

FINAL PROJECT EVALUATION
INTEGRATED COASTAL RESOURCES MANAGEMENT IN
PULAU LANGKAWI (ICRM-PL)

IMPLEMENTED
BY

TRAINING DEPARTMENT
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
AND
DEPARTMENT OF FISHERIES MALAYSIA

Conducted
by

Ibrahim bin Saleh

Consultant on Fisheries Project Evaluation
Kuala Lumpur, Malaysia

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FOREWORD

The Locally based Coastal Fisheries Management in Pulau Langkawi (LBCFM-PL)/ The Integrated Coastal Resources Management in Pulau Langkawi (ICRM-PL) Project, Malaysia, is a collaborative project between Southeast Asian Fisheries Development Center (SEAFDEC)/Training Department (TD) and the Department of Fisheries (DOF) Malaysia. The ICRM-PL project initial component of the Coastal Resources Management Program, which based on the adoption of ASEAN-SEAFDEC Fisheries Consultative Group (FCG) Scheme. ICRM-PL is financially supported by the Japanese Trust Funds, while DOF contribution is supported by Malaysia Government Fund.

Under the coastal resources management program, TD and DOF Malaysia collaborated in formulating and implementing the collaborative coastal fisheries management project. An aim of the collaborative project lies in promotion and achievement of sustainable use of fishery resources. TD and DOF Malaysia agreed^{9*} to transfer essence of technologies, accumulated knowledge and lesson learned, which gain through the implementation of coastal fisheries management project to other SEAFDEC member countries through the SEAFDEC's information network. This information may help ASEAN-SEAFDEC member countries consider their own policies and formulate new directions for the coastal resources management plan and implementation.



Siri Ekmaharaj, Ph.D
Secretary-General

PREFACE

The first collaborative project in introduction and demonstration of community based fishery resources management was deployed in Chumphon, Thailand, from November 2001 in the wake of decision made at the ASEAN-SEAFDEC Fisheries Consultative Group in 2001. As agreed at this meeting as well, the second sister project began in Langkawi, Malaysia, in August 2003 with the similar project operational framework based on lessons learned and experiences gained through the first project in Thailand.

The project had been operated various activities on the right track until 26th December 2004 when the devastating tsunami assaulted in the project operational area. The tsunami left the sever damages to the fishing communities; 85% of fishing vessels were destroyed to the extent of non-repairable. Thereafter, the project orientation was inevitably diversified to the rehabilitation of fishing fleet for a year or so. Toward the end of the year 2006, thanks to appreciable amount of effort exerted by the Malaysian authorities, foreign funding agencies and NGOs, the fishing activities had become more or less normalized to the pre-tsunami state. Under such circumstances, the project tenure was extended until December 2007 from the originally planned 2005 in a bid to attain the project original goals.

The project terminated in December 2007 and the final project evaluation to verify the project achievement consistent with the targeted goals was conducted by an out-sourced project evaluation consultant from February to March 2008. The final project evaluation report was hereto compiled and published.

Seiichi Etoh
Project Leader
SEAFDEC/TD

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AN EVALUATION OF THE COLLABORATIVE PROJECT

“LOCALLY BASED COASTAL FISHERIES MANAGEMENT IN PULAU LANGKAWI (LBCFM-PL)/ INTEGRATED COASTAL RESOURCES MANAGEMENT IN PULAU LANGKAWI (ICRM-PL)”

**IMPLEMENTED BY
TRAINING DEPARTMENT/SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER AND
DEPARTMENT OF FISHERIES MALAYSIA**

1. INTRODUCTION

Under the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) collaborative mechanism, it was agreed in 2001 that the Japanese model on Community Based Resource Management (CBRM) approach should be tried in Thailand. If shown to be successful, this approach should be disseminated to other SEAFDEC Member Countries. With this understanding, the project on Locally Based Coastal Fisheries Management in Pathew District (LBCFM-PD) was initiated in Thailand in November 2001 under a collaborative project framework between the Department of Fisheries (DOF) Thailand and Southeast Asian Fisheries Development Center (SEAFDEC) Training Department (TD).

Basing on the knowledge and experience gained from the LBCFM-PD in Thailand, a proposal was made to initiate a similar project in Langkawi, Malaysia. This project was then implemented under a collaborative framework between SEAFDEC and DOF Malaysia.

2. PROJECT BACKGROUND

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 two years (until July 2005) but was extended until December 2006 as agreed by the 27th SEAFDEC Program Committee Meeting (PCM) in December 2004. 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 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.

3. SCOPE OF EVALUATION

3.1 Relevance of Project to Development Priorities and Needs

The project, as implemented, is relevant to the development priorities and needs of the fishery sector in Malaysia. The assessment of the marine coastal fishery resources (Laongmanee 2007) and the socio-economic survey in Kuala Teriang, Langkawi (Etoh *et al.*, 2007) conducted in this project

are relevant. The results from these two studies will provide the baseline data and information required for the implementation of co-management of fisheries and CBRM-related activities.

DOF Malaysia is the custodian of the fishery resources in Malaysia and is responsible for their wise use and proper management which include the implementation of effective resource conservation and rehabilitation programmes. The management of fishery resources and fisheries are based on a holistic approach which encompasses the whole ecosystem and emphasizes the need for active stakeholder participation and involvement.

In the management of fisheries in Malaysia, the need for continuous improvement is reflected in the readiness for change. The management of fisheries in Malaysia is considered the best in the ASEAN region but Malaysia is still prepared to learn and to adapt and adopt measures that will improve the situation of her fisheries. Malaysia's fisheries are centrally managed but DOF Malaysia is prepared to co-manage these resources with stakeholders.

CBRM has proven to be effective in countries like Japan where it has been practiced for a long time. Such an approach has also shown promising improvement in the management of selected fisheries in Thailand and the Philippines where communities have been actively engaged.

DOF Malaysia bears the responsibility to prepare and empower communities in Malaysia in fisheries co-management and CBRM.

With this positive approach, DOF Malaysia agreed to implement this pilot project in Kuala Teriang, Langkawi. In fact DOF Malaysia had initiated the introduction of CBRM-related activities through the formation of Fishermen Economic Groups or *KEN (Kumpulan Ekonomi Nelayan)* in 2001 in several areas in Peninsular Malaysia. The name *KEN* suggested that emphasis was placed more on the economic objective even though DOF Malaysia has always incorporated biological and social objectives in management. The name *KEN* was changed to Fishery Resources Management Community or *KPSP (Komuniti Pengurusan Sumber Perikanan)* in July 2007. This shows the progression of fisheries management towards a more holistic and ecosystem based approach. Environmental objectives are now also included in fisheries management in Malaysia. This present SEAFDEC / DOF Malaysia collaborative project is therefore able to build upon and take advantage of the institutional arrangement established earlier.

3.2 Overall Objectives

The overall objectives of LBCRM-PL and later ICRM-PL were:

- i. to provide technical assistance for the sustainable development of coastal fishery communities in Pulau Langkawi
- ii. to introduce the CBRM approach for the management of fisheries in Langkawi and
- iii. to implement a pilot project using the CBRM / ICRM approach in Kuala Teriang, Langkawi.

The above objectives are clear to the fishing communities of Kuala Teriang and neighbouring Kuala Chenang, as well as the ground staff of DOF Malaysia in Langkawi. After the tsunami, the objectives were broadened to focus on community development for rehabilitation as well. The LBCRM-PL / ICRM-PL project document or "blue print", outlining the overall project for implementation was prepared in detail (Anon., 2003). Overall project achievements were also reported at the SEAFDEC Program Committee Meetings.

3.2.1 Specification of Targets

Basing on the above objectives, the targets and focus for the project were on the:

- i. state of the marine fishery resources of Kuala Teriang,
- ii. socio-economic status of community in Kuala Teriang,
- iii. enhancement in education, understanding and awareness of fisheries management in the local community in Langkawi and staff of DOF Malaysia,
- iv. increased awareness and understanding of CBRM and integrated fisheries management in the local community in Langkawi and staff of DOF Malaysia,
- v. implementation of CBRM,
- vi. development of local communities *KEN* / *KPSP* and *KEW* (Women's Economic Groups or *Kumpulan Ekonomi Wanita*) for fisheries management and
- vii. rehabilitation after the tsunami.

3.2.2 Beneficiaries of Project

The direct beneficiaries of this project are the fishing community in Kuala Teriang, Langkawi, and their families. Indirectly, the fishing communities in areas adjacent to Kuala Teriang may also benefit.

3.2.3 Prospects for Sustainability

Prospects for sustainability of relevant and related activities after the termination of this project are good. Fifty percent of fishers interviewed expected a continuation of the project (Etoh *et al.*, 2007). Fishers from *KEN* and womenfolk from *KEW* who were interviewed expressed support and commitment to continue relevant and related activities that had been started by this project. Staff members from DOF Malaysia are convinced that activities will continue as shown by the strong interest and support from the community in Kuala Teriang and adjacent villages such as Kuala Chenang.

However a minority of fishers felt that fisheries are threatened by declining fish stocks, decreasing number of fishers and the ageing fishing population (Etoh *et al.*, 2007).

As far as possible, the momentum gained from the implementation of the project especially during the last three years, should be maintained through close rapport and constant communication between the community and DOF Malaysia. DOF Malaysia should continue to work with *KEN*, *KEW* and monitor progress of activities initiated. Implementation of activities should be evaluated using selected indicators and feed-back should be used for improvement. Biological and socio-economic indicators can be used.

3.3 Quality, Clarity and Adequacy of Project Design

3.3.1 Realism, Clarity and Logical Consistency of Input and Output

The project design consisted many sub-projects (Table 1) and related activities. These were sufficient to meet the specified targets above. Sub-projects (i.) and (ii.) were directly related to the assessment of the state of the fishery. They consisted of activities to gather data and monitor the local fishery that is concentrated in an area within which Artificial Reefs (ARs) were earlier installed by the Fisheries Development Authority of Malaysia or *Lembaga Kemajuan Ikan Malaysia* (LKIM).

This area had potential as a site for the introduction of CBRM / ICRM-related activities. Data and information gathered were to provide the baseline for studying the effectiveness of ARs in fishery resource enhancement. Sub-project (iii.) provided the baseline socio-economic data.

The concept of CBRM focuses on the sustainable use, management and conservation of the resources by the community. Thus the community has to be educated and developed to undertake such a responsibility effectively. Sub-projects (iv.) onwards (Table 1) contain the element of community development and capacity building required for CBRM. The need for leadership development within a community should be emphasized as this is essential for the successful implementation of co-management and CBRM.

Some sub-projects were planned before the occurrence of the tsunami while others were added or expanded to incorporate rehabilitation efforts after the tsunami. With this number of sub-projects and related activities, alignment towards the achievement of the overall project objectives is important. The project document prepared for the project is an important document and should serve as the main reference for successful implementation towards the achievement of the project objectives. The project design matrix provided a good summary of activities as well as indicators to evaluate performance (Anon., 2003).

Table 1: Sub-projects planned for implementation

i.	Marine resources monitoring surveys
ii.	Impact surveys on Artificial Reefs (ARs) and / or Fish Enhancing Devices (FEDa)
iii.	Socio-economic survey
iv.	Community Based Resources Management (CBRM) / Integrated Coastal Resources Management (ICRM)
v.	Local business development by <i>KEN</i> and <i>KEW</i>
vi.	Community volunteer work
vii.	Managerial capacity of <i>KEN</i> for CBRM
viii.	Awareness strengthening among beneficiaries on CBRM
ix.	Motivation towards voluntary participation
x.	Fishing gear technology improvement
xi.	Installation, maintenance and utilization of ARs / FEDs for rehabilitation and enhancement of coastal resources
xii.	Extension services
xiii.	Public relations
xiv.	Development of framework and mechanism to ensure sustainability of CBRM
xv.	Impact and rehabilitation from tsunami
xvi.	Crab bank (Crab marking) project
xvii.	Mangrove re-planting

The project document which contains specified inputs and actions, and expected outputs, is required for effective project monitoring and evaluation. This is also necessary to prevent the loss of direction should a key staff member of the project e.g. the Extension Officer from the Fisheries District Office of Langkawi is transferred out of Langkawi.

Generally there is logical consistency between inputs (infrastructure and equipment, implementation of sub-projects and training) and outputs (results from sub-projects) towards achievement of targets. Planned activities undertaken were monitored and updated regularly and progress was reported at the Implementation Coordination Committee (ICC) meetings. These were recorded in the minutes of these meetings.

Overall the quality and quantity of input e.g. technical expertise and equipment as agreed were delivered within the time frame specified (with short delays that were accepted).

3.3.2 Institutional Relationships for Implementation

The institutional arrangement for project implementation depended on the lead roles played by SEAFDEC and DOF Malaysia. These were fully supported by the community. As earlier mentioned this project was able to take advantage of the institution established through *KEN*. At the start of the project, a list of stakeholders to be involved was also prepared by DOF Malaysia. These stakeholders were invited to participate in ICC meetings as well as in consultations for the zoning arrangement and for the preparation of the Fisheries Resources Management Plan (FRMP). The framework for Locally Based Coastal Fisheries Management and the organization for project management as proposed (Anon., 2003) are well developed.

3.3.3 Cost Effectiveness of Project

This project was implemented on a cost-sharing basis between SEAFDEC and DOF Malaysia.

The initial proposed budget estimate for 2003 was USD 35,000 from the Japanese Trust Fund and USD 10,000 under the Fisheries Consultative Group (FCG) (Anon., 2003).

From 2003 – 2007 (years when this project was implemented), *KEW* also received financial support from DOF Malaysia through other projects such as DOF Malaysia's Adoption Programme (*Projek Anak Angkat*) from 2004 – 2007; and Programme to Diversify and Increase Income of Farmers, Aquaculturists and Fishermen in 2007. *KEN/KPSP* Kuala Teriang received funding for its Community Project in 2003 and 2007. It was estimated that DOF Malaysia expended RM15,000 in training courses for *KPSP* in 2007.

For 2007, the Japanese Trust Fund IV provided USD 25,523 for this project while the Japanese Grassroot Tsunami Relief Fund provided USD 55,506 (Etoh, 2008).

Project	Year	Amount (RM)
<i>KEW</i> DOF Malaysia's Adoption Programme	2004	66,425
	2006	14,680
	2007	50,000
<i>KEW</i> Programme to Diversify and Increase Income of Farmers, Aquaculturists and	2007	129,990
<i>KEN/KPSP</i> Community Project	2003	27,570
	2007	48,370
Training Courses	2007	15,000

Source: Anuar Omar, Kedah State Fisheries Office

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.” Financial investment by the project had produced observed qualitative and infrastructure improvement within the community.

4. EFFICIENCY AND ADEQUACY OF PROJECT IMPLEMENTATION

4.1 Funds

During the period of project implementation, funds were sufficient judging by the achievement of outputs from planned activities for the various sub-projects. However the research component on Marine resources monitoring surveys and Impact surveys on Artificial Reefs (ARs) and / or Fish Enhancing Devices (FEDs) that was planned by FRI could not be achieved due to financial constraints.

Since this project was implemented was on a cost-sharing basis between SEAFDEC and DOF Malaysia, SEAFDEC supported their team members for project implementation and DOF Malaysia did the same. Participation at meetings and consultations by other stakeholders from Malaysia were self-funded. The project benefited from additional funds from the Japanese Grassroot Tsunami Relief Fund as well as from the Malaysian government for tsunami rehabilitation.

4.2 Quality and Timeliness of Input Delivery

Overall the quality and timeliness of input e.g. technical expertise and equipment as agreed were delivered within the time frame specified (with short delays that were accepted).

4.3 Adequacy of Technical Expertise

Technical expertise provided by the project was sufficient and this was very much appreciated by the community. Technical staff members from SEAFDEC who participated in the project were professional and knowledgeable. Technical staff members who were trainers at the training courses organized, as well as those who conducted the study tours outside Langkawi, were also relevant, knowledgeable and professional.

4.4 Managerial and Work Efficiency of Project Team

The project team, comprising members 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.

4.5 Implementation Difficulties at Local and National Levels

At the local level i.e. in Langkawi, there were no major problems faced in the implementation of the project but there were minor difficulties.

There were minor problems faced in the synchronization of schedules for activities planned for implementation among staff of SEAFDEC, DOF Malaysia and the fishers of Kuala Teriang, Langkawi. The project required full support and participation of fishers but their livelihood and earnings should

not be negatively affected by the project activities. Timing of meetings with fishers had to be well planned. Good coordination among the project staff involved was also necessary since members had to come from SEAFDEC, Thailand, and DOF Malaysia (whose team members comprised staff from Putrajaya, Penang, Alor Star and Langkawi) for ICC meetings and implementation of project activities. This situation improved with a better understanding of fishing days and times practiced by the local fishers as well as with better planning and communication among all involved.

There was an insufficient number of DOF Malaysia staff implementing this project. An additional DOF Officer in Langkawi could enhance closer rapport with the community as well as enhance implementation, monitoring and evaluation of the project. The Extension staff member from Langkawi assigned to the project had many other duties to perform.

At the national level, DOF Malaysia had planned for 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. However there was no dedicated budget allocated to support the participation of these officers. It would have been beneficial if officers from the Extension and Fisheries Management Divisions were involved fully in meetings and project activities from the start of this project to ensure continuity. Since this is a pilot scale project, the developmental process should be followed through to enable smooth implementation at other new sites after completion of at this pilot site.

4.6 Adequacy of Monitoring and Reporting

The insufficient number of extension staff members resulted in insufficient publicity and dissemination of extension information on project activities to the Kuala Teriang and communities of adjacent villages as well as other stakeholders e.g. the crab bank project could be better publicized through the distribution of flyers and posters. This was highlighted by the members of the community. Publicity of CBRM could also be enhanced through circulation of information through the mass media. Video clips or electronic materials could be prepared for dissemination. These activities should contribute significantly to education and increased public awareness on fisheries management and conservation.

The minutes of the Project Steering Committee and ICC meetings held at regular intervals, recorded progress of implementation of activities planned. These are sufficiently clear. The ICC meetings held regularly provided close monitoring of the project and sub-project implementation. Achievements from the implementation of project activities were reported in Biannual Project Progress Reports. Travel reports, as listed in the Biannual Project Progress Reports, were prepared by project team members. These are also sufficiently clear and adequate.

As a main output of this project, the process of introducing co-management of fisheries (including CBRM concept) at Kuala Teriang, Langkawi, should be documented for reference, to be used when required for other project sites.

4.7 Extent of National Support and Commitment

Generally there is strong support and commitment shown by fishers, the local community and other stakeholders, including the list provided below. This was shown by their attendance at meetings and

consultations. The local community i.e. fishers, members of *KEN* and *KEW* are also ready to implement activities as well as to provide information and feed-back on their implementation. They are confident they will be able to continue the activities started by this project after its termination.

DOF Malaysia is also confident the activities started together with the community at Kuala Teriang, Langkawi will be continued.

Stakeholders from Kedah State and Federal Governments

- i. Lembaga Kemajuan Ikan Malaysia (LKIM)
- ii. Kedah State Fisheries Office (PPN Kedah)
- iii. District Fisheries Office in Langkawi
- iv. Langkawi Development Authority (LADA)
- v. Fisheries Institute of Malaysia (IPM)
- vi. Fisheries Research Institute (FRI)
- vii. Fishermen Association in Langkawi (PN)
- viii. Village Level Security Committee (JKKK), Kuala Teriang

5. PROJECT RESULTS

5.1 Impact Surveys on Artificial Reefs (ARs) and/or Fish Enhancing Devices (FEDs)

Data collection for the monitoring of the fishery in Kuala Teriang was initiated by the project and SEAFDEC provided the financial support to employ enumerators until December 2007. From 2008, it was reported that FRI will continue this duty.

A report by Laongmanee (2007) entitled “Marine Resources Monitoring in Pulau Langkawi, Malaysia (2004-2006)” was jointly published by SEAFDEC and DOF Malaysia. This report provides baseline data on the state of the fishery in Langkawi with a focus on the Kuala Teriang. Data on catch composition; catch per unit effort (catch per trip for respective fishing gears); length frequency distribution of selected species; total landings and total value were collected and reported. Data collection began in April 2004 but was halted in December 2004 because of the tsunami. This activity was started again in August 2005. Data were obtained from fishermen’s and middlemen’s logbooks.

Laongmanee (2007) concluded that “*While the CPUE and total landings seemed to indicate that the marine resource is over-fished, the length distribution indicated the opposite.*” This conclusion seems to suggest that a consistent assessment of the status of the fishery could not be made with the data so far collected. The average total CPUE of the shrimp trammel net recorded in 2005 and 2006 was lower than that of 2004. However a declining trend of CPUE of shrimp trammel nets should not lead to the conclusion that this fishery is over-fished. CPUE will show a declining trend for an exploited population. Moreover Etoh *et al.* (2007) reported there was no decline in the catch per trip per boat of the shrimp trammel net was at 13.5kg in 2003 and 13.0kg in 2006. The catch rates for handlining and the drift gill net however showed declines in CPUE for the same period.

For meaningful interpretation of length frequency data, sample sizes should be sufficiently large and representative of the population. This seems to be a problem here as only small numbers were sampled (Laongmanee, 2007). Thus caution should be exerted in interpretation of results and conclusions made.

A sampling strategy should be developed to better estimate CPUE. In a trammel net or drift net fishery, the length of nets used should be a major consideration. In a single fishing trip performed by a trammel netter in Kuala Teriang, up to five sets of nets could be made. For each set, an estimated length of approximately 280 fathoms (10 pieces of net X 28 fathoms each) or approximately 560m, could be used. Thus the standardization of fishing effort has to be carefully considered. CPUE could be estimated as catch per set (or length of net used) rather than on a catch per trip basis.

A sampling design to enable sufficient numbers of specimens to be sampled and measured should also be developed. The whole catch from the boat could be purchased on a regular basis. Cooperation from the fishers and middlemen is required in the provision and compilation of data by them. This can be enhanced through maintaining close rapport with them.

Direct observation on catches by handlines was done by SEAFDEC and DOF Malaysia staff. Researchers from the Fisheries Research Institute (FRI) conducted monitoring of the resource and fishery in the vicinity of the ARs with objectives:

- to assess the effectiveness of the ARs for aggregating fish,
- to assess the functionality of ARs as spawning and nursery ground for fish and other marine organisms and
- to assess the changes in water quality parameters due to the presence of ARs.

FRI staff members were supposed to conduct this marine resource survey regularly every two months from April 2007 and SEAFDEC was to join the survey once every four months. Due to financial constraints only three monitoring surveys were achieved in 2007 (Etoh, 2008). The initial baseline report on the status of the fish stock in the ARs/FEDs area was not available except for some information on the bottom longline catch reported in Laongmanee (2007). Trip reports, with information on catch rates using handlines at the ARs; water quality parameters at sampling stations in AR area and fish landings by commercial handlines and driftnets at Kuala Teriang, were submitted to FRI and also presented at ICC meetings.

Activities related to the installation of FEDs conducted by SEAFDEC were reported at ICC meetings as recorded in the minutes. The 10 units of FEDs installed in April 2007 could not be located during a monitoring survey conducted by SEAFDEC/TD and FRI staff (Theparoonrat, 2007). They were lost by September 2007 probably due to destruction by illegal trawlers or possibly design flaws as well as. It was also reported at the 10th. ICC meeting that DOF Malaysia launched an additional 16 units of ARs at the project site on 1 November 2007.

No final report from the AR / FED sub-project has been produced. It will be useful to have such a publication prepared as it will provide support to the project along with the publications prepared by Laongmanee (2007) on marine resources and Etoh *et al.* (2007) on socio-economics since the ARs are the focus of the fishery to be managed in this area. The actual objectives of ARs / FEDs should be clear. Baseline data should be well documented to study development and succession of

fish and other organisms in ARs / FEDs, and these should be related to the specified objectives for the construction of ARs / FEDs. These scientific data should enhance the credibility to the Fishery Resources Management Plan (FRMP) that is to be implemented.

5.2 Community-based Resources Management Including Zoning Arrangement, Local Enforcement Unit and Resource Enhancement Activity

A few meetings were held to discuss the zoning arrangement since March 2005 and in November 2005, a consensus was reached on the zone to be demarcated as the community's fishing ground and the preparation of the Agreement of the Community's Fishing Ground (ACFG). During this meeting, the proposed Fisheries Resource Management Plan (FRMP) was also introduced. A stakeholders' consultation on the FRMP was held in November 2006 in Alor Star, Kedah. A draft of this FRMP, submitted to DOF Malaysia for consideration and refinement by the legal advisors, is still pending endorsement. In July 2007, the name *KEN* was changed to Fishery Resources Management Community (*Komuniti Pengurusan Sumber Perikanan*) or *KPSP*. It is hoped that the FRMP can be agreed upon, endorsed and implemented as soon as possible.

It is important that the first FRMP be implemented quickly. It is necessary that DOF Malaysia immediately initiates actions stipulated in the FRMP. It is proposed that DOF Malaysia dedicates a Fisheries Officer or hires a contract Fisheries Officer to assist the community at Kuala Teriang to fast-track the implementation of the FRMP. Duties of this officer should include the both technical and administrative functions dedicated to FRMP, including acting as a liaison officer. After an agreed time period of implementation, the FRMP should be reviewed by stakeholders and improved with the addition of new and updated information as well as scientific data. All fisheries management plans are dynamic and should undergo continuous improvement.

The duties, role and responsibilities of the Local Enforcement Unit (LEU) should be clarified and explained. To *KEN* members, LEU should be able to enforce locally accepted community laws related to fishing. These include no fishing on Fridays. No fishing should be conducted in the event of any deaths within the community in Kuala Teriang. Traditionally the penalty for such an offence is a fine of one dozen plates to be given to the mosque.

The LEU is expected to patrol the community's fishing ground. From September 2006, two Marine Enforcement Agency (MEA) officers were assigned to the LEU. It was proposed that two members of the community perform duties in the LEU voluntarily and on a rotation basis.

In order to intensify enforcement activity with the increasing occurrences of trawler infringement into their inshore fishing ground, *KPSP* formed a Local Enforcement Committee and at its first meeting on 12 March 2007, established the Local Enforcement Centre (LEC) in Kuala Teriang. A workshop to explain the roles and functions of LEC to *KPSP* and other members of the local community was conducted on 5 September 2007. LEC will play an active role in monitoring and surveillance of fishing activities as well as enforcement of regulations. During this workshop the formulation of FRMP was also explained (Etoh, 2008).

The establishment of LEC helped reduce the number of trawler infringements initially but during the monsoon season the number of illegal trawlers increased. Intrusion by illegal trawlers is the most serious problem faced by Kuala Teriang fishers (Etoh *et al.*, 2007). What is also worrying to the

fishers is that a new type of destructive high-opening trawl (crocodile net or *pukat buaya*) is being used. These are two of the most critical problems raised by *KPSP* and they need urgent solutions. The MEA stationed a patrol boat at the Kuala Teriang LEC in 2008 and DOF Malaysia donated necessary equipment such as binoculars and walkie-talkies to aid in observations of trawler intrusions.

Selected indicators, such as the increase or decrease in number of infringements by trawlers or the number of trawlers arrested, should be used to measure the effectiveness of the activities of LEU and LEC and these indicators should be monitored to provide feed-back for improvement.

5.3 Local Business Development by *KEW* (*Kumpulan Ekonomi Wanita*) and *KEN* (*Kumpulan Ekonomi Nelayan*)

KEW is currently actively involved in the production of snacks from anchovy “*Bilis Sira*” and anchovy-flavoured “*Maruku*”. The production of dry anchovy products started after an inspection of the women’s activity in Chumphon, Thailand, during a visit in April 2004 (Etoh, 2004). These products were then produced but production was halted and disrupted by the tsunami of December 2004. Production of “*Bilis Sira*” and “*Maruku*” resumed with technical and infrastructure support provided by this project, the Japanese Grassroot Tsunami Relief Fund as well as the Malaysian government. This contributed to rehabilitation of the community and local business development of *KEW* whose activities are now continued by 13 womenfolk. With the provision of a new building (or small factory) and more modern fish processing equipment, oven and “*maruku*” machine, the production was doubled in quantity.

These womenfolk were also able to upgrade the quality of their products through better management practices such as improved cleanliness and hygiene of premises and as well as the development of a more systematic production line. They hope to sell their products to a larger market. With this in mind, standardization and consistency of the quality of products is essential. Exposure to Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) through organized training courses is proposed. *KEW* should be made aware of the higher operating costs using new equipment and infrastructure.

The study tour to Chumphon, Thailand, for some members of *KEW* was very useful and provided them with possibilities of improvement and diversification of products. The training course on product development conducted for them at the Fisheries Training Institute, Terengganu, Malaysia, was also very useful and directly relevant to them.

In addition to quality control of products, the womenfolk benefited from a short course in accounting. *KEW* placed more effort in the establishment of a user-friendly book-keeping and accounting system enabling them to maintain transparency in money transactions which is of utmost importance in the development of business as a group activity. This system, which was also facilitated by the project through the provision of a desk-top personal computer, is now being practiced and is working well (Etoh, 2007).

KEW is confident it will be able to continue its business and some members will be training their children to start learning the trade. Indicators, already developed to monitor the performance of *KEW*, like the number of packets of “*Bilis Sira*” and “*Maruku*” produced or sold, profit or loss, will show the success or failure of this sub-project.

KEN members benefited from the provision of a new building and an ice-making machine. *KEN* is still involved in selling ice and lubrication oil which is so far profitable. The project provided training courses on repair of fibreglass boats and engines which enabled the members to start such economic activities. The new workshop for repairing boat engines has been leased out to a private operator who is also providing this service to the local community.

Appropriate indicators should be monitored to show success or failure from the local business development sub-project.

5.4 Community Volunteers

Voluntary work is part of the life of the community in the more rural areas in Malaysia such as in Kuala Teriang. “*Gotong royong*” or voluntary group activities, like cleaning the village, helping at “*kenduri*” (lunch or dinner parties such as for weddings) or helping at the mosque for religious activities, are quite commonly practiced. Families in Kuala Teriang also accept university trainees on a voluntary basis and also foster students from Sarawak and Sabah who come to Peninsular Malaysia on exchange programmes. Both men and women take part in voluntary work at the village level but wives of fishers spent more time for community volunteer work in *KEW* compared with fishers in *KEN* (Etoh *et al.*, 2007).

5.5 Managerial Capacity of *KEN* Kuala Teriang for Carrying Out CBRM

Kuala Teriang was selected as the pilot site for this collaborative project on CBRM because the community here shows strong cohesive traits. The community was able to cooperate with DOF Malaysia when *KEN* was first started. For the development of CBRM, it is crucial that there are members who can take the lead. More importantly they are also accepted by the community. Within the *KEN* in Kuala Teriang, members were able to identify and elect a leader in whom they had confidence to manage and lead them. Mr. Mahadir bin Ibrahim, Kuala Teriang Village Level Security Committee (*JKKK*) Chairman, was elected to lead and manage *KEN* Kuala Teriang, Langkawi, together with his committee members. The need for training to enhance leadership is again emphasized.

The managerial capacity of this committee in relation to CBRM was further enhanced through two study tours to Chumphon, Thailand, sponsored by the project. DOF Malaysia staff also participated in these study tours which they found to be very educational and relevant. *KEN* (now *KPSP*) and DOF Malaysia concur they can continue relevant activities after the termination of the project.

5.6 Community Development, Business Development, Community Volunteer Work and Administration of *KEN*

During the two study tours to Chumphon, Thailand, *KEN* members and other Malaysian participants were exposed to community and business development, community voluntary work and administration of the site managed by the Thai counterparts. The Malaysian participants reported that they were able to relate what they saw during the study tours to the situation in Kuala Teriang, Langkawi. They could then adapt certain activities for implementation in the local environment that would bring similar results e.g. crab bank (crab marking) project.

5.7 Awareness Strengthening on CBRM Among Beneficiaries and Total Community Development

The fishers and the communities in Kuala Teriang and adjacent Kuala Chenang were fully aware of the activities of *KEN* and the project. They supported the proposed zoning arrangement and are will to cooperate in the management of the fishery resources in the area (Etoh *et al.*, 2007).

Fishers interviewed said they understand the concept of CBRM but they will still have to depend on DOF Malaysia especially for enforcement of regulations. They are willing to cooperate fully with DOF Malaysia to co-manage the fishery.

This project has achieved its objective of introducing the concept of CBRM to the community. However the community may not be fully ready at this point in time to independently implement CBRM and manage the fishery. The model of CBRM as practiced in one country cannot be introduced in total to another country. Its introduction and implementation has to be adapted to the local historical, social, cultural, economic and development situations.

The community has benefited in terms of overall development in relation to increased awareness in the holistic approach to fisheries management.

5.8 Motivation Towards Voluntary Participation in CBRM and Community Development Work Among Beneficiaries

Although fishers at Kuala Teriang participated voluntarily in the project activities, the level of community voluntary work as a whole was still low (Etoh *et al.*, 2007).

The destruction caused the tsunami had fostered stronger cooperation among the communities in Kuala Teriang and surrounding areas and brought them closer. The communities were then more motivated to participate in voluntary work that is directly related to the rehabilitation of their homes, villages and communities. This includes re-building their fishing boats and appliances to enable them to return to fishing. Other government agencies like Drainage and Irrigation Department (*Jabatan Pengairan dan Saliran*) non-governmental organizations like UNICEF also participated in rehabilitation work after the tsunami.

At the start of the crab bank (crab marking) sub-project, *KEN* members were given a course on the mark and release of gravid crabs that they caught (Etoh, 2005). This sub-project could be the focus of community voluntary work in Kuala Teriang. A study to monitor the effectiveness of the crab marking project could be started by FRI with the cooperation and support of the community. If it can be scientifically shown that the release of gravid crabs can result in an increase in the stock size of the blue swimming crabs, then this should provide strong evidence that community voluntary work is effective.

Readiness to participate in voluntary work is an important element required for successful implementation of CBFM. Thus participation in voluntary community work in relation to CBRM should be further enhanced.

5.9 Fishing Gear Technology Improvement

Two courses in fishing gear technology development were conducted during the period of this project (Etoh, 2005). They were on the crab trap (“*bubu ketam*”) and shellfish trap (“*bubu siput pinang*”). Although these courses were successfully conducted, these two traps are not being by fishers at Kuala Teriang now. Crabs, especially the blue swimming crabs, are usually caught locally using drift nets. The shellfish “*siput pinang*” is a gastropod that is found in small numbers and currently there is no market for it locally. A course on fish aggregating devices was also successfully conducted for *KEN*. *KEN* members were able to compare the design and effectiveness of the SEAFDEC FEDs and their own traditional aggregating devices or *unjam*.

It might be useful to study the impact of squid fishing using light lures on the other fishery resources in the area. There are many vessels in Kuala Teriang fishing for squid during the squid season that extends from October / November to February / March the following year.

5.10 Installation, Maintenance and Full Utilization of ARs and FEDs as a Means of Rehabilitation and Enhancement of Coastal Resources

Sixteen units ARs built by LKIM in the fishing ground were already in place at the start of *KEN* activities in 2001. Four sets of FEDs were first installed by SEAFDEC in December 2004 and based on this experience 10 sets were installed in April 2007. However FEDs installed in April were lost by September 2007. DOF Malaysia launched another 16 units of ARs at the end of 2007 (Etoh, 2008).

Fishers and the community agreed that ARs / FEDs are beneficial to them. Many requested for additional ARs / FEDs to be installed (Etoh *et al.*, 2007) and they would be willing to help in their installation and maintenance. *KEN* / *KPSP* members are willing to volunteer to clean ARs / FEDs of ghost fishing nets as they know ghost fishing will negatively affect their fishery. Fishers acknowledged that ARs / FEDs helped increase catch. They also hope ARs / FEDs would be able to contribute to the rehabilitation of the declining fish resources of the area.

It is necessary that the impact of ARs / FEDs on the fishery resources be evaluated. Results from the evaluation 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.

FRI should continue monitoring the ARs (both old and new ones) to study their effectiveness for resource enhancement. A technical publication on ARs is proposed since ARs, around which fisheries are to be managed, are the focus of this project. A study on the impact of ghost fishing on the fish resources of the area could be initiated by FRI. This should take advantage of the willingness of the *KEN* / *KPSP* to help in the cleaning of ARs.

5.11 Extension Services

During the course of the project implementation the extension services provided mainly by DOF Malaysia through the Kedah State Fisheries Office and the Fisheries District Office in Langkawi were very good and appreciated very much by *KEN* / *KPSP* and *KEW*. However they expressed

that extension services could be further increased through an increase in the number of Fisheries Officers. An increase in one officer in Langkawi would help enhance more effective communication with the community and increase efforts in information dissemination on fisheries management and conservation, CBRM and co-management thereby increasing public awareness and education.

Dialogues and consultations with *KEN/KPSP*, *KEW* and other stakeholders should be conducted regularly. Flyers, pamphlets, brochures and reports on the project and sub-projects should be prepared for dissemination. Scientific data collected by the project and sub-projects should be translated and communicated to stakeholders through extension media in hard publications and soft electronic forms.

The signboard for the crab bank (crab marking) sub-project that was put up in Kuala Teriang in 2007 was useful for publicity. However *KPSP* felt this sub-project should have been publicized even more through the distribution of posters and flyers to a wider spectrum of the community and stakeholders to enhance better community volunteer work.

5.12 Public Relations

Good public relations have been maintained with *KEN/KPSP*, *KEW*, other community members and other stakeholders by the project team from SEAFDEC and DOF staff members. This is reflected in the readiness of *KEN/KPSP* and *KEW* to meet SEAFDEC and DOF staff members whenever called even at short notices.

5.13 Development of Framework and Mechanism to Ensure Sustainability of CBRM and Community Development after Termination of the Collaborative Efforts with SEAFDEC/TD and DOF Malaysia

The framework for CBRM has been developed through this project. DOF Malaysia attempted to introduce the new concepts of co-management and CBRM in 2001 through the formation of several *KEN*. However implementation of related activities was slow. The concept of CBRM has been successfully introduced and well accepted by *KEN/KPSP* and the community at Kuala Teriang and neighbouring village of Kuala Chenang through this project (Etoh *et al.*, 2007). In fact, this project acted as a catalyst for the introduction of CBRM concept to the local community.

However at this present time in Kuala Teriang, the fishery will be co-managed by *KPSP* and DOF Malaysia. DOF Malaysia is still responsible and committed to lead and guide the community towards implementing CBRM, until the time when the community is well prepared and empowered to function independently. Currently the community still needs DOF Malaysia and other relevant agencies to undertake the enforcement function together with the LEU and LEC.

To ensure sustainability of co-management and further development of CBRM in Kuala Teriang, relevant activities should be continued through:

- provision of training courses, upgrading of skills and relevant human resource development programmes including leadership training;
- efficient information dissemination, public awareness building and education of the community on fishery management and conservation;

- conduct of scientific surveys and studies on fishery resources, monitoring of ARs/ FEDs and documentation of results;
- monitoring of progress of *KEN/KPSP* and *KEW* businesses

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. DOF Malaysia is however aware that the Kuala Teriang *KPSP* should be empowered to undertake more CBFM activities in future.

A high level committee chaired by DOF Malaysia has been formed to act as an Advisory Committee on Fishery Management for *KPSP* of Kuala Teriang and this had met twice. Another committee for the development of FRMP was formed and had met once. These two committees should continue to play their important roles to ensure sustainability of co-management and CBFM activities.

The FRMP should be implemented quickly.

5.14 Impact and Extent of Rehabilitation from the Tsunami

About 60% of the respondents interviewed during the socio-economic survey in Kuala Teriang and Kuala Chenang reported the rehabilitation work after the tsunami was already complete while 25% reported that there is still work to be done. The survey also concluded there was no drastic change in the socio-economic status of the communities in Kuala Teriang and Kuala Chenang between 2003 and 2006 (Etoh *et al.*, 2007). The tsunami occurred on 24 December 2004. Although the communities were affected in the immediate aftermath of the tsunami, they reverted to the pre-tsunami state a few months later. This concurred with the results from the studies on the impacts of the tsunami on fisheries and coastal areas of Penang and Kedah that were conducted by FRI (Chee and Shahunthala, 2005).

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. This helped them to reorganize and carry on with their lives after a major catastrophe. As part of the rehabilitation efforts, the fish landing area near the Kuala Teriang *KPSP* building was re-constructed enabling a more systematic work process for landing, collection and transport of fish. The old wooden bridge was replaced by a concrete one. *KPSP* and the community acknowledged the contributions and support provided by all other government and non-governmental organizations towards the rehabilitation efforts.

The Drainage and Irrigation Department re-planted some mangrove trees to prevent erosion and wave action in Kuala Teriang. This effort is still being monitored for effectiveness.

6. CONCLUSIONS

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. The model of CBRM as practiced in one country cannot be introduced in total to another country. Its introduction and implementation has to be adapted to the local historical, social, cultural, economic and development situations. This is the reason 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 *DOF* Malaysia. The community will be empowered in stages to implement CBRM measures to manage the fishery independently in 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.

6.1 Recommendations

- i. The zoning arrangement as agreed should be incorporated into the *FRMP*. The *FRMP* should be accepted, endorsed and implemented quickly.
- ii. 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.
- iii. 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.
- iv. A study on the impact of ghost fishing on the fish resources of the area could be initiated by *FRI*.
- v. A study to monitor the effectiveness of the crab bank (crab marking) sub-project is proposed.
- vi. Monitoring of squid fishing with light lures is proposed.

- vii. The project on mangrove re-planting should be monitored for effectiveness together with the Drainage and Irrigation Department.
- viii. Information dissemination could be further enhanced through publication of technical papers, non-technical papers, extension documents, flyers, brochures as well as through electronic media.
- ix. Public awareness and education of the community on fishery management and conservation should be further enhanced.
- x. The progress of *KEN/KPSP* and *KEW* businesses should be monitored through the use of selected indicators.
- xi. 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.
- xii. 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.
- xiii. Funding for the implementation of FRMP should be made available by DOF Malaysia.
- xiv. 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.

6.2 Follow-up Assistance

- i. Training courses, upgrading of skills and relevant human resource development programmes including leadership training should be conducted.
- ii. Exposure to Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) procedure to improve quality of products produced by *KEW*.
- iii. Study tour to local CBRM project in Malaysia e.g. *Tagal* in Sabah.
- iv. Enhancement of community voluntary work.
- v. Provision of a marker buoy to mark the ARs in the area for safety in navigation and fishing.
- vi. Final wrap-up seminar for information exchange on “lessons learnt”.

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