2002.

In 2007-2008 tagging technique was used to estimate the number and growth rate of marine animals recaptured after releasing. In 2007 and 2008 releases, respectively, 1000 and 1968 of tagged sea bass size (8.5-12.3 cm) while 1128 and 1000 of tagged banana shrimps (size 4.5-9.5 cm) were recovered(**Fig. 13**). The biggest tagged sea bass (51 cm) was caught in Thung Maha Bay after releasing for 413 days. The CMDEC provided complimentary T-shirts for fishers who return the shrimps/fishes that have been tagged.

Fig. 13. Tagged sea bass recaptured from Thung Maha Bay

6.3 Mangrove Rehabilitation

The Pakklong Fishermen Group, students, teachers, Ao.Bo.To., fishermen, villagers as well as staff of CMDEC and SEAFDEC/TD cooperated in planting 1000, 2200 and 500 mangrove seedlings in 2005, 2006 and 2007, respectively (**Fig. 14**).

Fig. 14. Mangrove reforestation in the project site

Final Project Evaluation

The final project evaluation was outsourced through the Coastal Resources Institute (CORIN) of the Prince of Songkhla University, Hat Yai, Songkhla, Thailand. The results of the evaluation indicated that the activities of this project were well planned in such as way that every aspect of the issues has been resolved. Baseline survey was assessed as very good because it provides all the important details needed to identify and prioritize the issues in the project area. The CBRM activities were very significant in the understanding and learning process of the local people regarding the protection and conservation of the environment and the coastal resources.

The local businesses of the villages were also very significant as well, because these provided them with alternative and/or additional sources of income to sustain their daily needs. More importantly,

the dissemination of information materials to the local people was a great way to keep them updated with and informed about recent developments and enabled them to identify ways where they can participate and extend help. Lastly, the resource enhancement activities were also very important in engaging the interest and participation of the local people rather than just giving them theoretical knowledge which is difficult for them to visualize and understand. However, the weak point observed was the insufficient collaboration between the Ao.Bo.To. and other agencies involved in the project.

Follow-up Actions for the Project

After end of the LBCRM-PD/ICRM-PD, the DOF of Thailand through the CMDEC has been supporting the activities under the project until now, specifically:

- the activities of the PFG;
- in giving support materials for the maintenance of the crab bank;
- in releasing of more fingerings;
- in conducting training courses on sustainable use of the coastal resources for 150 students from 5 schools in the project site every year; and
- initiating green mussel culture.

Specifically in 2007 and 2008, some members from the PFG cultured green mussels using rope materials tied on rafts in Thung Maha Bay (**Fig. 15**). The spats of green mussels were sold to other farmers for culture in the Andaman Sea and adults of green mussel were distributed to the local markets. The DOF supported the materials for making and setting the rafts.

Fig. 15. Green mussel culture in the project site using rafts

Integrated Coastal Resources Management in Sihanoukville (ICRM-SV), Cambodia

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Introduction

The third ICRM project was initiated in 2005 Cambodia as the ICRM-SV under the collaborative arrangement between SEAFDEC and the Fisheries Adminitsration (FiA) of Cambodia, taking into account the geographical advantage and the prioritized need of a CBRM appraoch in the country. The ICRM-SV project site is located in Prey Nup II in Sihanoukville comprising four major villages (**Fig. 1**), where a core body to implement the CBRM concept has already been established prior to the implementation of the project.

Cambodia is the only country in Southeast Asia where a fishery resources co-management regime is legitimately established through the Royal Decree on Establishment of Community Fisheries and the Sub-Decree on Community Fisheries Management which were promulgated in May 2005 and June 2005, respectively. The FiA Cambodia has changed its governing structure with the creation of the new division called "Inspectorate Division", which is responsible for fisheries development at the provincial level. In line with this restructuring, Kampong Som FiA Cantonment (KSFC) was created in place of the old Fisheries Office of Sihanoukville Municipality.

Among the major achievements of the ICRM-SV is the preparation and development by the local fishers of the Community Fisheries Area Management Plan (CFAMP). Documents related to CFAMP and specifically the Community Fisheries Zoning Map (CFZM) and the Community Fishing Area Agreement (CFAA) have already been endorsed by the local administration offices for the approval of the Governor of Sihanoukville. The approved Guidelines for the Community Fisheries govern the implementation of the community-based fisheries resources management (CBRM) concept in Sihanoukville, Cambodia under the ICRM-SV project.

Objectives of the ICRM-SV Project

The ICRM-SV Project aims to: (1) develop the capacity of local human resources to empower then to manage and sustain coastal resources and community development; (2) encourage local peoples' participation in community activities; and (3) alleviate poverty in coastal fisheries communities.

Fig. 1. Map showing ICRM-SV project site

Activities of the ICRM-SV Project

The major activities implemented under the ICRM-SV project include:

1. Baseline/Monitoring Survey

1.1 Fish landing data collection

The fish landing data collection has been regularly conducted everyday by designated enumerators in fish landing stations. The data collected were sent to SEAFDEC/TD for analysis and compilation. The data obtained from February 2006 through September 2007 were analyzed and compiled in December 2007, and published in June 2008. The initial findings indicated some important trends of the fishery resources dynamics in 2006 and 2007, although the data collected seemed incomplete and insufficient.

2. Promoting and extending locally based fishery resources management

2.1 Community Fisheries Area Management Plan (CFAMP)

Following the Guideline of the Community Fisheries amended in 2007, related documents such as the Internal Law (I/L) and By-law (B/L), List of CF members, structure of the Community Fisheries Committee, Community Fisheries Area Management Plan (CFAMP), and Community Fishing Area Agreement (CFAA) were submitted to the newly reorganized office, the Kampong Som FiA Cantonment (KSFC). Although CFAMP has already been initially implemented, more time would be needed to implement it properly and until then, the impacts of CFAMP could only be assessed.

The formation of Community Fisheries Coordination Committee (CFCC) has been initially discussed. Consistent with the provisions in the Sub-Decree of Community Fisheries, the CFCC should be formed to pursue fisheries resources management matters.

2.2 Local Enforcement Unit (LEU)

Patrolling by the LEU has been made a regular activity as the patrolling the project area against illegal fishing has been considered vital considering that the project has established the fish refugia for blood cockle and the increasing numbers of illegal fishing boats with dredges observed in the demarcated zone. The community has been working closely with the local authorities and the FiA Office. As a result, illegal fishing activities have been cracked down and have since then been decreased considerably. In addition, mangrove forests have also bee protected from illegal occupations. The result of the patrolling activity by the LEU is shown in **Table 1**.

Table 1. Result of Patrolling by LEU from January to June 2008

Violations	Cases	Punishment for violators
Use of illegal fishing gear		
Blood cockle dredge	8	Confiscation of dredges and catch, and receiving lectures on law abiding
Push nets	14	Arrest
Mangrove felling	8	Write pledges not to do again
Digging ponds in mangrove forests	2	Write pledges not to do again

2.3 Establishment of the fish refugia

To follow up the recommendation made in the preliminary survey to establish fish refugia, a Fishers Workshop was held on 19 February 2008 at the project site, where the outcome of the preliminary survey was described and the objective to establish fish refugia was explained. The Blood Cockle Fishers Group (BCFG) was organized during the workshop under the Community Fisheries Prey Nup II with an initial of 25 fisher-members. Since then, more than 100 fishers have already been registered as members of the BCFG. Self-regulatory Measures (**Table 2**) have been developed by the BCFG in April 2008, which would be subsequently incorporated into the Community Fisheries Area Management Plan (CFAMP). The essence of the controlling measures is the harvestable size limitation and protection of fertile (gravid) shells during spawning season within the demarcated zone as fish refugia.

Table 2. Self-regulatory measures to control harvest of blood cockle

Area of coverage: 200 ha
Limitations Fishing season: all year round Fishing hours: no limit
Restrictions Harvestable size: • More than 100 pcs/kg or over 10 g/pc allowed all year round • Less than 50 pcs/kg allowed during the spawning month (one month)
Fishing entry In addition to the members of the BCFG, outsiders are also allowed to collect blood cockles in the demarcated self-regulated resources management zone, provided they should be bound to abode by the regulatory measures

Biological survey for the blood cockle refugia

Preparations for establishment of blood cockle refugia

The establishment of "fish refugia" in the project site was partly consorted with the regional movement led by the regional project on Establishing a Regional System of Fisheries Refugia, being deployed under the regional project of the UNEP/GEF. As envisaged, this project would establish several fish refugias in the coastal zones from Cambodia to Vietnam.

2.4 Crab bank

Three crab bank approaches were proposed in the project site, i.e. the Japanese model, Chumphon model and Langkawi model. Finally, the fishers decided to employ the Chumphon model, which involves the stocking of gravid crab in a cage during the calm seasons until the eggs are hatched. While during the monsoon seasons, gravid crabs would be released directly into the water after marking their carapaces as in the Japanese model. In May 2008, the Crab Bank Group was established with 11 crab fishermen as members while 5 gravid crabs were stocked in the project's crab bank. **Fig. 2** shows the progress of the crab bank activity of the project.

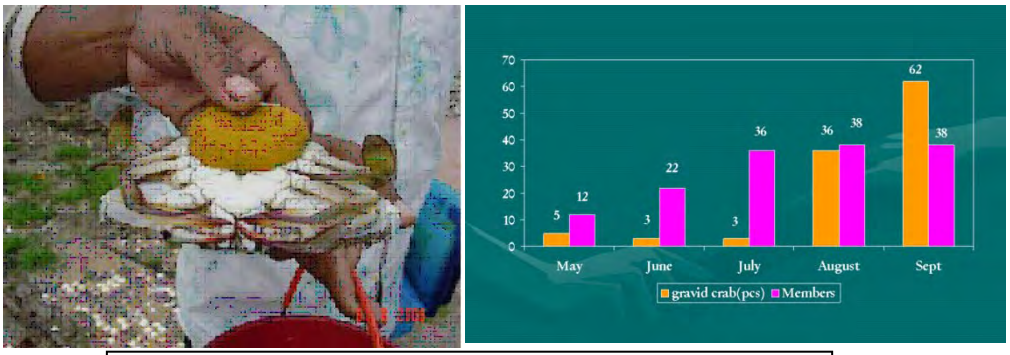


Fig. 2. Crab bank activity of the ICRM-SV project

3. Promotion of local business

Immediately after the start of the ICRM-SV project, the women's groups were organized under the framework of the Community Fisheries Nup Prey II. One of the most lucrative ventures the women's groups went into id mushroom production.

3.1 Women's Groups Activity

3.1.1 Mushroom production

The fishers (mostly women) organized themselves into "Mushroom Producers Group under Community Fisheries Prey Nup II (MPG)" and established their own Internal Rules of Mushroom Producers Group.

Mushroom production training under the ICRM-SV project

Members of the Women's Group involved in mushroom production

In the review of mushroom production in 2007, it was observed that the production level in 2007 was comparatively sluggish and as shown in **Fig. 3**. Although production had dwindled towards the end of 2007, the MPG continued producing mushrooms especially that production showed an increasing trend again in 2008.

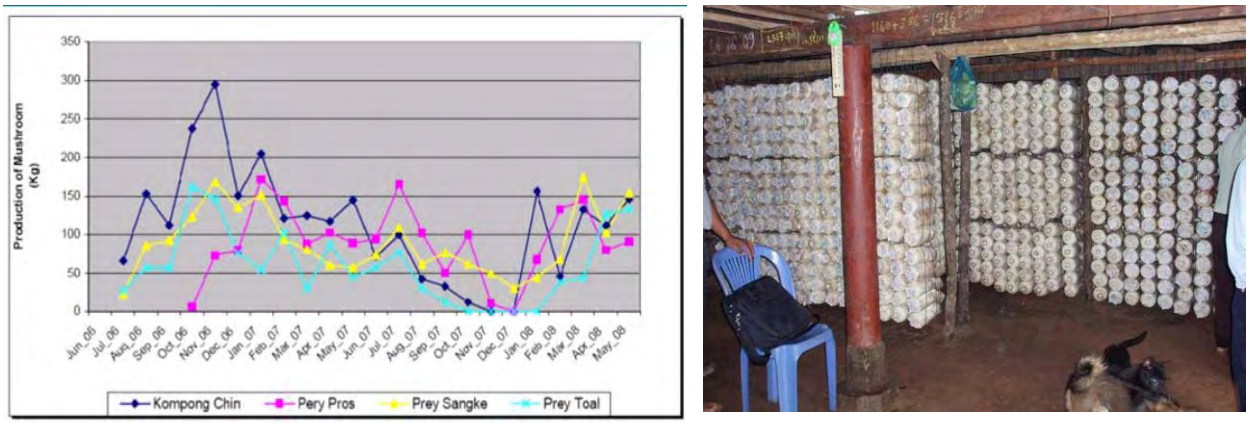


Fig.3. Mushroom production under the ICRM-SV project

Based on the account summaries, the groups have practiced maintaining their bookkeeping and accounting functions to a greater extent and accuracy in the recording has been noticeably improved. For the maximum utilization of the funds derived from the savings from mushroom production, the women's groups commenced diversifying to other local business ventures such as rice trading and animal raising. In addition, a mini-credit scheme was also initiated using as capital funds from their savings and incomes generated from bank interests.

3.2 Mud Crab Culture Group Activity

3.2.1 Mud crab fattening

Based on lessons and knowledge learned and experiences gained through the experimental mud-crab culture in early 2007, the second trial began in November 2007 using 847 pcs of juvenile mud crabs confiscated by the Kampong Som FiA Cantonment (KSFC) and brought to the project site. Later, 574 pcs female and 698 pcs male crabs were purchased from the local suppliers and stocked in pond No. 2 and 3, respectively. Further, 450 pcs female and 619 pcs male crabs were procured in December 2008 and stocked in Pond No. 4 and 5, respectively. Since then, the crab fattening exercise had been practiced together with monitoring and measurement of the salinity and water temperature which were recorded daily in the logbook.

Growth in sizes and weights, and DO were also periodically monitored in collaboration with a JICA Expert. The amount of daily feeds given was controlled by observing the remaining feeds on the feeding trays. The weight growth monitoring result showed a satisfactory progress as seen in **Fig. 4.**

Mud crab activity under the ICRM-SV project

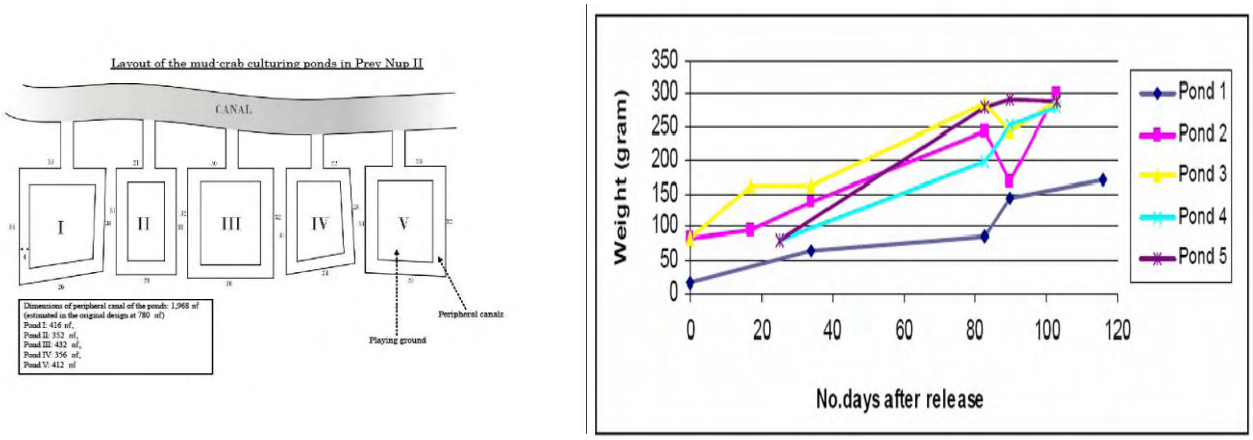


Fig. 4. Mud crab activity under the ICRM-SV project

Most crabs reached marketable size (200 g/pc) toward the end of February 2008 and were harvested from 28 February 2008 until 14 March 2008. However, the result indicated a low average survival rate ofs only 2.4% and the gross income was only 6,609,300 Riel equivalent to USD 1,652.

Since the members were eager to continue the activity, a JICA expert was asked to provide technical assistance and also committed additional JICA support to the scheme for the continuous monitoring system of DO, salinity and water temperature. After the members realized the real cause of low returns, they committed to exert their full efforts in the future operations.

3.2.2 Fish cage culture

Since the members of the fishermen's group in Kampong Chin are far from the mud crab culture ponds, therefore fish cage culture of grouper or sea bass was tried for them as an alternative livelihood. A suitable space in the Prey Nup Estuary was earmarked for this activity, which is located near the mouth of canal with minimum depth of 150 cm.

The Fish Cage Culturing Group (FCCG) was then organized as a sub-group of the CF Prey NupII in April 2008 with six (6) members to promote a cage culture venture. Sea bass (*Lates calcarifer*) was selected due to a number of advantages. Stocking of sea bass fingerlings started on 23 September 2008.

4. Enhancing the human resources capacity and participation

Throughout the project operation, main emphasis was given to human as well as institutional capacity building especially for the Community Fisheries Prey Nup II, and further for the sub-groups such as the Mud-crab Culture Group, Blood Cockle Fishers Group, Mushroom Producers Group, Crab Bank Group, and Fish Cage Culture Group. A series of workshops and study tours were conducted during which relevant handouts in Khmer were distributed as discussion and extension materials. Also, more chances were given to the members to participate actively in the discussions and presentations in the workshops so that they would be convinced to take part in the activities.

4.1 Study tours

Study tours were also conducted through the ICRM-SV project. These included: (1) study tour to Chumphon, Thailand to inspect the progress of the ICRM-PD activities more particularly the crab bank activity; (2) study tour to Stung Hao to inspect the Crab Bank activity with the participation of 16 members of the Crab Bank Group and the national project staff on 5th April 2008; and (3) study tour to Kompot Province to inspect mud-crab culture with the participation of 2 members of the Mud-crab Culture Group, the national project staff and the FiA staff on 8th April 2008 (**Fig. 5**).

Fig. 5. Study tour (above) and fishermen's workshop (below)

4.2 Workshops

In addition fishermen workshops were also conducted on various topics (Fig. 5 and Table 3)

Table 3. Fishers workshops held from January to June 2008

Date	Title	Topic	Participants
18.02.08	Women's Group	Establishment of Mushroom Producers Group	22
18.02.08	Crab Bank Workshop	Application of Crab Bank scheme in the area	26
19.02.08	8th Fishers Workshop	Application of fish refugia scheme in the area	35
19.02.08	Cage Culture Group	Preliminary discussion on cage culture	8
01.04.08	9th Fishers Workshop	Monitoring mud-crab culture outcome	22
01.04.08	2nd Crab Bank W/S	Establishment of Crab Bank Group and action plan	25
02.04.08	2nd Fish Refugia W/S	Establishment of Blood Cockle Fishers Group	39
03.04.08	2nd Cage Culture W/S	Establishment of Cage Culture Group	11
18.06.08	10th Fishers Workshop	Action plan on 3rd experiment of mud-crab fattening	27
18.06.08	3rd Cage Culture W/S	Practical and economic feasibility on sea-bass culture	13
19.06.08	3rd Crab Bank W/S	Debriefing on the outcome of study tour / monitoring gravid crab stocking	31
19.06.08	3rd Fish Refugia W/S	Formulation of Self-regulatory Regulation for blood cockle fishing	22

4.3 Training

More emphasis has been placed on site training especially in the improvement of bookkeeping and accounting technologies for the women's groups, Crab Bank Group and Mud-Crab Culturing Group. Through such efforts, the preciseness of the records entered in the accounting books has noticeably been reckoned and has been considerably improved.

5. Rehabilitation and enhancement of the coastal resources

5.1 Establishment of the fish refugia

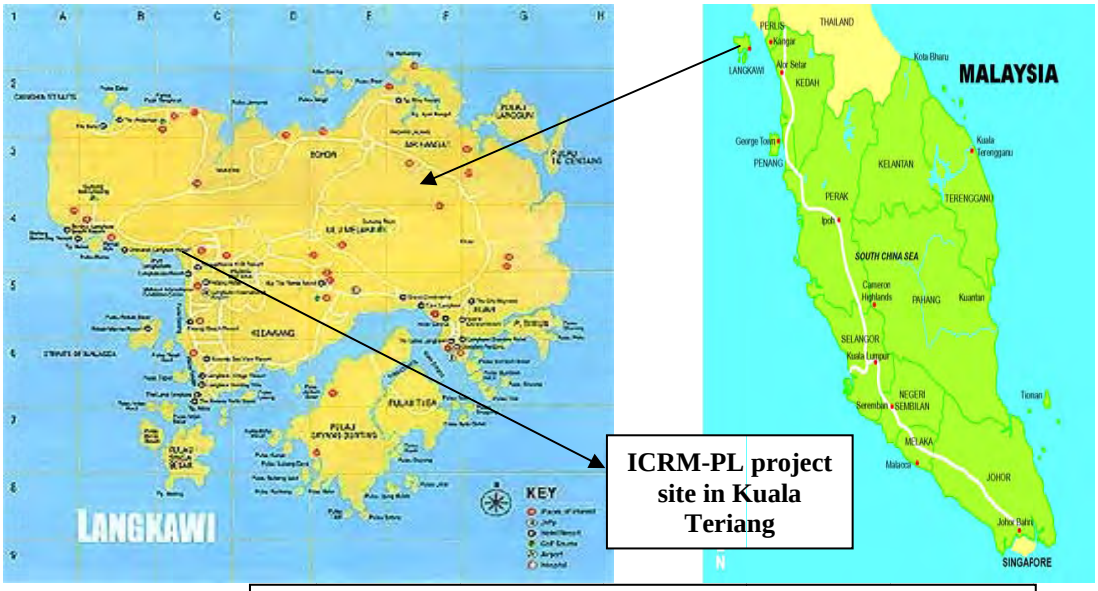
As envisaged, fish conservation area called fish refugia has been established, where initially the fish refugia targeting blood cockle fishing was established in the project area, and the self-regulatory measures have been formulated by the participating fishers themselves. The fish refugia established in the project area was the first one which is practically functional in Cambodia and is expected to be disseminated to other areas following this model depending on its outcome in future.

5.2 Mangrove reforestation

The first mangrove plantation day was on 5 December 2007 which included an educational session for school children who are responsible for environmental protection in the future. On that day, about 200 school children and 50 fishermen participated in the event and 1000 mangrove seedlings were planted in Khos Angkor. The condition of the mangroves has been monitored occasionally, and it was observed that over 50% of mangroves planted had survived.

Locally-Based Coastal Resources Management/ Integrated Coastal Resources Management in Pulau Langkawi (LBCRM/ICRM-PL), Langkawi, Kedah State, Malaysia

When tangible impact to the communities was observed in the implementation of the first pilot project on locally-based coastal resource management was initiated in Chumphon Province, Thailand, it was agreed at the 4th Meeting of the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) in 2002 that a similar project should be also implemented in Malaysia in a bid to disseminate experiences and knowledge gained through the first project to other SEAFDEC Member Countries. Thus, the project on "Locally-Based Coastal Resources Management in Pulau Langkawi (LBCRM-PL) began in Langkawi, Malaysia in August 2003 under the collaborative project framework with the Department of Fisheries (DOF) Malaysia and SEAFDEC Training Department (SEAFDEC)/TD.



Map showing the project site in Pulau Langkawi

While recognizing the need to put more emphasis on human capacity building concepts, the project was revitalized and renamed in January 2005 as the "Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL). The LCBRM-PL/ICRM-PL project had operated various activities on the right track since its inception and produced tangible outputs until 26 December 2004 when the devastating tsunami assaulted in the project operational area.

After the 2004 tsunami, the activities in the project site concentrated on the rehabilitation of the fishing village in the project site in Kuala Teriang, i.e. repair of fishing boats and jetties. In the middle of 2006 when the fishing activities in the project operational area had more or less normalized, the project resumed its activity in accordance with the original project concept. The re-stabilization of the fishing activities in the project operational area to its pre-tsunami state could not have been attained without the support and efforts exerted by the Malaysian authorities, foreign funding agencies and the NGOs.

The LCBRM-PL/ICRM-PL comprised six major activities, namely: (1) monitoring survey; (2) promoting the adoption of CBRM concept through extension; (3) developing local businesses; (4) enhancing human resources capacity building and participation; (5) fishing gear technology improvement; and (6) rehabilitating and enhancing the coastal resources.

The monitoring survey included the fish landing survey which was conducted daily by designated enumerators, the results of which were sent monthly to FRI for analysis; and the marine resources survey which comprised the regular marine biological and oceanographic surveys conducted every two months. The Fisheries Research Institute (FRI) in Penang took over the marine oceanographic and marine biological surveys from SEAFDEC/TD after 2006. The promotion of CBRM includes the establishment of zoning and formulation of the Fishery Resources Management Plan (FRMP), which has already been approved by DOF Malaysia; the establishment and embodiment of the Local Enforcement Unit was further strengthened with the assignment of more enforcement officers; and the establishment and management of crab bank system using the Japanese model.

The local business development activity has been strengthened with the construction of new fish processing yard for the Women's Economic Group (KEW) and the mechanical workshop for the Men's Economic Group (KEN), under the auspices of Japanese Tsunami Rehabilitation Fund. In enhancing human resources capacity building and participation, the functions of KEN which was later on revitalized as the KPSP were strengthened. Workshops, training and study tours formed major components of the project activities. Under the rehabilitation and enhancement of the coastal resources, ARs and FEDs have been installed while mangrove reforestation was promoted. After the involvement of SEAFDEC ended in 2007, the DOF Malaysia continued the implementation of these project activities.

Baseline and Monitoring Surveys LBCRM-PL/ICRM-PL

This activity comprised the fish landing survey and the marine resources survey. The Outcomes of the Baseline, Monitoring and Socio-economic Surveys were presented during the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review on Project ICRM-PL in Langkawi, Malaysia, 21-23 October 2008. The Report on Monitoring the Socio-economic Survey in Kuala Teriang, Pulau Langkawi, Malaysia (August 2006) was used as Reference Paper during the said Regional Seminar. In addition, the detailed fish landing data obtained from 2004 to 2006 were compiled in the report on "Marine Resources Monitoring in Pulau Langkawi, Malaysia (2004-2006)" which was also presented as Reference Paper during the October 2008 Regional Seminar.

Outcomes of the Baseline and Monitoring Socio-Economic Surveys

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Introduction

The Locally-based Coastal Resources Management Project in Pulau Langkawi was initiated in Langkawi, Malaysia in August 2003 under the collaborative operational framework between the Department of Fisheries (DOF) Malaysia and the Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD). Since the financial arrangement for the first phase of the project under the Japanese Trust Fund I was terminated in December 2004, the project continued its second phase in January 2005 with financial support from the Japanese Trust Fund IV for two years until the end of 2006. The second phase of the project put more emphasis on human capacity building in the coastal fisheries management sector, and the project title was changed to Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL).

The Tsunami disaster on 26 December 2004 damaged the project site. Since the unexpected natural calamity caused great changes and delays in the approaches and progress of the project, it was therefore agreed at the 28th Meeting of the SEAFDEC Program Committee in December 2005 that the project tenure would be extended for one more year until the end of 2007.

Socio-economic Survey is an important part of the project for collecting the baseline information before, during and after the project implementation. It is useful in identifying the needs and problems as well as in identifying the future plans to sustain the project. The Socio-Economic Survey of the ICRM-PL project was conducted two times. The first was the baseline socio-economic survey in 2003 when the project was initiated and the second was the monitoring socio-economic survey in 2006 after the Tsunami disaster to assess the condition of the community. The socio-economic database would be useful to assess the changes in the project area and during the project implementation for easy reference during future community development planning exercises.

The results from both surveys were analyzed and compiled at length as reports dealing with the survey outcomes. This report mainly addresses the socio-economic changes occurring during the tenure of the ICRM-PL project.

Objectives

Baseline survey was conducted in order to identify the:

- socio-economic status of the fishing communities;
- current status of coastal resources management, particularly for the fish aggregating device (FAD) management;
- gender roles in the community's economic development;
- role of KEN (Fishermen's Economic Group) members and the function of KEN to develop the community economics and manage the coastal resources; and
- problems, basic needs, and interests in appropriate extension services as well as in capacity building to encourage the local people to participate in community development.

Moreover, monitoring surveys were conducted to:

- monitor the changes in the socio-economic conditions of the project area starting in August 2003;
- monitor the changes caused by the December 2004 tsunami and to identify its lasting impacts;
- monitor the concerns among the stakeholders on the project operation and the new approach of community-based fishery resources management (CBFRM);

- identify the present socio-economic conditions as baseline reference for future development with the on-going application of CBFRM; and
- assess the extent of awareness toward the CBFRM concept and the positive cooperation of fishermen from neighboring villages under the newly developed framework of fishery resources management regime.

Basic Data Collection

Secondary data were collected from two reference documents, namely: Report on the Preliminary Socio-Economic Survey in Kuala Teriang, Pulau Langkawi; and Report on the Monitoring Socio-Economic Survey in Kuala Teriang, Pulau Langkawi in August 2006. These reports contained the results of the baseline and monitoring surveys, respectively.

The baseline socio-economic survey was conducted from 13 to 14 October 2003 to identify the socio-economic status of the fishing community, the current status of coastal resource management, the role of KEN members, and the functions of KEN. The survey also assessed the concerns on the basic needs, interests and the problems by interviewing 53 fishermen from three villages, namely: Kuala Teriang, Kuala Melaka and Batu Ara within the area of the KEN Kuala Teriang, based on the number of households in the villages.

The monitoring socio-economic survey was carried out on 18-20 July 2006 to monitor the changes in the socio-economic condition after the tsunami assaulted the project area, identify the present socio-economic conditions, and clarify the extent of awareness toward the CBFRM concept. The survey was conducted by interviewing 77 fishermen in the villages under the KEN Kuala Teriang, i.e. Kuala Teriang, Kuala Melaka and Batu Ara.

Data Analysis

The results from the secondary data were reviewed and analyzed using descriptive statistics to delineate the socio-economic information in terms of percentages and presented in tables or in matrix format. Tabulation of the data is done in a simple and easy form for better understanding of the socio-economic conditions.

Results of the Surveys

Part I. General Information

The baseline and monitoring surveys were carried out by interviewing 53 and 77 fishermen of the sample groups, respectively, from three villages within KEN Kuala Teriang. The average sampling representations from the three villages for the two surveys were 43.0% and 50.7%, respectively (**Table 1**).

Table 1. Number of households and sample sizes

Village	*Number of fisheries households*	*Number of interviewees*	Representatives (%)
Baseline Survey 2003			
Kuala Teriang	24	13	54.0
Kuala Melaka	31	13	42.0
Batu Ara	67	27	40.0
Total	**122**	**53**	**43.0**
Monitoring Survey 2006			
Kuala Teriang	46	23	50.0
Kuala Melaka	75	43	57.3
Batu Ara	31	11	35.5
Total	**152**	**77**	**50.7**

The results of the baseline and monitoring surveys showed that most fishermen were aged between 46 to 55 years old, representing about 41.5% and 32.5%, respectively. About 2.6% of fishermen in the monitoring survey were aged less than 25 years old, a fact that did not appear in the first survey (**Table 2**).

In addition, the data also indicated that most fishermen in the two surveys were married, representing about 94.3% and 92.2%, respectively. The percentage of single fishermen has increased from 1.9% in 2003 to 7.8% in 2006. From both surveys, the average number of family members was 6.0 and 5.8, respectively, and it appeared that the average number of household members was consistent. As for their educational level, most fishermen in the two surveys graduated from primary school levels, representing about 64.2% and 77.9%, respectively. About 22.6% and 15.6% of fishermen, respectively, completed the lower secondary school. A lower percentage of the fishermen completed upper secondary school at 13.2% and 6.5%, respectively (**Table 2**).

Most fishermen in the two surveys were engaged in fisheries activities, 52.8% and 68.8%, respectively. The percentage of fulltime fishermen in the second survey has increased from the first survey, followed by engagement in fishing combined with general labor (22.6% and 11.7%), agriculture (11.3% and 10.4%). Combined occupations with aquaculture and livestock have only been added in the second survey (**Table 2**).

Table 2. General information of the fishermen-respondents

Item	***Baseline 2003***		**Monitoring 2006**	
	Number	**Percentage**	**Number**	**Percentage**
Age group				
Under 25	0	0.0	2	2.6
25 - 35	7	13.2	8	10.4
36 - 45	12	22.6	19	24.7
46 - 55	22	**41.5**	25	**32.5**
56 - 65	9	17.0	21	27.3
66 - 75	1	1.9	2	2.6
76 - 85	2	3.8	0	0.0
Marital status				
Single	1	1.9	6	7.8
Married	50	**94.3**	71	**92.2**
Widower	2	3.8	0	0
Family structure				
Average no. of family members	**6**	-	**5.8**	-
Education				
Primary school	34	**64.2**	60	**77.9**
Lower secondary school	12	22.6	12	15.6
Upper secondary school	7	13.2	5	6.5
Occupation				
Fisheries only	28	**52.8**	53	**68.8**
Fishing &Agriculture	6	11.3	8	10.4
Fishing &Trading	4	7.6	2	2.6
Fishing &Labor	12	**22.6**	9	**11.7**
Fishing &Tourism	2	3.8	2	2.6
Fishing &Agri & Tourism	1	1.9	0	0
Fishing &Aquaculture	0	0	1	1.3
Fishing &livestock	0	0	1	1.3
Others	0	0	1	1.3

The baseline survey in 2003 indicated that the fulltime fishermen earned RM 570 per month which was less than the income of the part-time fishermen (**Table 3**). Fishermen engaged in agriculture and tourism earned the most income (2,700 RM/month) followed by the combination of fishing with trading (2,617 RM/month). In the monitoring survey, the monthly income level of the fulltime fishermen was RM 777 while the part-time fishermen engaged in trading earned the highest income (1,150 RM/month) followed by those engaged in tourism (800 RM/month) as shown in **Table 3**.

Table 3. Monthly income of fishermen respondents (in Malaysian Ringgit – RM)

Average income	Occupation							
	Fisheries only	**Combination with other profession**						
		Agriculture	Trading	Labor	Aquaculture	Livestock	Tourism	Agri & Tourism	Others
Baseline	**570**	1,071	2,617	1,015	-	-	975	2,700	-
Monitoring	**777**	604	1,150	405	670	60	800	-	100

The average ratio of boat owner in the baseline survey in 2003 was 66.0% (**Table 4**), almost similar to that of the monitoring survey (68.8%). Most fishermen in both surveys lived in their own homes (87.3% and 70.0%, respectively), they owned land (58.2% and 50.6%, respectively) and also owned motorbikes (96.2 and 87.0%, respectively) as shown in **Table 4**.

Table 4. Ownership of fishing boats and other assets

Property	*Baseline Survey 2003*	Monitoring Survey 2006
	(%)	**(%)**
Fishing boat		
Average ratio of boat owner	**66.0**	**68.8**
Other assets		
House	**87.3**	**70.0**
Farmland	3.8	15.6
Land	**58.2**	**50.6**
Vehicle/Car	21.5	26.0
Motorbike	**96.2**	**87.0**
Livestock/Cow	3.7	11.7
Chalet	1.2	0
Share	11.5	0

Part II. Engagement in capture fisheries

The results from both surveys showed a high percentage of unlicensed fishing boats about 65% and 71.7% in the baseline survey and the monitoring survey, respectively. Most fishing boats are motorized with outboard engines at 78% and 60%, respectively. The percentage of outboard engines decreased from 2003 to 2006 as shown in **Table 5**.

Table 5. Fishing boats with outboard and inboard motors

Fishing boat	*Baseline Survey 2003*	Monitoring Survey 2006
	(%)	**(%)**
Unlicensed boats	**65.0**	**71.7**
Licensed boats	35.0	28.3
Out board engine	**78.0**	**60.0**
In board engine	-	9.0
Without boat	-	31.0

Remarks: - means data not available

The main fishing gear used by the fishermen in the baseline survey were the shrimp trammel net (55%), bottom gill net (34%), hand-lining and long-lining. The results of the monitoring survey showed that the shrimp trammel net and drift gill net were favorably used in the fishing operations (about 66.2% and 62.3%, respectively). None of fishermen interviewed was engaged in long-line fishing (**Table 6**).

The average catch from long-lining and bottom gill net in the baseline survey were 60.0 kg and 46.0 kg per trip, respectively. In the monitoring survey, the average catch from bottom gill net was highest about 59.5 kg followed by the drift gill net at 31.9 kg (**Table 6**).

Table 6. Main fishing gear used and the average catch per trip per boat

Fishing gear	*Baseline Survey 2003*		Monitoring Survey 2006	
	% of fishing gear used	Catch per trip per boat (kg.)	% of fishing gear used	Catch per trip per boat (kg.)
Shrimp trammel net	**55**	13.5	**66.2**	13.0
Bottom gill net	**34**	**46.0**	2.6	**59.5**
Hand-lining	-	38.0	20.8	24.6
Long-lining	-	**60.0**	0.0	0.0
Drift gill net	0	0.0	**62.3**	**31.9**
Cast net	0	0.0	5.2	26.2

The results of the baseline and monitoring surveys showed that the fishermen used their catch for home consumption at 10% and 3.3%, respectively, while the remaining product was distributed through the middlemen (about 96%) and only a few (4%) was sold directly in open markets, with the same percentages in both surveys (**Table 7**).

Table 7. Disposal of fish catch and distribution

Disposal	*Baseline Survey 2003*			Monitoring Survey 2006		
	Disposal (%)	Middleman (%)	Open market (%)	Disposal (%)	Middleman (%)	Open market (%)
Consumption	10	-	-	3.3	-	-
Sale	90	96	4	96.7	96	4

Table 8 shows that the net income of using the hand-lining and long-lining fishing gear was high in the baseline survey and the average net income for owners and crew were 1,749 RM and 1,156 RM, respectively. For the monitoring survey, the owners and crew had the highest income from bottom gill net 10,983 RM and 6,118 RM, respectively followed by the drift gill net with average net income of 4,244 RM and 2,133 RM, respectively.

Table 8. Net income of boat owners and crew per working month

Fishing gear	Net income per working month(RM)			
	Baseline Survey 2003		Monitoring Survey 2006	
	Owner	Crew	Owner	Crew
Shrimp trammel net	755	393	1,999	797
Bottom gill net	851	497	**10,983**	**6,118**
Hand-lining	2,050	1,980	2,802	1,085
Long-lining	3,340	1,755	-	-
Drift gill net	-	-	4,461	1,655
Cast net	-	-	973	1,011
Average	**1,749**	**1,156**	**4,244**	**2,133**

Table 9 shows the result of the two surveys indicating that most fishermen lack access to credit 67.9% and 83.1%, respectively. The fishermen were able to access loans from middlemen about 30.2% and 14.3%, respectively. Only few fishermen utilize the credit scheme of commercial banks.

Table 9. Source of credit of fishermen interviewed

Source of credit	*Baseline Survey 2003*	Monitoring Survey 2006
	(%)	(%)
Without loan	**67.9**	**83.1**
Middleman (fishermen fund)	30.2	14.3
Commercial Bank	1.9	2.6

Part III. Gender roles

About 16% of the housewives interviewed in the first survey work outside their homes and about 3.9% in the second survey. They spent 11-14 hours and 9-10 hours per day a month, respectively for household work. Most fishermen in the two surveys fished for 7 and 8 hours a day around 20 and 22 days per month, respectively. The result of the monitoring survey also showed that about 3.9% of the housewives of fishermen interviewed dedicated their time for community volunteer works with the KEW (Women's Economic Group) for 5.5 hours a day for around 14 days a month. The fishermen interviewed dedicated their time to community volunteer works with the KEN for about 40% of their time (**Table 10**).

Table 10. Involvement of women and men in household work and other business

Item	*Baseline Survey 2003*	Monitoring Survey 2006
	Involvement	Involvement
Housewives		
work outside	16%	3.9%
time spent for house work	11-14 hrs/day/mo	9-10 hrs/day/mo
time for KEW	-	3.9%: 5.5 hrs/day; 14 day/mo
Fishermen		
time spent for fishing	7 hrs/day; 20 days/mo	8 hrs/day; 22 days/mo
time spent for house work	2-4 hrs/day; 2-5 days/mo	3-5 hrs/day; 2-3 days/mo
spend time for KEN	-	40%: 3.5 hrs/day, 2 days/mo

Part IV. Fishermen participation in social organizations

There were three existing community social organizations in both surveys, namely: KEN (Fishermen's Economic Group), FA (Fishermen's Association) and JKKK (Village Development and Security Committees) where the fishermen interviewed were members. In the baseline survey, about 49%, 45% and 37% were members in KEN, FA and JKKK, respectively. For the monitoring survey the percentage of fishermen interviewed were members in the KEN, FA and JKKK social groups at 37%, 27% and 4%, respectively (**Table 11**).

Table 11. Membership in KEN, FA and JKKK

Social organization	*Baseline Survey 2003*	Monitoring Survey 2006
Non members in any group	21%	27%
KEN	49%	37%
FA	45%	27%
JKKK	37%	4%

Part V. Problems, interests, needs and expectations in the future

The results of the baseline and the monitoring surveys indicating the problems, interests, needs and expectations in the future of the fishermen-respondents, are summarized in the following tables. The main problem of both surveys were the intrusion by illegal or foreign fishing boats, about 30.2% and 53.2%, respectively, followed by the difficulty in free access to the open sea because of silted canal, about 28.3% and 29.9%, respectively (**Table 12**).

Table 12. Problems of the fishermen respondents

Problems	*2003* (%)	2006 (%)
1. Intrusion by illegal or foreign fishing boats	30.2	53.2
2. Too shallow canals and no jetty exists	28.3	29.9
3. Low fish prices leading to lower incomes	7.5	20.0
4. Fishery resources decreasing	1.9	14.3
5. Sea conditions (weather and bottom condition)	9.4	1.3
6. Social occasions were a nuisance	7.5	-

Table 13 shows that the fishermen in the baseline survey were interested in professional training in engine repair and maintenance as well as in fish handling/processing and marketing, at 18.9% and

9.4%, respectively. For the monitoring survey the fishermen indicated willingness to undergo professional training, especially in new fishing gear and methods (28.6%) and engine repair and maintenance (10.4%).

Table 13. Interests of the fishermen respondents

Interest	***2003* (%)**	**2006 (%)**
1. Training course in engine repair and maintenance	18.9	10.4
2. Training course in new fishing gear and methods	-	28.6
3. Training course in fish handling/processing/market	9.4	-
4. Tourism business	9.5	1.3
5. Aquaculture	3.8	7.8
6. Continue as a professional fisherman	1.9	9.1

Table 14 shows that the most urgent need of the fishermen in the baseline survey were loans from the authorities to procure fishing boats and equipment or new business (45.3%) and construction of a new jetty and digging/deepening of the canal (26.4%), which was similar to that of the result in the monitoring survey where the need to construct a new jetty was necessary as indicated by 39.0% and availability of government loan as indicated by 22.1% of the respondents.

Table 14. Immediate needs of fishermen-respondents

Immediate Needs	***2003* (%)**	**2006 (%)**
1. Loans from government to procure fishing boats and equipment or new business	45.3	22.1
2. New jetty construction and digging/deepening of canal	26.4	39.0
3. Procurement of new engine and boats	7.5	16.9
4. Installation of more ARs and FADs	-	18.2
5. Navigational beacons with light for night fishing	-	13.0
6. Strict control of encroaching illegal fishing vessels	3.8	10.4

The result of baseline survey indicated that the fishermen expected to increase their fish production through the procurement of new and larger fishing boats, the use of more FADs, and improvement in fishing techniques (22.7%), and they also expected the authorities to solve the problem related to the shallow canal (9.4%). In the monitoring survey, they expected that the fishery resources would increase and the installation of more ARs and FEDs, about 29.9% and 19.5%, respectively (**Table 15**).

Table 15. Future expectations of the fishermen-respondents

Future expectation	***2003* (%)**	**2006 (%)**
1. Fisheries resources increased/high fish catch	7.5	29.9
2. Fishing with new and larger vessels/use of more FADs	22.7	-
3. Construction of deeper canal and a jetty	9.4	7.8
4. Continue to be professional fishermen	5.7	11.7
5. Installation of ARs and FEDs	-	19.5
6. Tourism business development	5.7	14.3
7. Need for succession of fishing by the next generation	-	15.6

Conclusion

Part I. General information

1. Most fishermen in the two surveys were aged between 46-55 years old and the fishermen aged less than 25 years old engaged in the fisheries sector had increased. Most fishermen in both surveys were married and obtained education in the primary school level.
2. The average number of household members in the two surveys was 6 persons, which was consistent in the two surveys conducted.
3. The fishermen in both surveys were mostly engaged in fisheries activities (52.8% and 68.8%, respectively) further showing that the percentage of the fulltime fishermen was increasing while part-time engagement with general labor, agriculture etc. showed decreasing trends.
4. The fulltime fishermen in the second survey earned RM 777 per month. This level was higher than the monthly income of the fulltime fishermen in the first survey (RM 570).
5. The average ratio of boat owner in the monitoring survey was 68.8% which was similar to the average ratio in the baseline survey (66%). Most fishermen in both surveys live in their own homes and own the land they were living on. Almost all fishermen have motorbikes. The data also showed that the results of two surveys had the same trend.

Part II. Engagement in capture fisheries

6. About 72% of the fishermen in the second survey had unlicensed fishing boats. This rate increased from the first survey (65%) which is quite unimaginable as many fishing boats were newly built or procured after the tsunami assault in December 2004 and which should have been registered with the DOF Malaysia. Most fishing boats in both surveys are motorized with outboard engines.
7. The fishermen favored to invest in shrimp trammel net for fishing in both surveys (55% and 66.2%, respectively) and in the second survey, drift gill net and cast net were additional fishing gears that they were willing to use but long-line fishing was out of scope.
8. The fishermen disposed their catch for home consumption at low percentages, 10% and 3.3%, respectively in both surveys. The results also indicated that the fishermen distributed the majority of their catch through the middlemen.
9. The average net income of the boat owners and employed crew of each fishing method in the baseline survey were RM 1,749 and RM 1,156, respectively. In the second survey, the boat owner obtained an average net income of RM 4,244 and RM 2,133 for the crew. This result showed that the average net income for boat owners and crew had increased.
10. The main source of credit for fishermen in both surveys was the middlemen. Most fishermen in the two surveys do not enjoy any credit scheme, about 67.9% and 83.1%, respectively. Lack of credit was identified as one of the main immediate needs for the communities.

Part III. Gender roles

11. About 16% of the housewives of fishermen in the baseline survey work outside their homes, a percentage which decreased in the second survey (3.9%). On the average, the housewives spent their time for household work (12.5 hours and 9.5 hours per day in the first and second surveys, respectively). In addition, 3.9% of the housewives in the second survey dedicated time for community volunteer work with the KEW (5.5 hours a day around 14 days a month), which indicated more awareness on the participation and usefulness of the group.
12. The fishermen in the two surveys dedicated their time of about 7-8 hours a day for fishing for around 20-22 days per month and in the first survey spent some time for household work (about 2-5 hours per day for 2-5 days a month). About 40% of the fishermen in the second survey also dedicated some time (3.5 hours per day around 2 days per month) to community volunteer work with the KEN.

Part IV. Fishermen participation in social organizations

13. The social organizations in the two surveys consisted of the KEN, FA and JKKK, consistent in the two surveys. Most fishermen in both surveys participated in the KEN, followed by FA and JKKK social groups.

Part V. Problems, interests, needs and expectations in the future

14. The most serious problem that the fishermen indicated in both surveys was the "intrusion by illegal or foreign fishing boats" (about 30.2% in the baseline survey and 53.2% in the monitoring survey). Since the data also showed that the percentage of the fishermen stressing such problem has increased, the government should reinforce control over such intrusion. The difficultly in free access to the open sea due to the silted canal was also among the major problems identified by the fishermen interviewed (28.3% and 29.9%, respectively). They suggested that the canals may either be dredged or construction of a new jetty should be carried out to solve the problem. About 20% of fishermen in the monitoring survey complained about the low fish prices and limited market that may lead to lower income of the fishermen. This ratio has increased to 20.0% in the monitoring survey compared with only 7.5% in the baseline survey in 2003.

15. Most fishermen in the baseline survey were interested in professional training in engine repair and maintenance (18.9%) and fish handling/processing (9.4%). They were also interested in tourism business (9.5%). About 28.6% of the fishermen interviewed during the monitoring survey were interested in the training course in new fishing gear and methods and about 10.4% were interested in engine repair and maintenance training. The percentage of fishermen who were willing to stay in the fishing business increased from 1.9% in the baseline survey to 9.1% in the monitoring survey.

16. The most urgent needs of the fishermen interviewed in both surveys were the availability of government loans for the procurement of fishing equipment or a new business, and construction of a new jetty. The fishermen proposed the digging and deepening of the canal. Installation of more ARs and FADs, and construction of a light house and installation navigational beacons with light for night fishing were identified recently as immediate needs as raise during the second survey.

17. About 22.7% of fishermen interviewed in the baseline survey wanted to go fishing with new and larger vessels, and the use of more FADs. Most fishermen interviewed in the second survey expected that the fishing resources could be increased (29.9%) an expectation that has increased compared with only 7.5% in 2003. Installation ARs and FADs are additional expectations during the last survey.

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Report on the Biological Study (LBCRM-PL/ICRM-PL, Kuala Teriang, Langkawi, Malaysia)

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Background

The LBCRM-PL project commenced operations in August 2003 under the collaborative framework of SEAFDEC/TD and the Department of Fisheries (DOF) Malaysia. Establishment of an artificial reef complex within the vicinity of the existing FADs in the waters of Kuala Teriang was among the activities conducted under the LBCRM-PL project in Pulau Langkawi. Site selection was conducted on 28 July 2003 by the staff of DOF Malaysia in collaboration with an Officer from DOF Thailand, Dr. Vicharn Insrisawang and SEAFDEC/TD Officer, Dr. Somboon Siriraksophon. The site chosen was at Lat. 6^{o} 20' 17.5" N and Long. 99^{o} 36' 37.5" E, where the water depth is 33 meters and the bottom sediment is sandy silt clay (4.3% silt, 14.5% clay and 81.2% sand, and others). Before the start of the project, a biological study was conducted by the staff of SEAFDEC/TD until the end of 2006.

Although the LBCRM–PL site is a restricted area, encroachment by trawlers was observed as reported during the 9th Coordination Committee Meeting held in Langkawi on 18 July 2007. Even purse seiners occasionally catch fish within the project site. From April 2004 until 2006, fishery resource surveys were conducted by SEAFDEC/TD. The activity aimed to ensure the sustainability of available marine resources, especially around the artificial reefs (ARs) and fish aggregating device (FADs).

After the biological study of SEAFDEC/TD until the end of 2006, this was continued in 2007 by researchers from the Fisheries Research Institute (FRI) of Penang, Malaysia. Only two study trips were however conducted in 2007 due to time and financial constraints. Meanwhile, in April 2007, 10 more concrete artificial reef units were deployed at Lat. 6^{o} 20.5' N and Long. 99^{o} 37.658' E. The objectives of this study were:

a. To assess the effectiveness of artificial reefs in aggregating fishes;
b. To assess the functionality of the artificial reefs as spawning and nursery grounds for fish and other marine organisms (long-term); and
c. To assess the sustainability of the fishery stock in the LBCRM-PL project site.

The Fisheries Research Institute Team

The members of the Team from FRI involved in the biological study comprise:

Abdul Razak Bin Latun	Senior Research Officer
Ahmad Husin Alias	Senior Research Officer
Hadzley Harith	Assistant Research Officer
Malek Daud	Senior Laboratory Assistant

Research Methodology

The study area

The study area (Fig. 1) was within the selected site for artificial reef construction, i.e. off Kuala Teriang, Pulau Langkawi at coordinates: Lat. 6^{o}20'17.5" N and Long. 99^{o}36'37.5" E. The depth of the water is 33 meters and the bottom sediment is silt clay. The locations of the FADs and ARs as well as the fishing gear operations in the project site are shown in Table 1. The fishing grounds of Pulau Langkawi are shown in Fig. 2.

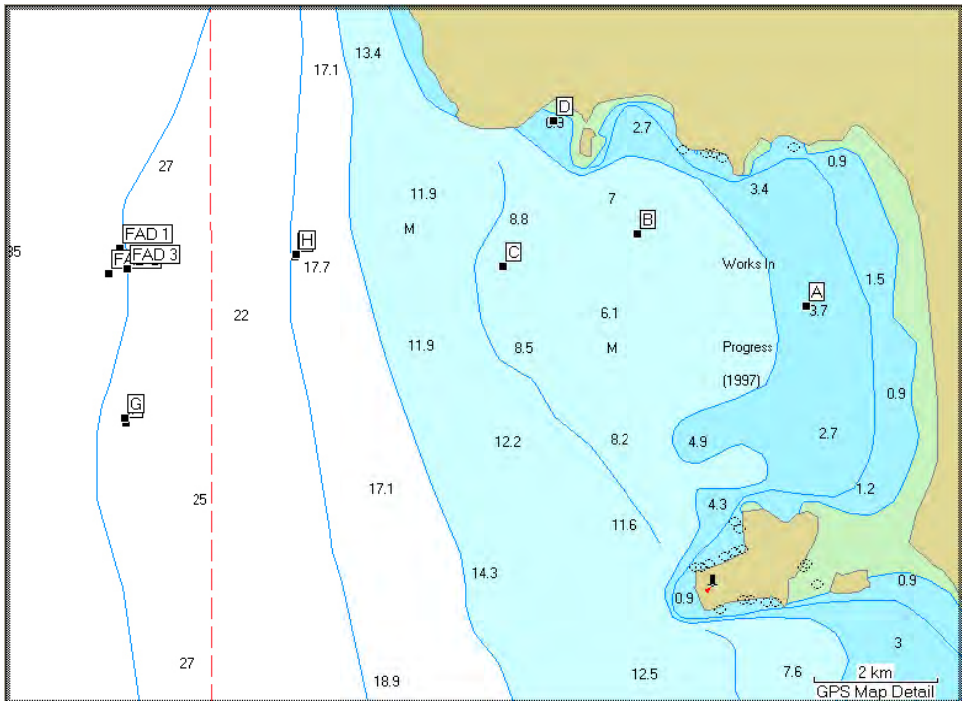

Fig. 1. Map of the study site at Kuala Teriang, Langkawi

Table 1. Locations of existing FADs, proposed ARs sites, and fishing gear operations

Stations	Item/Tasks	Latitude	Longitude
FAD I	FAD	6° 20.547' N	99° 36.102' E
FADII	FAD	6° 20.329' N	99° 36.002' E
FAD III	FAD	6° 20.363' N	99° 36.161' E
A		6° 20.521' N	99° 42.182' E
B		6° 20.680' N	99° 40.690' E
C		6° 20.390' N	99° 39.493' E
D		6° 21.692' N	99° 39.942' E
E		6° 20.476' N	99° 37.648' E
F	Proposed AR area	6° 18.991' N	99° 36.153' E
G	Proposed AR area	6° 19.033' N	99° 36.144' E
H		6° 20.5' N	99° 37.658' E

Conventional Water Quality Parameters and Nutrient Levels

Conventional water quality parameters such as temperature, oxygen, depth, salinity and pH were measured using a YSI 600 data sounder. These parameters characterized the existing conditions of the waters during the data collection. Water samples were collected from each sampling station and analyzed for ammonia, nitrite, nitrate, and phosphate using standard laboratory methods from APHA journal.

Catch rate study at Artificial Reefs and FADs areas

The catch rate study was conducted using baited single hook hand-line at the artificial reefs and FADs areas. The catch rate was expressed as weight of catch (kg) per angler per hour.

Fish landing data

Fish landing data were collected near the Kuala Teriang Jetty, from three sources, i.e. fisherman logbook, middleman logbook, and fish landing survey. The fish landing survey was initiated by SEAFDEC/TD from April 2004 until 2006, after which in 2007 the fish landing survey was continued by FRI. For monitoring purposes, all landing data were analyzed according to catch composition; CPUE (catch per unit effort); and total landing and total value.

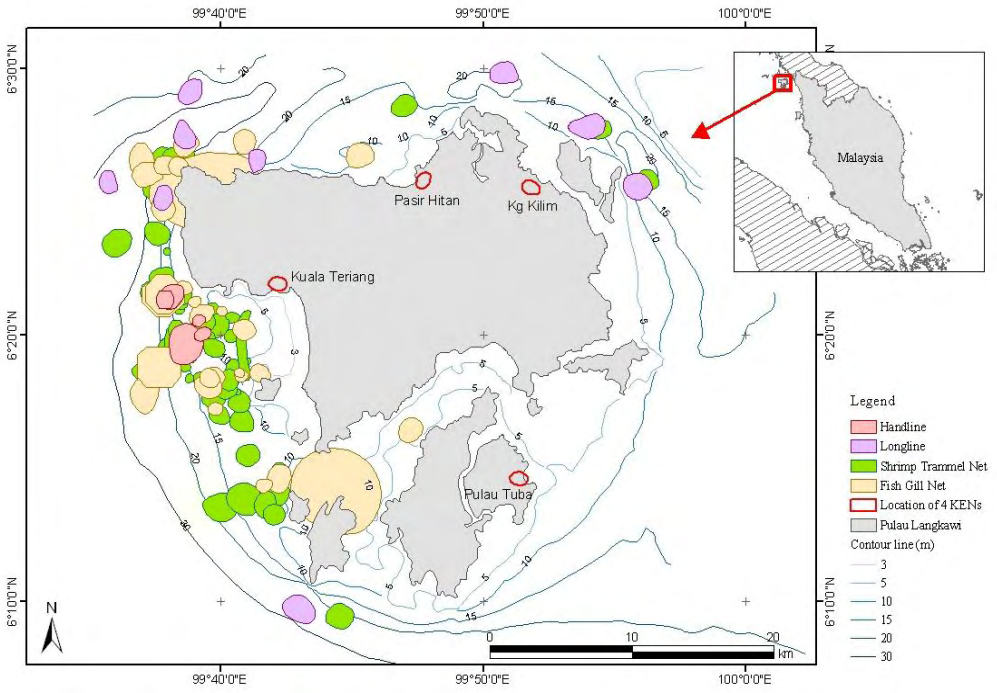

Fig. 2. Fishing grounds of Pulau Langkawi, Malaysia

Results

Conventional Water Quality Parameters and Nutrient Levels

The conventional water quality parameters (temperature, conductivity, salinity, D.O. pH) and nutrient levels (NO_3, NO_2, NH_3) in the FADs and ARs areas are shown in Table 2.

Table 2. Water quality parameters and nutrient levels in the FADs and ARs locations

Stations	Temperature (℃)	Conductivity µS/cm	Salinity (ppt)	D.O. (ppm)	pH	NO_3 (ppm)	NO_2 (ppm)	NH_3 (ppm)
FAD I	28.45	46.64	30.21	2.31	8.05	1.9	0.88	0.34
FADII	28.56	47.34	30.18	2.55	8.22	1.65	0.44	0.28
FAD III	28.53	46.88	30.08	2.34	8.23	1.68	0.56	0.22
A	28.61	46.98	30.32	3.11	8.43	3.05	1.04	0.46
B	28.54	46.87	30.23	3.43	8.32	1.11	0.56	0.34
C	28.68	47.59	30.12	3.20	8.31	2.04	0.46	0.24
D	25.58	47.68	30.24	3.22	8.06	1.38	0.68	0.42
E	28.55	47.54	30.22	3.43	8.08	1.24	0.52	0.34
F (Proposed AR area)	28.77	47.65	30.43	2.89	8.05	1.88	0.24	0.26
G (Proposed AR area)	28.92	47.66	30.28	2.99	8.12	1.94	0.45	0.28
H	28.53	47.87	30.45	2.88	8.23	1.89	0.32	0.42

Catch rate study at Artificial Reefs and FADs areas

The result from the catch rate study (Table 3) was rather scanty. Due to budget and time constraints this study was conducted only on one occasion in 2007.

Table 3. Catch rate study indicating the species composition (sampled on 13/6/07)

Species composition	No. of fish	Total weight (g)
Atule mate	16	1600
Megalaspis cordyla (torpedo scad)	12	2200
Rastrelliger kanagurta (Indian mackerel)	2	300
Lutjanus lutjanus (big eye snapper)	1	150
Nemipterus japonicas (threadfin bream)	1	90

However, the result also indicated that the catch rate per angler (in the vicinity of the ARs and FADs) = 0.7233 kg/hr/angler. Angling was not done in areas without ARs or FADs.

Fish landing data

Conducted at the start of the project, the pre-survey information showed that most fishermen in the village sell their catch to four middlemen in the village. Therefore, the data from those middlemen were taken to represent the total landing of the fishermen in the village. During the December 2004 Tsunami, many fishermen lost their boats and some middlemen lost their landing sites. Since then, two of the contact middlemen have changed their jobs. Hence, from August 2005 landing data were collected from the two remaining middlemen, thereby the data could no longer be assumed to represent the total landings of the fishermen in the project site. However, the trend of catch and its value could still be observed from the data collected from the remaining two middlemen.

Every two to four months, staff from SEAFDEC/TD, FRI and DOF Malaysia conducted fish landing survey for three (3) days. The catch from fishermen was sampled and measured for length and weight as well as species composition from each type of fishing gear.

Catch composition

Shrimp trammel net

The fisherman logbooks were the source of data for the catch composition. For the period between 2004 and 2006, Penchan (2006) cited that the catch composition from the shrimp trammel net include both demersal and pelagic fishes such as the Indo-pacific mackerel, Indian mackerel, gizzard shad, four finger fish, triple tail fish, croaker, marine catfish, sole, mullet, bream, bay sillago, banana prawn, western king prawn, greasy black shrimp, ray, shark, mantis shrimp, swimming crab, and mask crab. Shrimps and prawns are abundant all year round in Kuala Teriang waters. Penchan (2006) also reported that high percentage of banana and western king prawn (more than 20% of the catch) was observed from August to November 2006, and the greasy black shrimp (more than 70% of the catch) in November 2005 and from January to February 2006. Indian and Indo-pacific mackerels constitute less than 25% of the catch in 2005 and 2006 but constitute more than 25% of the catch in 2004. In the 2007 landings, the catch composition of shrimp trammel net included two species of crabs, banana and western king prawns, Indian mackerel, jew fish and flounder, showing less diversity in the 2007 catch as compared to the 2004, 2005 and 2006 catches.

CPUE

Shrimp trammel net

The CPUE data showed that shrimp is abundant all year round in Kuala Teriang waters (Penchan, 2006). The average CPUE of shrimp trammel net (Table 4) was between 0.36 kg/net/trip in August 2006 to 2.47 kg/net/trip in June 2004. Shrimps being the target species for trammel netting contributed CPUE of 0.11 kg/net/trip in November 2004 to 0.65 kg/net/trip in August 2004.

Length distribution

The total length of the greasy back shrimp was between 7.50 – 19.00 cm, and 11.50 to 23.50 cm for banana prawn. The average total length in June 2004, December 2004, August 2005, November 2005 and April 2006 of the greasy back shrimp were 11.85 , 11.38, 11.27, 11.75 and 15.83 cm, respectively while those of the banana prawn were 14.01, 16.19, 16.17, 15.67 and 17.78 cm, respectively.

The percentage length distribution of the greasy back shrimp and banana prawn showed that their sizes in 2006 were bigger than those in 2005 and 2004. The carapace width of swimming crabs was 9.50 to 18.00 cm. The average width of swimming crab in June 2004, December 2004, August 2005, November 2005 and April 2006 were 13.24, 13.42, 13.18, 13.14 and 14.25 cm, respectively. The total length of Indo-pacific mackerel in 2005 and 2006 were between 13.00 and 22.00 cm, respectively with the average length in June 2004, August 2005 and April 2006 at 16.97, 14.62 and 15.32 cm, respectively.

Discussions

The biological survey showed that the area in the vicinity of the artificial reef sites is rich in fishery resources. Data gathered during the biological baseline survey will be utilized in the future, to assess the effectiveness of the artificial reefs deployed in Kuala Teriang waters. More work and analysis are still needed in the future, considering that most of the fishes were caught at the sites near the existing FADs. The success of the FADs and artificial reefs in enhancing the fish stocks also depends on the surveillance efforts conducted by DOF Malaysia. Encroachment of trawlers and purse-seiners in the project site, which could still be observed should be deterred.

The catch during the transition period from Northeast monsoon season to Southwest monsoon season (March to May) showed that the catch composition of shrimp and prawn was lower than during the other months. The average CPUE of shrimp and prawn from the shrimp trammel net in March to May 2006 are between 0.27 – 0.42 kg/net/trip which it is not significantly different from the average CPUE of all data, i.e. 0.36 kg/net/trip. Therefore, it could be said that shrimps and prawns are abundant in the Kuala Teriang waters all year round (Penchan, 2006).

Table 4 shows that the average CPUE of shrimp trammel net in 2005 and 2006 was lower than in 2004. The total landing of shrimp and prawn as the target species of trammel net, considering the number of licensed shrimp trammel net, seemed to indicate that after the Asian Tsunami in December 2004, the fishermen in Kuala Teriang were putting more efforts for trammel netting which led to reduced CPUE.

Conclusions

The status of the marine resources in the fishing grounds of Kuala Teriang was monitored through the fishermen's catch composition and catch per unit effort. The CPUE and total landing indicated that the resources are overfished. Therefore, the resources need to be monitored continuously and good management of the resources should be necessary and should be put in place.

Most of the fishes were caught at the sites near the existing FADs. At the new artificial reefs areas, the catch was observed to be very poor. FADs should also be attached to the concrete reefs to attract more fishes. The effectiveness of the artificial reefs could only be assessed after being underwater for more than 6 months (observation from other artificial reefs projects world-wide). The success of the FADs and artificial reefs in enhancing the fish stocks also depends on the surveillance efforts conducted by DOF Malaysia. Encroachment of trawlers and purse-seiners in the project site were still observed and thus, should be deterred.

The fishermen involved in this project were very enthusiastic about the success of the LBCRM–PL project. The past four years saw the project steadily taking its pace, gaining momentum, and nurturing the interest of the public on their participation in fishery resource management. The project created a dynamic wave of awareness in conservation and sustainable exploitation of the fishery resources in Kuala Teriang waters. This concept of community-based resource management should be extended to other areas of Malaysia.

Acknowledgements

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Table 4. CPUE of fishing gear in Kuala Teriang

Fishing gear	Month	CPUE			No. of records	Source of data
		Min	Max	Average		
Shrimp trammel net (kg/net/trip)	Jun04	0.18	7.96	2.47	15	landing
	Aug04	0.20	7.78	1.23	48	Logbook
	Sep04	0.20	2.96	1.19	48	Logbook
	Oct04	0.21	1.54	0.71	44	Logbook
	Nov04	0.40	5.67	1.77	24	Logbook
	Aug05	0.11	2.61	0.70	87	Logbook+landing
	Sep05	0.11	3.83	0.66	109	Logbook
	Oct05	0.10	3.83	0.52	111	Logbook
	Nov05	0.14	1.05	0.50	68	Logbook+landing
	Jan06	0.08	0.83	0.37	15	Logbook
	Feb06	0.12	0.98	0.50	101	Logbook
	Mar06	0.10	3.01	0.87	96	Logbook
	Apr06	0.08	2.93	0.76	102	Logbook
	May06	0.20	2.72	0.74	86	Logbook
	Jun06	0.09	1.22	0.46	72	Logbook
	Jul06	0.05	1.39	0.53	143	Logbook
	Aug06	0.10	0.92	0.36	74	Logbook
	Sep06	0.16	1.30	0.48	56	Logbook
	Oct06	0.08	1.96	0.48	64	Logbook
	Nov06	0.07	0.99	0.48	37	Logbook
Bottom vertical longline (kg/100 hooks/trip)	Jun04	3.07	3.24	3.15	2	landing
	Aug04	3.78	9.91	7.25	3	logbook
	Sep04	1.65	35.83	12.07	9	logbook
	Oct04	3.04	26.52	12.36	16	logbook
	Nov04	3.87	17.83	9.33	6	logbook
	Dec04	6.10	9.02	7.56	2	landing
	Jan06	4.50	10.83	8.19	7	logbook
	Feb06	2.17	9.41	5.79	2	logbook
	Apr06	5.78	25.27	13.17	6	logbook
Pomfret gill net (kg/net/trip)	Apr06	-	-	0.60	1	logbook
	May06	0.08	1.57	0.57	14	logbook
	Feb06	0.24	0.46	0.35	2	logbook
	Jan06	-	-	0.20	1	logbook
Fish gill net (kg/net/trip)	Jun04	2.86	6.58	4.44	3	Landing
	Nov06	1.11	14.38	5.87	4	logbook
	Apr06	0.84	4.13	2.23	6	logbook
	May06	0.40	18.38	7.80	21	logbook
	Jun06	2.64	12.22	6.00	10	logbook
	Jan06	-	-	2.75	1	logbook
Squid cast net (kg/trip)	Nov04	2.20	14.00	7.02	9	landing
	Dec04	12.50	25.00	18.11	10	logbook
Crab gill net (kg/net/trip)	Jun04	0.27	2.59	1.13	3	landing

Promotion of Locally-Based Coastal Fisheries Resources Management (LBCRM-PL/ICRM-PL)

This activity, which was aimed at promoting the community-based coastal fisheries resources management (CBRM) in the local level, comprised three main sub-activities, namely: establishment of zoning and the Fishery Resources Management Plan (FRMP), establishment of the local enforcement unit, and establishment and management of the crab bank system.

While the CBRM approach was being promoted, the fishermen on many occasions expressed their positive views in many occasions that the volume of fish landing had been evidently increased since last year. They attributed this augmentation to the effective local enforcement activity. Moreover, during the stakeholders' consultation in November 2006 in Alor Setar, the advance draft of the Fishery Resources Management Plan (FRMP) was submitted to DOF for consideration including refining in the legal context by the legal advisors. While the FRMP was under scrutiny by the relevant offices in DOF Malaysia, the Fishermen Economic Group (KEN) was changed to the Fishery Resources Management Community (KPSP) with re-enforced responsibility and function focusing on community-based fishery resources management.

In a bid to minimize fishing efforts especially in trawl fishing, the Kedah State negotiated in January 2007 with the Fishermen's Association in Kedah State to abolish the trawlers or move their operational zone from the current Zone "B"[1] to Zone "C". As a result of repeated negotiations, among the 400 trawler owners in the State, 40 agreed to abolish their fishing boats by the end of November 2007. The State has compensated RM 1 million to the operators for such reduction of fishing effort, and decided that the abolished fishing boats would be sunk as ARs in the area. It is expected that this new policy in reducing the number of trawlers and in thrusting trawlers away from the Zone "B" to "C" would have positive outcomes in the efforts to curve the encroachment of trawlers in Zone "A", considering that the entire area of the project fishery management zone is within Zone "A".

On many occasions, the fishermen in the project area expressed their views that the volume of fish landing especially the black pomfret had obviously increased since the previous year without any justifiable reason. In a bid to reinforce the local enforcement activity, the KEN established a committee called Local Enforcement Committee (LEC) within their organization on 12 March 2007. The committee put forward a proposal to the DOF to provide a patrol boat to strengthen the MCS function. Responding to such request, the Marine Enforcement Agency (MEA) assigned two Enforcement Officers to the project site in Kuala Teriang to monitor incoming information on invasion of illegal fishing boats, and starting in 2008 MEA stationed a small patrol boat at the LEC Kuala Teriang. Upon receiving any news on encroachment of illegal fishing boats, the patrol boat is dispatched to the site, which can be reached within 30 minutes. Since this local enforcement system has been put in place and the news on such a control having spread widely among industrial fishermen, no encroachment by trawlers have since then been reported. DOF Malaysia has also donated necessary equipment to the LEC such as binoculars, walkie-talkies, etc.

It was a challenge for KEN after conducting a study tour to Chumphon, Thailand in April 2005 to establish a crab bank system in the project site. The successful outcome of the crab bank scheme being carried out by the ICRM-PD project impressed the KEN members as they also had encountered a similar problem of dwindling crab resources in the project site. Immediately after returning back from the study tour, the KEN tried out to locate a site for crab cages and negotiation with LADA was initiated. Considering that the ICRM-PD project also initiated the Japanese model of crab bank system in Chumphon by releasing gravid crabs to the water after marking on the carapaces, the KEN decided to undertake this system since it does not require the installation of cages.

[1] **Zone A: from the shore to 5 nautical miles (n.mi)**
Zone B: from 5 to 12 n.mi
Zone C – 1: from 12 n.mi to 30 n.mi
Zone C – 2: from 30 – 200 n.mi

In order to initiate the Crab Bank scheme adopting the Japanese model, the Crab Bank sub-group was organized and training on the crab bank system was conducted on 13 June 2007 for 48fishermen-participants. Thus, releasing gravid crabs has been carried out and a number of swimming crabs had been released to the sea. The signboard describing the scope of the crab bank activity was put up in front of the fishing jetty in July to disseminate the intention of the crab bank to the public and 70 T-shirts were distributed to the members in September for public relations purposes.

Fisheries Resources Management Plan for Kuala Teriang Langkawi, Kedah

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PURPOSE

To formulate Community-Based Fisheries Resource Management Plan for Kuala Teriang and Kuala Chenang, Langkawi, Kedah with the view of establishing a smart partnership between the government and local community. Partnership in this sense covers the areas of conservation, protection and management of fisheries resources that would lead to mutual benefit.

BACKGROUND

Fisheries Resources Management Plan for Kuala Teriang represents a progress in a long journey towards realizing a Community-Based Fisheries Management (CBFM) concept in Malaysian coastal fisheries. It is an outcome of a collaborative regional project established under the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) Mechanism back in 2003. This pilot initiative formally known as Locally Based Coastal Resource Management (LBCRM) in Pulau Langkawi is co-funded by the Department of Fisheries Malaysia and the Japanese Trust Fund Program in SEAFDEC.

In order to integrate the multi-faceted activities common to coastal communities, the project was later revitalized and known as Integrated Coastal Resources Management (ICRM). It embraces FEDs and ARs installation, fish landing data collection, creation of business activities, training, some research elements, and most importantly demarcation of the management zone.

The Plan is a premise that will guide everyone towards achieving a more successful Community-Based Fisheries Resources Management of Malaysian chapter in future.

Demography and socio-economic information

Information on population, occupation, sex ratio and profile of fishermen in the project area are shown in **Table 1**.

Table 1. General information on the villages covered by the project

Maklumat	Kuala Teriang	Kuala Melaka	Kuala Chenang	Pantai Kok/Sungai Kok
Head count	2104	870	2953	342
Gender ratio M:F	1007:1097	416:454	1530:1423	163:179
No of households	485	120	520	60
no of fishermen	386	268	220	13
No of KPSP* Members	47	13	105	-
No of Women's Group Members	17	-	-	-
No of Licensed Boats	73	39	40	13

Notes: All figures are estimates and changes taken place over time

KPSP – Fisheries Resources Management Group*

Status of fisheries industry in the area

Briefly, there are approximately 35 outboard boats while 38 inboard vessels registered in Kuala Teriang. The neighboring villages that are traditionally closely linked to Kuala Teriang are Kuala Melaka, Kuala Chenang and Sungai Kok. The main fishing gear used by fishermen are the fish and shrimp gill net, and hook and line. The record in 2004 shows the landing of various species from Kuala Teriang, Kuala Melaka, Kuala Chenang and Pantai Kok was about 3000 mt.

OBJECTIVE

The main objective of the FRMP is to promote the active involvement of the fishers in the community in managing, protecting, enriching and conserving the fisheries resources sustainably with a view of raising their socio-economic level and livelihood.

GOALS

Specifically, the FRMP aims to:

a. promote direct involvement of the community;
b. ensure that resources in the demarcated area are managed sustainably;
c. implement CBRM in accordance with the CCRF;
d. ensure an equitable distribution of resources among stakeholders;
e. promote equal sharing of responsibility between local community and government in managing the resources;
f. conserve the marine ecosystem in light to minimize further destruction; and
g. increase monthly community income level to at least RM1000

FISHERIES RESOURCE MANAGEMENT ZONE OF KUALA TERIANG (ZPSPKT)

Zoning

The said zone would be gazetted under Section 61, Fisheries Act 1985 and would be known as the "Fisheries Protected Area".

Location

The area covers approximately 30 nautical miles and has been traditional fishing ground for fishermen from Kuala Teriang, Kuala Chenang, Pantai Kok, Kuala Melaka and its vicinity and represented by the following coordinates:

a. Position A (099°33'58.49"E, 06°20'47.14"N) to position B (099°37'52.00"E, 06°23'28.00"N)
b. Position B to position C (099°38'49.00"E, 06°21'38.50"N) and connected to D (099°42'30.00"E, 06°19'21.00"N)
c. From position D to position E (099°36'05.65"E, 06°17'47.12"N)
d. From position E to position A and 5 nautical miles from the shore

The ARs and FADs

To highlight the FADs and ARs installed in the area by various parties among others, the local community, LKIM, DOF and SEAFDEC/TD, the FADs and ARs installed are listed below and the location of the FADs and ARs is shown in **Fig. 1**:

FADs[1]	Longitude	Latitude	Owner	Year installed
1.	099°37.655 E	06°20.450 N	Rozi bin Ismail	2005
2.	099°37.574 E	06°20.320 N	Rozi bin Ismail	1999
3.	099°36.164 E	06°20.134 N	Che Isa bin Hassan	1999
4.	099°36.247 E	06°20.276 N	Che Pa bin Bakar	1966
5.	099°36.019 E	06°20.276 N	Mahadzir bin Ibrahim	1966
6.	099°36.148 E	06°19.762 N	Hashim b Awang	1970
7.	099°36.342 E	06°19.830 N	Morat bin Osman	1966
8.	099°36.136 E	06°19.009 N	Kuala Teriang (4 units)	2004
9	099°36.400 E	06°20.266 N	KEN Kuala Teriang	2001

ARs[2]	Longitude	Latitude	Owner	Year installed
1.	099°36.006 E	06°20.327 N	LKIM	2001/2004
2.	099°37.658 E	06°20.501 N	LKIM	2006
3.	099°36.106 E	06°19.652 N	LKIM	1997

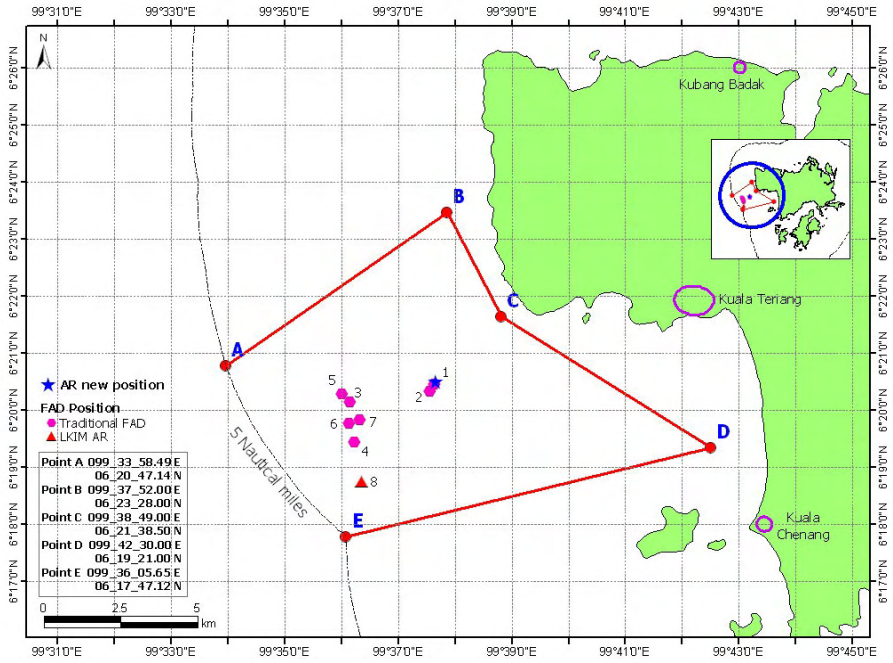

Fig. 1. Location of FEDs and ARs in Pulau Langkawi

THE ROLE OF INSTITUTIONS AND THEIR RESPONSILBILITIES

Fisheries Resource Management Committee of Kuala Teriang (JPSPKT)

The Committee comprises 17 members lead by a chairman and assisted by vice chairman, secretary, treasurer and 14 committee members (**Table 2**), under the supervision of the DOF and LKIM. The committee reserves the right to appoint additional members where and when necessary including managerial staff.

Table 2. The Fisheries Resource Management Committee of Kuala Teriang (JPSPKT)

Advisor	Director of Kedah State Fisheries or his representative Dirrctor of Kedah State LKIM or his representative
Chairman	Chairman of KEN Kuala Teriang
Vice Chairman	Pengerusi KEN Kuala Chenang
Secretary	Secretary of KEN Kuala Teriang
Treasurer	to be appointed
Members	1 representative from JKKK Chenang 1 representative from JKKK Kubang Badak 1 representative from JKKK Kuala Teriang 1 representative from JKKK Kuala Melaka 1 representative from JKKK Batu Ara 4 representatives from KEN Kuala Teriang 2 representatives from KEN Kuala Chenang 1 representative from the fishermen's community in Kubang Badak 1 representative from the Area Fishermen's Association of Langkawi

Responsibilities of the JPSPKT

a. overall planning of the resources management of the area
b. to manage and protect the FADs and ARs including access to the use, installation, maintenance and security
c. to ascertain that the method and resource exploitation system in the area are in conformity with the existing procedures and licensing policy of the DOF Malaysia

d. to assist the government in managing, conserving, protecting the resource as well as to formulate the resource management relevant policies
e. to resolve problems and conflicts among the fishers in a community
f. to collect , safe keep and disseminate information on members, gears, boats, etc.
g. to conduct consultations with the concerned fishermen communities
h. to convene meetings at least once a month

Coordination and Monitoring Committee (JKPP)

This Committee would coordinate and monitor the implementation of the management plan, and would comprise:

Chairman : Director General DOF or his representative
Members : Fishermen Industrial Development, LKIM HQ
Kedah Fisheries State Director or his representative
Kedah LKIM State Director or his representative
Langkawi District Office
Langkawi Development Authority (LADA)
Kedah Marine Department
Fisheries Research Institute of Malaysia
Legal Advisor, DOF
Kedah Department of Drainage and Irrigation
Kedah Fishermen Association (NEKAD)
Representative from JPSPKT (2)
Representative from SEAFDEC/TD
Representative from academe
Representative from NGO
Member of Parliament (to be decided)
Secretariat : DOF Malaysia

Responsibilities of JKPP

a. to act as advisory body to JPSPKT mainly in the area of resource management and policy
b. to monitor the implementation of the plan
c. to decide on unresolved matters raised by JPSPKT
d. to plan and formulate policy and concept implementation of CBRM
e. to review and decide on the type of assistance and support services to be provided towards the successful implementation of the management plan including, R&D, training, information collection, etc.
f. to convene meetings at least once every 3 months

The Role of Community

Membership

All members of KEN Kuala Teriang and Kuala Chenang are automatically members of the management system and deserve the equal rights to voice their opinion and be benefited from the resource exploitation of the area.

The Rights of non-member

Fishermen domicile in the vicinity and yet non-members of the system are allowed to exploit the resource son conditional basis. They will not enjoy the privilege to utilize the facility provided such as FADs and ARs owned by KEN.

The Role of Area Fishermen Association (PNK)

The Area Fishermen Association forms part of the system by being member of the JPSPKT. Fishermen are required to be first a member of PNK before being allowed to join the KEN.

MODES OPERANDI

Consultations

a. The existing consultation mechanism such as KEN[1], PNK[2] and JKKK[3] will be continued
b. All proposals will be tabled to JPSPKT to be scrutinized and decided for possible implementation
c. Matters that require government's decision would be forwarded to JKPP

Conflict Settlement

- First to be handled by JKPSKT and subsequently by JKPP for unresolved issues
- Any violation to the norms and understanding reached, are to be resolved in accordance with the existing or improved punishment system

Government's Responsibility

a. to provide technical advice in the area of resource management, legal, organization management, entrepreneurship, etc.
b. to provide support in the area of research, training, extension, etc.
c. duty bound to continuously provide enforcement and effective prosecution
d. secretariat for JPSPKT
e. to ensure that plan is implemented and expanded elsewhere
f. to register and provide detailed information on FADs and ARs to the stakeholders
g. to seek for development fund
h. to conduct 'base-line survey' to gather basic information on resource status and socio-economic background
i. to conduct impact evaluation program in a stipulated period
j. to meticulously back the plan with regulation and practical legal instruments

Role of the Community

a. to form and activate Implementation Committee (J/K pelaksanaan)
b. to formulate and design implementation system for management plan, such as punitive measures, conflict settlement, etc.
c. to ensure that implementation procedures run in parallel with existing government policy in view to achieve its goal
d. to assist the government in enforcement
e. to provide and channel information to government
f. to ensure that the rights of the community is equally safe-guarded
g. care taker of the safety of FADs and ARs as well as other facilities provided
h. to search for fund for day to day management operation, FEDs maintenance, etc.
i. to conduct environmentally related activities

SOURCE OF FUND

For operations

The JKPSKT to secure and generate income/fund thru *inter alia*

- membership fees
- revenues from fines
- FEDs and ARs utilization charges
- business activities, e.g. recreational fisheries, boat rental etc.
- contributions from KPSP, PNK, etc.

Government's contribution

Possible government department and agency's contributions through normal development funds would be sought to enable the conduct of various activities *inter alia* research, training, provision of facilities etc. in accordance with the requirement and existing policy of the government.

MANAGEMENT OF FISHERIES RESOURCES

Management of FADs and ARs

a. Cover those registered by DOF
b. All FADs and ARs constructed and installed by DOF/other agencies will automatically be transferred to KEN while those constructed and installed by individuals will remain as their own
c. All new installations will undergo stringent scrutiny by the JPSPKT. DOF/LKIM will provide technical advice in terms of suitable location, etc.
d. KEN will be responsible in full to regularly maintain the FADs and ARs
e. JPSPKT would device operational procedure in consultation with members, non-members and sports fishermen in the use of ARs and FADs. Procedures will also be developed for mooring and anchoring.
f. JPSPKT to resolve issues pertaining to encroachment and destruction of FEDs and ARs

Management of Fishing Gear

Fishing Vessel

To adopt conditions, policy and licensing procedures those are being implemented by DOF. List of registered vessels will be maintained by a database being developed by JKPSPKT

Allowed Fishing Gear

a. Kail Mengail (hook and line)
b. Mengeret (trolling)
c. Pukat-pukat hanyut kecuali yang tidak dibenarkan seperti dinyatakan dalam (all gill net except stated below)
d. Bubu ikan yang saiznya kurang dari 3 x 8 (kaki) (fish trap not more than 3x8 m)

Not Allowed fishing Gear

a. Pukat sotong yang menggunakan lampu (squid net with lights)
b. bubu sotong (squid trap)
c. Pukat Jerut Bilis (anchovy purse net)
d. Bubu ikan yang saiznya melebihi 3 x 8 (kaki) (fish trap more than 3x8 m)
e. Pukat Tunda dan Jerut Ikan (trawler & purse seine net)
f. Rawai (long line)
g. Pukat Hanyut Tenggiri (saiz mata 4 inci dan ke atas)- gill net with mesh size > 4 inch

Environmental Conservation

The JPSPKT should engage itself in conserving and protecting the environment by adopting fisheries activities in responsible manner. It is also envisaged to be involved in environmental related activities, such as:

a. mangrove reforestation
b. proper waste effluent discharge to the sea
c. environmental awareness campaign
d. beach and fish landing jetty cleaning

Legal Back-up and Licensing Procedures

a. The demarcated zone is gazetted under Section 61 Fisheries Act 1985 as Fisheries Protected Area
b. To make necessary amendment to licensing procedural to ensure its consistency and relevance to the management plan
c. Through the Director-General's Directives as stipulated in section 10, Fisheries Act 1985

Monitoring & Evaluation

To ensure that the management plan is effectively implemented in order to achieve its objectives, a practical evaluation and monitoring system will be put in place. These would include the following:

a. Conduct of 'Base line survey' to establish reliable preliminary information prior to implementation;
b. As a matter of sustainability, resource survey in the area should be conducted at regular intervals;
c. Regular monitoring should be conducted by convening the JPSPKT and JPT meetings and producing a monthly;
c. Internal impact assessment should be carried out by the DOF; and
d. A third party impact assessment should subsequently be conducted once in three years.

Establishment and Embodiment of Local Enforcement Unit (LEU)

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Background

Kuala Teriang fishermen were always confronted with that have affected their livelihoods, such as:

- Encroachment of zones by trawlers
- Destruction of breeding areas – natural and artificial reefs
- Destruction of FADs installed by the local fishers

Such problems have also created uneasiness on the part of the fishermen, who took their own action on the perpetrators, which escalated into social conflicts among the fishermen, i.e. between trawlers and the local fishers. In this regard, the DOF Malaysia took action to win back the confidence of the fishers and help ease the problems, by closely monitoring the situation.

Thus, the DOF Malaysia adopted a Monitoring and Surveillance System of the fishing activities to ensure compliance, by using traditional techniques that include air and surface surveillance. However, such techniques led to increased operational costs. An alternative method was therefore explored which is the setting up of a monitoring station in Kuala Teriang. The setting up of a Monitoring Centre was launched in August 2006 within the fishing village using a space allocated by the fishermen association.

Monitoring Operations Centre

Monitoring services is round the clock – until midnight, and conducted by shifts. The Manual for Standard Operations was published as guide in monitoring and surveillance activities. The main objectives of the Monitoring Centre are to: (1) monitor the fishing activities in the area; (2) channel information regarding activities contrary to the law for quick action; (3) serve as one-stop centre for information exchange between fishermen and DOF staff; (4) enhance cooperation between local fishermen and DOF Malaysia; and (5) improve confidence of the locals towards DOF Malaysia. The Monitoring Operations Centre is also envisaged as a place of gathering for locals to meet up with DOF representatives.

Efficacy of the Monitoring Station

- Renewed confidence and respect by the locals
- Fishers became acceptable to changes and new ideas brought by the DOF
- Local resources have been effectively protected
- Less incidence of encroachment
- Losses of FAD's decreased
- Increased in revenue for locals
- Increased in catch of high valued species
- More reefs are being deployed to increase breeding areas

From 2003 to 2006, encroachment by trawlers was observed to have decreased (**Table 3**). Thus, the setting up of monitoring stations can be an alternative method of monitoring and surveillance and is more cost effective considering that the operational cost of using the traditional methods had been escalating.

Table 3. Efficacy of the monitoring and surveillance activities

	2003	**2004**	**2005**	**2006**
Complaints	30	35	30	25
Arrests of encroachment	12	31	36	11

Establishment and Management of Crab Bank System: An Experience in Kuala Teriang, Pulau Langkawi

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Department of Fisheries Malaysia

Introduction

The Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL), Malaysia was implemented under a collaborative project framework between SEAFDEC through the Training Department (SEAFDEC/TD) and Department of Fisheries (DOF) Malaysia starting in August 2003 after successful implementation of the project in Pathew District, Chumphon Province, Thailand then known as the Locally Based Fisheries Management (LCBRM-PD).

The Malaysian project site which is located in a fishing village in Kuala Teriang, Pulau Langkawi, had previously carried out CBRM-related activities through the formation of a Fishermen Economic Group or *KEN* since 2001 emphasizing more on economic activities. *KEN* was later renamed in 2007 as the Fisheries Resources Management Community (KPSP) in line with the activities that give more focus on responsible fisheries management and with greater emphasis on ecosystem and environmental aspects.

Under the collaborative involvement of SEAFDEC/TD, many scheduled programs and activities were carried out with the assistance and participation from various agencies mainly by the DOF Malaysia. Among the activities and programs initiated and carried out were: Fishing Gear Technology, Biological Survey, Statistics, Outboard Engine Repairs Workshop, Fiberglass Fishing Boat Repair and Maintenance, Simple Book-Keeping Methodologies, Installation of FEDs and Working Visits to project sites in Thailand. One of the activities which interest the KPSP was the Crab Bank project after a study tour for the then *KEN* members in Kuala Teriang to the ICRM Project site in Pathew District, Chumphon Province, Thailand conducted in April 2005.

Background of Crab Bank System

THAILAND

The initiative of preserving natural crab resources, which has been declining over the years, was initiated at the ICRM-PD project in Pathew District, Chumphon Province, Thailand since year 2002. The necessary steps involved restocking the gravid crabs caught by the fishermen in spawning cages. This project was initiated under the supervision of an NGO, the Thai Environmental Institute and subsequently handed over to the collaborative project ICRM-PD of SEAFDEC and DOF Thailand in August 2003. Since the main fishing gear being operated was the collapsible crab trap, further studies and steps were taken to reduce the juvenile crabs being caught by enlarging the mesh size of the trap bottom from 1.2 to 2.5 inches so that the smaller ones could escape while the trap is being hauled. Hence the catch data collected from year 2002 to 2006 showed an increase in catch landings and marked crabs sighted, also the carapace length of female and male crabs caught varied (**Table 4**).

Table 4. Record of swimming crab catch in Pathew District, Chumphon Province, Thailand

Data: CMDEC 2007

year	Average carapace length (cm)		Total catch(Ton / year)
	Male	Female	
2002	8.60	8.97	–
2003	9.17	9.56	72.1
2004	9.55	10.01	87.6
2005	10.15	10.34	112.6
2006	10.39	10.62	142.6

As part of the ongoing activities of the Pakklong Fishermen Group (PFG) in Pathew District, Chumpon Province, Thailand, this particular activity on crab resources rehabilitation was specifically undertaken by the Crab Trap Fishing Sub-Group as one of their main activities in 2004. The process of releasing gravid crab and stocking in cages takes about one month or more until the eggs are hatched. However, some problems were encountered along the way such as loss of stocks by theft, high mortality rate, high feeding costs, and laborious work in feeding and stocking. In 2006, a study tour to Japan was conducted for the Chairman of PFG, and a Fisheries Extension Officer to inspect and observe the crab bank scheme practices successfully conducted for the past 20 years in Hyogo Prefecture of Japan.

This method and approach in Japan impressed the participants on crab resource management and thus, a trial using the Japanese system was introduced upon their arrival in Thailand by Crab Bank Sub-Group of the PFG. The Japanese system seemed to be more simple and practical as it was found to be very applicable in the project area. After the gravid crabs with live-bearing eggs are caught these are marked **X** on the carapace after being cleaned, they are released back to the sea for spawning. The approach was found easy which could be practiced voluntarily among the members.

Establishment of Crab Bank in Kuala Teriang, Langawi, Kedah, Malaysia

There are two main common species of swimming crabs (blue and red) found in the waters of Malaysia, having high demand as delicacies and fetching reasonable high prices at all levels in the market chain. Thus, improved fishing efficiency and efforts by modern technologies available to the fishing communities to increase the daily catches became known phenomenon. The total catch landings and retail values of the two types of crabs from 2004 to 2006 in Malaysia showed significant contribution to the crab fishing industry of the country (**Table 5**).

Table 5. Estimated total crab landings in Malaysia by year and retail prices

SPECIES/YEAR	2004	2005	2006
Blue Swimming Crabs			
Landings (mt)	3,162.00	3,786.00	3,486.00
Retail price M$/kg	RM 12.00	RM 12.00	RM 12.00
Red Swimming Crabs			
Landings (mt)	9,350.00	5,959.00	5,813.00
Retail price M$/kg	RM 9.50	RM 9.00	RM 10.00

Source: DOF Malaysia

The interest on crab bank system was thus mooted, gained recognition and obtained popularity among the then KEN members. The serious commitment and responsibility of the local fishermen as shown by the Crab Bank Sub Group in Pathew District, on the steps taken to conserve the crab resources by the stakeholders was an inspiration for the KEN members.

Meanwhile the survey results carried out by SEAFDEC/TD in Langkawi from April to December 2004**,** showed an estimated 3,494 kg of the swimming crabs landed predominately by gill netters which suggested the potential of the resources which could be tapped. Steps were initiated by the then KEN group in Kuala Teriang to obtain a suitable site from the Langkawi Development Authority (LADA) to introduce the cage system. Unfortunately for more than a year they were not successful in obtaining any site for this purpose due to some unavoidable circumstances.

In the meantime, it was suggested that the Japanese model which was successfully introduced in Chumphon, Thailand in 2006/2007 was initiated. Since this method does not require any cages, it is cost effective but it needs the voluntary commitment by the members specifically in releasing the gravid crabs caught back to the sea after marking the carapace. On 22 March 2007, a decision was finalized to introduce the Japanese crab bank system in Kuala Teriang. Thus, a total of 300 sets of rectangular collapsible crab traps were donated by SEAFDEC in April 2007 to the members, which could be used on a trial basis by the participating members.

A practical workshop was organized on Crab Bank System for the crab fishers by SEAFDEC/TD and DOF Malaysia on 13 June 2007. Attended by 23 participants, the Workshop aimed to disseminate the concept, procedures, methodologies and recording in logbooks as well as the appropriate way to release the crabs back to the sea. Hence, the Crab Bank Sub-group was organized and a signboard to promote the activities was made by SEAFDEC/TD.


Marking the crab carapace (left) and training on logbook entry (right)

Objectives

The Crab Bank system was introduced to the FRMC *(KPSP)* Kuala Teriang, Langkawi for the Crab Trap and Gill Net Fishers in order to achieve and fulfill the following objectives:

i. To introduce to the crab fishers (stakeholders) the voluntary scheme of releasing gravid crabs caught alive back to the sea after marking the carapace;
ii. To assist in preserving and sustaining the crab resources as well as minimizing their extinction by taking necessary steps on resource utilization at an optimum level;
iii. To encourage and impart awareness to the fishing communities and the public regarding the steps taken to conserve, protect and rehabilitate the crab resources;
iv. To promote teamwork, cooperation and responsibilities towards the importance of crab resources conservation to fishing industry in Malaysia; and
v. To recognize the FRMC (KPSP) as the front liner and initiator of the management and conservation of crab resources to the fishing communities and industries.

During the workshop, the Crab Fishers' agreed to abide by the conditions on recording the number of every gravid crab caught in a logbook provided to each member. Follow up and counterchecking would be done by the District Fisheries Extension Officer. A token as form of incentive, was promised to the participants recording the highest catch and release by the end of December 2007.

Tools and Materials

The crab trap and gill net fishers of FRMC (KPSP*)* Kuala Teriang are the participating members and the necessary materials needed included a special marker pen, log book to record the catches, a towel to clean the carapace, and possibly a camera to record while marking and releasing the gravid crabs. In December 2007, the logbooks were inspected and it was observed that only three (3) participants could provide the necessary figures (**Table 6**).

Table 6. Number of crabs released by KPSP Kuala Teriang

PERIOD	PARTICIPANT	QUANTITY (pcs)	FROM 4.6.08 - 15.9.08 (pcs)
From 0.06.2007 To 03.06.2008	No.1	140	(30)
	No.2	63	(25)
	No. 3	30	(20)
Total	3	233	(75)

From the total of 24 participants, many did not record for some reasons that included loss of their log books although according to some members, they released gravid crabs but never recorded. Nevertheless, after the introduction of the system, the opinion received from the fishers was that the crab landings have since then increased slightly and the system appeared to be more practical, applicable and acceptable for implementation.

Rewards and Appreciation

As a form of appreciation towards the commitment shown, and in order this scheme will be continued for the benefit of the crab fishers and conserve the crab resources, prizes were given out for the three (3) participants after auditing. It was understood that the participation of the members was not active and they seemed not willing to use traps because the gears either drifted or were stolen. A new group consisting of 10 members using traps and gill-nets volunteered to take part in the project.

Prize for the *Crab Bank* Winner (*left*), the *Crab Bank* members (*center*), and marked crab for releasing back to the sea (*right*)

Future Programs on Crab Bank

The Department of Fisheries Malaysia will continue to promote this program under the ongoing its Fisheries Extension activities through dialogues, study tours, short-term training sessions, and onsite demonstrations, to the fishing communities especially the crab fishers. The DOF will also conduct monitoring, collection and analysis of the catch data with the collaboration of Fisheries Research Institutes of the country. Initiatives have been taken to produce leaflets and pamphlets on Crab Bank system to promote and conduct awareness programs to the stakeholders and the public on the conservation plans for the crab resources. Such activities will be evaluated from time to time in accordance to the needs and the convenience of the stakeholders and the responsible authorities, to make such approaches acceptable and their implementation successful.

The DOF is identifying other suitable FRMC (KPSP) groups or individuals especially the crab fishers to introduce this project as part of the conservation effort. Rewards and appreciation to the crab fishers in the form of certificates and prizes are also being considered as form of encouragement by the DOF. This could also serve as a platform for the involvement of dignitaries and corporate bodies at the local level, which will ultimately benefit the communities.

Conclusion

Along with the experience from Thailand and Japan, it has been observed that the implementation of Crab Bank scheme which is simple and costs effective, has the potential towards the efforts of conservation and protection of the dwindling crab resources. It could also create awareness and responsibility among the fishers in contributing to the enhancement of the resources, through voluntarily participation by the stakeholders for the benefit of the fishing industry.

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Local Business Development

Development of local business ventures is one of the major components of ICRM-PL to maximize the women work force. Moreover, the men workforce was also tapped through the machine workshop. Under the project, a proposal to establish a women's network in Langkawi was included in the project action plan in 2007 which aimed to provide the women's groups in Langkawi with opportunities of mutually exchanging views and experiences in group activities like product development and community voluntary works. In order that the current women's activity in the project area, and to diversify the current production lines of the KEW, the DOF donated a Maruku forming and cooking machine costing about RM 19,000 under their own Tsunami Fund. In addition, various fish processing machineries like continuous sealing machine, cooking oven, dryer, and labeling machine were purchased by the DOF to equip the newly completed fish processing yard.

The simplified two ledger books, i.e. "Monthly Material Procurement Record" and "Monthly Production and Sales Record", which were modified into "a user-friendly version", were introduced to the KEW in April 2007. Since then, records on the output products, purchasing materials and sales of products have been clearly and precisely entered. Also, monthly stock inventory by physical verification was conducted. The bookkeeping and accounting practices have been closely monitored by the DOF Extension Officer and the SEAFDEC team periodically. When it was necessary to make rectification or correction of the entries in the books, spot trainings were conducted by the SEAFDEC staff. The KPSP is negotiating with the Anchovy Consortium in Langkawi for the processing anchovy products on consignment basis for export to neighboring countries. The production will commence after the commissioning of the new fish processing yard by KEW.

The KPSP also continued to sell block ice and lubrication oil to their members at their premises. The fuel oil is supplied at the subsidized rate by the Fishermen Association. A new Mechanical Workshop was constructed for the KPSP, which was leased out to a KPSP member for him to operate on the contract basis paying 10% commission on income on top of the monthly rental fee of RM1,500. The DOF contributed RM 14,140 to KPSP to procure the necessary engine repair tools for the Mechanical Workshop.

Activities of the Women's Economic Group (KEW)

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Background

Under the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) collaborative mechanism adopted by the Association of Southeast Asian Nations (ASEAN) and the Southeast Asian Fisheries Development Center (SEAFDEC) in 1998, the Training Department (TD) collaborated with the Department of Fisheries (DOF) of Thailand to implement a coastal resource management program starting in 2001. An existing project proposal planned to be implemented in Chumphon Province, Thailand was reformulated as the joint TD and DOF initiative for a period of five years. Thailand was designated as the lead country and SEAFDEC/TD as the implementing department for SEAFDEC. It was also agreed that the knowledge and experiences gained from the project would be disseminated to the other Member Countries through the SEAFDEC information transfer and dissemination approaches.

The project has produced tangible impact and was acknowledged by the SEAFDEC Member Countries at the 4th SEAFDEC FCG Meeting in Myanmar in March 2002 and the 25th SEAFDEC Program Committee Meeting in Singapore in October 2002. The latter meeting pointed out that it was an opportune time to transfer the technologies, including experiences and knowledge gained, to other Member Countries. Thus, the Committee Member from Malaysia offered Langkawi as a pilot site for the implementation of a similar approach on a cost-sharing basis. Several SEAFDEC/TD missions to Langkawi were subsequently conducted to look into the possibility of setting up a similar coastal resources management project, called the "Locally Based Coastal Resources Management in Pulau Langkawi (LBCRM-PL)". The project was initiated in August 2003 for 24 months during its first phase under the co-financing arrangement with the Japanese Trust Fund-1(TF-1) and DOF Malaysia. However, in the course of the project operation, the financial arrangement with TF-1 was terminated in December 2004 and a new financing arrangement under TF-4 commenced in January 2005.

In conjunction with this change, it was determined that the first phase of the project would be terminated at the end of 2004 and the 2nd phase of the project to start in January 2005 with three years tenure until the end of 2007. The 2nd phase put more emphasis on human capacity building in the coastal resources management sector. Consequently, the project title of the second phase was also changed to "Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL)". The overall objectives of this project are: establishment of sustainable coastal fisheries management at the local level; rehabilitation of coastal fisheries; and alleviation of poverty in coastal fisheries communities. More specifically, the project aimed to provide technical assistance to ensure the sustainable development of coastal fishery communities in Pulau Langkawi within the framework of the collaborative project.

The ICRM-PL project has six main activities, with "encourage local business venture" as one of the main activities. Encourage Local Business was mainly concerned with increasing and creating alternative job opportunities, mainly outside the marine capture fisheries, placing emphasis on increasing income. The alternative job opportunities were envisaged to compensate part of the decreased income resulting from lesser dependence on marine capture fisheries. The project envisaged to assist the people in increasing their incomes in two ways: by improving technologies in fishing and handling, marketing and processing of fisheries products; and by creating alternative job opportunities outside capture fisheries through the promotion of coastal aquaculture, fish cage culture, etc.

The ICRM-PL project was implemented in Kuala Teriang, where the Kuala Teriang KEN (Kampung Economi Nelayan - Fishermen's Economic Group) is active as a functional group to handle group economic activities specifically in fundamentally developing community economics. Establishment of local business ventures was part of the implementation plan to mainly create job opportunities for the women in the community.

Objectives

1. Create alternative job to increase households incomes and develop community economics; and
2. Enhance women's participation in community development.

Outcomes

1. Improved role of women, for them to be more active and skillful in the techniques of fish processing and product development;
2. Developed products in community to be promoted as modern products; and
3. Increased incomes of the fishing households.

Procedure of implementation

Women in the community at the project site were the target group to participate in the local business venture activity. The top priority objective of this activity was to increase the income of the fishing households. SEAFDEC/TD conducted the preliminary socio-economic survey, the result of which disclosed that over 80% of housewives in the project area were idle and willing to do some work in order to acquire additional income. The women's group established on 9 February 2004 was a sub-group of the Kuala Teriang KEN. Before becoming an official group for the project, the group was a volunteer group under the Women's Islam (WI), with its main activity focused on social activities and meetings. The women's group was initially composed of 11 members from three villages: 2 members from Kuala Teriang, 5 members from Batu Ara, and 4 members from Kuala Melaka. Now, there are 15 members tasked to carry out the group's activities in the project. The women's group was named the KEW (Kumpulan Economi Wanita - Women's Economic Group) in Kuala Teriang.

Appraisal assessment of data was used to formulate and arrange the training course and activities for the women's group. The agreed activities of the women's group included:

1. Study tour on fish processing to observe active and successful women's groups in other provinces and countries;
2. Training course based on the women's needs;
3. Construction of facilities and procurement of materials;
4. Providing channel of coordination with related government agencies; and
5. Arranging discussions and problem analysis including finding possible solutions.

Study tours

1. A study tour to Chumphon and Phangnga Provinces in Thailand was conducted from 28 April to 2 May 2004, by the team consisting of five (5) representatives of the women's group and two (2) officers of DOF Malaysia. This was aimed at learning how to set up a cottage scale fish processing yard and processing of value-added products, exchanging views on women's participation in community development, and studying the organization and operational characteristics of women's activities. In addition, the team visited fishing villages in Phangnga Province, where the inhabitants were predominantly Muslims and where the participation of women in the activities is very visible.
2. A study tour to Johor and Perak, Malaysia was conducted on 2-6 August 2004. Fish cracker processing was the main activity observed during the study tour, which had two participants comprising an officer from DOF Malaysia and the leader of the women's group.

Training course

1. A training course on surimi and fish ball processing was conducted in Penang, Malaysia on 10-12 May 2004, with six (6) members of the women's group participating.

2. A training course on Simple Bookkeeping and Accounting Management was held on 15-16 June 2004 in Langkawi, Malaysia, attended by 10 leading women's group members. Four basic ledger books; i.e. General Ledger, Materials Ledger, Product Ledger, and Labour Ledger, were introduced during the training and a practical exercise for completing the books were also carried out by the participants.
3. A training course on Accounting, Marketing and GMP was held in Kelantan, Malaysia on 18-20 September 2004, where 12 members of the women's group participated.
4. A training course on Fish Product Processing at the Fisheries Institute of Malaysia (IPM) in Kuala Terengganu, Malaysia was conducted on 9-14 April 2005. The training course covered the basic concept of food hygiene and minced fish production using underutilized fish species. Fifteen (15) members of the women's group participated in the training, which included the production of Surimi and Otoshimi products, Tilapia Fillet, Fish ball and Fish cake, Fish Nugget, fish finger, fish burger and Keropok Lekor.
5. The training course on processing seasoned/dried fish satay using threadfin bream was arranged by the DOF and the Malaysian Agriculture Research and Development Institute (MARDI) on 18-19 September 2005.
6. Training on computerized bookkeeping system was also conducted in April 2006 by a computer supplier from the Kedah State.
7. A 3-day training course in accounting was organized by the Kedah State on 13-15 September 2006 for the KEN and KEW in the state. Three members of KEW participated in the training which had a total of 40 participants.


Training courses: simple bookkeeping and accounting management (left) and fish processing at IPM (right)

Construction of facilities and procurement of materials

1. The DOF Malaysia provided most of the equipment and materials to the women's group since the start of its active production. The fund was disbursed for this purpose from September 2004 until the middle of November 2004, when the cottage-scale fish processing yard was completed. The equipment provided are as follows:
    - Hot oven
    - Gas stove with 2 gas containers
    - Sealing machine
    - Freezer (refrigerator)
    - 2 Tables and chairs
    - Packaging and labeling materials
    - Building (4 m x 8 m)

The total budget allocated was 50,000 RM (Malaysian Ringgit), of which 20,000 RM was contributed by the village fund of the LADA (Langkawi Development Agency) and 30,000 RM for equipment and materials was from the DOF of Kedah State. The cottage-scale fish processing yard was completed in the middle of November 2004 and the women's group started their production activities in December.

2. After the tsunami (26 December 2004), the women's group's vital activity shifted its momentum to the rehabilitation of the affected area, and responding to their needs, the DOF and LKIM (Malaysia Fisheries Development Authority) contributed 60,000 RM to expand the processing yard to cope with the women's requirements to increase their processing capacity.
3. SEAFDEC/TD provided a complete computer unit to the women's group in June 2005 to enable them to improve transparency and be able to adopt an effective bookkeeping and accounting system.
4. The DOF Malaysia also provided the necessary equipment such as a strainer and a digital weighing scale up to 15 kg to the women's group in July 2005.
5. The construction of the second cottage-scale fish processing yard under the auspices of the Japanese Grassroots Assistance for Tsunami Disaster (JGATD) had been delayed due to the slow process of designing and approval within the Malaysian authorities. Construction eventually started in October 2006. The cost allocated for this construction was RM 186,000 broken down as follows:

Building cost	RM 100,000 (JGATD)
	RM 60,000 (DOF)
Machinery and equipment	RM 26,000 (JGATD)
Total	**RM 186,000**

6. Aimed at diversifying the production lines of the KEW, the DOF donated a Maruku forming and cooking machine costing about RM 19,000 under their own Tsunami Fund. In addition, various fish processing machineries like continuous sealing machine, cooking oven, dryer, and labeling machine costing about RM 50,000 were purchased by the DOF in September 2007 to fully equip the newly completed fish processing yard. The processing yard was expected to be operational in early 2008.

Providing channel of coordination with related government agencies

1. The marketing channel has been expanded through private traders such as the Ismail Group. A sales outlet at the Handicraft Sales Center was provided by LADA (Langkawi Development Agency).
2. A one-day workshop was organized by the Fish Technology and Fishermen Community Section of the DOF in Langkawi on 8th May 2006, in a bid to identify appropriate and lucrative local business ventures. Twelve (12) and 8 members from KEN and KEW Kuala Teriang, respectively participated in the workshop.
3. During the National Contest on Women's Group Activity organized by the Ministry of Agriculture of Malaysia on 8th August 2006, the women's group (KEW) in Kuala Teriang was awarded the 5th prize for their various group activities. The KEW in Kuala Teriang was the only group selected from the fisheries sector.
4. The Annual Meeting of the KEN and KEW Federation was held in the state of Negeri Sembitan on 19-21 December 2006 with 128 representatives from KENs/KEWs of the country. Two members of the Women's Group (KEW) Kuala Teriang participated in the meeting and presented the progress of their activities. Their performance was extremely highlighted as the first success case in Malaysia and an effort to disseminate similar activities in other KEWs was proposed.

Arranging discussions and problem analysis including finding possible solutions

1. The simplified two ledger books, i.e. "Monthly Material Procurement Record" and "Monthly Production and Sales Record", were modified into "a user-friendly version" and introduced to the KEW in April 2007. Since then, records on output products, purchasing materials and sales of products, have been clearly and precisely recorded. Monthly stock inventory by physical verification was also conducted. The bookkeeping and accounting practices have been closely monitored periodically by the DOF Extension Officer and the SEAFDEC team. When it was necessary to make rectification or correction of the entries in the books, spot training were conducted by the SEAFDEC staff.
2. The ICRM-PL project also conducts ICC meetings (Implementation Coordination Committee) three times/year, and SC meetings (Steering Committee) once a year. During those meetings, problems on the women's group activities are discussed and solutions are also formulated.



Discussions on: bookkeeping with local business team (left) and on problems and solutions ICC meeting (center); and KEW participants in training on food processing (right)

Results

The first year (2004)

1. The two study tours conducted have been very fruitful as considered by the participants who also embrace the concept of "*seeing is believing*", which implanted innovative ideas in the women's group activities.
2. The main products of the women's group are dried/seasoned anchovy with fresh chili and dried chili.
3. Currently, marketing is concentrated in Langkawi and most of the products are sold at the project site. Since their product is new to the island, therefore sale is moving very fast without any competition.
4. The women's group was divided into four (4) sub-groups to distribute the processing work evenly and their activities are regulated by their self-established eight (8) rules:
   - One group will produce 3 kg of dried anchovy per day
   - The working hours start from 0930 until 1700
   - If a member in a sub-group cannot come to work, it is necessary to call a member from another sub-group to replace her
   - If a member from another sub-group doesn't come to work, that member will pay 3 RM to the group
   - All members must undertake their duty one way or another
   - The group will clean and dry 5 kg of anchovy each day (in preparation for the next day's production)
   - Facilities and working areas in the building should be cleaned before leaving, and
   - All members should maintain a good working relationship


The second year (2005)

1. The facilities and equipment for producing fish products had suffered comparatively little damage by the tsunami and the activity by the women's group was reactivated soon after minor repair works on the facilities and equipment. The Project agreed to diversify into more product lines anticipating an expansion of the marketing opportunities. Coping with this need, a training course in fish processing was arranged at the Fisheries Institute of Malaysia (IPM) in Kuala Terengganu.
2. During the training course at IPM, the women's group planned to start the same processing, but dried product without handling wet fish was proposed, therefore the proposal to build a new fish processing yard in another site near the sea was submitted to the JKKK (Village Security and Development Community) for obtaining the necessary funds. At that time, it was most likely that the JKKK would provide the funds in 2006.
3. The systemized bookkeeping was a new concept of cash handling for the women's group and in the beginning it seemed a difficult task for the group to carry out (**Table 1**). However, based on the result of the training evaluation, 75% of the participants indicated that the system was "understandable". Subsequent monitoring was deemed necessary to put the system in place.
4. Expansion of the marketing channels for the products was one of the main concerns of the women's group. The Fisheries Institute in Malaysia (IPM) agreed to assist them by looking at the possibility of distributing the products in Kuala Lumpur and also by opening a stall in the new jetty in Perak State.

Table 1. Accounting of the expenditures and income of the women's group in 2005

Month	B/F	Sales	Materials	Share for attendance	Gross income	Balance
January	454.10					454.10
February	454.10	0.00	271.10	-	-271.10	183.00
March	183.00	186.50	270.00	0.00	-83.50	99.50
April	99.50	4,976.50	253.00	750.00	3,973.50	4,073.00
May	4,073.00	603.00	731.90	0.00	-128.90	3,944.10
June	3,944.10	1,559.00	862.90	0.00	696.10	4,640.20
July	4,640.20	2,129.50	1,479.00	0.00	650.50	5,290.70
August	5,290.70	771.00	618.40	0.00	152.60	5,443.30
September	5,443.30	1,156.00	294.50	2,840.00	-1,978.50	3,464.80
October	3,464.80	325.50	79.50	0.00	246.00	3,710.80
November	3,710.80	322.50	965.20	0.00	-642.70	3,068.10
December	3,068.10	894.00	783.60	0.00	110.40	3,178.50
Total		**12,923.5**	**6,609.1**	**3,590.0**	**2,724.4**	**3,178.50**

The third year (2006)

1. Three snack-type products called Maruku (dry noodle type and biscuit type) and Rempeyde (fried cracker type) were developed through the initiative of the women's group from their own study, where the trial production took place in September 2006.
2. While reviewing their monthly transactions sheet in 2006, it was found that their business incurred some deficits. This was beyond their comprehension considering that the gross income in 2005 was RM 2,724.40 after deducting RM 3,590.00 which was distributed to the members (**Table 1**). Also considering that their production in 2005 resumed in March after the rehabilitation from the tsunami disaster. In order to determine the causes of the deficit (**Table 2**) and formulate measures for improvement, an investigation was conducted by a team consisting of members from DOF Headquarters, Fisheries Training Institute (IPM) of Terengganu and SEAFDEC/TD on 20-21 March 2007.

After thorough investigation, it was found that the economic returns in processing seasoned/dried anchovy was very sound, even coping with the rising commodity inflation in 2005 and 2006. Their profit margin against the direct production cost was as high as 86%.

Table 2. Accounting of the expenditures and income of the women's group in 2006

Month	B/F	Sales	Materials	Share for attendance	Gross income	Balance
January	3,178.50	611.50	533.30	0.00	78.20	3,256.70
February	3,256.70	2,248.00	711.45	0.00	1,537.05	4,793.75
March	4,793.75	795.00	103.20	0.00	691.80	5,485.55
April	5,485.55	102.00	3,004.35	0.00	-2,902.35	2,583.20
May	2,583.20	651.00	285.90	0.00	365.10	2,948.30
June	2,948.30	1,226.00	755.00	0.00	471.00	3,419.30
July	3,419.30	882.00	1,352.00	0.00	-470.00	2,949.30
August	2,949.30	882.00	611.00	0.00	271.00	3,220.30
September	3,220.30	495.00	440.00	0.00	55.00	3,275.30
October	3,275.30	291.00	144.70	1,272.00	-1,125.70	2,149.60
November	2,149.60	1,167.00	1,310.00	0.00	-143.00	2,006.60
December	2,006.60	1,550.00	731.00	0.00	819.00	2,825.60
Total		**10,900.5**	**9,981.9**	**1,272.0**	**-352.9**	**2,825.60**

The fourth year (2007)

1. Production was suspended for almost one month between middle May to middle June due to lack of cooking oil in the market and also because of a public civil work on road construction in front of the processing yard. Thus, production and sale volumes in May and June have relatively decreased (**Table 3**).
2. Construction of the new fish processing yard was completed in early 2007, however due to delayed installation of power and water supply systems by the contractor, commissioning of the yard has been dragging behind schedule.
3. Finally, the new fish processing yard was completed in early December 2007 including the installation of the electrical wirings and water pipes by the contractor. The official commissioning of the yard took place in early 2008.

Table 3. Monthly transactions by the women's group in 2007

Month	B/F	Sales	Production cost	Gross income	Share for attendance	Transfer to Saving AC	Net income	Other income	Balance
Jan	2,825.60	890.00	403.90	486.10	400.00	250.00	-163.90	0.00	2,661.70
Feb	2,661.70	1,513.00	288.10	1,224.90	400.00	250.00	574.90	0.00	3,236.60
Mar	3,236.60	984.50	691.20	293.30	0.00	250.00	43.30	0.00	3,279.90
Apr	3,279.90	3,182.00	911.00	2,271.00	0.00	0.00	2,271.00	0.00	5,550.90
May	5,550.90	803.50	365.90	437.60	0.00	0.00	437.60	0.00	5,988.50
Jun	5,988.50	1,369.50	944.60	424.90	0.00	0.00	424.90	0.00	6,413.40
Jul	6,413.40	1,979.00	391.15	1,587.85	2,773.00	600.00	-1,785.15	0.00	4,628.25
Aug	4,628.25	2,028.00	951.95	1,076.05	0.00	350.00	726.05	0.00	5,354.30
Sep	5,354.30	776.00	279.00	497.00	0.00	0.00	497.00	0.00	5,851.30
Oct	5,851.30	2,917.50	820.30	2,097.20	0.00	0.00	2,097.20	0.00	7,948.50
Nov	7,948.50	797.50	1,436.60	-639.10	2,000.00	0.00	-2,639.10	0.00	5,309.40
Dec	5,309.40	2,922.00	906.30	2,015.70	0.00	0.00	2,015.70	0.00	7,325.10
Total		**20,162.50**	**8,390.00**	**11,772.50**	**5,573.00**	**1,700.00**	**4,499.50**	**0.00**	**7,325.10**

Fish processing equipment provided by DOF Malaysia for the KEW in Kuala Teriang

Conclusion

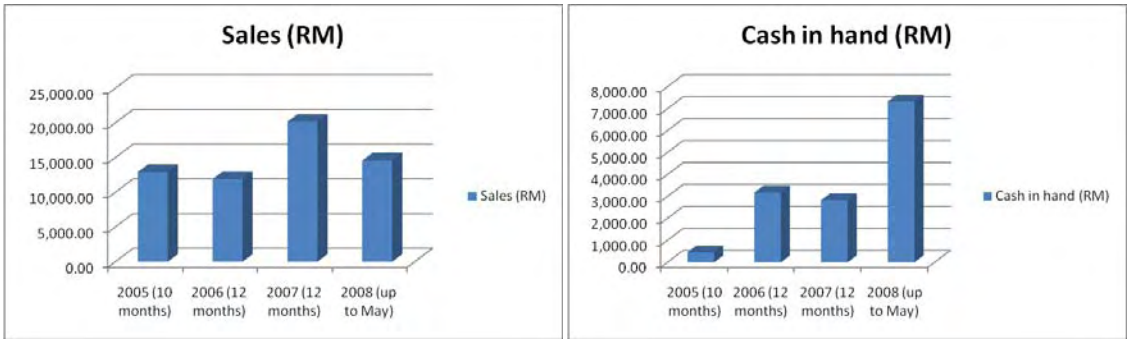
1. The women's group has 15 members with two offices, the new office is used to produce the products and old office is for selling their products.
2. They produce two main products, namely: Ikan Bilis (anchovy processing) and Maluku.
3. The money saved was 2,700 RM and their net income was 5,593.25 RM.
4. Marketing of the products by the KEW is mainly in Langkawi, and extended to Petronas petrol stations and the Carrefour Department Store.
5. The bookkeeping and accounting system for the processing of their transactions has been well established with the KEN thus, monitoring the financial status of the new enterprise was not a problem at all.
6. The women's group has acquired more improved technology on factory management from the IPM, which has been developed into commercial business. This group was expected get GMP (Good Manufactory Products) certificate during the next two months (August 2008).

At the national Contest on Women's Group Activity organized by the Ministry of Agriculture on 8th August 2006, the women's group (KEW) in Kuala Teriang was awarded the 5th prize for their various group activities. Furthermore, The Annual Meeting of the KEN and KEW Federation was held in the state of Negeri Sembitan on 19-21 December 2006. Their performance was extremely highlighted as the first success case in Malaysia and an effort to disseminate similar activities in other KEWs was proposed

Table 4 Comparison of the transactions of the women's group from 2005 to 2008

Year	Cash C/F	Sales	Production cost	Gross income	Shares distributed	Transferred to Saving Acct.	Net income	Other source of income	End balance
2005 (10 months)	454.10	12,923.50	6,609.10	6,314.40	3,590.00	0.00	2,724.40	0.00	3,178.50
2006 (12 months)	3,178.50	11,900.50	9,981.90	1,918.60	1,271.50	1,000.00	-352.90	0.00	2,825.60
2007 (12 months)	2,825.60	20,162.50	8,390.00	11,772.50	5,573.00	1,700.00	4,499.50	0.00	7,325.10
2008 (up to May)	7,325.10	14,583.50	8,600.25	5,983.25	4,532.00	0.00	1,451.25	4,142.00	12,918.35

Note: ***Other source of income came from Agriculture Ministry of Malaysia***



Production and sale of the KEW from 2005 to 2008 (left) and cash in hand of KEW from 2005 to 2008 (right)

Recommendations

1. The KEW as well as the DOF Malaysia should realize that managing the new premises (commercial-scale) is completely different from that in the past which is cottage-scale management.
2. The operational cost of the new premises including the depreciation of huge infrastructures and modern machinery is expected to be than five times more than the cost of maintaining the original premises.
3. In addition, the standardization of the product quality becomes more essential in case of mass production, particularly when envisaging an expansion of the marketing channels.
4. Guidance and training should be provided by the Fish Handling and Processing Unit of DOF Malaysia and the Malaysian Fisheries Institute (IPM) in Terengganu.
5. KEW is confident that they will be able to continue their business venture, in fact some members indicated that they will train their children to start learning the trade.



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Fishing and Vessel Repair Technology Improvement

The activity aimed at improving the fishing and vessel repair technology had original five major components, namely: (1) Fishing Gear Survey (29-32 March 2004); (2) Mechanical Training for Fishermen in Langkawi (29-31 March 2004); (3) Fishing Trial 1 (14-17 June 2004); (4) Fishermen Training on Fishing Technology (9-11 August 2004); and (5) Fishing Trial 2 (20-23 December 2004). However, when Tsunami struck the project area on 26 December 2004, an additional training on Fiber Reinforced Plastic (FRP) Works was deemed necessary to help the fishermen repair their damaged fishing boats.

Inside the canal of Kuala Teriang
(Photo by Research Division, SEAFDEC/TD)

(Photo by VSulit)

Although the LCBRM–PL project was continued until 2008, the sub-activity on Fishing and Vessel Repair Technology Improvement in Langkawi was stopped after the sub-activity on Fiber Reinforced Plastic (FRP) Works Training for Fishers in Langkawi was completed in May 2005. In 2005, after the Tsunami occurred on 26 December 2004, the facilities at project site provided by the Department of Fisheries Malaysia, KEN and LKIM in Kedah State, and by SEAFDEC/TD had been ruined. The most urgent activities undertaken by the fishers in the project site were focused on reconstructing the facilities and repairing their fishing gears and boats.

Teluk Barambung Bay during low tide
(Photo by Research Division, SEAFDEC/TD)

Final Report on Fishing and Vessel Repair Technology Improvement in Langkawi

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INTRODUCTION

The activity on *Fishing and Vessel Repair Technology Improvement in Langkawi* was initiated under the *Locally Based Coastal Resources Management – Palau Langkawi (LCBRM–PL)*. The activity was carried out in collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysian Fisheries Development Authority) in Kedah State, and SEAFDEC/TD. The activity comprised the following six (6) sub-activities:

1) Fishing Gear Survey (29-31 March 2004)
2) Mechanical Training for Fishers in Langkawi (4-6 May 2004)
3) Fishing Trial I (14-17 June 2004)
4) Fishing technology and practices training for fishermen in Langkawi (9-11 August 2004)
5) Fishing Trial II (19-23 December 2004)
6) Fiber Reinforced Plastic (FRP) Works Training for Fishers in Langkawi (23-26 May 2005)

After the December 2004 Tsunami that affected the activities of the project site, the fishing trials for the remaining fishing gears have been cancelled in order for the related organizations to conduct relief assistance to the fishers. For its part, SEAFDEC/TD strengthened the implementation of several related project activities, e.g. CBFM through zoning management system, the development of local enforcement approach, identification of possible products for development, etc. Fishing gear improvement was given less priority in 2005 except the training of Fiber Reinforced Plastic (FRP) Works for Fishers in Langkawi which was arranged from 23 to 26 May 2005. Moreover, it was also agreed to suspend some activities in 2006, e.g. responsible fishing approach using selectivity fishing gear, i.e. the introduction of shrimp bottom drifted gillnet for responsible fishing, training on safety for small scale fishing boats.

FISHING GEAR SURVEY (29-31 March 2004)

Fishing Gear and Practices Survey was the first sub-activity of the *Fishing and Vessel Repair Technology Improvement in Langkawi* under the *Locally Based Coastal Resources Management – Palau Langkawi (LCBRM – PL)*, carried out with the collaboration of the Department of Fisheries Malaysia and SEAFDEC/TD. As a preliminary survey, the Fishing Gear and Practices Survey focused on the identification of the fisheries conditions, i.e. fishing gears and their accessories, fishing practices and fishing grounds as well as catch compositions around the project sites in Langkawi Island. The collected information was used as basis for the initiation of appropriate fishing technology improvement in the target fisheries communities in Langkawi through the SEAFDEC/TD extension methodology.

Objectives

1) To investigate the current fishing gears and activities at the project area, i.e. Kuala Teriang and general observation at Kuala Malaka;
2) To identify the needs for fishing technology improvement of the local fisherman in the project area; and
3) To draft the tentative details for improving local fishing techniques through training methods.

Fishing ground and fishing village

The survey and observation was carried out in Kuala Teriang and Kuala Melaka, western part of Langkawi Island. Both fishing communities are located on the coast of Teluk Barambung Bay. The bay topography is wide and plain with muddy bottom. The distance from the port to the fishing ground according to the type of fishing activities (e.g. for gillnet fishing operation), is 5-8 nm with a depth of 8-20 m.

Aerial view of Langkawi Island (left) and (right) Kuala Teriang (A) and Kuala Melaka (B)
(Photo by Google Earth)

Fishing boat

Most of fishing boats in Kuala Teriang, are small scale. Before the Tsunami disaster, almost all fishing boats were made of wooden materials. Few Fiber Reinforced Plastic (FRP) fishing boats were noted during the observation. Most of the boats were 5-6 meter long, installed with 15-40 hp outboard engine and a few with long-tail engines, not equipped with any deck machineries, fish finders and radio communications. The fishing boats in Kuala Teriang operate in the zone A.

A fishingboat in Kuala Teriang
(Photo by Research Division, SEAFDEC/TD)

After the 2004 Tsunami, some of the wooden fishing boats were damaged. Almost all of the new fishing boats are now made of FRP material and equipped with outboard engines because this was convenient to obtain government technical assistance.

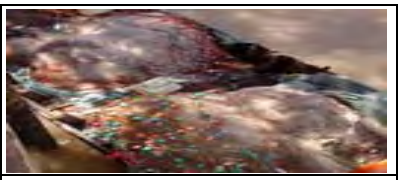
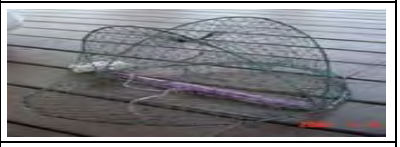
Some fishing boats at Kuala Melaka were bigger in size than at Kuala Teraing and were fitted with inboard engines. Some of the boats were equipped with deck machineries such net hauler. But since Kuala Melaka was not within the project site, only a general observation was conducted without any deeper details.

A fishingboat in Kuala Melaka
(Photo by Research Division, SEAFDEC/TD)

Fishing Gear

There were seven main fishing gears found in the project area in Kuala Teriang (**Table 1**).

Table 1. Fishing gear with corresponding descriptions

Shrimp trammel net (Pukat tika lapis*) Since the fishing ground has a muddy bottom characteristic, it is a common habitat for shrimps. Trammel net was the most dominant gillnet used by the local fishermen in the survey area. The target catch was Banana Shrimp (*Metapenaeus merguiensis*).	
Bottom gillnet (Pukat hanyut dasar laut*) There were few types of bottom gillnets found during the survey. The main target species were the Indo-pacific mackerel (*Rastellinger* spp.) and blue swimming crab (*Portunus pelagicus*).	
Drift net (Jaring hanyut permugaan air*) The most important target for drift gillnet is the Silver Pomfret (*Pampus argenteus*).	
Bottom longline (Rawai*) Bottom longline used for catching demersal fishes, e.g. grouper (Serranidae), crocker, etc., was noted during the survey. However, the number of fishermen operating the bottom longline was less than those using the gillnet.	
Crab trap (Bubu ketan*) Few fishermen used the collapsible trap for catching crab. Their target catch is the Serrated Mud Crab (*Scylla serrata*), found in the mangrove area.	
Ivory whelk lift net (Bubu siput*) Only few fishermen use 40-50 lift nets to collect the Ivory whelk (*Babylonia* spp.) due to the limited marketing. The Ivory whelk is not widely harvested by local fishermen.	
Hand line or Fish jigging (Kail mengail*) Fisherman in Kuala Teriang installed fish aggregating devices (FADs) around the gulf to provide fish shelters and means of gathering fishes. The major fishing gear used within the FADs was hand line. The dominant catches were sea bream, snapper and grouper. Some carangid could also be caught using suitable hook and line techniques.	
Trolling line (Mengeret*) Trolling line is operated around the Artificial Reefs/Fish Aggregating Devices (ARs/FADs). The dominant catches were pelagic fishes, i.e. Spanish mackerel, barracuda, bonito, etc. The present local technology was appropriate for fisherman to catch few fishes everyday.	

Conclusion and Recommendation

The LBCRM-PL Project Manager coordinated with fishing gear and fishing ground researchers for the conduct of the fishing gear survey and data collection at Kuala Teriang fishing community, Pulau Langkawi Island before the end of March 2004. The survey team reported results of the survey to the local fishers, and proposed an action plan on the introduction of fishing technique improvement. The participating local fishers made some recommendations based on results of the survey. Finally, they agreed that the proposed action plan on the introduction of fishing technique improvement should be implemented. The conceptual framework of the action plan places emphasis on the promotion of selected fishing gears, methods and improvement.

The general conceptual framework consists on four categories as follows:

1. The selected fishing gears and methods should not be in conflict with the Malaysian Fisheries Regulations;
2. The selected fishing gears and methods should be convenient for the fisheries management people in order for them to be able to control the fishing activities;
3. The selected fishing gears and methods should be similar and consistent with the local fishing gears employed in project area; and
4. The selected fishing gears and methods should be eco-friendly fishing gear to enhance effective ARs/FADs* utilization.

Based on the above four main concepts, fishing gear technologists selected seven (7) types of fishing gears listed as follows:

1. Bottom vertical longline (BVL) targeting the demersal fish resources around the FADs and ARs/FADs;
2. Collapsible crab trap targeting the blue swimming crab resources around the fishing village as well as mud crab in the mangrove area;
3. Collapsible crab trap may be used as fishing tool for the diverse responsible practices, e.g. crab bank, juvenile release, etc.
4. Squid trap targeting the cuttlefish resources in the bay around the fishing village;
5. Trolling line for cuttlefish around the FADs and ARFADs;
6. Trolling line for pelagic fish resources around the FADs and ARFADs; and
7. Fish trap targeting the demersal fish resources around the FADs and ARFADs.

The fishing trials for the Fishing Technology Improvement in Langkawi were split into two sessions. In the first session on June 2004 (Fishing Trial I), four fishing gears such as the BVL, collapsible crab trap, trolling line for pelagic fish, and Ivory whelk trap were used for the conduct of the planned sea trials and promoted to the fishermen. For the second session in December 2004 (Fishing Trial II), three fishing gears, i.e. collapsible fish trap, lobster trap and wooden squid trap were used for the conduct of the sea trials and promoted to the fishermen.

MECHANICAL TRAINING FOR FISHERS IN LANGKAWI (4-6 May 2004)

The LBCRM-PL Project Manager coordinated with Department of Fisheries Malaysia, KEN and the LKIM in Kedah State, fishers group at the project site, and SEAFDEC mechanics/researchers to conduct a mechanical training for fishermen at Kuala Teriang fishing community, Pulua Langkawi Island. The course focused on workshop arrangement, maintenance and handling procedures for engine trouble. The training also introduced the implementation of gasoline engine, engine selection for ship propulsion, and propeller selection. Handling of mechanical tools, basic measuring tools and tester used for engine repair and maintenance were also included.

Objectives

This training course was organized on 4-6 May 2004 for technical fishermen in the coastal fishery management project, to promote the setting up of local workshop and maintenance for fishing vessels with small sized engines.
This training course was also aimed at promoting the establishment of engine repairs shop for handling engine trouble in fisheries communities. As envisaged, after the training the fishermen themselves should be able to handle basic maintenance of engines, and maintain longer lasting engines with good condition and without any trouble while operating at sea. Specifically, the objectives were:

1) To train local mechanics on the management of engine workshop;
2) To train local mechanics on outboard engine repair and maintenance;
3) To train local fishermen on the technique of outboard engine daily maintenance; and
4) To discuss with fishermen and fisheries officers the plan for improvement of mechanical services.

Training schedule

First day

0900-1200	- General information on workshop set up
	- Mechanical equipment for workshop
	- Storage and arrangement of tools
1300-1600	- Introduction to gasoline engine and combustion system
	- Fuel system and appliance
	- Ignition system
	- Starting devices
	- Transmission system and propeller selection
	- Questions and answers

Second day

0900-1200	- Engine disassembly handling
	- Major important measuring parts
1300-1600	- Engine assembly
	- Engine running test
	- Trouble shooting
	- Fine tuning and adjustment
	- Questions and answers

Third day

0900-1200	- General information on gasoline engine
	- Basic maintenance procedures of outboard engine
1300-1600	- Periodic maintenance
	- Engine running test
	- Questions and answers

Training activities

Specifically, the training activity was conducted in order to:

1) Provide technical knowledge to the participants through lectures, practical, discussion and demonstration of engine workshop maintenance, including the introduction of appropriate periodical maintenance check and fine tune up of engines to prevent engine trouble while operating at sea and maintain the engine's long-life, fuel savings, good engine performance with low pollution and improved incomes;
2) Introduce the method of determining the engine parts replacement after the engine has been used for some period of time as well as handling engine operations and maintenance;
3) Impart knowledge on engine trouble shooting of various systems such as carburetor, cooling, ignition, and transmission systems;
4) Guide the participants on workshop tools arrangement and management of a local service workshop; and
5) Guide the participants in developing the lay out of new local engine workshop building construction and acquisition of the necessary workshop equipment, hand tools and facilities.

Results of the training

1) The technical fishermen gained technical knowledge on small marine engines and in the periodical handling methods for engine maintenance together with local workshop establishment with the appropriate workshop tools and facilities for engine services, and management of tools, data taking and technical data profile arrangements.
2) The fishermen should be able to handle basic engine trouble shooting, daily check and maintenance procedures for engines.

Expectations

This training course is expected to help promote in fisheries communities the establishment of engine repairs shop for handling any engine trouble. The fisherman themselves should be able to handle basic maintenance of engines and enable them to use engines longer with good conditions and without any trouble while operating at sea.




The training activities




The establishment and promotion of locally engine workshop in Langkawi

FISHING TRIAL I (14-17 June 2004)

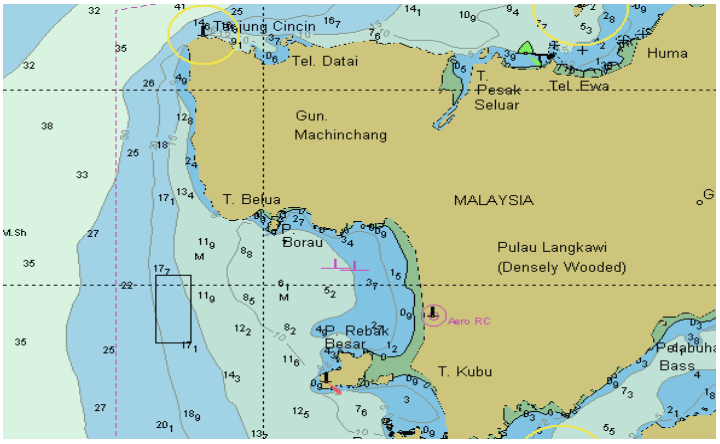
The local fishers agreed that the proposed action plan on the introduction of fishing technique improvement should be implemented. The first fishing gear trial was therefore designed to investigate the effectiveness of the selected fishing gear.

Objectives

1) To conduct fishing trials and investigate the fishing efficiency of the following fishing gears:
   a) Collapsible crab trap
   b) Bottom vertical longline (BVL)
   c) Trolling line
   d) Ivory whelk trap

Area of Operation

The fishing trail covered the area around the Artificial Reef and Fish Aggregating Devices (ARs/FADs), 3-5 nautical miles (nmi) off the coast of Kuala Teriang in the western part of the Langkawi coastal zone. The approximate depth of the area is 20-25 m while the depth around the ARs/FADs is 15-20 m and in front of the Marina Yacht Club, Pantai Kok with a depth of 5-8 m. The stations for the trials are marked as in the Map below:



Fishing trial stations in Kuala Teriang

Detailed Activities

14 June 2004 (Monday)

0900	Arrival Kuala Teriang, preparation of fishing gear and discussion with fisheries officer and fishermen group leader.
1145	Departure from Kuala Teriang for fishing ground at ARs/FADs and FADs.
1205-1240	Setting up of fishing gear: 50 collapsible crap traps, 20 Ivory whelk traps then return to Kuala Teriang
1340	Arrival in Kuala Kuala Teriang

15 June 2004 (Tuesday)

0935	Departure from Kuala Teriang for fishing ground
1005-1430	Hauling of collapsible traps and Babylonia traps, setting up of 1st BVL (50 branch lines) and 4 sets of trolling line, setting up of 2nd collapsible trap then return to Kuala Teriang
1500	Arrival at Kuala Teriang

16 June 2004 (Wednesday)

0900	Departure from Marina Yacht Club, Pantai Kok for fishing ground
0920-1330	Hauling of collapsible traps, setting up of 2nd BVL (50 branch lines), setting up of 3rd collapsible trap then return to Pantai Kok
1330-1400	Arrival at Marina Yacht Club, Pantai Kok

17 June 2004 (Thursday)

1000	Departure from Marina Yacht Club, Pantai Kok for fishing ground
1015-1100	Hauling of collapsible traps then return to Pantai Kok
1100-1115	Arrival at Marina Yacht Club, Pantai Kok

Results and Conclusion

Collapsible crab trap

Three fishing operations were deployed overnight during the sea trial operation. The fishing ground for the first and second operations were set around the ARs/FADs. The third operation was set in front of the break-wave of Marina Yacht Club, Pantai Kok, in order to compare the sizes of the crabs between near shore and around the ARs/FADs. The number of traps deployed on every operation was 50 traps. Indo-Pacific mackerels were used as bait for the traps.

The total volume of swimming crabs caught during the three (3) operations was 14.86 kg consisting of 76 pcs of crabs. The total percentage of the swimming crab caught compared with number of traps deployed was 50.67 %. The highest catch was in station No.2 at 7.92 kg/38 individual crabs followed by station No.1 with 5.1 kg/26 individual crabs, and station No.3 with 1.84 kg/12 individual crabs. The average size of the crabs at the ARs/FADs area was about 200 g/crab and at station No.3 which represented the near shore fishing ground was about 150 g/crab. Considering the fishing ground and the size of the crabs, responsible researchers recommended to operate the collapsible crab traps in the area around the ARs/FADs since the abundance and size of swimming crabs near the shore area was less and smaller than those around the ARs/FADs.

The second dominant species was Terapon (*Terapon* spp.). Ninety individual Terapons with a total weight of 3.9 kg were caught during the three (3) operations. The first operation had the highest catch (3.3 kg with 73 individual fishes). However, since Terapons were classified as trash fish it is necessary to develop an appropriate method for filtering out the fish from the trap. So far, the responsible manner adopted was releasing the fish back to the sea during the hauling operation otherwise using the fish as baits for the traps.

The other commercial catch is grouper (*Epinephelus* spp.) Forty three groupers with a total weight of 6.33 kg were caught during the three fishing operations. The average size of the grouper was 147 g, which comprised the third major catch. Most of groupers were alive during the hauling operation and most of them were delivered to fish cages for culture. Ivory whelk (*Babylonia areolatus*) was an important incidental catch, discovered only during the third operation in front of the Marina Yacht Club, Pantai Kok. Collapsible trap has shown to be efficient for collecting the Ivory whelk.

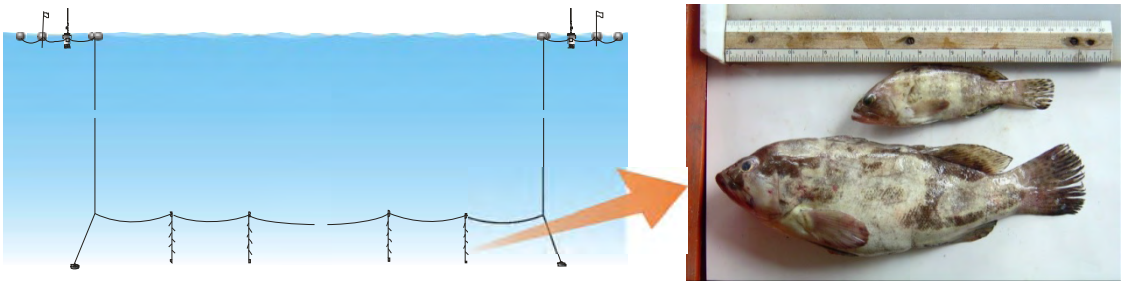
Thus, it could be concluded that the collapsible trap trial was very successful. The target resources, i.e. swimming crabs and grouper showed high catch rate. However, investigation of the trap selectivity for other marine animals such as trash fishes, Ivory whelk, etc. should be done before extending the technology to the local fishermen. The following management issues should be considered before extending the technology to local fishermen:

1) Investigate crab abundance in the fishing grounds
2) Control the proper number of traps in fishing grounds
3) Monitor the number of crab landing in order to find out the indication of abundance
4 Control the landing size of crabs in order to reduce recruitment and over-fishing
5) Increase the value of the catch by live preservation techniques or live storage methods

Collapsible crab trap trial and catches in Langkawi
(Photo by Research Division, SEAFDEC/TD)

Bottom Vertical Longline

The problem in setting up of the BVL around the ARs/FADs was the lack of an echo sounder. In order to prevent entangling of the BVL with the ARs/FADs, the mainline was set out of the artificial reef area in the fishing ground as done by local fishermen with the ordinary bottom longline. The catch was successful during the fishing trial, with the highest catch in the first operation. Croaker was the dominant catch with 6.8 kg/46 fishes. Other fishes caught were the Starry emperor fish and Threadfin bream. It should be mentioned that the dominant catch was not the rocky fish but remained with their schooling behavior. The hooking rate by the 1st operation was satisfactory, about 30 fishes/100 hooks.



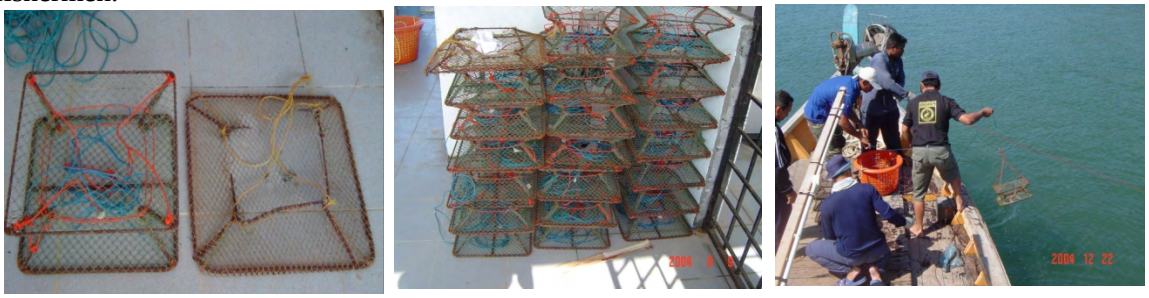
Bottom Vertical Longline construction and catches
(Illustrated and Photo by Research Division, SEAFDEC/TD)

The second operation was deployed crossing the artificial reef area, but it was observed that the bait was eaten by the smaller fishes. Majority of the catch could not be identified because of the less number of catches, 12 individual fishes. The hooking rate in the second operation was unsatisfactory, less than 10 fishes/100 hooks. The BVL fishing operation at the fishing ground of Kuala Langkawi showed different fishing potential because the operation could be conducted even in the area without rocky substrate, showing that the fishing ground has very rich resources.

Ivory whelk lift net and ivory whelk trap

Operating the ivory whelk lift net and ivory whelk trap was not successful during the first trial because the researchers selected the wrong fishing ground. It was only during the

conduct of the last collapsible trap operation that the researchers were able to recognize the Ivory whelk fishing ground which was located in front of the break-wave of Marina Yacht Club, Pantai Kok. The fishing ground for the ivory whelk was in a very particular place as suggested by the local fishermen.



Ivory whelk lift net and ivory whelk trap and fishing trial
(Photo by Research Division, SEAFDEC/TD)

Trolling line

Trial operation of the trolling line in Langkawi was aimed to test the artificial lure. The result of the trial around the ARs/FADs was not successful because the types of artificial baits were not able to catch the fishes. From the previous trips during the fishing gear survey, trolling and hand lining made use of live baits. This was applicable and the local fishing techniques were found appropriate for fishing in the ARs/FADs area.

Trolling line accessories
(Photo by Research Division, SEAFDEC/TD)

FISHING TRIAL II (20-23 December 2004)

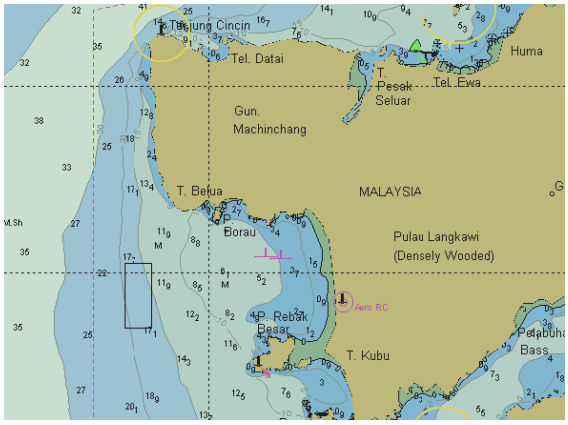
Because there were various kinds of fishing gear planned to be tried in Langkawi fishing ground, the first fishing trial could not be completely investigated. After the local fishers agreed that the proposed action plan on the introduction of fishing technique improvement, the second fishing gear trial was designed to investigate the effectiveness of remaining fishing gear.

Objectives

1) To conduct fishing trials and investigate the fishing efficiency of the following fishing gears:
   a) Collapsible fish trap
   b) Lobster trap
   c) Wooden squid trap
   d) Ivory whelk Trap
2) To compare the fishing efficiency of various types of collapsible crab traps.

Area of Operation

The Fishing trial covered the area around the Artificial Reefs and Fish Aggregating Devices (ARs/FADs), 3-5 nmi off the coast of Kuala Teriang, western part of the Langkawi coastal zone. The approximate depth of the area is 20-25 m, the depth around the ARs/FADs was 15-20 m and in front of the Marina Yacht Club, Pantai Kok, the depth was 5-8 meters. The stations were marked as shown in the Map bellow:



Detailed Activities

20 December 2004 (Monday)

0930	Departure from Marina Yacht Club, Pantai Kok for fishing ground
1000-1500	Fishing trial around ARs/FADs off Kuala Teriang, i.e. setting up of 52 collapsible crab traps, 5 collapsible fish traps, 10 squid traps, and 20 Ivory whelk traps
1630	Arrival at Kuala Teriang

21 December 2004 (Tuesday)

0930	Departure from Marina Yacht Club, Pantai Kok for fishing ground
1000-1400	Hauling of 1st collapsible traps and resetting for 2nd operation, hauling of squid traps (found that 6 squid traps were lost), hauling of Ivory whelk traps, and setting up for 2nd operation.
1400	Arrival at Kuala Teriang

22 December 2004 (Wednesday)

0900	Departure from Marina Yacht Club, Pantai Kok for fishing ground
0920-1330	Hauling of 2nd collapsible trap and setting up of 3rd operation, hauling of 2 squid traps (found 8 squid traps were lost), hauling of 5 fish traps and then resetting, hauling of 20 Ivory whelk trap, and resetting for 2nd operation
1400	Arrival at Marina Yacht Club, Pantai Kok

23 December 2004 (Thursday)

0900	Departure from Marina Yacht Club, Pantai Kok for fishing ground
0930-1200	Hauling of collapsible crab traps, hauling of remaining 2 squid traps, hauling of 5 fish traps, hauling of 20 Ivory whelk traps
1230	Arrival at Marina Yacht Club, Pantai Kok

Results and Conclusion

Collapsible Fish trap

Referring to the first fishing trial of Bottom vertical longline, the potential of demersal fish resources particularly grouper and Jew fish around the ARs/FADs showed efficiency for developing a steady supply for the fish markets and cage culture facilities around Langkawi and adjacent areas. Fishing gear technologists therefore considered designing and constructing a local fish trap the size and material of which should not create burden for the fishers to carry to their fishing boats. The design of such collapsible fish trap was based on the combined design of the collapsible crab traps and red sea bream fish traps which are widely used by Thai fisherman.

The frame of trap is made of 8.0 mm iron bar. The trap wall is made of polyethylene net with 380d/15 twine size. The trap's height is 80 cm, width is 70 cm and length is 120 cm with 2 circle shape entrances. The trap is meant to be collapsible in order to maximize the number of traps that can be loaded in a fishing boat. Approximately, about 20 traps could be carried by a fishing boat in one trip. Baits are used to attract the target fish. During the fishing trial, five collapsible fish traps were set up over-night and the catch result was very satisfactory. The dominant target species caught by the fish traps was grouper. The average catch of grouper per trap per hauling time was 0.51 kg/trap/hauling with an average size of 221 g/individual grouper. Swimming crabs were also caught as by-catch. The total weight of the swimming crabs was 4.88 kg and average swimming crab per trap per hauling time was 0.49 kg/trap/hauling with an average size of 257 g/individual crab, which was bigger than the average size of crabs caught by the collapsible crab trap. Based on the preliminary catch report, it can be concluded that the collapsible fish trap is efficient for promotion to the fishermen in Langkawi.

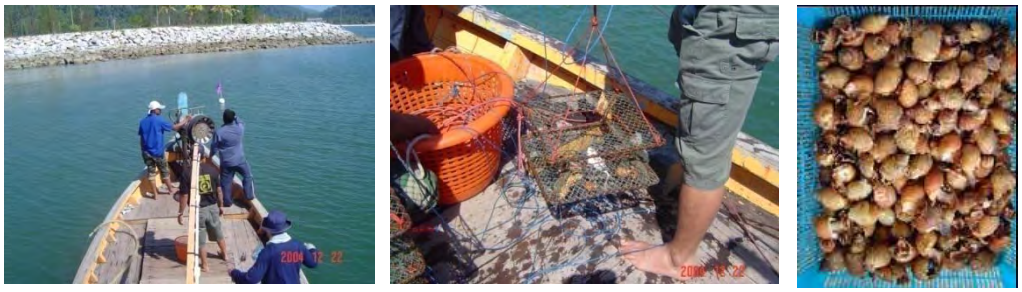
The first operation for this fishing trial was on 20-22 December 2004 and the second operation on 22-23 December 2004. The different soaking interval has been set between operation No.1 and 2. However, there was not much difference in catch between the soaking time of 48 hours and 24 hours. It can be preliminary concluded that the collapsible fish trap could be set over-night only and the fishermen could haul the catch every day.

Collapsible fish trap trial and catches in Langkawi
(Photo by Research Division, SEAFDEC/TD)

Ivory whelk trap

The Ivory whelk trap was targeted to collect the Ivory whelk *(Babylonia aerolatus).* The design of the trap is uncollapsible, which was developed from the Ivory whelk small lift net. The top side of the trap is left open for convenience in removing the Ivory whelk, while the non-targeted fishes and crabs can easily escape from the Babylonia trap. The only problem with the Ivory whelk is marketing since it is not a favorite shell in Langkawi, while there are no export industries operating in the island at present.

Since the first fishing trial in June 2004, the operation of Ivory whelk trap had not been successful because of some misunderstandings on the location of the appropriate fishing ground. On this fishing trial, three operations were conducted and the result was not different to the previous trips in June and August using the collapsible crab trap. The average size of the Ivory whelk was 40 g/trap and a catching rate of 10.1 kg/100 traps (373 ind/100 traps). However, it was still deemed necessary to investigate the abundance of Ivory whelk before extending the technology to the local fishermen because only one fishing ground was discovered at present.



Fishing ground, out of Marina Bay, Pantai Kok, Ivory whelk trap fishing trial and the catches (Photo by Research Division, SEAFDEC/TD)

Squid trap

The squid trap targets the big-finned reef squid *(Sepioteutis lessoniana).* The trap, which was designed by Thai local fisherman, is uncollapsible. Ten squid traps were set during the sea trial and two traps were retrieved back after completing the last operations. The loss of 8 squid traps during the operations was caused by the weight of trap sinker which was too light. Since some trawlers came close to the ARs/FADs area at the night, these must have possibly caused some traps to be swept away.

Three squids were caught after soaking the traps for one night, all of then big-finned reef squid caught by only one trap. The total weight of the three squids was 920 g with an average weight of 307g/squid. The result of the squid trap fishing trial was unclear because almost of the squid traps disappeared from their original setting positions. However, from the observation of the first hauling, squid traps had shown efficiency to catch the three big-finned reef squids. It is therefore possible to harvest squids using the squid trap in the fishing ground around Langkawi Island.

Squid traps and catch, big-finned reef squid (Photo by Research Division, SEAFDEC/TD)

An experiment was conducted to compare the fishing efficiency of the various types of collapsible trap designs. Three (3) types of collapsible traps, namely: 20 rectangular collapsible crab traps, 20 semi cylindrical crab traps and 12 local Malaysian traps, were set during the fishing experiments. All operations were deployed overnight around the ARs/FADs. The total catch from the three operations was 21.15 kg. The dominant species was the swimming crabs (63 pcs weighing 13.22 kg). The average weight of the crab was 220 g/crab. Almost all were female swimming crabs as indicated by the out-carapace egg stage. It should be considered that the spawning season of swimming crab around Langkawi Island is during the northeast monsoon.

During the first operation, there was a trouble in sorting the catch. All catches by type of collapsible trap were mixed on board without sorting so that it was not possible to separate the catches by trap. Thus, the comparison of the three types of traps was calculated from the catch data during the second and third operations. The catch result from the second operation had the best catch with 30 swimming crabs weighing 6.26 kg. The total weight of the swimming crabs form the 3 operations was 13.22 kg with an average weight of 0.08 kg/trap. The total number of swimming crabs was 63 crabs and the average number of swimming crabs was 0.4 crab/trap (2 crabs/5 traps).



Three types of collapsible fish traps tried in Langkawi Island
(Photo by Research Division, SEAFDEC/TD)

The catching performance of the SEAFDEC-designed collapsible crab traps was 180 g/trap and 75 ind/100 traps, while the catching performance for the local collapsible crab trap was 30 g/trap (10 ind/100 traps). The lobster traps were not able to catch any lobster but in terms of the catching performance of crab, the rate was 710 g/trap and 30 ind/100 traps. From the preliminary report, it appeared that the rectangular collapsible crab trap had the highest efficiency compared with the other two designs. The semi cylindrical and the local Malaysian trap designs showed closely similar average catch in terms of weight/trap.

TRAINING ACTIVITY ON FISHING TECHNOLOGY AND PRACTICE (9-11 August 2004)

After the selected fishing gears were found applicable during the conduct of the fishing trials, practical on-site training on fishing technology was designed for local fishers. The training on fishing technology is a sub-activity of the Fishing Gear Improvement in Langkawi under the LCBFM-PL.

Objectives

1) To conduct practical training for local fishers on fishing gear construction. This practical training aimed to make the local fishermen understand the construction of fishing gears and be able to construct and repair the gears by themselves. Aside from knowing the fishing gear construction technique, fishing selectivity features and responsible fishing methods are also introduced to the fishermen. The selected fishing gears are the *Bottom Vertical Longline* and the *Collapsible trap*

2) To conduct practical training for local fishers on fishing operation as part of the training program which aims to evaluate the fishing efficiency of the fishing gears. The fishermen's participation is enhanced through actual practice of the fishing operations for 3 types of fishing gears, namely: *Bottom Vertical Longline, Collapsible trap*, and *Ivory whelk trap;* and

3) To investigate the fishing ground for the Ivory whelk trap in front of Marina Yacht Club, Pantai Kok.

Area of Operation

The fishing gear construction training sessions were carried out at the office of KEN (Fisheries Cooperative) in Kuala Terieng. The fishing operations were conducted around the ARs/FADs, about 3-5 nmi from the Kuala Teriang. The approximate depth is 20-25 m, while the depth around the ARs/FADs is 15 to 20 meters. The catching efficiency of Ivory whelk trap was re-evaluated and its fishing ground was investigated in front of Marina Bay, Pantai Kok with a depth of 5 to 8 meters.

Detailed Activities

9 August 2004 (Monday)

0930	Arrival in Kuala Teriang, preparation of training facilities and training materials
1445	Departure from Pantai Kok for fishing ground at ARs/FADs
1445-1530	Setting up of fishing gears, i.e. 50 collapsible crap traps and 20 Ivory whelk traps then return to Pantai Kok
1600	Arrival at Pantai Kok

10 August 2004 (Tuesday)

0900	Arrival of all training instructors at Kuala Teriang
1100-1600	Departure of instructor and group A participants from Pantai Kok for fishing station. 20 Babylonia traps were set first in front of break-wave out of Marina Bay, Pantai Kok. First hauling of collapsible crab trap operation (24 traps were lost probably due to the encroachment of some bottom trawlers near the ARs/FADs). The second set of collapsible crab traps were put in operation.
1130-1200	Six participants under group B attend the lectures on Bottom vertical longline and Collapsible trap. Appointment for afternoon practicing set.
1445-1600	Continuation of the practice on collapsible crab trap construction

11 August 2004 (Wednesday)

0900	Arrival of all instructors at Kuala Teriang
1015-1200	Four participants in Group A attend the lectures and practicals on collapsible crab trap construction
1130-1330	Participants attend the shipboard training while instructors leave for Pantai Kok for the hauling operation of the deployed fishing gears
1430-1600	Eight participants attend the lectures and practice on the collapsible trap construction
1730-1900	Discussion on the training and activities concerning the trip

Results and Discussion

1) The training had the full cooperation of the Department of Fisheries Malaysia, specifically providing the hydro-acoustic equipment, i.e. echo sounder for detecting and recording the bottom topography around the ARs/FADs and Global Positioning Satellite (GPS) for recording the position of ARs/FADs. Two experts from the Fisheries Training Institute (FTI) of Terangganu also closely cooperated with the SEAFDEC staff during conduct the training activity.
2) Two unexpected incidents occurred during the training on fishing technology for fishermen in Kuala Teriang.
   2.1 A member of the fishermen group in the village passed away on 9 August 2004, and almost all fishers attended his funeral. Few fishermen came late for the training in the morning. Furthermore, in the afternoon some fishermen left the class early so that the training could not cover all the planned subject matters. Thus, the training was not able to achieve the expected goals.
   2.2 Due to the shrimp boom during the period of the training activity, almost all participants preferred to go shrimp fishing than attend the training. Some of the fisherman left the morning session and some unlisted fishermen attended the afternoon practice session. This made it very difficult to make all fishermen understand the details of the training program. The same problem also occurred during the fishing operation session. Some fishermen who attended the fishing gear construction did not participate in the fishing operation session while some fishermen who participated the fishing operation session did not attend the session on fishing gear construction.
   2.3 On the second day, no fisherman attended the fishing operation session because most of them left the village for shrimp fishing and since the Malaysian coordinator and instructor did not expect them to return on time the training activities had to be cancelled.
3) The researchers recommended that a more suitable training location be arranged because the office of KEN was located in the fishermen's village and the fishers could leave the class anytime they want to.
4) The training methodology should be carefully selected in order to capture the interest of the fishermen.
5) Because of the unexpected problems combined with the unsuitable training location, the fisheries training program in Langkawi was not 100% successful. The improvement of the training method should take into consideration an understanding of the living and daily activities of the fishermen.
6) The evaluation of the training for fishermen in Langkawi based on the instructors' observation is shown in the table below:

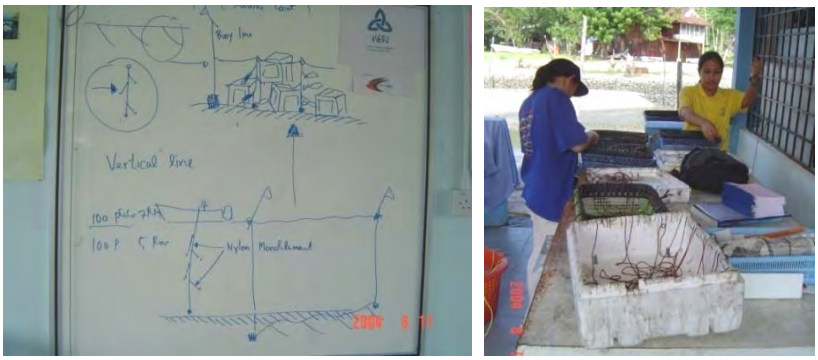
Collapsible crab trap

1) Fishermen participants were able to construct, repair collapsible crab traps and conduct the fishing operations by themselves.
2) The fishermen indicated their interest to further try the collapsible crab trap fishing operation and requested SEAFDEC to arrange for the traps at the fishermen‘s expense.
3) Due to the limitation of practical time, the construction of collapsible trap frame could not be practiced. Although the Instructor prepared some frames from SEAFDEC/TD, the fishermen requested the SEAFDEC instructors to teach them how to make the collapsible trap frame. The Instructors recommended to the local fishermen to copy the frame of the traps by themselves.

Practical training on collapsible crab trap construction and operation
(Photo by Research Division, SEAFDEC/TD)

Bottom vertical longline

1) Bottom vertical longline was not strengthened during the practical session because there was not much time available for the practical construction. Fishing operation was conducted only once because the second operation had no fisherman participating, and the fishermen had already acquired skills and experience for bottom longline fishing operation.
2) Marine catfish was the dominant species for the BVL during this trip. Although it was not the main target for this fishing gear, it confirmed the efficiency of BVL in Langkawi fishing ground. However, it was also noted that the BVL design needs modification for fishing operations around the ARs/FADs.



Practical training on Bottom Vertical Longline construction
(Photo by Research Division, SEAFDEC/TD)

Ivory whelk trap

1) Fishing operation of Ivory whelk trap had been practiced during the training for fishers because the construction of Ivory whelk trap is not complicated. The fishermen could easily copy the prototype of an Ivory whelk trap.
2) It was confirmed that the Ivory whelk fishing ground has been discovered off the break-wave of Pantai Kok. However, the abundance of the Ivory whelk should be investigated and monitored in a longer term. It was also essential to search for other Ivory whelk fishing grounds if the fishers would like to harvest this resource in the future.
3) Marketing of Ivory whelk was a major problem for the promotion of harvesting this resource.

List of Instructors

1) Dr.Seiji Etoh from SEAFDEC/TD (Chief of Project and Program Consultant)
2) Issara Chanrachkij from SEAFDEC/TD
3) Pratakphol Prajakjitt from SEAFDEC/TD
4) Mr. Hussin bin Abdul Rahman from Fisheries Training Institute (FTI), Terengganu
5) Mr. Mustafa bin Bidin from Fisheries Training Institute (FTI), Terengganu
6) Ms. Toko Nakajima from SEAFDEC/TD

List of Participants

1) Mr. Mansor bin Ali
2) Mr. Archad bin Ramli
3) Mr. Anura bin Taib
4) Mr. Mohamad Zul bin Putih
5) Mr. Ahmad bin Hamid
6) Mr. Osman bin Anustafa
7) Mr. Azman bin Chepa
8) Mr. Saad Sirun
9) Mr. Che Won Sood
10) Mr. Roz Ismail
11) Mr. Ramli Hassin
12) Mr. Roslizan Razali
13) Mr. Hassin Ismail
14) Mr. Chepa Bakar
15) Mr. Yusuf Saleh

TRAINING FIBER REINFORCED PLASTIC (FRP) WORKS (23-26 May 2005)

A serious disaster in Southeast Asia and South Asia on 26 December 2004, the Tsunami that occurred along the Coast of Andaman Sea, generated by an earthquake around Aceh in the northern part of Sumatera Island of Indonesia, led to a massive tidal wave. The powerful tidal wave destroyed infrastructures, fishing villages and fishing facilities along the shores from Indonesia to the coasts of Africa. Malaysia was one of the countries directly affected by that Tsunami and according to the information released by the Department of Fisheries Malaysia, Kuala Teriang was one of the fishing villages in Langkawi Island directly affected by the Tsunami, where houses, jetties, fishing boats including fishing gears had been badly damaged.

SEAFDEC as an intergovernmental organization established in Southeast Asia, is responsible for the promotion of sustainable fisheries in the region. Based on its technical competence in various disciplines of fisheries, SEAFDEC over the past almost 40 years, has played a significant role in fisheries development in the region. One of the activities of SEAFDEC mobilized by the SEAFDEC Training Department is on ship construction and marine engineering. This was part of elements promoted during the rehabilitation process of the concerned Tsunami-damaged area in Kuala Teriang.

With this reason and while responding to the request from the Kuala Terieng fishermen, SEAFDEC collaborated with the DOF Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, in the conduct of a training program on the use of Fiber Reinforced Plastic (FRP) materials for ship parts repair, for the local fishermen in the affected area. The training program is part of the sub-activity Fishing Gear Technology Improvement under the ICFM-PL project.

Objectives

To develop human capacity in repairing minor damages to wooden fishing boats during the tsunami wave and the possibility of replacing the wooden parts with FRP materials.

Expected outcome of the activity

1) The fishermen gaining basic knowledge and techniques in fiberglass materials for repairing minor damages to wooden boats.
2) The fishermen resuming their fishing activities after completion of the repairs to their fishing boats.

Training contents

23 May 2005

Morning session

Thirteen (13) participants attended the meeting for the training course arrangements. Ms. Sabidah informed the meeting on the objectives of SEAFDEC's mission in Langkawi, which was to train fishermen on FRP for repairing the fishermen's boats. The arrangements included the training period (0900 to 1600 hrs from 24 to 26 May 2005), program and regulations on allowance payment. The participating fishermen collaborated with organizers in preparing two old fishing boats as training tools.

Afternoon session

SEAFDEC team prepared some equipment and materials, e.g. wood, plywood, saw, electric hand drill, electric grinding machine, roller, etc.

24 May 2005

Morning session

Training activities started at 0900 hrs at the meeting room of KEN's office, where Ms. Sabidah informed the participants on the objective of the training course, that is the knowledge gained from the training would help the fishermen repair some parts of their fishing boats by themselves, and to some extent to make some parts of a fishing boat, e.g., roof of engine, seat in boat, etc.

Mr. Sutthipong lectured on the following:

1) What is fiberglass and what it is made of,
2) Benefits and advantages of using fiberglass,
3) Samples of fiberglass products,
4) Materials of fiberglass,
5) Methods and ratio of fiberglass,
6) Calculation of FRP materials, and
7) Pre procedure before boat repair

Afternoon session

All participants moved from the lecture room to practical session in the camp. There were two boats for repair and for making fiberglass parts. One boat was repaired and its cabin constructed, and the other boat had also its cabin constructed. Training on the repair of the first boat started by checking the damaged areas which were then repaired, the second step took off by repairing the damages parts, and the third step was to copy the old parts of boat using new plywood as materials. The three steps took too long to complete so that the training could not be finished within one day. The repair of the second fishing boat was started by cleaning the old color around the boat, and preparing the plywood for the cabin.

25 May 2005

Morning session

The participants continued to prepare new parts of the boat using plywood, a step which was difficult and took long time to finish because this would make use of a carpenter's knowledge.

Afternoon session

When the replacement of old parts by new parts using plywood was finished, Mr. Sutthipong explained on the value of fiberglass used per surface area. The first layer of fiberglass would be applied, after the structure of the boat was finished. The second step would lay up the glass fiber and cover with polyester resin again. All work should be left to dry.

26 May 2005

After all parts had dried up, work on the surface was made by electric drill for the third layer coating, which should be applied two or three times to make the surface smooth.

Conclusion and recommendations

1) The fishermen understood the area or parts of the boat to be repaired and how to replace such area or parts.
2) The fishermen understood the four (4) major steps of fiberglass works.
3) The fishermen requested second training on construction of fiberglass boats for the members of KEN. However, the materials from Thailand was not enough for this training because the first plan was intended for demonstration only, such as making some parts of the boat or ice box but the fishermen wanted to make cabins for the two boat, so much of the materials would be used.
4) The instructors for this training were not sufficient to take care of all participants.

Training coordinators

Ms. Sabidah BT Saleh, Extension Officer, DOF, Langkawi

Ms. Sumitra Ruangsivakul, Head a.i., Socio-economic Section, Research Division, SEAFDEC/TD

Instructors

Mr. Sutthipong Tanasarnsakorn: Head, Marine Engineering Section, SEAFDEC/TD

Mr. Thaweesak Thimkrup: Instructor, Marine Engineering Section, SEAFDEC/TD

Participants

The beneficiaries who are fishermen in the project area**:**

Mr. Ismail Jaman	Batu Ara
Mr. Dali Murad	Kg. Ranggut
Mr. Hashim Ismail	Kuala Teriang
Mr. Roslah Othman	Batu Ara
Mr. Saad Siran	Batu Ara
Mr. Hj. Pazil Din	Kuala Malaka
Mr. Musa Ahmad	Kg. Ranggut
Mr. Lazim Hashim	Kg. Paya
Mr. Osman Awang	Kuala Teriang
Mr. Baharam Sharif	Kg. Ranggut
Mr. Rozi Ismail	Kg. Ranggut
Mr. Ismail Taib	Kuala Teriang
Mr. Musa Taib	Kg. Ranggut

CONCLUSION OF THE PROJECT ACTIVITIES ON FISHING TECHNOLOGY IMPROVEMENT IN LANGKAWI ON 18 NOVEMBER 2005

The workshop on Fishing Gear Improvement in Langkawi was held at the Aquaculture Project Office Meeting Room, Langkawi Fisheries Office on 18 November 2005. The workshop was aimed to review the previous activities and seek for solutions to the problems encountered during the implementation of the various sub-activities such as introducing fishing gear and fishing operation as well as arrangements for the future programs required by the local fisherman in project area. The following contains the report of workshop including the outcomes of the discussions with the fishermen and local fisheries officers.

Details of discussion

The Chairman of Meeting, Mr. Sei Etoh, expressed his gratitude to all local fishermen and the Malaysian fisheries officers who came and welcomed them to the meeting. He briefly presented objectives of the meeting i.e., to review the work on fishing gear technology improvement in Langkawi, to analyze the problems in implementing the four introduced fishing gears and operations, and to discuss the plans for 2006. The background of the *Fishing gear improvement in Langkawi* activity was reviewed as well.

The conclusion of the activities conducted under the Fishing Gear Improvement in Langkawi included the following:

1) Fishing Gear Improvement.
   1.1) The purpose of the activity on materials improvement was to look for appropriate materials that could be used for a longer time.

   Progress: Fishing gear materials, e.g. Non-rusty hook, Ethylene Vinyl Acetate (EVA) float for gillnet are not available in domestic fishing stores. Such materials had to be ordered from foreign countries such as Thailand, Vietnam, Taiwan and Korea. The process therefore, was difficult to conduct.

   1.2) Finding out new sources of materials supply for the fisher groups under the cooperative mechanism.

   Progress: The activities involved the local fishing stores in order that the source of the low price of nets could be facilitated by ordering the materials from net making factories in Thailand. This needed further agreement from the local fishermen.

   1.3) Improving the fishing gear storage in order to extend the life span of the gear.

   Progress: Not implemented because fisherman had proper storage of their fishing gear.

2) Based on the results of the fishing gear survey in the project area, and the fishing trials I and II, fishing gears had been selected for the fishing trials as shown below:

1)	Bottom vertical longline (BVL)	Done/satisfactory
2)	Collapsible crab trap	Done/satisfactory
3)	Collapsible Fish trap	Done/satisfactory
4)	Ivory whelk Trap	Done/satisfactory
5)	Trolling line for pelagic fish	Done/satisfactory
6)	Squid trap	Done/incomplete
7)	Trolling line for squid	Not tried because of lack of experts

3) Improvement on deck machineries and installations

   Progress: Local hauling devices for gillnet was found suitable for large inboard gill net fishing boats. The introduced new devices for small-scale fishing boats, however, should be imported from foreign countries because most of boats were outboard equipped, which is not proper for long term investment.

4) Improvement on mechanical techniques

   Progress: Practical training on mechanical targeting the outboard engine maintenance was conducted with the collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, and SEAFDEC/TD marine engineers.

5) Improvement on Fiber-Reinforcement Plastic (FRP)

   Progress: Practical training was conducted with the collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, and SEAFDEC/TD marine engineers. The local fishermen had requested the chairman for practical training on FRP fishing boat construction.

6) Improvement on fish handling and preservation techniques

   Progress: SEAFDEC/TD promoted the use of fish containers on-board fishing boats in order that the fishers could improve the quality of their catch before landing.

After the meeting, the conclusion related to the activity on Fishing Gear Improvement in Langkawi could be described as follows:

Collapsible crab trap

Problems/Constraints	Suggested Solutions
1) Fishermen were concerned that the bottom trawl fishing activities in their fishing ground might damage the collapsible crab traps	1) Zoning arrangement shall be introduced in 2006. The zoning policy can prevent the fishing activity conflict between bottom trawl fishing and the fishermen in the concerned zone.
2) The investment needs certain amount of money. The fishermen requested SEAFDEC to support some fishing gears.	2) No comment from SEAFDEC side on the subsidies in terms of fishing gears and accessories.
3) The introduced fishing gears may disturb the drifting nets.	3.1) Fishermen did not consider this as a serious problem however the collapsible crab trap could be possibly set only in the daytime. 3.2) Fishing gear can operate close to the ARs/FADs to prevent any disturbance with the drifting nets.

Bottom vertical longline

Problems/Constraints	Suggested Solutions
1) Fishing ground is very limited corresponding to the several ARs/FADs.	1) The fishermen suggested that the operation of BVL could be implemented after the 10 ARs/FADs are installed in 2006. 2) BVL should be promoted as it showed fishing efficiency by catching some demersal fishes on the flat bottom topography in the fishing ground out off the ARs/FADs.

Ivory whelk Trap

Problems/Constraints	Suggested Solutions
1) No market	1) SEAFDEC was asked to establish a program on marketing promotion.
2) Specific and limitation in terms of number of fishing grounds	2) Investigate more fishing grounds in order to sustain the catch in the future.

Squid trap

Problems/Constraints	Suggested Solutions
1) Fishermen were concerned on possible disturbance caused by the drifting net.	1.1) No discussion on the possible solution. 1.2) Fishing gear can be operated close to the ARs/FADs to prevent any disturbance with the drifting net.

Collapsible fish trap

Problems/Constraints	Suggested Solutions
1) Fish traps could be stolen by other fishermen.	1) No discussion on the possible solution.
2) Fishermen were concerned that bottom trawl fishing activities in their fishing ground may damage the collapsible fish traps.	2) Zoning arrangement shall be introduced in 2006. The zoning policy can prevent any fishing activity conflict between bottom trawl fishing and the fisherman in the concerned zone.
3) Fishing gear may disturb the drifting net and bottom gillnet in coral reef area.	3.1) Fishing gear can operate close to the ARs/FADs to prevent any disturbance with drifting net. 3.2) Limit the fishing ground of trap within the area of the Kuala Teriang ARsFADs.
4) Cost of fishing gear construction is high. The fishermen requested SEAFDEC to support some fishing gears.	4) No comments from SEAFDEC side on the discussion on subsidiaries in terms of fishing gear and accessories.

Regarding the future plan for 2006, the meeting discussed and concluded to conduct activities, the details of which appear in the following table:

Items	Results of Discussion
1) Improvement of Mechanical technique	The Fishermen agreed to conduct training on marine outboard engine. The training shall be conducted by requesting technical assistance from the Fisheries Development Center in Penang, Malaysia. SEAFDEC shall take the responsibility of paying the allowances for the fishermen participants, lunch as well as coffee break. The Fisheries Development Center of Penang shall be responsible for the transportation costs, accommodation expenses and allowances of instructors. The training methodology shall be detailed during the further discussions.
2) Improvement of fish handling and preservation techniques	Activities on the improvement of fish handling and preservation techniques have been disagreed because
1.1) Mobile freezing unit and basic knowledge on refrigerator system	1) The fishermen commented that they were not interested in the mobile freezing unit because it is too big for their vessels and ice box is proper for their land preservation.
1.2) Mobile air pump unit for live marine catches	2) The fishermen have already invented air pump for live marine catches
3) Training on safety for small scale fishing boats	The fishermen agreed with the training activity. The training shall be conducted by requesting technical assistance from IPN, Terrenganu. Training place and methodology shall be detailed during the further discussions.
4) Responsible fishing approach by using selectivity fishing gear i.e., introduction of shrimp bottom drift gillnet for reducing by-catch from shrimp fishing by trammel net	1) The fishermen showed interest in the shrimp bottom drift gillnet and a fishing gear technologist shall prepare the necessary fishing gear for trial next year.
5) Rehabilitation of mangrove area in the project site	Mr. Etoh had already planned the activity on the rehabilitation of mangrove area in the project site in 2006.

List of participants at the fishermen's workshop

SEAFDEC/TD
1. Mr. Sei Etoh
2. Mrs. Sumitra Ruangsivakul
3. Mrs. Penchan Laongmanee
4. Mr. Isara Chanrachkij
5. Ms. Saivason Klinsukhon

DOF, Malaysia
1. Mr. A. Krishnasamy, DOF, Kuala Lumpur
2. Mr. Dzulkifli b. Husain, IPM
3. Mr. Choong Kah Tung, DOF, Pulau Penang
4. Mrs. Sabidah Saleh, DOF, Langkawi

Fishermen
1. Mr. Rozi Ismail
2. Mr. Azman Chepa
3. Mr. Roslah Othman
4. Mr. Hashim Ismail
5. Mr. ABD Halim Hussain
6. Padzil Bin Din
7. Xansor Bin Xnan
8. Osman Bin Itan
9. Murai Bin Osman

FINAL DISCUSSION ON FISHING TECHNOLOGY IMPROVEMENT IN LANGKAWI

Since the first activities on fishing gear improvement in Langkawi had been approved within the *Locally Based Coastal resources Management – Palau Langkawi (LCBRM-PL)*, fishing gear experts from the Department of Fisheries Malaysia and SEAFDEC/TD had collaborated to carry out diverse activities for the purpose of enhancing the fishermen skills and experience on various fishing technologies, e.g., FRP technique, outboard engine and fishing practices. The first sub-activity had been carried out from March 2004 to May 2005. The final project discussion related to the fishing technology improvement concluded as follows:

1) According to the catch results, the marine resources in Langkawi, i.e. Banana shrimp, swimming crab and grouper, appeared abundant. Fishing gears, e.g. Trammel net, drifting gillnet, bottom gillnet were used with impressive catching efficiency. However, such kinds of gears are limited in terms of their selectivity features. In order to sustain the long-term fisheries resources, stock assessment on the resource abundance should be conducted through proper scientific methods. Any fishing gear implemented in Langkawi fishing ground should be limited in terms of their fishing capacity, e.g. size, number or type of gear or open access only for local fisher groups. Fishers and fishing gear registration should be strengthened in order to continue monitoring the local fishing capacity for sustainable fisheries resources.

2) Fishing gear capable of enhancing responsible fishing, i.e. collapsible fish trap, collapsible crab trap through diverse methodologies, e.g. crab bank, juvenile release, landing size control, and etc, should be promoted with proper responsible practices. Fishing technology promotion aimed to harvest the marine resources should be avoided in order to prevent over fishing in the future.

3) In order to harvest squids, handy cast net operated with lamp should be approved. Handy cast net and limitation of lamp can control low fishing capacity. However, giant cast net should not be allowed until the investigation on the impact of light fishing in the area is concluded.

4) Local fishermen in Langkawi have very good skills and experience on fishing gear maintenance and fishing operations. Further skills improvement should focus on marine engineering and fishing boat maintenance. Introducing alternative energy e.g. sailboat, engine modification for combusting by LPG (Liquid Petroleum Gas) should be introduced to local fishermen to prepare them to face the impact of the fuel crisis.

Outboard engine with LPG (left) and fishing boat using sail (right)
(Photo by Capture Fisheries Technology Division, SEAFDEC/TD)

5) Local fishermen should be grouped, then establish appropriate safety measures system for coastal fishing activities by small vessel as well as continue monitoring the illegal fishing boats that encroach the local fishing area. Communication or collaboration methods between the small scale local fishermen and patrol officers should be established.

Bamboo markers to indicate underwater concrete blocks ARs (left) and illegal trawler (right) (Photo by Research Division, SEAFDEC/TD)

6) Improvement of fish handling and preservation techniques should focus on the live catch market in order to add income value for the fishermen. Live catches can supply the hotels and Chinese restaurants at Langkawi Island, Penang Island or in Hadyai, Thailand.
7) Coastal fisheries management by zoning policy should be introduced to protect marine resource destruction by bottom trawls. An agreement with other local fisher groups, however, should be established and clarified through announcements.strengthened in order to continue monitoring the local fishing capacity for sustainable fisheries resources.

Enhancement of Human Resources Capacity Building and Participation

One of the most significant developments in this activity was the institutionalization in July 2007 of the Kumpulan Pengurusan Sumber Perikanan or KPSP (*Fishery Resources Management Community),* which emanated from the Fishermen Economic Group or KEN. The KPSP, which has taken over all the functions of KEN and which focuses on responsible resources management and agro-based industries, has committed to reinforce the objective of KEN which was meant to pursue economic activities only. Four KPSPs have been organized in Pulau Langkawi, i.e. Kuala Teriang, Kuala Chenang, Kilim and Kubang Badak.

The KPSP was envisaged to serve as a mechanism to strengthen the fishermen's livelihood through economic-based activities, partnership, capacity building, entrepreneurship and a responsible resources management where the local fishermen live, work and share the same needs and difficulties. Therefore, they are encouraged to group together to upgrade their livelihoods.

Moreover, considering that enhancement of the human resources capability and participation is the most basic activity leading to the full success of the ICRM-PL project. Human capacity building and participation under the ICRM-PL project has been promoted through workshops, training and study tour arrangements that support the other main project activities.

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Organization and Function of KEN and KPSP

Department of Fisheries Malaysia

Introduction

For years, some form of cooperation and sharing of responsibilities or economic-based activities among the fishing communities already prevails in some localities in Malaysia. The fishermen are sharing the same needs and issues in their localities regardless of whether they are small-scale or big-scale fishermen. Therefore, they are encouraged to group together in order to identify their needs and problems as well as solve their problems through their various economic activities.

While recognizing that the cooperation demonstrated by the fishermen was in a rather fragmented manner, the Department of Fisheries (DOF) Malaysia established the Fishermen Economic Group (Kumpulan Ekonomi Nelayan) or KEN to be responsible in implementing the community-based activities. In the early nineties, many groups were formed throughout the country, with the most number of groups in the State of Terengganu. With more emphasis currently being given to resources management and agro-based industries, DOF Malaysia upgraded KEN into a more comprehensive group for integrated fisheries community projects, known as the Fisheries Resources Management Community (Komuniti Pengurusan Sumber Perikanan) or KPSP in 2007. The main function of the KPSP is to develop and strengthen the livelihoods of fishing communities in the country through cooperation, entrepreneurship, education and responsible fisheries resource management. Hence, the KPSP becomes more competitive, dynamic and have greater impact to the community. As of 2007, more than 58 KPSPs have been formed in Malaysia.

Organization and Coordination

The DOF Malaysia while realizing that the KPSP could not be managed, monitored and supervised by the government officers only, encouraged the communities' active participation in the supervision through the appointment of good local leaders and strengthening of the well organized organization. The bottom-up approach was emphasized where proposals for projects/activities originate from the fishermen themselves. This approach had shown a high rate of compliance of the regulations and success in projects/activities implementation.

Under the KPSP rules, the fishermen are encouraged to form a KPSP with a membership of 10 to 50 persons per group. The groups could include the various stakeholders such as village representatives, members of Fishermen Associations, fishers including female fishers, housewives and the youth. The group administration is lead by a chairman and vice chairman with one secretary, an assistant secretary, a treasurer, and several committee members. However, there are cases that the membership could be more or less than the number being recommended in the KPSP rules. For example, there are groups which have about 147 persons such as those in Pantai Chenang, Langkawi, Kedah.

Implementation

In order to implement a project, DOF Malaysia needs to identify the potential group and their location. This is often followed by a series of consultations, motivation, project identification, planning and implementation of the KPSP project by the fisheries officer at the district, state and national levels. Thereafter, a proposal of the group would be brought forward for DOF approval. The process is shown in **Fig. 1.**

The KPSP programs have the following objectives:

- To create cooperation between fishermen and related local socio-economic development agencies;
- To develop local fisheries resource management system;
- To promote innovative, creative and competitive entrepreneurship; and
- To generate economic power in the fishing communities.

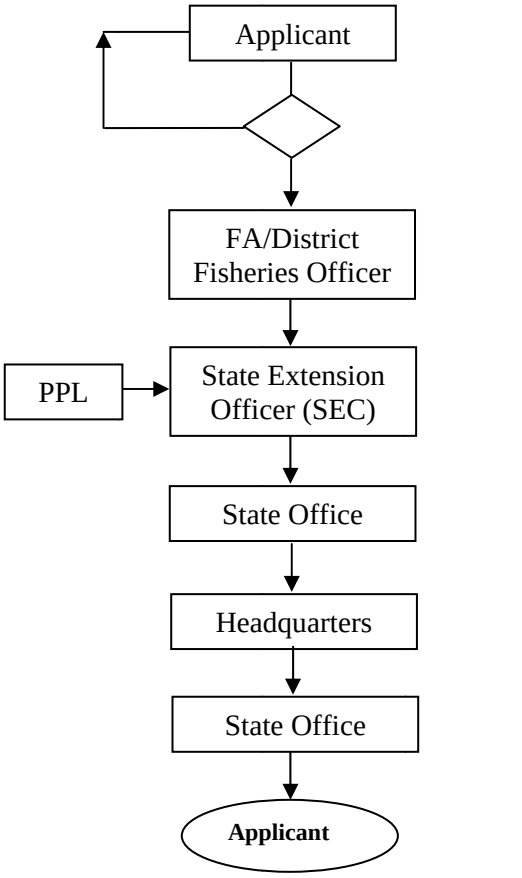

Fig. 1. Process of establishing KPSP

In order to achieve the goals of successful and sustainable KPSP, the DOF Malaysia emphasizes on several issues and outlines several strategies that include the following:

- Identification of issues, needs and local potentials, specifically emphasizing on the need for bottom-up rather than top-down approaches to manage the small-scale fisheries
- Preparation of Business Plan, with DOF Malaysia assisting the fishermen in the preparation of proposals and conduct of viability study of the proposed activities
- Providing training, assistance, support and motivation to enhance knowledge on management, administration, technology, marketing and finance
- Assisting the group to enhance their income by providing incentives and out-sourcing of other allocations
- Continuous project monitoring and technical assistance by DOF technical staff, even if management of small-scale fishermen poses an extraordinary challenge for the local authority and government
- Creating group or business networking at the district, state and national levels for the purpose of information and opportunity sharing

Projects Definition

Activities which have been proposed and are being defined by both DOF Officer and the committee members of KPSP based on the fishers' capabilities and willingness to undertake the tasks, could include: (1) Marketing of fisheries products; (2) Outboard and inboard workshop; (3) Fiberglass boat workshop; (4) Fish handling activities; (5) Fisheries trading center; (6) Fisheries agro-based industry; (7) Agro-tourism activities; and (8) Other fisheries related activities.


Some of the activities of KPSP of Malaysia

Conclusion

While promoting the development of small-scale fisheries, greater emphasis should be placed on management and conservation of fisheries resources. Given such situation, the DOF Malaysia established the KPSP as forum for the development and upgrading of the livelihoods of fishing communities to the extent that the outcome could exceed the national poverty level and guarantee a minimum net income of RM3,000.00 per month for every fisheries entrepreneurs.

Some of the Fisheries Resources Management Communities (KPSPs) in Malaysia

NO.	KPSP	STATE	ACTIVITIES	MEMBERSHIP
1.	KPSP Kuala Teriang Langkawi	Kedah	Processing FADs	60
2.	KPSP Pulau Betong, Bayan Lepas	Pulau Pinang	Marketing	25
3.	KPSP Seberang Parit, Sitiawan	Perak	Chalet (Home-stay) Hatchery	12
4.	KPSP Tok Muda, Klang	Selangor	Processing Cockle Culture	22
5.	KPSP Kg. Teluk Pelanduk, Port Dickson	N. Sembilan	Agro-tourism Marketing	65
6.	KPSP Telok Mas	Melaka	Green mussel culture Marketing	56
7.	KPSP Kg. Kesang Laut, Muar	Johor	Marketing	90
8.	KPSP Sungai Ular, Kuantan	Pahang	Fibreglass boat workshop Marketing	60
9.	KPSP Kg. Merchang, Marang	Terengganu	Marketing	90
10.	KPSP Kg. Pachakan, Pasir Putih	Kelantan	Marketing Fibreglass boat workshop	41
11.	KPSP Tanjung Manis, Sarikei	Sarawak	Processing	15
12.	KPSP Kg. Terusan Tengah, Semporna	Sabah	Fish Pen culture	12


Some of the activities of KPSP of Malaysia

Workshops, Training and Study Tours

Jariya Sornkliang
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SEAFDEC/TD

Background

The project on "Locally Based Coastal Resources Management in Pulau Langkawi (LBCRM-PL)" was started in August 2003 under the collaborative arrangement between the Department of Fisheries (DOF) Malaysia and the Training Department of the Southeast Asian Fisheries Development Center (SEAFDEC/TD). After the Tsunami disaster in December 2004, it was decided that the project would continue until 2007, and consequently the project name was changed to "Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL)". The ICRM-PL project was already completed by the end of 2007. While the ICRM-PL project was still operating, a number of project activities were conducted that include the baseline and monitoring surveys, rehabilitation and enhancement of the coastal resources, promotion of local business, fishing gear technology improvement, encouraging and extending locally-based resources management, and enhancing human resources capability and participation.

Objectives

The main objectives of the activity on enhancement of the human resources capability and participation are:

1. To build awareness and consensus on the project activities as the first step to achieve the smooth implementation of the project;
2. To realize the effort towards building awareness and consensus through appropriate education and training programs; and
3. To motivate the people to generate self-regulatory management framework and organize community-based development projects on their own.

Activities

The project conducted a number of workshops, training sessions and study tours for the local people and DOF officers.

Organization and Management of Fishermen's Group

Study Tour to Chumphon by KEN Members of Kuala Teriang

In April, the Malaysian mission participating in the 3rd Steering Committee (SC) meeting observed with keen interest the activity on Crab Bank conducted under the project ICRM-PD in Chumphon Province, Thailand. After they suggested in the SC meeting for the possibility of transferring such technology to Langkawi, Malaysia, the meeting endorsed their proposal. Thus, SEAFDEC/TD made arrangements to send a team on a study tour, comprising five (5) fishermen representatives from KEN, an Extension Officer from the District Fisheries Office of Langkawi, and an Officer from the Extension Division of DOF Malaysia, to the project site of the ICRM-PD from 26 to 30 June 2005. The major objectives of the study tour were: (1) to study the applicability of a crab bank scheme which had been successfully implemented in Chumphon, in Langkawi; (2) to study a newly challenging activity in relation to fisheries enforcement in the demarcated zones within the ICRM-PD by the Pakklong Fishermen's Group (PFG); and (3) to observe the Babylonia shell culture and evaluate the possibility of introducing the culture to Malaysia in the future as a lucrative small-scale culture venture. This study tour was practical and fruitful for the participants because it provided them the chance to discuss and exchange as well as share views on many issues and experiences that were commonly encountered in both areas.

Fishermen Workshop on Zoning Arrangement

In the process of forming the Fishery Resources Management Committee (FRMC), two zoning meetings were held in July 2005, as indicated during the previous reporting period. Through these two meetings, the framework and structure of the FRMC were established. As a next step, the management plan was supposed to be drafted by the FRMC and submitted to DOF Malaysia for endorsement, and to be gazetted by the Minister of Agriculture. While the formulation of the management plan was ongoing, a fishermen's workshop was held from 7 to 9 March 2006 in Surat Thani, Thailand, which was participated in by officers of DOF Malaysia including a legal officer, a committee member from KEN Kuala Teriang and Kuala Chenang, and SEAFDEC/TD staff. A suggested model of a management plan was prepared by SEAFDEC/TD and presented at the workshop as part of the discussion materials. Based on this model, the advance draft of the management plan was completed by KEN after lively discussion in Bahasa Malay.

Workshop on Establishment of Crab Bank in Langkawi

The training course was held on 13 June 2007 with 48 participants including 12 active members of the Crab Bank. The objectives were to organize a crab bank sub-group within KEN, to disseminate the whole concept of crab bank scheme including the procedures explaining how to apply the methodology and how to record data in the logbook, and to discuss among members the appropriate way of releasing crabs.

Fishermen's Workshop

Aimed at disseminating the information on the establishment of the local enforcement center (LEC) in Kuala Teriang and its functions to the neighboring fishing communities, a fishermen's workshop was conducted on 5 September 2007. In this workshop, 32 participants including representatives from Kuala Cheneng and Kilim attended. The background of formulation of the fishery resources management plan (FRMP) within the zoning arrangement was addressed by the project leader while the facilities and functions of LEC was explained by the Deputy Director of DOF Kedah to the stakeholders including those from the neighboring villages.

Fishermen's Workshop on the Project

A fishermen's workshop was held on 20 December 2003 in Langkawi. It was opened by the Parliamentary for the Malaysia Ministry of Agriculture and was aimed both at enhancing local human resources and initiating the project operations. During the workshop the justification for and the implications of the project were explained to the stakeholders and the outline of the project work plan was also described. About 70 stakeholders participated, including eight women.

Fishermen's Training Course on the CBRM Concept

The fishermen's training course on the basic concept of CBFM was held from 16 to 17 August 2005 in Penang, in which 10 fishermen from KEN Kuala Teriang and two neighboring villages participated. This training aimed to familiarize the fishermen with the principle, basic concept and needs for a radical change towards coastal fishery resources management, and to realize the roles of fishermen and fishing communities in the sustainable development and management of the coastal resources. In the first day, a lecture on the general concept and benefits of CBRM citing the development history in Japan and the role of fishermen in the realization of CBRM was made. Particular focus was made on the case of Kuala Teriang especially for the zoning arrangement, which was the theme that the fishermen in KEN Kuala Teriang were currently tackling on. Thereafter, a lecture on the CBRM concept outlining the approach in formulating a resources management plan by the fishing communities was made by Dr. Kuperan, a freelance consultant on coastal resources management. The lecturer demonstrated the CBRM concept in the local language and on ways of achieving pragmatic solutions. The lecture was therefore very understandable for the fishermen and the session was conducive for them. On the 2nd day, a visit to KEN Teluk Kumbar and KEN Pulau Betong was made. The former demonstrates the successful efforts of KEN in controlling the encroachment by trawlers while the latter is commended as a successful case in the deployment of effective marketing system.

Local Business Development

Study Tour by the Women's Group of Kuala Teriang

From 28 April to 2 May 2004, five (5) representatives from the women's group, one officer from DOF Kuala Lumpur and an extension worker from the Langkawi District Fisheries Office visited the project site in Chumphon, Thailand with the aim of learning how to set up a cottage-scale fish processing yard and processing of value-added products, exchanging views on women's participation in community development, and studying the organization and operational characteristics of the women's activities.

In addition, the team visited the fishing villages in Phangnga Province, Thailand, where the inhabitants were predominantly Muslims and where the women play very active part in the community activities. The study tour was considered very fruitful for the participants and the innovative ideas have been implanted in the women's group activities.

Training Course on Surimi and Fish Ball Processing in Penang, Malaysia

The DOF Malaysia provided a training course on surimi and fish ball processing in Penang, Malaysia from 10 to 12 May 2004 for six (6) members of the women's group.

Simple Bookkeeping and Accounting Management Training Course

In the wake of the commencement of the activities of the women's group in the KEN of Kuala Teriang, the need to develop commercial management skills in the group was apparent. Since a systemized bookkeeping and accounting system is essential for sound business management of a cottage-scale activity, a training course in simple bookkeeping and accounting was therefore conducted from 15 to 16 June 2004 in Kuala Teriang for 10 leading women's group members.

In addition, since it was considered that this system is similarly applicable to the business activities of the KEN, 10 participants from the KEN committee members also attended the training. In the course, four basic ledger books, i.e. General Ledger, Materials Ledger, Product Ledger, and Labor Ledger were introduced, and the exercise for completing the books also followed. Such systemized bookkeeping was considered a new concept on handling finances by them and at the start it seemed difficult for them to comprehend. However, based on the result of the training evaluation, 75% of the participants indicated the training as "understandable".

Study Trip to Johor and Perak

Study trip to Johor and Perak from 2 to 6 August 2004 was arranged by DOF Malaysia, for the participants to learn the processing of fish cracker (keropok).

Training Course in Accounting, Marketing and Acquiring GMP Certificate

A training course in accounting, marketing and acquiring GMP certificate was held from 8 to 20 September 2004 in Kelantan, in which 12 members of the women's group participated. This course was also arranged by DOF Malaysia.

Fish Product Processing Course

As pointed out at the 1st ICC meeting on 1 March 2005, diversification to more products lines should be promoted in anticipation of an expansion of the marketing opportunities. Coping with this need, the training course in fish processing was conducted at the Fisheries Institute of Malaysia (IPM) in Kuala Terengganu, for one week from 9 to 14 April 2005.

The training course included the basic concept of food hygiene and minced fish meat production using underutilized species of fish to produce surimi products. In this training course, 15 members of the women's group from the project area participated.

Training Course in Simple Bookkeeping with the Use of a PC

After the project introduced simple bookkeeping and accounting methods aimed at maintaining transparent accounting and business transactions, the methods were considered new to them. Although they have applied this system in practice, but still the project needs to closely monitor the newly introduced system. At the 1st project Implementation Coordination Committee (ICC) meeting on 1 March 2005, this issue was discussed and DOF, Malaysia agreed to conduct a further brush-up training course in simple bookkeeping with the use of a computer (PC) for the women's group.

Thus, SEAFDEC/TD provided a simple PC and the training course was conducted in Langkawi for two days in June 2005. This training course mainly focused on the basic operation of a PC and the application of basic accounting software. In this course, only three (3) selected members participated as it was an intensive training course, and in order that follow-up and monitoring of their correct data-input will be easy.

Training Course on Processing Seasoned/Dried Fish

The training course on processing seasoned/dried fish stay using the threadfin bream was arranged by the DOF and Malaysia Agriculture Research and Development Institute (MARDI). Two instructors from MARDI came to Langkawi for physical training in processing from 18 to 19 September 2005.

In the wake of the training course, the women's group planned to start the processing of the said product, but since the present existing processing yard was basically designed for processing dried products only without facilities for handling wet fish, therefore the proposal to build a new fish processing yard in another site near the sea was submitted to the JKKK (Village Protection and Development Committee) for obtaining the necessary funds. That time, it was most likely that the JKKK would provide the funds in 2006.

Workshop for Local Business Development

A one-day workshop was organized by the Fish Technology and Fishermen Community Section of the DOF in Langkawi on 8 May 2006 in a bid to identify appropriate and lucrative local business. At this workshop, 12 and 8 members from KEN and KEW Kuala Teriang, respectively, participated. As a result, an idea came from the KEW to process fish rolls (spicy fish paste rolls) and for the KEN, to culture grouper in cages. As for the proposal of KEW, it would be challenged after the completion of the 2nd fish processing yard which at that time was still under construction. For the proposal of KEN, the major constraint would be allocating the required space by LADA.

Training Course on User-friendly Bookkeeping and Accounting System

The training course on the introduction of a simplified "user-friendly" bookkeeping and accounting system was conducted from 4 to 5 April 2007 for members of the KEW. Since then, regular monitoring on the proper application of this newly introduced system has been continued by SEAFDEC/TD staff and DOF Extension Officer.

Habitat Rehabilitation and Resources Enhancement

Short Training Course in Fish Landing Data Collection at Kuala Teriang

To establish a science local data collection system for fish landing data in the project operation area in Kuala Teriang, a short training course for middlemen and extension officers was therefore held on 30 March 2004 to guide the participants in entering the fish landing information into the logbook which were prepared by SEAFDEC/TD in Bahasa Malay. Two researchers from SEAFDEC/TD conducted the training course which also aimed to orient the participants on the use of the logbook to record the daily fish landing data from April 2004. The participants were instructed to send the logbooks to SEAFDEC/TD regularly. As a result, four middlemen cooperatively recorded the monthly fish landing data.

Fish Enhancing Device(FED) Training and Installation in Langkawi, Malaysia

In the preliminary survey conducted in July 2003, it was suggested that FADs should be installed around the ARs to interact with their respective characteristics and roles. In line with such orientation, the project team of SDI-4 in SEAFDEC/TD devised a type of FAD called FED (fish enforcing device). Thus, SEAFDE/TD under its Resources Enhancement Project, organized a training and installation program for Fish Enhancing Device (FED) that make use of a long-lasting endurance synthetic material and new construction design. The program was conducted for the local fishermen group in Kuala Teriang, Langkawi, Malaysia from 19 to 23 December 2004.

The training was conducted by introducing the construction and performance of the newly designed FED to the 25 participating local fishermen. The installation of 4 units of FEDs around the artificial reefs was conducted at latitude 06 19'.009 N. longitude 099 36'.136 E. The installation area had a water depth of 31 m with soft muddy bottom.

Training and Demonstration on Construction of FEDs (Fish Enhancing Devices)

A one-day training and demonstration was held on 19 March 2007 for the KEN Kuala Teriang fisherfolks under the technical guidance of the SEAFDEC/TD team, assisted by a local fishery officer, who served as an interpreter in Bahasa Malaysia. Twenty (20) fisherfolks participated in this activity.

Fishing Technology Improvement

Mechanical Training in Langkawi

This training program was organized from 4 to 6 May 2004 for technical persons and fishermen in the coastal fishery management project to enhance their knowledge on the setting up of a workshop and maintenance for fishing vessels with small-sized engines. Two engineers from SEAFCDE/TD conducted the mechanical training course on outboard engine maintenance where 15 fishermen participated. The training course focused on workshop arrangement, maintenance and handling procedures for engine troubles.

The training commenced with the introduction of the appropriate gasoline engine technology for ship propulsion and propeller selection. It also includes handling mechanical and measuring tools that are useful for engine repairs and maintenance. After the training, SEAFDEC/TD donated some basic repair tools and repair manuals for Yamaha outboard engines.

Fishermen Training in Langkawi on Fishing Technology

Training in improved fishing methods was conducted for 15 fishermen from 9 to 11 August 2004 on three types of fishing methods. Prior to introduction of these fishing methods in the project operational area, an experimental fishing to test the applicability of these methods was carried out in June and the result and potential was convincing. The new and improved fishing methods introduced were the bottom vertical longline, collapsible crab trap and *Babylonia* shell trap.

However, the interest of the participants in the training was not high at that time because it was at the midst of shrimp season and most fishermen were busy fishing at sea. It was also aggravated by poor participation due to an incidental social occasion (a funeral). Nevertheless, the fishermen greatly appreciated the crab trap fishing method among others, as it demonstrated a good catch during training compared with local trap that they used to adopt. Also, it was observed that Babylonia shells were abundantly caught by the traps. But since the shells are not commonly consumed in the area unlike in Thailand where the shell is marketed for as much as 200 Baht/kg, a collective effort is needed in finding the marketing outlets for Babylonia shells.

Fishing Trial in Langkawi

The SEAFDEC/TD fishing technology team identified seven (7) fishing methods that could potentially be introduced to the project operational area. Three of them were introduced in August after having tested their applicability while the other types of fishing gear were tested for applicability from 19 to 23 December 2004. These were: (1) Collapsible crab trap with 3 different designs (rectangular collapsible crab traps, semi-cylindrical crab traps and local crab-traps); (2) Collapsible fish traps; (3). Babylonia trap; and (4) squid traps.

As a result, it was found that the rectangular collapsible fish trap was the most effective among the first three different types. For the fourth type which is the squid trap, more trials were deemed necessary while the collapsible fish trap was recommended as promising. As to the Babylonia trap, it was also recommended because of its high selectivity and abundant catch subject to ensuring the availability of market outlets for the catch.

Training Course on Fiberglass Reinforced Plastic (FRP) Work for Local Fishermen in Kuala Teriang

At the 1st ICC meeting held on 1 March 2003, SEAFDEC/TD suggested that a training course for repair of wooden boats that were damaged by the 2004 tsunami should be conducted, since the planned training courses for improved fishing technology were unlikely to be appropriate during that time of rehabilitation. Instead, in a meeting the representatives of KEN agreed to have such a training course as it was urgently needed by the fishermen in Langkawi. SEAFDEC/TD suggested that the training course would be on the repair of the damaged wooden boats replacing some parts with FRP materials.

After the proposal was approved during the meeting, the training was conducted for 13 trainees from 23 to 26 May 2005 at the project site. SEAFDEC/TD assigned two trainers and a coordinator. The outcome of this training was so fruitful and practical for the fishermen that another session of the training course was requested.

Fishing Gear Improvement in Langkawi

The fishermen's workshop aimed to primarily review the past activities on the introduction of improved or new fishing methods, and discuss the follow-up actions was conducted on 18 November 2005 with 10 fishermen participants. In this workshop, all related activities were reviewed and the follow-up actions were proposed. In fact, the fishermen admitted that some of fishing methods introduced was effective but they were not very confident in incorporating these into their traditional fishing practices for one reason or another.

Nevertheless, they proposed to have training courses like, outboard engine repair and maintenance, bottom drift gillnet fishing methods for shrimp, and safety at sea in the working program for 2006. Also, it was proposed to consider looking at the marketing opportunities through marketing promotion campaign in tourist hotels, for Babylonia shells considering that the shells were found abundant in the project site.

Conclusion and recommendations

The five (5) workshops, 16 training sessions and three (3) study tours arranged by the ICRM-PL project to promote human capacity and participation, include the following:

1. On rehabilitation and enhancement of the coastal resources, the activities included the Fish Enhancing Device (FED) training and installation in Langkawi, Malaysia; the workshop on the establishment of crab bank in Langkawi, and the training and demonstration on the construction on FEDs (Fish Enhancing Devices).
2. For the promotion of local business, the activities consisted of a study tour for the women's group of Kuala Teriang; training course on surimi and fish ball processing in Penang, Malaysia; simple bookkeeping and accounting management training; study trip to Johor and Perak; a training course in accounting, marketing and acquiring GMP; fish product processing course; training course in simple bookkeeping with the use of a PC; training course on processing seasoned/dried fish; workshop for local business development; and training course on user-friendly bookkeeping and accounting system.
3. On fishing gear technology improvement through the Mechanical Training in Langkawi, the activities included the fishermen training in Langkawi on fishing technology, fishing trial in Langkawi, training on fiberglass reinforced plastic (F RP) works for local fishermen in Kuala Teriang, and fishing gear improvement in Langkawi.

4. Under the encourage and extend locally base resources management, the activities were the fisherman's workshop, fishermen's training course on the CBRM concept in Penang, and the fishermen workshop on zoning arrangement which was organized for the project to support the main activity. A short training course on fish landing data collection at Kuala Teriang, a study tour to Chumphon by KEN members of Kuala Teriang, and a fishermen's workshop were also conducted.

In the conduct of the abovementioned activities, there was always good cooperation and support from the villagers and the p roject staff. The feedback of such activities indicated the importance of human capacity building and participation to support the project activities under the ICRM-PL project. It should be noted that even before the start of the project, a workshop, training and study tour arrangement were conducted to make fishermen and the women understand the objective of the project scheme and improve their knowledge and experience.

The most important thing was the recommendations made by the fishermen and wom en from the workshop, training and study tour arrangement, which helped in achieving the objectives of the project activitie s. The fishermen and women were the most important variables for management because they are always in the area and know very well their area. Therefore, their ideas have been accommodated in the project's plan.

The ICRM-PL project was fortunate because a fisherman's group called KEN (Kumpulan Ekonomi Nelayan) or the Fishermen Economic Group (in English) already existed in the project site before the project started. Now, the name has been changed from KEN to KPSP (Fishery Resources Management Community). Coastal resources management was participated in by the fishermen‘s group especially in the zoning arrangeme nt and FED installation.

The fishermen also improved their knowledge about fishing gear technology. For the women's group called KEW (Women's Economic Group), their focus was on local business. They decided to produce Anchovy products, which they themselves developed and tried creating other kinds of products. Bookkeeping was a necessary element for the transparency of all transactions and this was adopted by the fishermen's groups because the project always conducted training sessions on this to enhance their knowledge.

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Rehabilitation and Enhancement of Coastal Resources

This activity includes installation of artificial reefs (ARs) and Fish Enhancement Devices (FEDs) to enhance the aquatic resources in the project site. Prior to the installation of ARs or FEDs in Kuala Teriang, Pulau Langkawi, selection of the site was conducted in order to assess the suitable module that would be installed. During the site selection, general information of the area including the characteristics of the bottom was collected, and used as basis for selecting the artificial reef module.

The 16 units of artificial reefs were installed by DOF Malaysia in November 2007 within the zoning with an area of 69 x 42 m. The position of the installation is at Lat. 06°20.294 N and Long. 099°37.678 E. The depth of location is about 20 m but the fishermen claimed that it was relatively shallower. It is evidently true that most local FADs are concentrated in the deeper waters of 30 m depth.

Ten sets of FEDs were installed in April 2007 after convincing the authorities that trawlers' invasion of the coastal fishing zone had been controlled. However, when the impact survey on the installed FEDs was carried out on 4-5 September, it was disclosed that the installed FEDs were removed by trawlers. It is now obvious that no FEDs should be installed until the problem on encroachment by trawlers is controlled by LEU otherwise these should be installed in positions just adjacent to the ARs. A fact was disclosed after conducting the bottom condition survey by echo-sounder on 4-5 September indicating that that local FADs installed in the bottom in all locations appeared to be huge ARs. This seems to be a reason why the local FADs were not removed by trawlers but only the newly installed FEDs.

Installation of Artificial Reefs (Unjam-Unjam) by LKIM

Dianatul Azni Binti Mohd. Yazid
Economic Officer
Fisheries Development Authority Malaysia (LKIM)
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Unjam-unjam is an artificial reef developed by the Fisheries Development Authority Malaysia (LKIM) that combines a permanent structure (artificial reef) and semi-permanent structure (FAD) purposely on the seafloor to influence the physical, biological, or socio-economic processes related to the living marine resources in coastal waters. It is a practical and effective way to gather fish and breed in the short run, and to recover marine sources in the long term.

Previously, old tires were commonly used but now the trend has switched to using concrete blocks and other materials such as steel, ceramics and rock incorporated in custom-designed artificial reefs.

The main objectives of deploying this government – funded "*unjam-unjam*" scheme which the LKIM first adopted in 1983 are:

1. To enhance the biological productivity and fisheries resources in the inshore waters (0-5 miles) through the creation of new fish habitats;
2. To enhance the productivity of catching as compared to cost of operation, time consumption will be less for searching the fishing area;
3. To rehabilitate and conserve fisheries resources adversely affected by trawling activities;
4. To create a kind of "user right" for the artisanal fisherman over the fisheries resources around the "unjam-unjam";
5. To promote awareness and sense of responsibility among the fisherman to sound resource management and conservation practices; and
6. To encourage the business activity of sport fishing and local tourism by the fishermen.

UNJAM-UNJAM (LKIM'S ARTIFICIAL REEF)

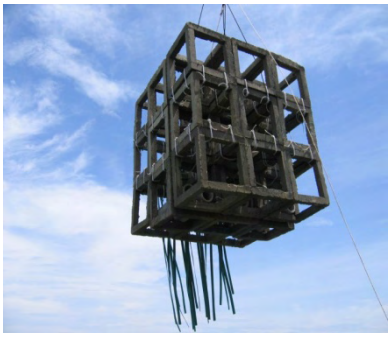
Apart from being functional as **Fish Aggregating Devices (FADs),** *unjam-unjam* also acts as sanctuaries for marine fishes, once marine growth has already flourished and new ecosystem is created. The materials chosen should resist rapid corrosion and should not introduce harmful substances into the marine environment. LKIM's *"unjam-unjam"* scheme is socio-economically biased towards increased accessibility to the resources, catches and incomes of the artisanal fishermen.

As of December 2007, a number of LKIM's *unjam-unjam* were constructed and established at over 500 locations all over the country's coastal waters. About 65% *unjam-unjam* in Peninsular Malaysia are located in the coastal w aters off the east cost as the west coast has the disadvantage of being narrow and having unsuitable substrate such as the Straits of Malacca.

TYPES OF UNJAM-UNJAM

KUBOID MARINOVASI

UNJAM SOTONG



UNJAM KUBOID

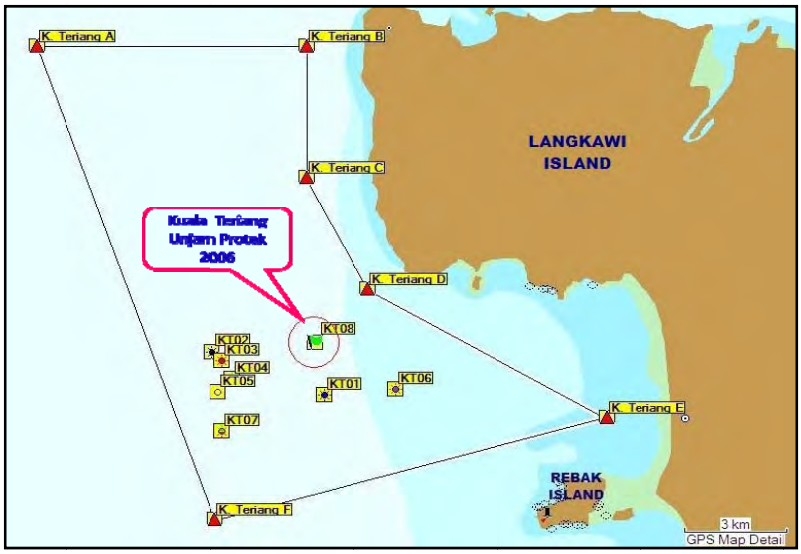
BIO-CERAMIK

UNJAM SOTONG

SINE SLAB

For the Integrated Coastal Resources Management Project (ICRM-PL) in Pulau Langkawi, LKIM's main participation is to develop and construct the artificial reef (*unjam-unjam*) for deployment in the demarcated zone in other to rehabilitate and enhance the coastal resources. The details on the installation of ARs by LKIM are as follows:

Date of Installation	:	21 January 2006
Types of ARs module	:	concrete 'Unjam Protek'
No of Units	:	10
Total Project Cost	:	RM 183,000.00
Location	:	Demarcated Zone Kuala Teriang
Water Depth	:	21.7 meter with muddy-sandy bottom sediment



Location of Artificial Reefs and FADs in the waters off Kuala Teriang, Langkawi

The Unjam installed by LKIM in Kuala Teriang, Langkawi, Malaysia

No	Location	Year Built	Type of Module	Coordinates	Budget (MYR)
1	Kuala Teriang 1	1990	BAMBOO+CYLINDER	06°19.6'N, 99° 37.8'E	28,000
2	Kuala Teriang 2	1991	CUBOID+CYLINDER	06°20.327'N, 99°36.006'E	10,000
3	Kuala Teriang 3	1992	CYLINDER	06°20.183'N, 99°36.162'E	10,000
4	Kuala Teriang 4	1994	CUBOID	06°19.878'N, 99°36.339'E	10,000
5	Kuala Teriang 5	1997	CUBOID	06°19.652'N,99°36.106'E	30,000
6	Kuala Teriang 6	2001	CUBOID	06°19.700'T, 99°38.939'E	80,000
7	Kuala Teriang 7	2004	CUBOID	06°18.990'N, 99°36.171'E	100,000
8	Kuala Teriang 8	2005	PROTEK	06°20.492'N, 99°37.645'E	183,000

The Unjam Protek 2006 of LKIM in the ICRM-PL Project Site in Kuala Teriang

Location	Year Built	Type of Module	No	Coordinates
Kuala Teriang	2006	Unjam Protek	1	06°20.505'N, 99°37.634'E
Kuala Teriang	2006	Unjam Protek	2	06°20.506'N, 99°37.642'E
Kuala Teriang	2006	Unjam Protek	3	06°20.504N, 99°37.647'E
Kuala Teriang	2006	Unjam Protek	4	06°20.497'N, 99°37.652'E
Kuala Teriang	2006	Unjam Protek	5	06°20.501'N, 99°37.661'E
Kuala Teriang	2006	Unjam Protek	6	06°20.489'N, 99°37.656'E
Kuala Teriang	2006	Unjam Protek	7	06°20.487'N, 99°37.647'E
Kuala Teriang	2006	Unjam Protek	8	06°20.492'N, 99°37.645'E
Kuala Teriang	2006	Unjam Protek	9	06°20.494'N, 99°37.640'E
Kuala Teriang	2006	Unjam Protek	10	06°20.498'N, 99°37.661'E

The LKIM's Unjam Protek

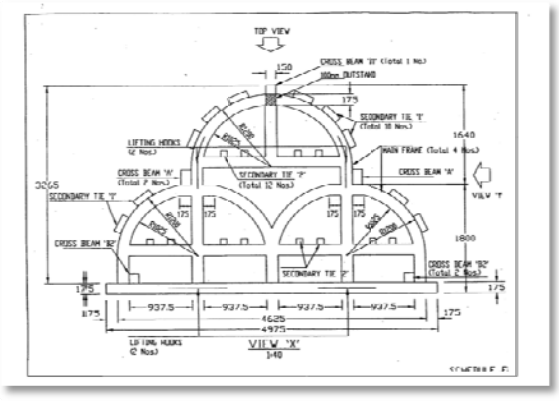
A concrete structure measuring 4975 x 3000 x 3440 mm, made from reinforced concrete Grade 40 with hump-back shaped formed by steel framework. It is designed to withstand current pressure load in the sea.

Characteristics of Unjam Protek

1) *Unjam Protek* has a large base compared with its height that keeps excellent stability even on a slant surface
2) This module gives less tide flow at the bottom, and its structure is hard to soil refilling and scouring
3) It has incomparably larger rate between total projection area and one direction projection area compared with that of other's, and it has the great complex interior
4) The complex interior is suitable for young fishes in a shelter effect
5) The inside of *Unjam Protek* could attract a large number of fishes and make fishes stay longer, because the inside structure has an extensive and complex surface area that promotes bacteria to attach due to various shadows, and flow lines

Design of One Unit of Unjam Protek

Component	Qty	Overall Dimension (mmxmmxmm)	Component Weight (tons)
FRAME	4	175x4975x3290	9.08
CROSS BEAM 'A'	2	250x150x3000L	0.55
CROSS BEAM 'B1'	1	150x150x3000L	0.17
CROSS BEAM 'B2'	2	150x150x3000L	0.33
SECONDRY TIE '1'	10	100x300x3000L	2.20
SECONDRY TIE '2'	12	100x100x3000L	0.88
		Total weight	13.21



INSTALLATION OF *UNJAM-UNJAM*

- Installation work includes preparation, laying-down, diving and handling on barge
- Global Positioning System (GPS) is used to provide the position of the proposed location of the artificial reefs
- Although the criteria for site selection had been established, the zoning of ARs within the municipal waters has to be considered, considering that sometimes, AR location intervenes with other fisheries activities
- Divers are needed to carry out underwater activities such as guiding the position of artificial reefs, releasing of slings, underwater inspection and rearranging stones as found necessary


ARs properly stacked and loaded at both sides of the barge


ARs ready to be installed at identified position


On-board crane lifting the ARs


ARs unloaded and placed on the seabed

UNDERWATER VIEW OF INSTALLED UNJAM PROTEK



After Unjam Protek is lowered to the seabed, diver's responsibility is to guide the ARs to position in the site

MONITORING AND RESEARCH PROGRAM WITH OCEANOGRAPHY INSTITUTE

On April 2007, research by INOS under Malaysia University of Terengganu found that all unjam structures on various locations in Kuala Teriang did not receive major damage due to the 2004 tsunami. Thus, the fishermen were able to continue their regular activities in Kuala Teriang.

Moreover based on feedback from fishermen who fish in the AR areas, they indicated that they are beginning to experience increased incomes and returns. Thus, more artificial reefs were requested by the local fisherman especially in Langkawi Island. Unjam-unjam came from the concept of making the best house for marine life, thus making the fishing grounds rich enough for fishermen to get good catch.

Installation of Artificial Reefs by the DOF Malaysia

Ahmad bin Ali, Mohamed Pauzi bin Abdullah, Abdul Aziz bin Yusof, Zaidnuddin bin Ilias
Department of Fisheries Malaysia

Artificial reefs (ARs) are objects of natural or human origin deployed purposely on the seafloor to influence physical, biological, or socioeconomic processes related to the living marine resources.

Under the 9th Malaysian Plan (2006-2010) focus of DOF Malaysia was placed on building big size ARs for soft bottom (muddy a rea) and hard bottom (sandy area). These ARs would be used mainly for the protection of coastal habitat from trawlers as well as for enhancement of the lobster resources. It was envisaged that by 2010, DOF Malaysia will come out with new design of ARs for specific purposes (soft bottom, hard bottom and for lobster).

Common Objectives of ARs Deployment

- Resource enhancement
- Increasing catch
- Diving site
- Recreational ishing
- Habitat protection
- Research
- Mitigation of habitat damage and lose
- Others

Deployment of ARs in ICRM-PL Project Site in Kuala Teriang

The activity started with site selection of the location based on suggestion from state fisheries office after several consultations between stakeholders (fisherfolk community from Kuala Teriang), SEAFDEC/MFRDMD and Kedah State Fisheries staff.

Consultation (left), sampling of sediment and benthos (center), and sediment sample showing soft bottom (right)

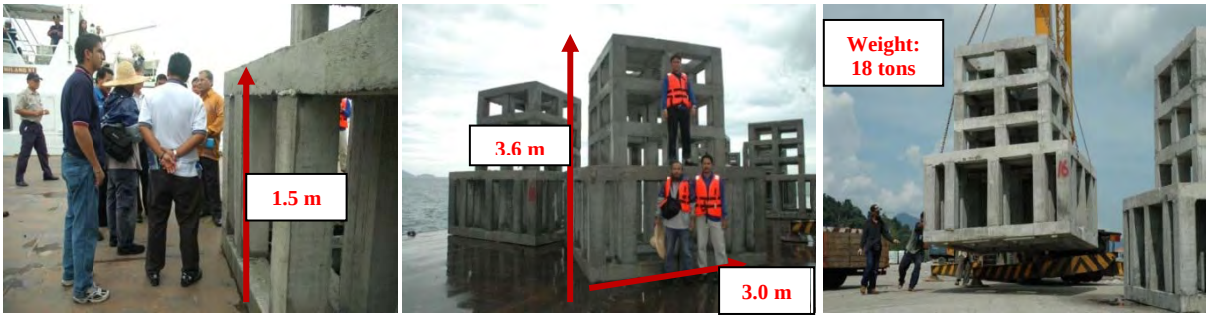
Specification of ARs for Soft Bottom

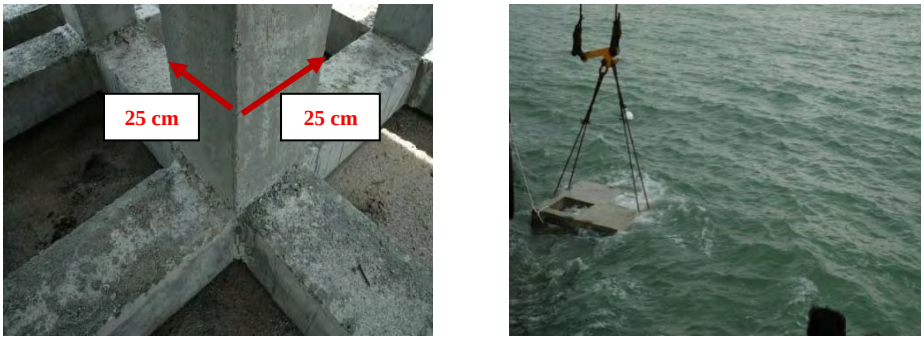
The DOF study team recommended that the ARs should have reinforcement using 1.2 cm solid steel bar covered with cement mixture grade 50, and weighing about 18 tons/unit, 3.6 m height x 3 m width x 3 m length. The ARs should comprise 25 piles and connected each other at the base. This is to ensure that the structure is really strong and could not break during transportation and deployment.

For soft-bottom ARs: construction of base (left), construction of solid steel bar 1.2 cm dia (center), and construction of 25 piles (right)

ARs ready for deployment

The lower part of the ARs is expected to submerge during deployment if the thickness of muddy layer is about 1.5 m. Only upper part (2.1 m) will be on the sea floor.





Structure of base (above) and actual deployment (center and right)

Each AR is marked with styrofoam float (left), the location of ARs (right) is about 1.5 nautical miles from Langkawi Island

Monitoring

The development of ARs at Kuala Teriang was monitored using CCTV, through SCUBA diving as well as fishing. Three diving trips were conducted but unable to record any photo or video because of very low visibility due to the muddy water. Schools of pelagic fish species such as scombridae were observed around the AR structures. However, the local fisherfolk also informed the project staff that they also caught big size of snappers, groupers, barracudas, Spanish mackerel, cobia, scads, sweet-lips and trevallies during night fishing, using squid as bait.

After three (3) months, snappers, groupers as well as coral species were observed near or inside the ARs. After seven months sessile organisms attract the larvae and juvenile of unidentified fish species around the ARs while adult fish species such as snappers, sweetlips, yellow tail fusilier and groupers were also observed. After 16 months, the structures look like natural habitat of adult demersal species such as snappers, groupers, sweetlips, yellow tail fusilier, etc. while adult snappers and sweetlips were noticed within the ARs structure. After 18 months, adult grouper was observed within the ARs structure.

Issues and challenges

- Drift nets entangle the bouys and make fishing activity using hand line always not successful
- The area covered with ARs is very small and only few fishermen can go fishing at one time
- The ARs function as fish aggregating devices, where fishermen also catch the adult fishes aggregating near the ARs hence, the ARs are not really for resource enhancement
- Lost fish traps and scattered net materials near the ARs if not monitored would lead ‘ghost fishing’
- Catching fish using fish trap near the ARs would result in decreasing of the resources within short period of time
- Recreational fishing or fishing for leisure vs fishing for livelihood at the ARs site, could lead to competition with local fishermen

Conclusion

- The project at Kuala Teriang is still at experimental stage and SEAFDEC/MFRDMD/FRI should continue monitoring the development especially on the suitability of the design of the ARs.
- Preliminary results showed that the structure could aggregate adult, juvenile and larvae of both pelagic and demersal species.
- The structure has now become new habitat for larvae and juvenile as well as adult of certain species.
- The ARs also resulted in slight increase of the incomes of the local community in Kuala Teriang.

Installation of FEDs by SEAFDEC/TD

Yuttana Theparoonrat
Head, Coastal Small-scale Fisheries Management Division
SEAFDEC/TD

The SEAFDEC Training Department together with the ASEAN and SEAFDEC member countries, conducted the project on "Resources Enhancement" under the Special Five-year Program on Sustainable Fisheries for Food Security in the ASEAN Region from 2002 to 2005. The first project activities were started on 2003 at the pilot project site in Pathew District, Chumporn Province, Thailand and Pulau Langkawi, Malaysia as case study areas. This project was designed to integrate the installation of artificial habitats in inshore waters after a careful pre-assessment of the environmental and socio-economic impacts. In 2003, the project proposal preparation and planning as well as establishing the core working group were carried out. A review of Existing Artificial Reefs and Resources Enhancement Projects in the ASEAN countries was also conducted.

Selection of Site and Suitable Module of Artificial Reefs at Kuala Teriang, Pulau Langkawi

An observation visit for the Selection of Site and Suitable Module of Artificial Reefs at Kuala Teriang, Pulau Langkawi Island was conducted on 28 July 2003 by Dr. Somboon Siriraksophon of SEAFDEC/TD assisted by an Officer from the DOF of Thailand, Dr. Vicharn Insrisawang, who made the following observations:

General Information and Bottom Characteristics

About 800 Artificial Reefs "cuboid shape" were first deployed in 5.7 nautical miles (Nm) from the Kuala Teriang Fishing Village. Near these artificial reefs (around 400-500 m distance), 4 stationary FADs (Fish Aggregating Devices) made of bamboo pole fixed above the water while the coconut fronds were set below the sea surface were also noted. The depth of the water is about 32-33 m. Bottom sediments was collected using grab, and from the samples it was concluded that the bottom characteristic in this area is muddy-sand of about 81.2% clay and 4.3% silt. The direction of the current at near bottom was also observed by sight while dropping the bottom sediment grab. It was observed that the sea current moves to South or South-East.

Selecting the Artificial Reef Module for Deployment

After discussing with the fishermen operating pelagic hand-line fishing at the FAD areas, in addition to the consideration of the bottom characteristics (muddy sand) and depth of water (~32 m), the site for the artificial reefs was selected at the center of the four stationary FADs (Fig. 1a, Fig. 1b). The module of artificial reef was designed to be suitable for the soft bottom like muddy-sand due to its high sinking rate by a pocking-pressure effect. Two module shapes, namely: Leg or Table shape and Cubic shape were selected for this site (Fig. 2a, Fig. 2b).

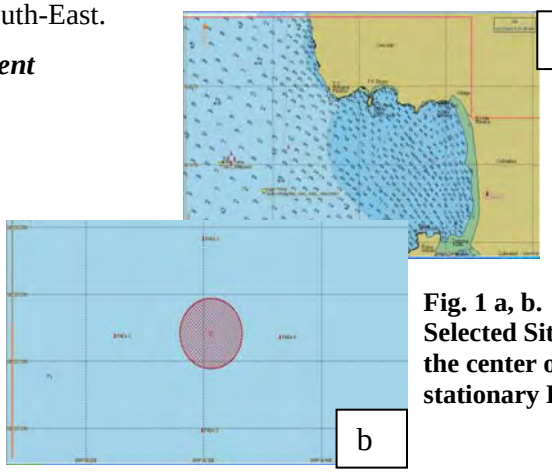


Fig. 1 a, b. Selected Site at the center of four stationary FADs

The leg or table shape should be higher than the thickness of the muddy-sand by about 20% (it is suggested that measuring the thickness of the muddy-sand should be done first). For example if the thickness of muddy-sand is 80 cm, then the length of leg or table shape must be ~96 cm. This shape will be deployed first at the bottom before setting the cubic shape above the leg or table shape.

Volume and Number of Reef Blocks

In order to make the artificial reefs more effective in aggregating fish, Nakamura (1982) reported that the reef volume (concrete volume) should not be less than 2,000 m^3 which means that the number of Cubic shaped concrete block reefs of 1.5x1.5x1.5 must not be less than 879 units, while the number of Leg or Table shaped concrete blocks should not be less than 450 units.

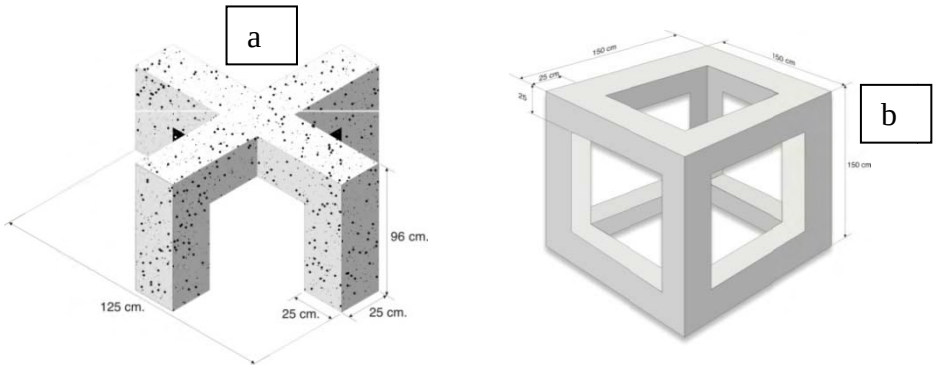


Fig. 2. Two modules of artificial reef designs for the site at Kuala Teriang: (a) Leg or Table shape, and (b) Cubic shape

The arrangement/setting of these concrete block reefs is shown in Fig. 3. While considering the depth of the water (32 m), it was suggested that the artificial reefs should be set to occupy around 10% of the water depth, therefore after setting the artificial reef its height is expected to be around 3-4 m. This would enhance the fishes, both demersal and pelagic fishes to aggregate/stay in the reef. The SEAFDEC Training Department in cooperation with Department of Fisheries Malaysia through the Fisheries Research Institute (FRI) in Penang and the SEAFDEC Marine Fishery Resources Development and Management Department (MFRDMD) in Terengganu, conducted environmental survey studies at the proposed artificial reef installation site in Pulau Langkawi, Malaysia from 8 to 16 December 2003.

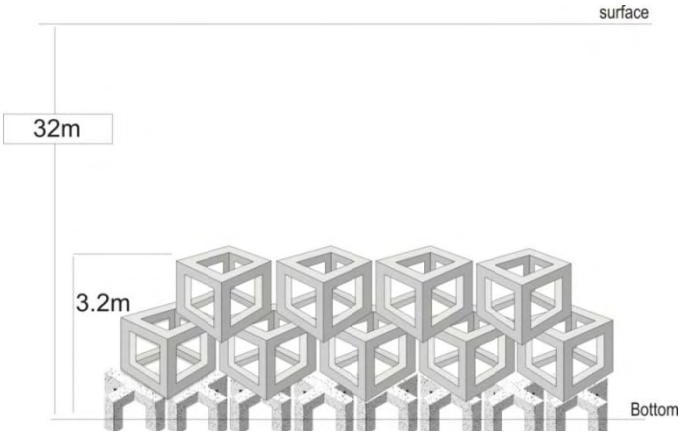


Fig. 3. Arrangement of two modules of artificial reefs for the site at Kuala Teriang

Fig. 4. Environmental survey at the proposed artificial reef installation site at Pulau Langkawi, Malaysia using the K.K. SENANGIN II

The environmental survey studies were carried out using the K.K. SENANGIN II (Fig. 4). Several fisheries environmental parameters were monitored. Information on the oceanographic parameters including water current and speed/direction were collected. Biological information like benthos, phytoplankton, zooplankton, and fish larvae distribution was also collected. Fishing surveys using various fishing gear including the Trammel net, Squid trap, Crab trap were also carried out. The biological samples were analyzed by FRI.

Fish Enhancing Device (FED)

The local fishermen in Langkawi, Malaysia have been using the traditional Fish Aggregating Devices

(FADs) or "unjam" in combination with Artificial Reefs (ARs) as auxiliary fishing gear for luring both pelagic and demersal species for their fishing operations. The fisherman installed FADs around the ARs, and using traditional fishing gear such as hand line, gill net and fish trap, they usually operate around the ARs. An "unjam" comprises bamboo poles of approximately 10 m long and float attractors (underwater appendages) made of coconut fronds tied to the whole length of the anchor line, and sandbags as anchor. The damage on the "unjam" could usually occur in the float and the underwater appendages. Another reason contributing to its short endurance period was the anchoring mechanism of the unjam which use sandbags as anchor which can only last for about two months (Ahmad Ali et. al, 2004). Since the local fishermen in Langkawi use the "unjam" permanently as ARs to aggregate fish schools for their fishing, then it is necessary to lengthen the endurance of the "unjam" using long lasting materials and new construction designs.

SEAFDEC/TD under the Resources Enhancement Project, organized a training and installation program for Fish Enhancing Device (FED) using a long lasting endurance synthetic materials with new construction design (Fig. 5-11). The program was conducted for the local fishermen's group in Kuala Teriang, Langkawi, Malaysia from 19 to 23 December 2004. The training was conducted by introducing the construction and performance of new designed FED to 25 participating local fishermen. Hands-on training for fishermen to construct 4 units of FEDs was also performed. Installation of 4 units of FEDs around the artificial reefs was conducted at Latitude 06° 19'.009 N Longitude 099° 36'.136 E. The water depth at the installation area with soft muddy bottom is 31 m.

Fig. 5. Introduction of FED construction and performance

Fig. 6. Preparation of cement anchors

Fig. 7. Construction of FED main rope and appendages

Fig. 8. Installation of FED main rope and buoy connection

Fig. 9. Installation of FEDs using local fishing boat

Fig. 10. Releasing of FED at marked position

Fish Enhancing Device Installation Area

Location : Kuala Teriang, Langkawi, Malaysia (Fig. 12)
Latitude 06° 19'.009 N
Longitude 99° 36'.136'E
(Δ Number 8)

Water Depth : 31 m

Date : 18-24 December 2004

Fig. 11. FED installed around ARs in the project site

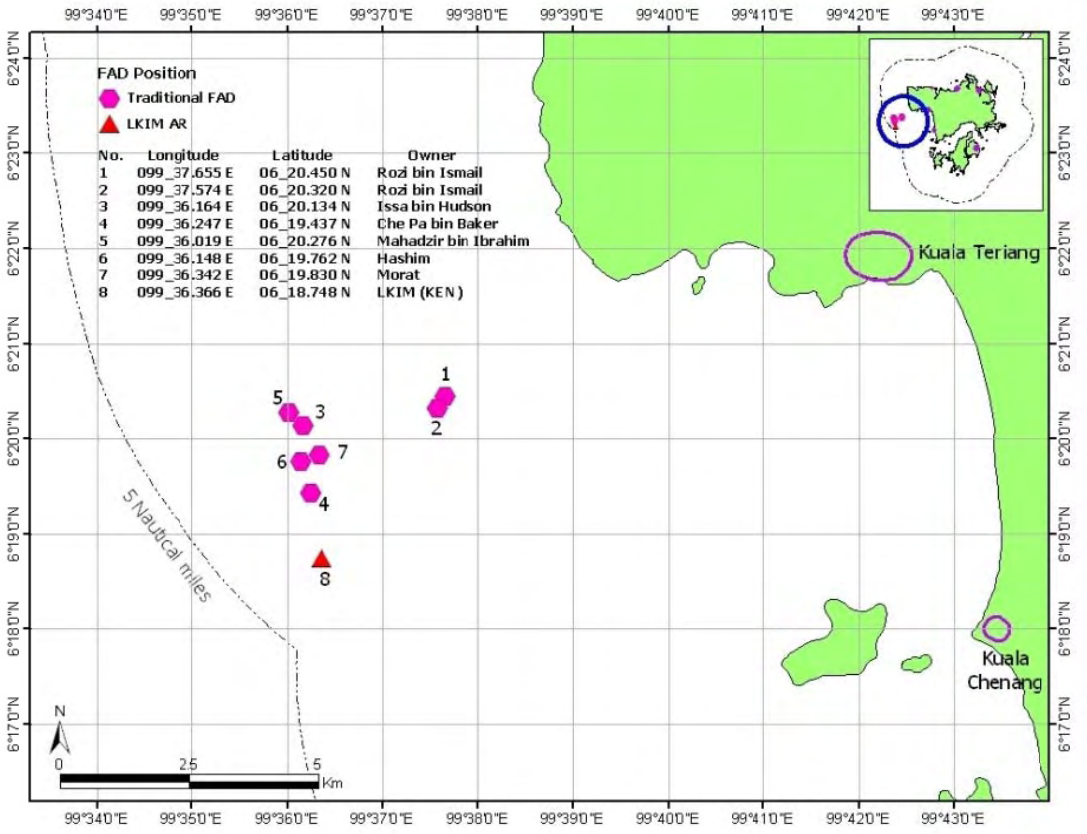


Fig. 12. Chart of installation position of FEDs (Δ Number 8)

The Fish Enhancing Devices (Fig. 13-14)

Project : SEAFDEC/TD Resources Enhancement

Location : Langkawi, Malaysia

Water Depth : 31 m

Material : Synthetic Fiber - Poly-Propylene (PP)
Poly-Ethylene (PE)

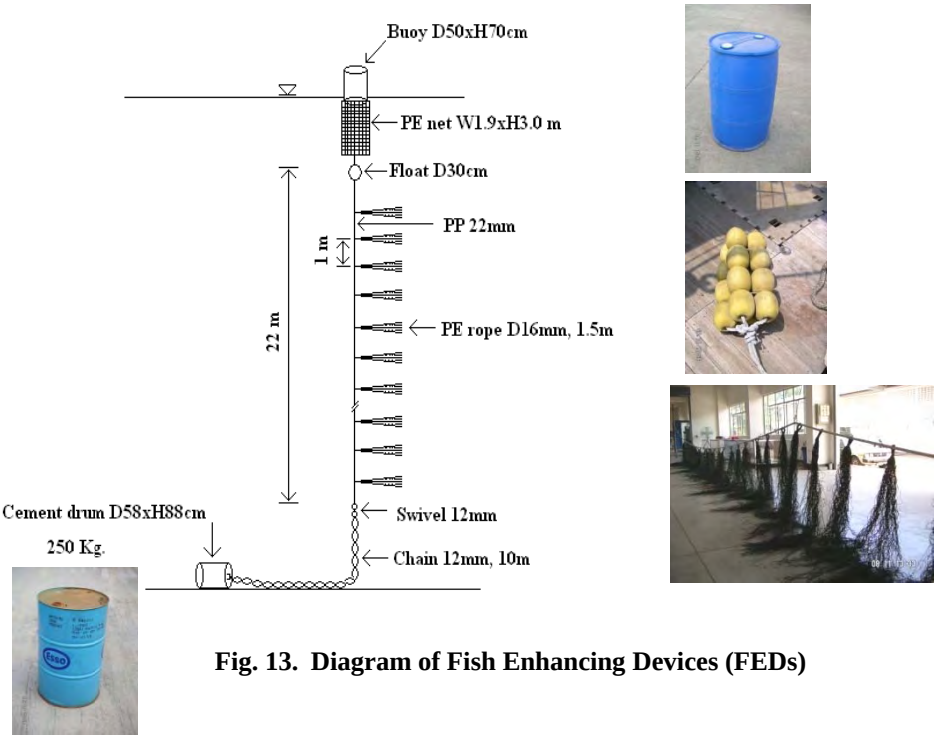


Fig. 13. Diagram of Fish Enhancing Devices (FEDs)

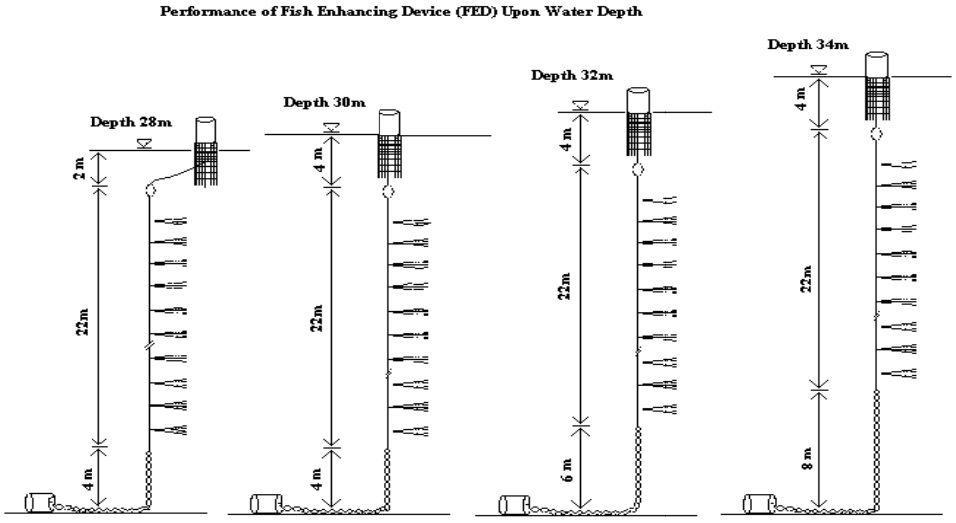


Fig. 14. Mechanism of FEDs allows self-adjustment during low and high tides

Soon after the installation of FADs in Langkawi, a big natural disaster "Tsunami" hit the Indian Ocean and Andaman Sea on 26 December 2004. Many fishing boats and fishermen's houses in Kuala Teriang, Langkawi were damaged by the big wave. All fishing activities were suddenly paralyzed as the fishermen stopped their fishing activities to concentrate on rehabilitation. The Relief Programs of the Malaysian Government were focused on re-building the fishing village including the fishing boats and gears. The fishermen in Kuala Teriang, Langkawi only returned to fishing in March 2005. Nonetheless, it was observed that the FEDs set up were not damaged during the Tsunami.

At the beginning of the new fishing season, the fishermen reported that the amount of fish catch around the FEDs was very high. The fishermen said that they could get a lot of benefits from the FEDs. However, in July 2005, the fishermen group of Kuala Teriang reported that all FEDs had disappeared, which was attributed mainly to the encroachment of trawlers in the demarcated zone.

Based on such circumstance, the National Coordinator for Japan commented during The 28th Meeting of the Program Committee of SEAFDEC held in Bangkok, Thailand in December 2005, that: **"The use of artificial reefs is based on national interests and capacity. To this end, pilot activities on artificial reefs should be given low priority" (Para 27).**

In connection with such comment by the National Coordinator for Japan, SEAFDEC/TD had to scale down all activities related to artificial reefs under the Resources Enhancement Program in Pathew District in Chumporn Province, Thailand and in Pulau Langkawi, Malaysia.

Artificial Reefs Installation

The installation of artificial reefs in Langkawi, Malaysia was conducted from 20 to 22 January 2006. The installation observation trip by the TD staff was supported through the project on Locally Based Coastal Fisheries Management: Pulau Langkawi (LBCRM-PL) under the Japanese Trust Fund Program. Since under the Resources Enhancement Program, it had been proposed to conduct studies on the impact of artificial reefs (ARs) installation to fisheries resources in the project site in Malaysia, the Malaysian Government through the LKIM proposed to install 10 units of ARs in Kuala Teriang in Langkawi Malaysia on 21 January 2006.

The environmental survey aimed at monitoring the effect of ARs to the fisheries resources in the installation site before the actual ARs installation was conducted by TD in November 2005. In the ARs installation activities, LKIM requested SEAFDEC/TD to assist the fishermen in the proper installation position and procedure. Thus, SEAFDEC/TD sent one researcher to participate in the installation in collaboration with fisheries officers of DOF and LKIM Malaysia

The Fisheries Development Authority of Malaysia (LKIM) finally installed 10 units of ARs on 21 January 2006. The installation position is Latitude 06° 20.501' N, Longitude 99° 37.658' E with water depth of 21.7 m. The ARs were carried by iron barge with tug boat from the construction site to the installation position. The barge was anchored at the nearest position of installation site using two concrete blocks, 5 tons each, on the fore and aft of the barge. Setting of the ARs was performed by using hydraulic crane with its wire cables laying down the ARs on the sea bottom and the divers guided the release of the cable hook from the ARs. Setting of each AR was conducted at position around the barge as shown in Fig. 15, 16, 17a, 17b, 17c. Each setting point was recorded using handy GPS. The construction and installation costs of the ARs were provided by LKIM, Malaysia.

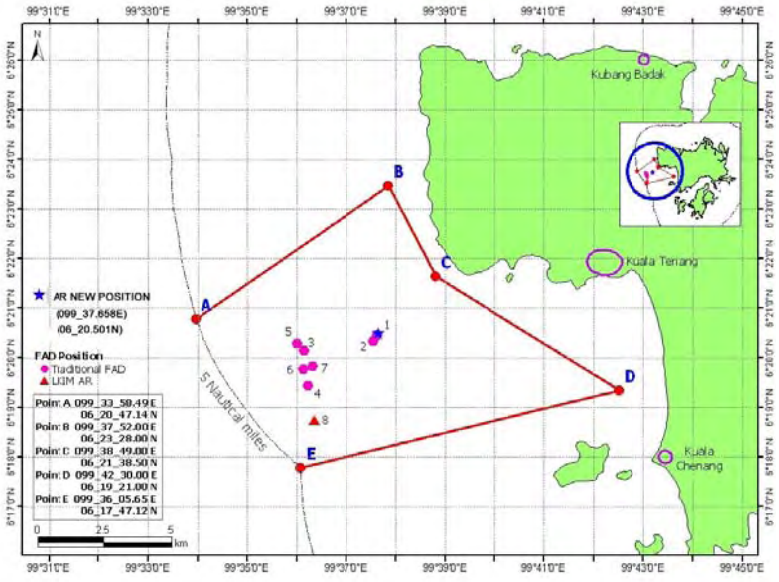


Fig. 15. Position (No.1) of Artificial Reefs installation (star marked)

Position of Artificial Reefs in Langkawi, Malaysia
21 January 2006

No. 1	Lat.	06º 20'.505 N
	Long.	099º 37'.634 E
No. 2	Lat.	06º 20'.506 N
	Long.	099º 37'.642 E
No. 3	Lat.	06º 20'.504 N
	Long.	099º 37'.647 E
No. 4	Lat.	06º 20'.497 N
	Long.	099º 37'.652 E
No. 5	Lat.	06º 20'.501 N
	Long.	099º 37'.661 E
No. 6	Lat.	06º 20'.489 N
	Long.	099º 37'.656 E
No. 7	Lat.	06º 20'.487 N
	Long.	099º 37'.647 E
No. 8	Lat.	06º 20'.492 N
	Long.	099º 37'.645 E
No. 9	Lat.	06º 20'.494 N
	Long.	099º 37'.640 E
No. 10	Lat.	06º 20'.498 N
	Long.	099º 37'.661 E

Note: Water depth 21.7 m
Bottom sediment Muddy sand
Barge size 50 x 20 m
Barge direction Co 150º

Fig. 16 Structure of artificial reefs

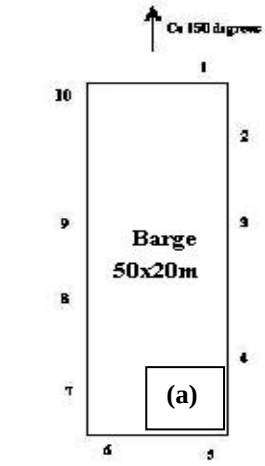


Fig. 17 (a,b,c). Position and installation of ARs in Langkawi, Malaysia

Training and demonstration on the construction of FEDs

Training and demonstration on the construction of FEDs (Fish Enhancing Devices) and pre-installation marine biological survey for FEDs off Kuala Teriang, Langkawi, Malaysia, 17-22 March 2007 were conducted. Upon the request of KEN Kuala Teriang fisherfolks for the installation of FEDs (Fish Enhancing Devices) in 2006, SEAFDEC/TD under the LBCRM-PL project responded to the request but the installation was however delayed due to an improvement of the design of the FEDs.

The follow-up survey from Chumporn Province, Thailand showed that all of the FEDs installed in June 2006 had some weak points and must be improved for more durability and effectiveness. Many points were considered and improved on its construction such as replacing the steel structures with rust-proof materials such as stainless steel, adding another cement sinker to secure the unit in place and could not be taken away easily, enhancing its attracting performance by providing fine mesh netting panels under the supporting floats and preventing incidental damages by fishing boats, and by using only a pipe to mark its position at the surface (instead of using an expensive foam-inserted buoy as in the previous one).

This design will be effective for pelagic species and in shallow waters which was proven to last at least six months in the waters (Fig. 18). All materials were procured, prepared, partly assembled and transported to Kuala Teriang, Langkawi, Malaysia by boat from the Thailand border (Satun Province).

The training and demonstration was conducted on 19 March 2007 for the KEN Kuala Teriang fisherfolks under the technical guidance of the SEAFDEC/TD team and assisted by a local fishery officer for interpretation between English and Malaysian languages. There were around 20 KEN fisherfolks who participated in this activity. Some of them had already experienced similar training and installation in 2004 when the SEAFDEC team first introduced this device to the project site.

Fish Enhancing Device (FED) Design (Type-II, Improved)

Project	**: SEAFDEC/TD, Resources Enhancement**	
Location	**: Langkawi Island, Malaysia**	
Water Depth	**: 28-34 m**	
Material	**: Synthetic Fiber**	**-Poly-Propylene (PP)**
		-Poly-Ethylene (PE)
		-Polyvinylchloride (PVC)
Duration	**: 17-22 March 2007 (Demonstration)**	

Fish Enhancing Device (FED)
(Water depth 28-34 m)

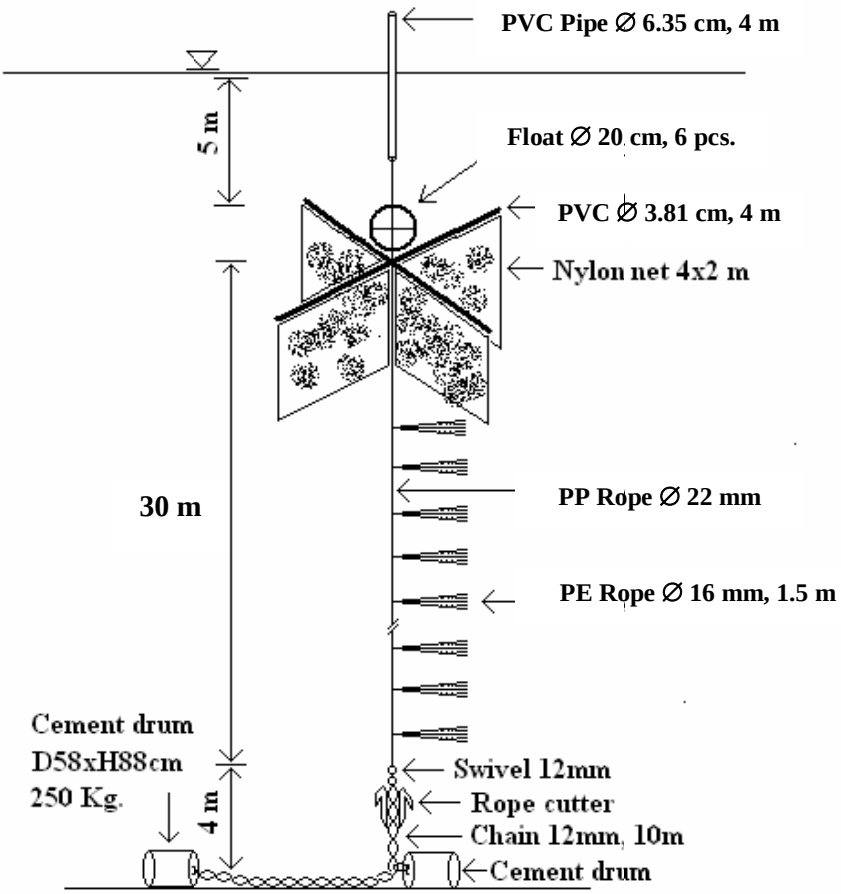


Fig. 18. FEDs construction design (improved, Second version)

Partly finished FED has been assembled (except the 2 cement sinkers). The related activities are shown in Fig. 19. It took around 6 hrs to complete a set of FEDs. Then, the fisherfolks were requested to complete all the 10 units of FEDs by themselves within one month and all units were proposed to be installed in the demarcated zone of Kuala Teriang in May 2007 (Fig. 20).

Fig. 19. Training and Demonstration on the Construction of FED to the fisherfolk of KEN Kuala Teriang, Langkawi, Malaysia, 19 March, 2007

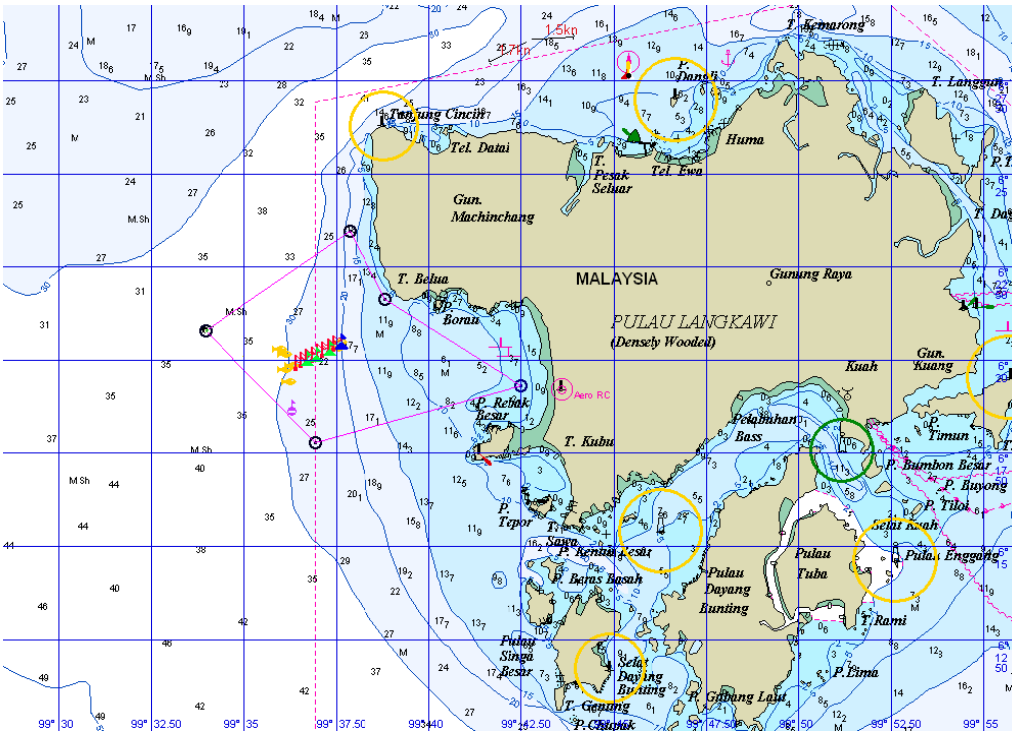


Fig. 20. Chart showing proposed FEDs installation site as requested by the KEN Kuala Teriang fisherfolks in 2007 (indicated by a red circle)

Pre-installation marine biological and oceanography survey for FEDs

Marine physical and biological survey is one of the essential tools to monitor the effectiveness of the environmental and fisheries habitat changes brought about by the installation of FEDs. Prior to the installation of the FEDs, therefore, an identical survey has to be initiated. This survey was carried out from 20 to 21 March 2007. A small fishing boat was chartered and the following parameters were collected and investigated using available oceanographic equipments prepared by the FRI staff. The summary of the results of the pre-installation survey is shown in Table 1.

Water quality

Conventional water quality parameters such as temperature, salinity, turbidity, depth, redox potential, dissolved oxygen and pH, which characterized the conditions existing at the site during sampling, were monitored *in situ* using a Multi Parameter Water Quality Monitor. Nutrients such as NO_2, NO_3, NH_3 and PO_4 were periodically monitored within the study site.

Plankton

A plankton net was towed horizontally to collect some planktons (zooplankton and phytoplankton) including fish larvae assemblages. The samples collected were preserved in 10% formalin. Identification of the species and abundance were analyzed at the FRI laboratory.

Benthos (Benthic fauna)

Benthic fauna is an indicator for the bottom characteristics and productivity of the area. This biological aspect was investigated by collecting bottom sediments using a small grab. Samples were collected twice and preserved before sieving. Abundance, species composition and distribution of the collective organisms living in, on, or near the bottom substrate were analyzed at the FRI laboratory.

Catchability of fishes

For this purpose hand-lining was conducted at the survey site. It effort was measured as kg catch/man/hour and would be conducted both during spring and neap tides. However, the team failed to catch any fishes due to the strong current and the anchor could not make the boat steady in one place. Moreover, the muddy sand bottom could show low productivity rather than a sandy or rocky bottom in terms of fish existence or abundance.

Table 1. Summary of the Pre-installation marine biological and oceanography survey for FEDs

Date	Activity
20 March 2007	*Station 1*: N 06°20.5200, E 099°37.6399 Water quality (surface, mid-water, bottom, 20 m) Water sample (surface and bottom, 20 m) Benthos (×2) Plankton net (Horizontal tow) *Station 2*: N 06°20.5004, E 099°37.6194 Plankton net (surface), Benthos (×2) *Station 3*: N 06°20.476, E 099°37.648 Plankton net (surface) Benthos (×2) **Stations 1-3* are towards the traditional FADs, depth 20 m
21 March 2007	*Station 4*: N 06°18.991, E 099°36.153 Depth 108 ft (36 m) Water quality (sub-surface, mid-water (15m) and bottom (27 m)) Grab (×2) *Station 5*: N 06°_19.033, E 099°_36.144 Depth 103.1 ft (34.3 m) Water quality (sub-surface, mid-water (16m) and bottom (28 m)) Grab(×2) Plankton net (surface) Hand-line fishing (Station 5) **Stations 4-5* are proposed to install FEDs as requested by KEN Kula Teriang Fisherfolk

Analysis of data

All data obtained were compiled and analyzed by FRI and periodically monitored.

Working staff

1. Abdul Razak Bin Latun-Fisheries Research Institute, Penang
2. Hadzley Harith- Fisheries Research Institute, Penang
3. Choong Kah Tung -State Fisheries Department, Penang
4. Taweekiet Amornpiyakrit-SEAFDEC/TD
5. Suchart Kijsamut-SEAFDEC/TD

The time allocated for the fisherfolk to complete the construction of 10 sets of FEDs was unfixed, but it should not be more than 1 month. However, the fisherfolks showed their enthusiasm to install the FEDs as soon as possible in the requested site. Hence, the SEAFDEC team decided to continue the installation in early April 2007. Monitoring survey on its effectiveness was discussed after the installation (Fig. 21).

Fig. 21. Pre-installation marine biological and oceanography survey for FEDs, 20-21 March, 2007 at the requested installation site of FEDs

Installation of 10 units of FEDs

The SEAFDEC/TD staff introduced a new design of FEDs to the fishermen group of Kuala Teriang, Langkawi, Malaysia on 17-22 March 2007 under the project Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL). In the wake of the training course on construction of FEDs on 19 March 2007, 10 sets of FEDs were completed by the members of KEN before the end of March 2007. The Steering Committee (SC) meeting held on 22 March 2007 agreed to carry out the installation of the units on 4 April 2007. The positions where these units would be installed in the zoning demarcation were determined during the SC meeting. The two patterns of the proposed installation position of the FEDs are shown in the following diagrams (Table 2, Fig. 22, and Table 3, Fig. 23):

Proposed Langkawi FEDs Setting Position by TD

Pattern A (along transect line between local FADs and artificial reefs set by LKIM)

Table 2. Proposed position of installation of ARs (Pattern A)

No.	Latitude (N)	Longitude (E)
1	06º 20’.4995	99º 37’.6391
2	06º 20’.4901	99º 37’.6510
3	06º 20’.4245	99º 37’.5051
4	06º 20’.3528	99º 37’.3600
5	06º 20’.2811	99º 37’.2133
6	06º 20’.2095	99º 37’.0670
7	06º 20’.1370	99º 36’.9199
8	06º 20’.0653	99º 36’.7748
9	06º 19’.9928	99º 36’.6289
10	06º 19’.9229	99º 36’.4830

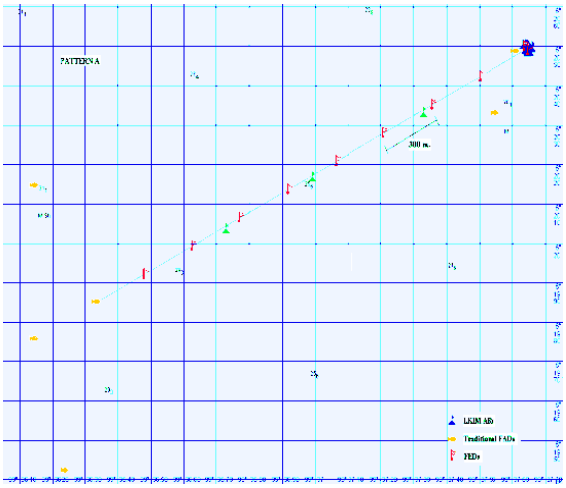


Fig. 22. Proposed position of ARs installation (Pattern A)

Pattern B (around artificial reefs set by LKIM, Malaysia 21 January 2006)

Table 3. Proposed position of installation of ARs (Pattern B)

No.	Latitude (N)	Longitude (E)
1	06º 20'.5200	99º 37'.6399
2	06º 20'.5200	99º 37'.6604
3	06º 20'.5004	99º 37'.6194
4	06º 20'.5004	99º 37'.6399
5	06º 20'.5004	99º 37'.6600
6	06º 20'.5004	99º 37'.6801
7	06º 20'.4910	99º 37'.6501
8	06º 20'.4799	99º 37'.6198
9	06º 20'.4799	99º 37'.6399
10	06º 20'.4799	99º 37'.6600

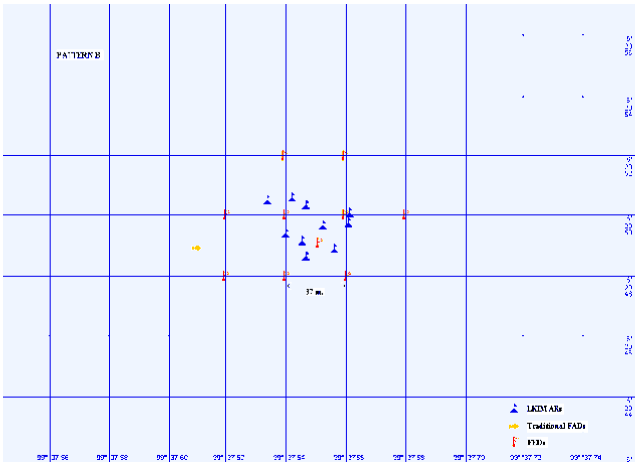


Fig. 23. Proposed position of ARs installation (Pattern B)

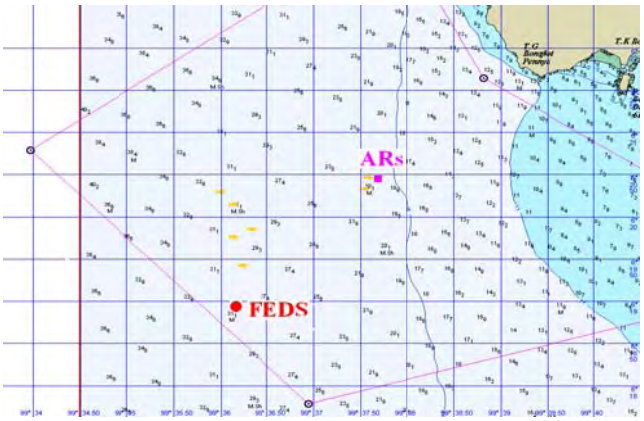
The TD staff accompanied by fisheries officer of DOF Malaysia installed the 10 unit s of FEDs on 4-5 April 2007. The installation position was proposed by the fishermen group as indicated in Fig. 24-25. About 20 fishermen participated in the installation process (Table 4, Fig. 26), which was conducted using two local fishing boats equipped with GPS and Echo-sounder system.

Fig. 24. Discussion among fishermen group (left), and materials preparation (right)

Fig. 25. FED installation at position pre-indicated by fishermen group

Table 4. FEDs installation position in demarcated zone of Kuala Teriang on 4 April 2007

No.	Position	
	Latitude	Longitude
1	6º 19'.025 N	99º 36'.211 E
2	6º 19'.011 N	99º 36'.151 E
3	6º 19'.004 N	99º 36'.202 E
4	6º 18'.999 N	99º 36'.184 E
5	6º 18'.977 N	99º 36'.184 E
6	6º 18'.970 N	99º 36'.170 E
7	6º 18'.954N	99º 36'.151 E
8	6º 18'.935 N	99º 36'.159 E
9	6º 18'.901 N	99º 36'.217 E
10	6º 18'.968 N	99º 36'.209 E



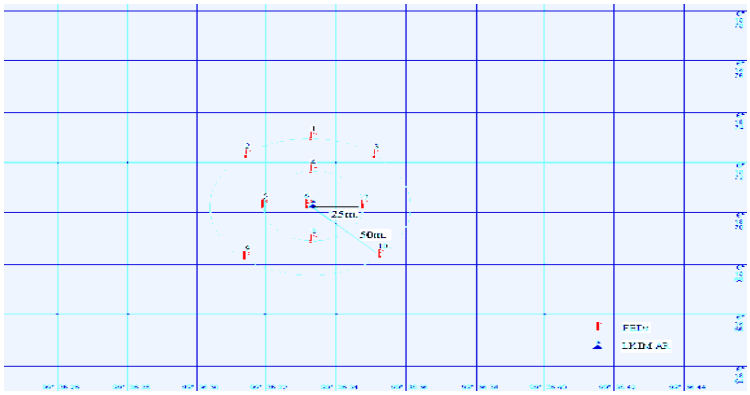


Fig. 26. Position of FEDs installation in the demarcated zone of Kuala Teriang on 4 April 2007

Monitoring of the Fish Enhancing Devices (FEDs) in Kuala Teriang, Langkawi, Malaysia

SEAFDEC/TD staff in cooperation with fisheries officers of FRI, DOF Malaysia conducted monitoring survey on the condition and performance of FEDs as well as survey on marine environmental conditions on 4-5 September 2007. Monitoring of the FEDs was conducted through under-water observation by scuba diving as well as using echo-sounder. The position of the FEDs was searched by GPS. However, no FEDs were found during the survey. Based on reports from the local fishermen, some parts of PVC pipes used as markers and buoyancy float of the FEDs were cut by commercial trawlers (Fig. 27-29).

Fig. 27. Vessel cruise track (red lines) while searching for FEDs (yellow spots)

Fig. 28. PVC pipes as markers and buoyancy floats of the FEDs were cut by commercial trawlers

Fig. 29. Commercial fishing boat operation in the project demarcated zone

Recommendations

The installation position of FEDs was proposed by local fishermen group to take place in the demarcated zone of Kuala Teriang. Even through the FEDs position was located in the demarcated zone, lack of intensive patrolling system by fisheries officers may have led to the damage of the FEDs by the intruding commercial trawlers. During the monitoring survey conducted, it was noted that three commercial trawlers were operating inside the area of the demarcated zone. There was no immediate action from the local fishermen to report to the authorities to stop the intruding trawlers. In order to avoid further damages to fishing gear and the resources enhance devices that may be installed later, measures to prevent illegal trawlers from entering the demarcated zone should be re-considered.

For further installation of FEDs by the project in the demarcated zone, it was recommended that the FEDs should be installed near artificial reefs that were installed by LKIM on 20-22 January 2006 (Fig. 30-31). The ARs could serve as protection from further damage of the FEDs by the trawlers.

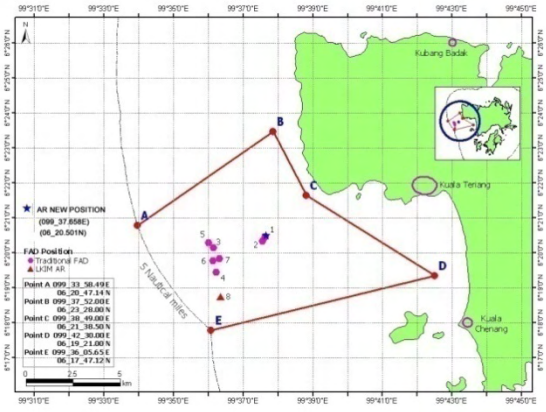


Fig. 30. Location of ARs installed by LKIM on 20-22 January 2006

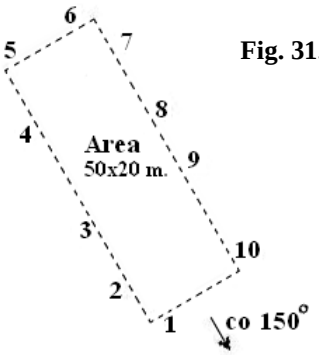


Fig. 31. Installation of ARs by LKIM on 20-22 January 2006

Mangrove Reforestation in Kuala Teriang Area, Langkawi

Abdul Najib Abdullah
District Engineer
Department of Irrigation and Drainage
District of Langkawi, Kedah

Importance of Mangroves

Fisheries

Mangrove forests are home to a large variety of fish, crab, shrimp, and mollusk species. These fisheries form an essential source of food for thousands of coastal communities around the world. The forests also serve as nurseries for many fish species, including coral reef fish. A study on the Mesoamerican reef, for example, showed that there are as many as 25 times more fish of some species on reefs close to mangrove areas than in areas where mangroves have been cut down. This makes mangrove forests vitally important to coral reef and commercial fisheries as well

Timber and plant products

Mangrove wood is resistant to rot and insects, making it extremely valuable. Many coastal and indigenous communities rely on this wood for construction material as well as for fuel (charcoal). These communities also collect medicinal plants from mangrove ecosystems and use mangrove leaves as animal fodder. Recently, the forests have also been commercially harvested for pulp, wood chip, and charcoal production.

Tourism

Given the diversity of life inhabiting mangrove systems, and their proximity in many cases to other tourist attractions such as coral reefs and sandy beaches, it is perhaps surprising that only a few countries have started to tap into the tourism potential of their mangrove forests. These places offer snorkeling expeditions in and around mangroves to witness a marvelous variety of baby fish, jellyfish, and urchins against a magical background of interwoven roots delving deep into the sandy substrate. Great potential exists elsewhere for revenue generation in this manner, which values the mangroves intact and as they stand.

Coastal protection

The dense root systems of mangrove forests trap sediments flowing down rivers and off the land. This helps stabilizes the coastline and prevents erosion from waves and storms. In areas where mangroves have been cleared, coastal damage from hurricanes and typhoons is much more severe. By filtering out sediments, the forests also protect coral reefs and sea grass meadows from being smothered in sediment.

December 2004 Tsunami

Aftermath of the December 2004 Tsunami: Kuala Teriang, Kedah State, Malaysia

Mangrove Reforestation

The government of Malaysia has set a task force to carry out mangrove replanting. YB Prime Minister's call in March 2005 to restore degraded areas so that people lives and their livelihoods are not adversely affected when faced with natural disasters such as tsunami and typhoons. This project will also promote public awareness on the importance of mangrove ecosystems through direct community participation. The replanting site will be used as a demonstration site on community participatory project for mangrove conservation.

Activities

November 2006: 12,000 seedlings have been planted in Kuala Teriang area.

December 2006: official launching by the Chief Minister of Kedah.

A total of 14,000 seedlings have been planted, using two species of mangroves, i.e. *Rhizophora apiculata* (bakau minyak) and *Rhizophora mucronata* (bakau kurap).

Problems

- Strong waves have uprooted the seedlings
- Logs and debris from Sungai Melaka swept and uprooted the seedlings
- Vandalism by kids swimming around the reforestation area
- Pollution due to effluents from a nearby stream, suspected to be toxic to the mangroves as about 2,000 plants have died

Solutions

To reduce wave height and wave energy from uprooting the seedlings, 4 units of 50meter length geotubes have been installed. Each geotube has 3m diameter.

Conclusion

Mangrove replanting in Kuala Teriang is considered to be successful because out of 14,000 seedlings planted about 10,000 survived (70% survived).


Recommendations

Prior to deforestation, a study on the local environment is important, specifically on:

- Wave action and direction
- Climate
- Long shore sediment transport
- Soil particle characteristic
- Any source of pollution
- Floating logs and debris, etc.

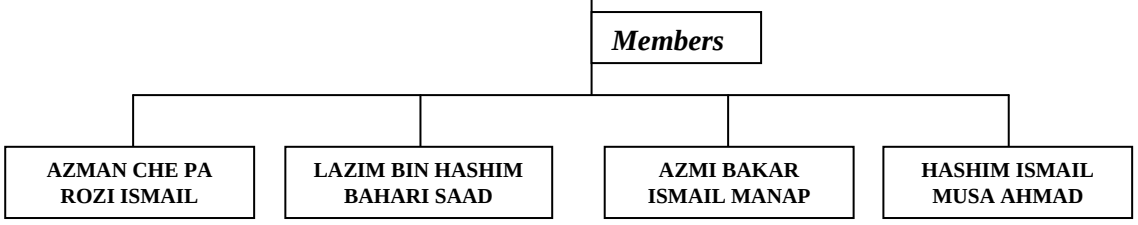

Beneficiaries' Views on the Impact of the LBCRM-PL/ICRM-PL Project

Komuniti Pengurusan Sumber Perikanan (KPSP)-Kuala Teriang
Fisheries Resources Management Community
Kuala Teriang, Langkawi, Kedah State, Malaysia

Background of KPSP – KUALA TERIANG

Formerly known as Kumpulan Ekonomi Nelayan (KEN), the Komuniti Pengurusan Sumber Perikanan (KPSP) formed on 10 July 2008 with 50 members. Started off with fishing activity around FADs and is individually run. Awareness emerges among the community to get united in light of the need to address encroachment by trawlers that damaged their FADs. KPSP believes that the voice of the masses as one is better heard than an individual.

The Committee of KPSP - KUALA TERIANG



Activities of KPSP

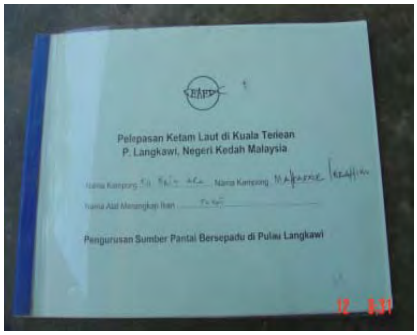
Core business of KPSP

1. Traditional FADs and ARs
2. Sale of ice
3. Sale of Lubricant
4. Outboard engine repair workshop
5. Fish cage culture (in progress)

Crab Bank System: a new experience of KPSP







KUMPULAN EKONOMI WANITA (KEW)
The committee

Chairman
PUAN CHE EMBON BT SAAD

Deputy Chairman
PUAN AZIZAH BT HASHIM

Secretary
PUAN MAHANI BT MANSOR

Deputy Secretary
PUAN ZAUYAH BT YAAKOB

Treasurer
PUAN TEMPAWAN BT ABDULLAH

Members

JELIAH BT DIN
HASHIMAH PUTEH
AMINAH MURAD

RAJEMAH AHMAD
RAHMAH ARIFIN
JALILAH ABD.JALIL

NORIZAN SAAD
CHE SHAM PUTEH
KU FAEZAH KU BULAT

Continuous capacity building enhances the role of fishermen in resources management

Already there are some positive signs

- Obvious reduction in the number of encroachment by trawlers thanks to equal commitment by the community and the DOF Malaysia
- Improved income
- Long-disappeared certain fish species have re-emerged
- We are more convinced to be part in the management process
- Household income has been encouraging
- We are now more united especially when it comes to making decision on what is best to done in managing the fisheries resources

Re-emergence of long disappeared creatures…unbelievable





Future plans

1. FADs and ARs
   - to deploy more ARs .
   - to continue improving the crab stock – of course through catch-and-release program
2. Selling ice
   - to increase the sale of cube ice to meet local demand.
3. Sale of lubricant
   - to add more product into the list with focus on recreational fishing equipment
4. Outboard engine repair workshop
   - to offer improved services with competitive pricing
5. Women's Group (KEW)
   - to increase production capacity
   - product diversification, e.g. on anchovy (EMPEYEK BILIS)
   - to beef-up promotions

Conclusion

We are united to pursue further from here and the continued guidance from the government is imperative. It is our wish to have a greater stake in managing coastal fisheries in future. The Government's efforts deserve appreciation.

Report on the Final Evaluation[1] (May 2008) LBCRM-PL/ICRM-PL

Ibrahim Saleh
Consultant, Malaysia

Summary

The collaborative project implemented by SEAFDEC and DOF Malaysia, named Locally Based Coastal Resources Management in Langkawi (LBCRM-PL), started in August 2003 with an initial duration of two years (until July 2005) but was extended until December 2006. The project was again extended until December 2007 because of the tsunami that affected the area. Funding of the project from August 2003 – December 2004 was by the Japanese Trust Fund 1. From January 2005, the project was funded by Japanese Trust Fund IV which placed emphasis on human resource development. The project title was then changed to "Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL)." This evaluation is intended to assess the marine biological impact on the marine resources and the socio-economic impact on fishing communities towards the achievement of the project objectives.

Objectives of LBCRM-PL/ICRM-PL

The overall objectives of LBCRM-PL and later ICRM-PL were:

1. to provide technical assistance for the sustainable development of coastal fishery communities in Pulau Langkawi;
2. to introduce the CBRM approach for the management of fisheries in Langkawi; and
3. to implement a pilot project using the CBRM / ICRM approach in Kuala Teriang, Langkawi.

Targets

Based on the above objectives, the targets and focus for the project were:

1. the state of the marine fishery resources of Kuala Teriang,
2. the socio-economic status of community in Kuala Teriang,
3. enhancement in education, understanding and awareness of fisheries management in the local community in Langkawi and staff of DOF Malaysia,
4. increased awareness and understanding of CBRM and integrated fisheries management in the local community in Langkawi and staff of DOF Malaysia,
5. the implementation of CBRM,
6. the development of local communities *KEN/KPSP* and *KEW* (Women's Economic Groups or *Kumpulan Ekonomi Wanita*) for fisheries management, and
7. rehabilitation of the community after the December 2004 Tsunami.

Beneficiaries

The direct beneficiaries of this project are the fishing community in Kuala Teriang, Langkawi and their families. In addition, indirectly the fishing communities in areas adjacent to Kuala Teriang could also benefit from the project operations. Generally, there is strong support and commitment shown by fishers, the local community and other stakeholders.

[1] The detailed Final Report on the Evaluation of the ICRM-PL Project was published jointly by SEAFDEC/TD and DOF Malaysia in June 2008

Prospects for Sustainability

There is logical consistency between inputs and outputs of the project. The quality and quantity of inputs, e.g. technical expertise and equipment as agreed were delivered within the time frame specified. Specifically, the project has been good and encouraging where the community expressed their support. The DOF Malaysia has also been convinced that project can continue. But *the fishery resources must be available*.

Project Design

The project comprised many sub-projects and related activities specially those that are related to the state of the fishery resources. The socio-economic impact has been considered, e.g. status of the community. There is continuous community development and capacity building focusing on CBRM. As for the efforts on rehabilitation after the tsunami, these have been carried out through the various rehabilitation activities.

The institutional arrangement for project implementation depended on the lead roles played by SEAFDEC and DOF Malaysia. The increased awareness in CBRM and co-management of fisheries; and the development and upgrading of skills of members of *KEN* and *KEW* showed the project was "cost effective."

Technical expertise provided by the project was sufficient and this was very much appreciated by the community. The project team, from SEAFDEC and DOF Malaysia, acted very professionally and efficiently. The team successfully implemented the project and managed it well to meet the expectations of the community. At the national level, DOF Malaysia had planned for the involvement of officers from other Divisions, e.g. Extension and Fisheries Management Divisions in this project. The officer from the Planning Division played the role of project coordinator.

Project Document

- **Main reference** used and is very important (for continuity especially when officers are transferred/changed)
- **Project design matrix gave good summary** of activities and indicators to evaluate performance (*performance indicators* are very important to evaluate if objectives are met, they should be *simple and understandable by fishers and communities*)

Institutional Relationship

- Lead role by SEAFDEC and DOF Malaysia
- Existing institution established through *Kumpulan Ekonomi Nelayan* (KEN) that was established in 2001
- Participative approach by stakeholders
- Stakeholders identified

Efficiency & Adequacy of Project Implementation

- Funds – sufficient except for monitoring and impact survey on Artificial Reefs (ARs)
- Timeliness of Input Delivery – delivered within time frame planned
- Technical expertise – sufficient, professional, knowledgeable & relevant
- Managerial & Work Efficiency of Project Team - professional and efficient
- Implementation difficulties – no major problems
- Minor problem in scheduling of meeting dates among SEAFDEC, DOF Malaysia and fishers
- Insufficient number of DOF staff – an additional officer required

However, funds should be made available for staff from relevant Divisions of DOF Malaysia to ensure continuity of activities. Furthermore, the Extension & Management Divisions Officers should be involved, and that the activities and success story should be transferred to other sites.

Monitoring & Reporting

The List of documents prepared that included the following are very useful:

- Project Document
- Marine Resources Monitoring Report
- Monitoring Socio-economic Survey Report
- Biannual Project Progress Reports
- Travel Reports
- Minutes of Project Steering Committee and Implementation Coordination Committee

Reports in the form of Minutes of the Project Steering Committee and ICC meetings; Biannual Project Progress Reports and travel reports from the implementation of project activities are also sufficiently clear and adequate. However, the process of introducing co-management of fisheries (including CBRM concept) at Kuala Teriang, Langkawi, should be prepared as main output, considering that this process is to be repeated at other sites. Such document would therefore be used as a reference and thus, should be made available.

Project Results

The following observations were noted:

- Resource Monitoring Survey
  - No consistent assessment was made
  - Sampling design for resource monitoring should be reviewed and improved (CPUE and length frequency) and the time frame should be extended
  - Monitoring to be continued at AR area
- Socio-economic monitoring survey was completed and the results are useful
- Community based resource management, Zoning arrangement, Local Enforcement Unit & Resource Enhancement activities came up with very good results
- Awareness, strengthening and motivation on CBRM and fisheries co-management are very important for the stakeholders
- Fisheries Resource Management Plan (FRMP) should be finalized, adopted and implemented as soon as possible
- Local business development for both *Kumpulan Ekonomi Wanita* (KEW) & *Kumpulan Ekonomi Nelayan* (KEN) would be sustained
- Training, study tours, courses have been very useful as these have upgraded the capabilities of the fisherfolk
- Physical upgrading and equipment provided especially after the tsunami, have contributed a lot to the rehabilitation of community.

Specifically, the conclusion from the Marine Resources Monitoring Survey seems to suggest that a consistent assessment of the status of the fishery could not be made with the data so far collected. A sampling design to enable sufficient numbers of specimens to be sampled and measured should also be developed. It is necessary that the impact of ARs (Artificial Reefs)/FEDs (Fish Enhancing Devices) on the fishery resources be evaluated and results should be properly translated and communicated to fishers, community members, *KEN/KPSP* and other stakeholders to further enhance their understanding and acceptance of the need for fisheries management and conservation.

KEN/KPSP and *KEW* were grateful and satisfied with the financial and infrastructure (buildings and equipment) contribution provided by the project through SEAFDEC and DOF Malaysia as well as through the Japanese Grassroot Tsunami Relief Fund. They also appreciated the training courses and study tours conducted to help develop their capacity in CBRM; fishery resources management, conservation and rehabilitation; fishing gear technology; repair of boats and engines, and in the development of human capital in small fishery-related business enterprises.

Sustainability of Project

- Mechanism & framework to ensure sustainability of CBRM & co-management of fisheries
  - Framework developed
  - Maintain momentum in implementation of activities
  - Training including *leadership training*
  - Information dissemination
  - Conduct of scientific surveys, monitoring of ARs and document
  - Monitor progress of *KEW, KEN* businesses

Conclusions

- Project achieved its objectives of introducing CBRM through provision of technical assistance to community through pilot project at Kuala Teriang
- Community is able to start co-management of fisheries
- Impact of project on coastal fisheries could not be quantitatively assessed
- No drastic change in socio-economic status but increased awareness in CBRM and holistic approach to fisheries management
- Project successfully implemented

This project has achieved its objectives of introducing the concept of CBRM through the provision of technical assistance to the community through the pilot project at Kuala Teriang, Langkawi. However *KPSP* may not be fully ready at this point in time to independently implement CBRM and manage the fishery. DOF Malaysia will continue to play a lead role in the co-management of the fishery in Kuala Teriang and is confident of continuing these activities together with *KEN/KPSP, KEW* and other members of the community.

The model of CBRM as practiced in one country cannot be introduced in totality to another country. Its introduction and implementation has to be adapted to the local historical, social, cultural, economic and development situations. It is for this reason that this project was started as a pilot scale project in Langkawi, Malaysia. The Kuala Teriang community still needs to be guided and prepared. The community is able to start co-managing the fishery with assistance from DOF Malaysia. The community will be empowered in stages to implement CBRM measures to manage the fishery independently in the future.

The impact of the project on coastal fisheries could not be assessed quantitatively because of inadequacies of the data collected. A review and improvement in sampling methodology to be used should be undertaken. The time frame for monitoring the fishery and collection of data should be extended.

There was no drastic change in the socio-economic status of the fishing communities in Kuala Teriang and Kuala Chenang between 2003 and 2006. However the Kuala Teriang community has benefited in terms of overall development in relation to increased awareness in CBRM and the holistic approach to fisheries management within the time frame of the project. The Kuala Teriang community was exposed to the need for active participation in activities related to fisheries management and conservation, including enforcement of rules and regulations.

Leadership and managerial capacities for CBRM and fisheries co-management were enhanced. Local community voluntary work and participation in conservation was demonstrated and enhanced through the crab bank (crab marking) sub-project. *KEW* and *KEN/KPSP* also benefited in the development of local businesses.

The project has been implemented successfully. It had created a significant impact for the introduction of CBRM/ICRM and fisheries co-management on the local communities at Kuala Teriang and adjacent villages. It could have produced an even much greater impact with the dissemination of more extension documents and information to the local community and other stakeholders.

Prospects for sustainability of relevant and related activities after the termination of this project are good. It is important that the first FRMP (Fishery Resource Management Plan) be implemented quickly. It is necessary that DOF Malaysia immediately initiates actions stipulated in the FRMP.

Recommendations

- The zoning arrangement as agreed should be incorporated into the FRMP. The FRMP should be accepted, endorsed and implemented quickly.
- The process of introducing co-management of fisheries and CBRM at Kuala Teriang, Langkawi, should be documented for reference and to be applied in other sites.
- Monitoring and assessment of the fishery in the area to study the effectiveness of ARs for resource enhancement should be continued. Results should be documented.
- A study on the impact of ghost fishing on the fish resources of the area could be initiated by FRI.
- A study to monitor the effectiveness of the crab bank (crab marking) sub-project is proposed.
- Monitoring of squid fishing with light lures is proposed.
- The project on mangrove re-planting should be monitored for effectiveness together with the Drainage and Irrigation Department.
- Information dissemination could be further enhanced through publication of technical papers, non-technical papers, extension documents, flyers, brochures as well as through electronic media.
- Public awareness and education of the community on fishery management and conservation should be further enhanced.
- The progress of *KEN/KPSP* and *KEW* businesses should be monitored through the use of selected indicators.
- A Division 1 Officer from DOF Malaysia (or contract officer) should be stationed and dedicated to the project site in addition to the Extension Officer for more effective implementation, monitoring and evaluation.
- DOF Malaysia should continue to maintain the momentum established or further develop the close rapport and communication with *KPSP* to ensure the sustainability of fisheries co-management and CBRM activities.
- Funding for the implementation of FRMP should be made available by DOF Malaysia.
- The Fisheries Management Division of DOF Malaysia should implement the FRMP and play a lead role in further developing fisheries co-management and CBFM related activities in Malaysia.

Follow-up Assistance

1. Training courses, upgrading of skills and relevant human resource development programs including leadership training should be conducted
2. Exposure to Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) procedure to improve quality of products produced by *KEW*
3. Study tour to local CBRM project in Malaysia, e.g. *Tagal* in Sabah
4. Enhancement of community voluntary work
5. Provision of a marker buoy to mark the ARs in the area for safety in navigation and fishing
6. Final wrap-up seminar for information exchange on “lessons learnt”

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Visit to the ICRM-PL Project Site in Kulala Teriang by the Regional Seminar Participants

22 October 2008

The participants in the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL held in Langkawi, Malaysia from 21 to 23 October 2008, had the chance to visit the ICRM-PL project site in Kuala Teriang, Langkawi. Arranged by the DOF Malaysia, the site visit gave the participants opportunity to discuss with the fishermen's groups (i.e., KPSP and KEW) on their activities. The participants were also able to witness the progress and improvements of the project site after the December 2004 Tsunami which devastated the project site.





The newly constructed fish processing plant for the KEW: construction and equipping with modern facilities was done through the DOF Malaysia


Products of the KEW-Kuala Teriang



Access bridge over the canal in Kuala Teriang (a post-tsunami infrastructure)

Regional Seminar participants inspecting the KPSP facilities

KPSP Chairman (center) welcomed the participants

SEAFDEC Secretary-General giving token of appreciation to KPSP Chairperson (left) and to KEW Chair (center) while participants looked on (right)

Partaking of the food prepared for the participants by the KPSP and KEW

Acknowledgment

The project staff of ICRM-PL would like to extend their sincere appreciation to DOF Malaysia and other related agencies including the Fisheries Development Authority of Malaysia (LKIM), Fishery Research Institute (FRI), Fisheries Institute of Malaysia (IPM), State Fisheries Office in Kedah, Langkawi Development Authority (LADA), Drainage and Irrigation Department in Langkawi (JPS), and SEAFDEC/TD for the successful implementation of the project in Langkawi, Kedah State, Malaysia. Special thanks are offered to the Government of Japan through its Trust Fund Program for the financial support to the project. The project is also thankful to the Japanese Embassy in Malaysia through the Grassroots Tsunami Fund, for its contribution for the rehabilitation of the project site after the December 2004 Tsunami, which substantially funded the reconstruction of some physical facilities damaged by the devastating tsunami.

Finally, the project staff specifically thanked the real actors who have been playing the main roles in the project operation: the fisherfolk, *including fish-women by all means,* in Kuala Teriang. Their self-motivation towards the realization of the CBRM concept and total community development has been noteworthy to receive a very special appreciation and further possible support. It is the wish of the project staff that the newly organized fisheries community, the Kuala Teriang Fishery Resources Management Community (KPSP), and also the Women's Economic Group (KEW) would have all the success and prosperity in the future.

For the successful conduct of the Regional Seminar, special thanks go to DOF Malaysia and SEAFDEC for co-organizing the Seminar. Also to the Seminar Committees for the excellent arrangements, to the Seminar Secretariat led by *Mr. Arthur Besther Sujang* of DOF Malaysia and the SEAFDEC Secretariat and TD staff for coming out with this publication which highlights on the achievements of the LBCRM-PL/ICRM-PL.

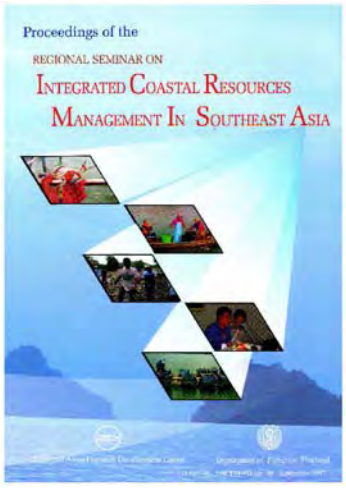
Related Publications on the SEAFDEC ICRM Project

List of ICRM-PD Publications

No.	Title of publication	Author(s)	Date of publication	Language
1	Locally Based Coastal Resources Management: LBCRM in Pathew District, Chumphon Province	SEAFDEC		Thai
2	Background and Project Proposal of Locally Based Coastal Resources Management in Pathew District, Chumphon Province	Yamao, Phattareeya (Eds)	July 2002	Eng
3	Marketing and Utilization of Fish Products In Tambol Pakklong, Pathew District, Chumphon Province	Yamao, Amporn	August 2002	Thai
4	People's Groups and Community-Based Arrangements in Tambol Pakklong, Pathew District, Chumphon Province	Sumitra, Yamao,Jirapa	September 2002	Eng
5	Marketing and Utilization of Fish Products in Tambol Pakklong, Pathew District, Chumphon Province	Amporn, Yamao	August 2002	Eng
6	Women's Group with Fisheries Production Potential in Tambol Pakklong, Pathew District, Chumphon Province	Sumitra, Yamao, Jirapa	September 2002	Thai
7	Pre-survey of the Community to Formulate Implementation Plans and Activities of the LBCRM Project: Project Site in Pathew District, Chumphon Province	Phattareeya, Jinda, Kongpatha, Jirapa, Baramee	September 2002	Eng
8	Develop Extension Methodologies and Strengthening the Extension System in Locally Based Coastal Resource Management in Tambol Paklong, Pathew District, Chumphon Province, Thailand	Kongpathai	September 2002	Thai
9	Quarterly Report No. 1	Yamao (Ed)	January 2002	Eng
10	Quarterly Report No. 2	Yamao (Ed)	April 2002	Eng
11	Quarterly Report No. 3	Yamao (Ed)	July 2002	Eng
12	Quarterly Report No. 4	Yamao (Ed)	October 2002	Eng
13	Report on the Study Trip to the Philippines	Yamao (Ed)	January 2002	Eng
14	Report on the Study Trip to Malaysia	Yamao (Ed)	August 2002	Eng
15	Overview of Fishing Activities in the Pakklong Sub-district Coastal Area, Pathew District, Chumphon Province	Sukchai, Wirote	January 2003	Eng
16	Catch Composition and the Length Frequency Distribution of Indian Squid (*Loligo duvauceli*) from Squid Cast Nets in the Coastal Area of Pakklong Sub-district	Phattarajit, Phamornpan, Khunruthai, Boonyarith, Chaiyan	January 2003	Eng
17	The Marine Environmental Condition of the Pakklong Sub-district Coastal Area and their Effect on Coastal Aquaculture	Penchan, Sumana, Chumchoke	January 2003	Eng
18	Quarterly Report No. 5	Phattareeya (Ed)	February 2003	Eng
19	Annual Report of the Locally Based Coastal Resource Management in Pathew District, Chumphon Province: Year 2002	SEAFDEC/TD Socio-economics Section	March 2003	Eng

No.	Title of publication	Author(s)	Date of publication	Language
20	Seminar on Community Based Fisheries Management Concept in Pathew District, Chumphon Province (19-21 Feb 2003)	SEAFDEC	April 2003	Eng
21	Report on the Study Trip to Malaysia Part II	Phattareeya (Ed)	May 2003	Eng
22	Large Cast Net and Anchovy Falling Net Fisheries: Community Based Economic Development: Survey in Pakklong Sub-district, Pathew District, Chumphon Province	Phattareeya, Jinda, Kongpathai, Jirapa, Baramee	September 2003	Eng
23	Proceedings of the Toward Further Development of Coastal Resource Management: Lessons Gained Through Locally Based Coastal Resource Management in Pathew District, Chumphon Province, Thailand (with CD)	SEAFDEC	September 2003	Eng
24	Quarterly Report No. 7, April – June 2003	Sei Etoh(Ed)	October 2003	Eng
25	Quarterly Report No. 8, July – September 2003	Sei Etoh (Ed)	December 2003	Eng
26	Quarterly Report No. 9, October – December 2003	Sei Etoh (Ed)	March 2004	Eng
27	Crab Fisheries Survey to Sustain Community-Based Economic Development: In Pakklong Sub-District, Pathew Distirct, Chumphon Province	Phattareeya, Jinda, Kongpathai, Jirapa	June 2004	Eng
28	Crab Fisheries in Locally Based Costal Fisheries Management, Pathew District, Chumphon Province	Jinda, Sansanee, Phattarajit, Sukchai	September 2004	Thai
29	Fishing Gear Replacement Project: Changing mesh size at bottom side of crab trap in Pathew Sub-District, Chumphon Province	Jinda, Thaworn, Jiraporn, Kwanruthai	September 2004	Thai
30	Squid Fisheries in Pakklong Sub-District, Pathew District, Chumphon Province (2003-2004)	Sansanee, Phattarajit, Sukchai	September 2004	Thai
31	Marine Shrimp From Shrimp Trammel Net in Locally Based Costal Fisheries Management Pathew District, Chumphon Province	Rojjanarut, Thaworn, Jiraporn, Kwanruthai	September 2004	Thai
32	The Status of Coral Reef in Pathew District, Chumphon Province	Uncharee	September 2004	Thai
33	Report of Household Survey in Pakklong Sub-District, Pathew District, Chumphon Province	Phattareeya, Jinda, Kongpathai, Jirapa	September 2004	Eng
34	Carrying capacity estimation of marine finfish cage culture at Pathew Bay, Chumphon Province, Southern Thailand	Tookwinas, Songsangjinda, Kajonwattakul, Singharachai	March 2004	Eng
35	Overview of Fishing Activities in the Pakklong Sub-District Coastal Area, Pathew District, Chumphon Province	Sukchai	July 2004	Eng
36	Monitoring of Density and Distribution of Meiofauna in the Pakklong Sub-District Coastal Area	Jarumon, Panitnard, Penjan, Summana, Chumchoke, Chanchai	March 2004	Eng
37	Manual of Fishing in Coastal Resources Management Area, Pathew District, Chumphon Province	SEAFDEC		Thai
38	Bi-annual Project Progress Report of LBCFM-PD	Sei Etoh (Ed)	September 2004	Eng
39	Mid-term Evaluation of LBCFM-PD	Somsak Chullasorn	September 2004	Eng

No.	Title of publication	Author(s)	Date of publication	Language
40	Seminar Recommendations on Research, Technical and Data Analysis (17-18 August 2004)	SEAFDEC	September 2004	Thai
41	Seminar on Development Concept of Coastal Fisheries Management in Pathew District, Chumphon Province	SEAFDEC	September 2004	Thai
42	Bi-annual Project Progress Report of LBCFM-PD	Sei Etoh (Ed)	February 2005	Eng
43	Bi-annual Project Progress Report of LBCFM-PD (Jan-June 05)	Sei Etoh (Ed)	June 2005	Eng
44	Bi-annual Project Progress Report of LBCFM-PD (July-Dec 05)	Sei Etoh (Ed)	Dec 2005	Eng
45	Bi-annual Project Progress Report of LBCFM-PD (Jan-June 06)	Sei Etoh (Ed)	June 2006	Eng
46	The New Experience of Sub-district Administrative Organization	Phattareeya, Jinda, Jirapa	January 2007	Eng
47	Final Evaluation of LBCFM-PD	Somsak		Eng
48	Bi-annual Project Progress Report of LBCFM-PD (Jul-Dec 06)	Sei Etoh (Ed)	December 2006	Eng
49	Proceeding of the Regional Seminar on Integrated Coastal Resources Management in Southeast Asia: Lessons Learned through Integrated Coastal Resources Management in Pathew District, Chumphon Province (ICRM-PD)	SEAFDEC	September 2007	Eng



List of ICRM-PL Publications

No.	Title of publication	Author(s)	Date of publication	Language
1	Program Document on Locally Based Coastal Resources Management	SEAFDEC		Eng
2	Bi-annual Project Progress Report of LBCRM-PL	Sei Etoh (Ed)	September 2004	Eng
3	Bi-annual Project Progress Report of LBCRM-PL	Sei Etoh (Ed)	April 2005	Eng
4	Bi-annual Project Progress Report of ICRM-PL	Sei Etoh (Ed)	July 2005	Eng
5	Bi-annual Project Progress Report of ICRM-PL	Sei Etoh (Ed)	January 2006	Eng
6	Bi-annual Project Progress Report of ICRM-PL Jan-Jun 06	Sei Etoh (Ed)	September 2006	Eng
7	Bi-annual Project Progress Report of ICRM-PL Jul-Dec 06	Sei Etho (Ed)	February 2007	Eng
8	Bi-annual Project Progress Report of ICRM-PL Jan-Jun 07	Sei Etoh (Ed)	July 2007	Eng
9	Marine Resources Monitoring in Pulau Langkawi, Malaysia (2004-2006)	Penchan Laongmanee	September 2007	Eng
10	Bi-annual Project Progress Report of ICRM-PL Jul-Dec 07	Sei Etoh (Ed)	January 2008	Eng
11	Final Project Evaluation of the Integrated Coastal Resources Management in Pulau Langkawi	Ibrahim bin Saleh	May 2008	Eng
12	Report on Monitoring Socio-economic Survey in Kuala Teriang, Pulau Lanngkawi, Malaysia in August 2006	Sei Etoh, Thanyalak, Saivason	November 2007	Eng
13	Proceedings of the Regional Seminar on Integrated Coastal Resources Management Approach in Southeast Asia: Review of the Project ICRM-PL	SEAFDEC	December 2008	Eng

List of ICRM-SV Publications

No.	Title of publication	Author(s)	Date of publication	Language
1	Project Document on Integrated Coastal Resources Management in Sihanoukville (ICRM-SV)	Sei Etoh	July 2005	Eng
2	Preliminary Socio-economic Survey in Commune Teuk Thla, Sihanoukville, Cambodia	Sei Etoh *et al.*	September 2005	Eng
3	Annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV)	Sei Etoh	January 2006	Eng
4	Bi-annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) January-June 2006	Sei Etoh	September 2006	Eng
5	Bi-annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) Jul-Dec 2006	Sei Etoh	January 2007	Eng
6	Women's Group Activity in Production of Mushroom Community Fisheries Prey Nup II, Sihanoukville, Cambodia	Sei Etoh	June 2007	Eng
7	Bi-annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) Jan-Jun 2007	Sei Etoh	August 2007	Eng
8	Fish Landing Data in Prey Nup II under the Project Integrated Coastal Resources Management in Sihanoukville (ICRM-SV)	Penchan Laongmanee		Eng
9	Bi-annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) Jul-Dec 2007	Sei Etoh	January 2008	Eng
10	Bi-annual Project Progress Report of Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) Jan-Jun 2008	Sei Etoh	July 2008	Eng

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