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Complied Report

on

LOA/RAP/2005/39

A Technical Assessment for Determining
the Level of Fishing Capacity, Impact of Tsunami on
Fishery Resources and Identification of Resources Access
and Other Fishery-Related Issues in the Impacted Area

under

FAO/THA/05/002 - “Emergency Assistance to the Tsunami-affected
Fishing Communities in Southern Thailand”

and

OSRO/THA/505/CHA - “Strengthening the Coordination and
Assessment of Fishing Resources and Inputs Provided by
Tsunami Emergency Relief”

by

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Executive Summary

The Indian Ocean Tsunami that hit the Andaman Coast of Thailand in December 2004 was the worst natural disaster the country ever faced. Humanitarian aid and other immediate relief efforts poured in from sources around the world as part of the emergency responses. Issues such as food, temporary shelter, water supply, health and sanitation were given priority. Damages to human, properties and their livelihoods were rapidly assessed by various organizations and, based largely on these assessments, several permanent housing projects and boat replacement programs began. In parallel, rapid assessments of impacts to coastal and environmental resources were conducted, giving scientific communities, natural resource managers and policy makers a unique opportunity to examine where things are and, more importantly, to consider where they should be.

Fisheries are important from an ecosystem standpoint and human perspective. Ecosystem health, for example, is maintained through biodiversity and sustainability of fisheries resources. For the majority of people affected by the tsunami, however, their livelihoods and well-being depend largely on exploitation of fisheries. Needless to say, incorporating both aspects, for short- and long-term management of fisheries is a challenging task. Efforts to increase understanding about fisheries in the Andaman area, in terms of status of resources and level of exploitation before and after the tsunami, are greatly desired.

This report is prepared for FAO as part of the contractual service (reference no. LOA/RAP/2005/39) on 'Technical Assessment for Determining the Level of Fishing Capacity, Impact of Tsunami on Fishery Resources and Identification of Resource Access and Other Fishery-Related Issues in the Impacted Area'. The main objectives of this technical assessment are:

1. Determining the level of fishing capacity in the tsunami affected areas in southern Thailand.
2. Evaluation of the impact of tsunami on fishery resources and the identification of resources access and other fishery-related issues in the area.
3. Dialogue with the Department of Fisheries on fishery management in the Andaman Sea.

In addition to this executive summary, other deliverables included reports on the review of existing information; the field level discussions; 2 field consultation workshops; synthesis of the information from the background assessments, consultations, and the fisheries review; the final workshop with the Department of Fisheries; policy briefing note; and final report of major activities, progress, results, conclusions, and recommendations. The study focused on six Andaman provinces, namely Ranong, Phang Nga, Phuket, Krabi, Trang and Satun.

The study consisted of three main parts: (1) literature review of fisheries and other resources pre- and post-tsunami; (2) primary field data collection using rapid rural appraisal techniques, in-depth interviews and field level discussion and field consultation workshops at local and regional level on main issues; and (3) a national level workshop for policy discussion and recommendations with the Department of Fisheries.

Literature review and desk study was performed to gather background information about status of fisheries prior to the tsunami and historical pattern of exploitation. Similarly, studies related to pre- and post-tsunami conditions of other coastal resources, such as mangroves, coral reefs and seagrass, and other environmental resources (e.g., water quality) were also reviewed. The review also contains information from various assessment reports of damages to human, properties and natural resources. Overall, the importance of fisheries of the Andaman Sea is highly recognized. With long-standing tradition in fishing, fisheries resources have been continuously exploited. Production from marine capture fisheries in this area had steadily increased from 1970 to 1998, after which production had declined. At the same time, traditional, small-scale fishing boats were replaced by mechanized boats using effective fishing gears. These mechanized small-scale fishing boats were not registered until the new boat registration system came into effect, such that in 2003 the number of registered vessels went from about 2,500 to 15,500. Even the statistics of catch per unit of effort in the small scale fisheries in the area are rather steady as stated in the report on the final workshop with the Department of Fisheries, it is highly unlikely that the Andaman fisheries resources can sustain that level of fishing pressure in the long run. Concerns about the status of resources and level of fishing effort are prominent, particularly after the tsunami when long-term damage to fisheries resources is difficult to gauge and with a rising trend in fishing efforts due to an increase in number of fishing boats that are relocated from the Gulf of Thailand as well as those rebuilt after the tsunami. Further, damages to coastal resources and environmental quality and, consequently, impacts on fisheries productivity, are inconclusive, suggesting that careful considerations must be taken in the post-tsunami management of the Andaman Sea fisheries. Another interesting dynamic in the coastal areas is the recent development of shrimp farming and fish culture. These aquaculture practices involve use of low value fish and trash fish as feed, increasing exploitation pressure on fisheries.

Several issues and problems related to fisheries were identified during interviews, field level discussions and stakeholders' consultation workshops. These issues were categorized into indigenous or chronic problems (i.e., those that have been persisting in the region) and post-tsunami problems (i.e., those arise as results of the tsunami). Among chronic problems are poor enforcement, incomplete and outdated information about fisheries, weak community participation and resource degradation. Examples of poor enforcement are seen in the violation of trawlers and large push netters that continue to operate illegally within 3 km from shore. The statistical data collection system in Thailand, as in many countries, suffers from lack of funding and personnel, making it difficult to update information. Also similar to other countries, information about small-scale fisheries is generally poor. While Thai government embraces decentralization and has established local government agencies (i.e., Tambon Administrative Office), the general sentiment is such that participation from a broad range of stakeholders, particularly small-scale fisheries, is still poor or not meaningful. Finally, habitat degradation and unsustainable fishing practices remain some of the major concerns.

The post-tsunami problems are mainly related to uneven distribution of aid, lack of coordination between aid agencies, conflicting land use rights, physical alteration of coastal areas, and increasing number of fishers. The first two issues are related. Several aid agencies have been working in the area to distribute aid and to provide

immediate relief to people in the affected areas. Lack of coordination between these agencies resulted in unfair distribution of aid as those receiving aid were not necessarily those who needed it most. Also related to the above is the government policy after the tsunami to grant legal documents for land ownership. Small-scale fishers who have long settled in the area are in no possession of such papers and have thus been resettled in other areas, further away from the coast, while land ownerships are given to land developers. The last two post-tsunami problems are directly related to the well-being of small-scale fishers. Physical alteration of the coastal areas caused by the tsunami in terms of topography and waterways affect fishers' access routes to the sea, while changes in tidal cycle forced fishers to change their fishing pattern. Adding to this hardship is the increasing number of fishers and fishing boats, particularly foreign migrant fishers who had never owned boats prior to the tsunami, but were given ones by donor agencies.

These issues were presented at the final policy workshop participated by government officials, stakeholders and researchers. Workshop participants generally agreed on the issues and problems faced by coastal communities in the Andaman Sea and extensively discussed policy recommendations to address the situation. From this workshop, ten key recommendations can be made to the Department of Fisheries as a means to encourage formulation of fisheries policies that correspond well with the post-tsunami reality.

1. Promote livelihood diversification, including non-fishing options such as ecotourism and aquaculture of non-carnivorous species;
2. Amend fishing laws, revise legal framework and provide guidelines and funding to facilitate community-based management, as well as encourage meaningful stakeholders' participation through training and capacity building;
3. Revise the zoning system for Andaman Sea, with clear demarcation for small-scale and commercial scale fishers and for conservation, exercise control over dual registered boats and those from other areas, and reconsider the highly unpopular 'Seafood Bank Policy';
4. Control of illegal fishing gears, including those from other areas;
5. Increase accuracy and consistency in the statistical data collection system, through involvement of local institutions and communities;
6. Disseminate information to stakeholders and promote communication;
7. Enhance conservation and natural resource protection effort through consideration of seasonal closure for important fisheries and evaluation of artificial reef initiatives;
8. Support the development of centralized fish markets to assist fishers in acquiring fair prices for their products;
9. Improve effectiveness of aid distribution through coordination with various agencies and implementation of programs to protect interests of women, children and marginalized fishers; and
10. Develop an integrated management plan for the Andaman fishery that is realistic and pragmatic and that draws upon available information.

Final Report
Report No. 1

**A Technical Assessment for Determining
the Level of Fishing Capacity, Impact of
Tsunami on Fishery Resources and
Identification of Resources Access and
Other Fishery-Related Issues in the
Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

June, 2006

Executive Summary

The Indian Ocean Tsunami that hit the Andaman Coast of Thailand in December 2004 was the worst natural disaster the country ever faced. Humanitarian aid and other immediate relief efforts poured in from sources around the world as part of the emergency responses. Issues such as food, temporary shelter, water supply, health and sanitation were given priority. Damages to human, properties and their livelihoods were rapidly assessed by various organizations and, based largely on these assessments, several permanent housing projects and boat replacement programs began. In parallel, rapid assessments of impacts to coastal and environmental resources were conducted, giving scientific communities, natural resource managers and policy makers a unique opportunity to examine where things are and, more importantly, to consider where they should be.

Fisheries are important from an ecosystem standpoint and human perspective. Ecosystem health, for example, is maintained through biodiversity and sustainability of fisheries resources. For the majority of people affected by the tsunami, however, their livelihoods and well-being depend largely on exploitation of fisheries. Needless to say, incorporating both aspects, for short- and long-term management of fisheries is a challenging task. Efforts to increase understanding about fisheries in the Andaman area, in terms of status of resources and level of exploitation before and after the tsunami, are greatly desired.

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Several issues and problems related to fisheries were identified during interviews, field level discussions and stakeholders' consultation workshops. These issues were categorized into indigenous or chronic problems (i.e., those that have been persisting in the region) and post-tsunami problems (i.e., those arise as results of the tsunami). Among chronic problems are poor enforcement, incomplete and outdated information about fisheries, weak community participation and resource degradation. Examples of poor enforcement are seen in the violation of trawlers and large push netters that continue to operate illegally within 3 km from shore. The statistical data collection system in Thailand, as in many countries, suffers from lack of funding and personnel, making it difficult to update information. Also similar to other countries, information about small-scale fisheries is generally poor. While Thai government embraces decentralization and has established local government agencies (i.e., Tambon Administrative Office), the general sentiment is such that participation from a broad range of stakeholders, particularly small-scale fisheries, is still poor or not meaningful. Finally, habitat degradation and unsustainable fishing practices remain some of the major concerns.

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immediate relief to people in the affected areas. Lack of coordination between these agencies resulted in unfair distribution of aid as those receiving aid were not necessarily those who needed it most. Also related to the above is the government policy after the tsunami to grant legal documents for land ownership. Small-scale fishers who have long settled in the area are in no possession of such papers and have thus been resettled in other areas, further away from the coast, while land ownerships are given to land developers. The last two post-tsunami problems are directly related to the well-being of small-scale fishers. Physical alteration of the coastal areas caused by the tsunami in terms of topography and waterways affect fishers' access routes to the sea, while changes in tidal cycle forced fishers to change their fishing pattern. Adding to this hardship is the increasing number of fishers and fishing boats, particularly foreign migrant fishers who had never owned boats prior to the tsunami, but were given ones by donor agencies.

These issues were presented at the final policy workshop participated by government officials, stakeholders and researchers. Workshop participants generally agreed on the issues and problems faced by coastal communities in the Andaman Sea and extensively discussed policy recommendations to address the situation. From this workshop, ten key recommendations can be made to the Department of Fisheries as a means to encourage formulation of fisheries policies that correspond well with the post-tsunami reality.

1. Promote livelihood diversification, including non-fishing options such as ecotourism and aquaculture of non-carnivorous species;
2. Amend fishing laws, revise legal framework and provide guidelines and funding to facilitate community-based management, as well as encourage meaningful stakeholders' participation through training and capacity building;
3. Revise the zoning system for Andaman Sea, with clear demarcation for small-scale and commercial scale fishers and for conservation, exercise control over dual registered boats and those from other areas, and reconsider the highly unpopular 'Seafood Bank Policy';
4. Control of illegal fishing gears, including those from other areas;
5. Increase accuracy and consistency in the statistical data collection system, through involvement of local institutions and communities;
6. Disseminate information to stakeholders and promote communication;
7. Enhance conservation and natural resource protection effort through consideration of seasonal closure for important fisheries and evaluation of artificial reef initiatives;
8. Support the development of centralized fish markets to assist fishers in acquiring fair prices for their products;
9. Improve effectiveness of aid distribution through coordination with various agencies and implementation of programs to protect interests of women, children and marginalized fishers; and
10. Develop an integrated management plan for the Andaman fishery that is realistic and pragmatic and that draws upon available information.

1. Introduction

The devastating tsunami that struck the Indian Ocean on 26 December 2004 has a massive impact on the fisheries sector in the six Andaman provinces of Thailand. Most fishers have lost their fishing boats along with their fishing gears not to mention their beloved ones. Under this circumstance, the government by the Department of Fisheries with the donation of both national and international agencies had provided these fishermen fishing vessels and fishing gears so they could continue their normal life. However, there is a good opportunity for the government to plan for a better strategy and management in fishery in order to ensure the sustainable use of the fishery resources via restoration of the biodiversity and proper fishing capacity in the area. The Coastal Development Center, Kasetsart University therefore, has carried out the study under the financial support by the FAO with the ultimate objective of developing policy recommendations for the Department of Fisheries to ensure the sustainable use of the coastal marine resources in the Andaman area. This final report will summarize all works been taken and recommendations suggested by the consultation and policy workshops.

2. Data Acquisition

Existing information was reviewed in order to evaluate fishing capacity, total number of fishing vessel in this study, both before and after the tsunami incident. Abundant of coastal fishery resources in term of catch per unit of effort was also reviewed to evaluate the fishery status in the area. Assistance from all donors regarding fishing vessels and fishing gears was also reviewed to analyze the fishing capacity. These secondary data plus other aspects were verified in the randomly selected fishing villages in all 6 provinces before 2 field level discussions in each province were carried out using the RRA technique to identify principal problems faced by the small scale fishers in the area. These problems were then presented to the stakeholders comprising small scale fishers, aquaculturists, local government officers, officers from DOF, DMCR in the 2 brain-storming consultation workshops carried out in Phuket and Trang. These principal problems and recommendations refined in the consultation workshops were re-analyzed in the policy workshop convened at the Faculty of Fisheries, Kasetsart University in early June. The final recommendation resulting from the policy workshop was submitted to the FAO which in turn will communicate with DOF for implementation.

3. Reported Submitted

Excluding inception report and this final report, a total of 5 reports plus a policy brief note have been submitted to the FAO. They are as follows:

3.1 Report on the review of existing information

This report is aimed to review secondary data on the structure of fishery industries in the Andaman area both before and after the tsunami incident by studying national fisheries statistics and census. Activity reports on tsunami damage assessments, inputs provided to tsunami affected fishers were critically reviewed. Most data were

acquired from the Department of Fisheries, Department of Marine and Coastal Resources, and from the final report "Project on Survey and Research Study for Rehabilitation of Natural Resources and Environment" submitted to Ministry of Natural Resources by Chulalongkorn University. Reports from the FAO/DOF Post-Tsunami Rehabilitation Coordination Unit on the donor agencies were reviewed. Consultation with Sustainable Development Foundation, Thailand, and Save Andaman was conducted. Recommended methodology on fishery data collection, fishing boat registration, and coastal fishery management measures were also suggested.

3.2 Report on the field level discussions

This report is the result of the critical interview with the small fishers using RRA techniques to address their perception on changes in fishery resources availability, fishing activities and practices due to impact of tsunami and on the key issues concerning future management. Issues discussed in the interview include fishing activities, natural resources, environmental and socio-economic factors. The field level discussion was also used for verification of secondary data acquired from the literature reviewing. Results from this report were presented in the field consultation workshops carried out in Phuket and Trang for further discussion and comment.

3.3 Report of the 2 field consultation workshops

The main objective of the field consultation workshop is to identify the important issues that will be used as the topics in the final workshop with the Department of Fisheries. Schedule and topics for discussion in the workshops depend upon the information and issues acquired from the field level discussion and data collection. The topics include resources status and availability, sound regulations, action plan and management plan for sustainable fishery. Report of the field consultation workshops presents the results along with the detail discussion of the workshops.

3.4 Synthesis of the information from the background assessments and consultations and the fisheries review

This report is the synthesis based on the results of 3 reports: review of existing information, the field level discussion, and consultation workshops held in Phuket (20-21st April 2006) and Trang (27-28th April 2006), plus a report on the field verification of the secondary data. The report summarizes the assessment of two important aspects related to Andaman Sea fisheries: resource availability and fishing capacity. Factors concerning coastal aquaculture in the areas and those related to fishing community and household are also reported. The final section of the report provides a summary of main problems and recommendations concerning resource availability, fishing capacity and other related factors identified based on primary data gathered during in-depth interviews. This final section was presented at the final workshop with the Department of Fisheries to facilitate discussion about policy recommendations for the management of Andaman fisheries and coastal resources.

3.5 Report of the final workshop with the Department of Fisheries

The final workshop with the Department of Fisheries is aimed to be the forum for the fishers, fishery-related participants and the Department of Fisheries along with other related government agencies to discuss the key issues in future planning and management of the Andaman fishery. Principle problems obtained from the field consultation workshops were distributed to all participants for their approval and comment. Additional problems were also suggested in the workshop before sound measures were recommended for the sustainable use of the fishery resources in the area. Principle problems and recommendations were the main issues in the final report.

4. Principle Problems and Recommendation

Five indigenous, 5 post-tsunami, and a separated problems were identified in the policy workshop by using MindManager as a tool (Appendix A:). It is noted that the problems listed in Appendix A are the same as those listed in the policy workshop report but are rearranged in details by the research members to better reflect the situation in the area.

The recommendations acquired from the policy workshop are as follows:

1. DOF should reassess its position in terms of establishing a sustainable level of fishing capacity in the Andaman Sea and amend its policies to support accordingly.
2. DOF should improve its methods of data collection to cover detailed information on small scale fishery in order to be able to estimate separated MSY between coastal and the rest of the EEZ. Better efficiency in data collection and dissemination is also recommended.
3. DOF should promote aquaculture systems that do not add pressure to the fishery such as non carnivorous fish species, mollusks & seaweed culture.
4. DOF should encourage the diversification of fishing livelihoods to include non fishing options such as home stay tourism to reduce pressure on the resources.
5. DOF should support community based fishery management which will empower local community to protect their valuable resources. This might requires capacity building of the local community as well as local fishers.
6. DOF should enforce the fishery law strictly especially on the destructive fishing gears to reduce damage to the nursery ground in the coastal area.
7. DOF should implement zoning measure to mitigate the confrontation between fishers using different gears.
8. DOF should employ ecosystem-based management to better manage the resources instead of focusing on only the economically important species.
9. DOF should promote practice of selective artisanal fishing methods such as hand lining which can greatly contribute to ensuring long term sustainability of fish stocks

5. Recommendations for Policy Formulation

Based on the research conducted by CDC and the stakeholder workshops, a number of recommendations can be made to the DOF and other government agencies regarding policies relating to the management of Andaman fishery.

Available documented information suggests that, in recent years, the level of small-scale fishing effort has expanded on the Andaman fishery, and it is likely that such expansion contributes to an overall decline of fisheries resources, although the relative contribution to the decline by the small-scale sector and larger sized fishing vessels has not been quantified or documented.

There is a recorded decrease in the catch per unit effort has decreased in many fisheries and the gradual trend towards fishing down the food chain. An indication of this is the current trend of harvesting of squid and jellyfish, has been observed. The decline in resources indicates that the fishery cannot sustain the level of fishing effort that is currently in place and has strong implications for the viability of the fishing livelihood for the small-scale fishers. Already many have moved into alternative or supplementing occupations (particularly tourism in areas where this is an option)

Following the tsunami disaster, DOF policy has been to rebuild the fishing industry and restore number of fishing boats to pre-tsunami levels. The implicit assumptions are: 1) fishing capacity before the tsunami was at an appropriate level, and 2) fish stocks were not affected, in the long term, by the tsunami. The restoration of capacity has focused largely at the small-scale fishing vessel part of the fishery, principally because the larger sized vessels were repaired by the owners and far fewer large vessels were actually damaged or destroyed by the tsunami wave. Thus capacity restoration (or even increased capacity) has taken place in the small vessel (below 12 m) part of the fishery.

Available information and field work, undertaken during this project strongly suggests that the assumption that fishing capacity was at an appropriate level prior to the tsunami is incorrect and current fishing capacity (in the Andaman fishery) is now beyond that which can be sustained by the fishery. This however does not disaggregate between larger vessels and the small vessel fishery. Field level discussions with fishers indicate that their catches are generally stable but probably lower than in the past. Fisheries also do not report that they feel that the number of fishers in the small-scale fishery is too high.

With respect to the assumption that the tsunami had no significant long term affect on fish stocks there is no strong scientific evidence to confirm any change on fish stock. It should be noted however, that following the tsunami, the stock of jelly fish in some provinces particularly in Ranong Province has increased dramatically. This has increased to a point that fisheries are now targeting jellyfish, collecting 14-16 inches in diameter of jelly fish and earned 2,000 – 4,000 baht per day. In addition, a large stock of oriental hard clam (*Meretrix sp.*) has been found in Ban Boh Jed Look, La Ngu District, Satun Province, which did not previously have such a stock or fishery and this is now providing a source of income for local families.

Based on this emerging information, it is strongly recommended that the DOF reassess its current policy regarding the fishing capacity in the Andaman fishery and review management approaches which could to sustain small-scale fisheries in the Andaman Sea and support fishing communities. More specifically this should consider the following ten issues:

1. Diversification of Livelihoods

In order to reduce fishing pressure on the Andaman fishery, the DOF needs to assess its policies in terms of:

- More proactive efforts in encouraging people to leave the fishery
- Finding additional means to encourage the diversification of fishing livelihoods to include non fishing options such as home stay tourism and cottage industries;
- Review of current aquaculture systems and promotion of aquaculture systems which do not add to the pressure on the fishery such as non-carnivorous fish species, mollusks and seaweed culture.

2. Community-based Management

From the survey work carried out, it is clear that the Andaman Sea coastal communities wish to be more closely involved in how their fisheries are managed. The concept of community-based management (CBM) is understood by stakeholders as well as government, to offer considerable advantages in terms of resource management, over traditional top-down management system.

In order to facilitate this, the DOF needs to assess its policies in terms of:

- Improving/amending the Fishing Laws to provide a clearer legal framework for greater community involvement in fisheries management;
- Publishing and disseminating clear guidelines on the roles, rights and responsibilities of communities in co-management of their fisheries;
- Developing initiatives that empower, strengthen and support fishing communities as partners with government in the enforcement of the Fisheries Law and their own compatible community rules;
- Training and capacity building of community organizations including DOF, villagers groups, Tambon Administrative Organizations, fishermen's organizations and networks;
- Publishing and disseminating clear guidelines on the organization, roles and responsibilities of coastal protection volunteers;

- Prioritizing CBM from a funding perspective.

3. Zoning of the Fishery

The zoning of the Andaman Sea for sustainable and highly productive management is seen as necessary, so that mutually compatible activities can coexist. The current zonation system is not without its problems in terms of enforcement and fueling conflict between stakeholders.

In order to facilitate a more harmonious zonation of the Andaman fishery, the DOF needs to assess its policies in terms of:

- Creating a clearer demarcation of small-scale and commercial fishing areas;
- Implementing strategies that reduce the risk of conflict between small-scale and commercial fishers;
- Creating a clearer demarcation and higher degree of protection of conservation areas;
- Reconsidering the ‘Seafood Bank Policy’, which is currently unpopular amongst many fishing communities;
- Control of the numbers of dual registered boats and boat marking should be applied to all Thai fishing boats.
- Control of the numbers of outsiders exploiting the fishery;
- Exacting a tax on outsiders exploiting the natural resources, for use by communities in CBM.

4. Fishing Gears

The use of destructive fishing gears by small-scale as well as commercial scale fishers remains a major problem in the Andaman Sea and is thought to be a major factor in the general decline of the fishery. This issue is compounded by many outsiders such as boats from the Gulf of Thailand and migrated Burmese, exploiting the fishery on a seasonal basis. In order to reduce the number of destructive gears and outsiders exploiting the Andaman fishery, the DOF needs to assess its policies in terms of:

- producing and disseminating clear guidelines on legal and illegal gears;
- enforcement of the law regarding illegal gears;
- producing and disseminating clearer information on allowable crab trap mesh sizes.

5. Information Collection and Statistics

Data and information gathering is an integral part of fishery management, and must contribute to the “knowledge” needed for rational management. The collection of data and information should have a clear objective in terms of management use, and target management needs at relevant levels from local community to national. These levels often have quite different information requirements.

In order to improve the information and data collection system being used in the Andaman fishery, the DOF needs to assess its policies in terms of:

- achieving greater accuracy and consistency regarding the numbers of fishing boats, number of fishers, and the amount of catches of coastal and off-shore fisheries;
- greater involvement of local institutions and communities in the information gathering process;
- agreeing on a MSY figure for the coastal and offshore Andaman fisheries, so that improved management strategies can be implemented successfully.

6. Communication and Dissemination of Information

The close cooperation between government and fishing communities is central to good fishery management and in order to achieve this, it is important that both parties have access to the same information. Research over the past decades has enabled an improved understanding of the dynamics of the fishery but little of this information has been made available, in an appropriate form, to the many levels of stakeholders in the fishery.

In order to improve the dissemination of information to stakeholders in the Andaman fishery, the DOF needs to assess its policies in terms of:

- producing and disseminating information package for targeted stakeholders;
- achieving a clearer articulation and wider dissemination of Government Fisheries Policies.

7. Conservation and Natural Resources Protection

The conservation of the Andaman Sea's biodiversity and habitats is essential for the long term health of the fishery. The protection offered by mangrove forests, in some tsunami affected areas is a useful lesson on the benefits of maintaining natural ecosystems.

In order to improve conservation and protection of natural resources, the DOF needs to assess its policies in terms of:

- the perceived success by many stakeholders in the fishery of the DOF's artificial reef initiatives;
- consideration of the seasonal closure of some fisheries, to protect some vulnerable species.

8. Marketing of Fisheries Products

The increased cost of fuel and other fishery inputs is creating hardship for many of the small-scale fishers dependent on the Andaman fishery for their livelihoods. This price escalation has not been mirrored by a proportional increase in the price of fishery products resulting in a loss of economic viability in many fishing households.

In order to assist fishing communities in acquiring a fair price for their products, the DOF needs to assess its policies in terms of:

- supporting the development of centralized fish markets where fish can be amassed and quality maintained.

9. Coordination with other Agencies

The reaction of the international community, government and non government agencies to the tsunami disaster was impressive but also highlighted the need for good coordination, consistency and compatibility of the aid delivered. As the region now moves on from disaster relief towards a phase of sustainable development, the need for coordination of effort in supporting fishing communities remains.

The response to the tsunami disaster also highlighted social equity problems that exist in many communities. Whilst many people did benefit from the generous aid provided by government and other agencies, there are many accounts of the 'wrong people' receiving this aid. Whilst in some cases, many genuinely needy people missed out.

In order to improve the effectiveness of aid targeting Andaman fishing communities, the DOF needs to assess its policies in terms of:

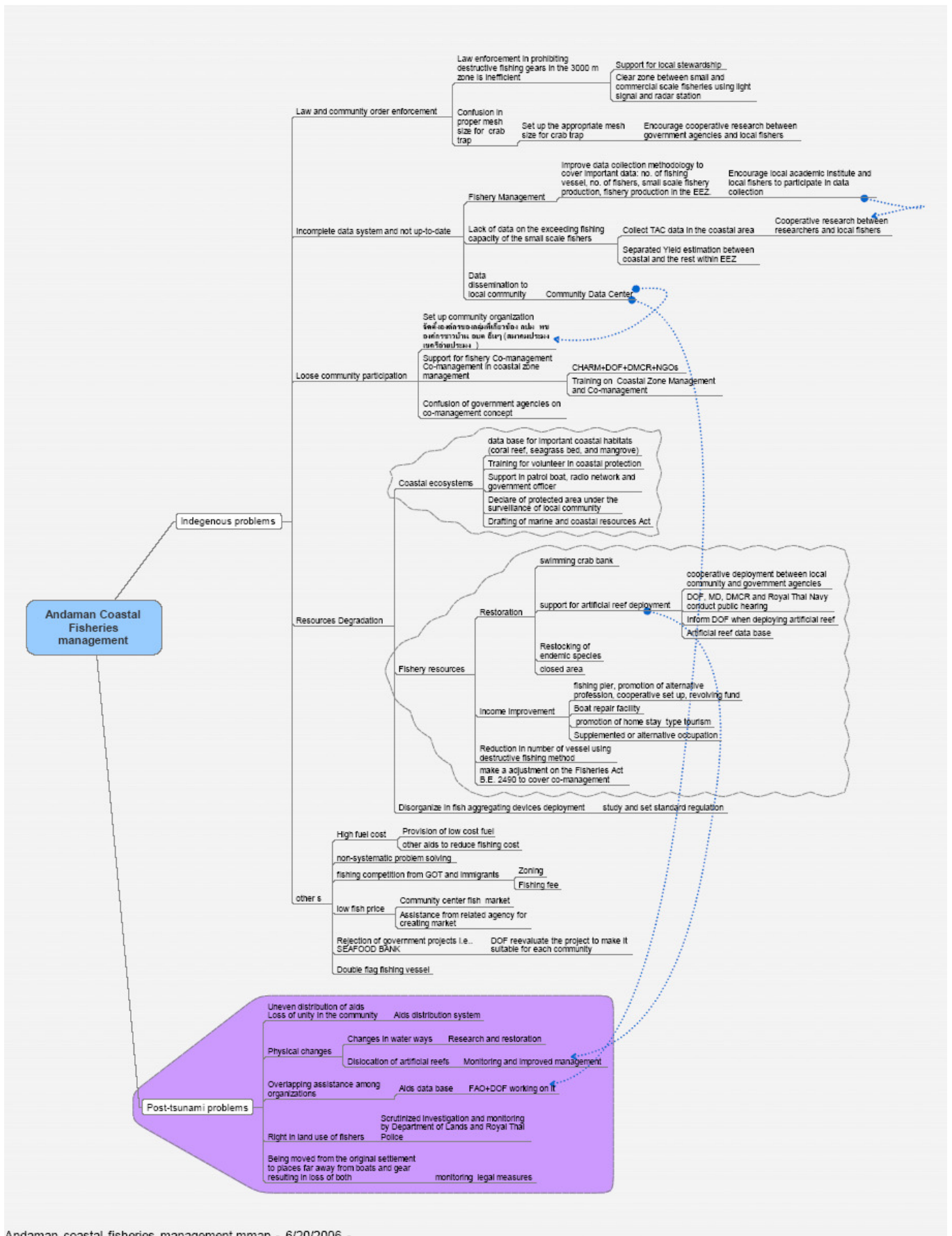
- improving the levels of monitoring and interaction with NGOs and private organizations, working on developing/rehabilitating the Andaman fishery;
- promoting 'special' programs to protect the interests of women, the poor and marginalized people who are dependent on the fishery;
- protecting fishing communities land and fishery access rights.

10. Development of a Management Plan for the Andaman Fishery

The many issues and recommendations laid out above suggest that there is a pressing need for a more holistic approach to sustainable management of the Andaman fishery.

- In order to achieve this, it is strongly recommended that the DOF consider developing an integrated management plan for the Andaman fishery, which draws on available information and is both realistic and pragmatic.

Appendix A



Policy Briefing Note

Report No. 2

**A Technical Assessment for Determining
the Level of Fishing Capacity, Impact of
Tsunami on Fishery Resources and
Identification of Resources Access and
Other Fishery-Related Issues in the
Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

June, 2006

Policy Brief

Based on the research conducted by CDC and the stakeholder workshops, a number of recommendations can be made to the DOF and other government agencies regarding policies relating to the management of Andaman fishery.

Available documented information suggests that, in recent years, the level of small-scale fishing effort has expanded on the Andaman fishery, and it is likely that such expansion contributes to an overall decline of fisheries resources, although the relative contribution to the decline by the small-scale sector and larger sized fishing vessels has not been quantified or documented..

There is a recorded decrease in the catch per unit effort has decreased in many fisheries and the gradual trend towards fishing down the food chain. An indication of this is the current trend of harvesting of squid and jellyfish, has been observed. The decline in resources indicates that the fishery cannot sustain the level of fishing effort that is currently in place and has strong implications for the viability of the fishing livelihood for the small-scale fishers. Already many have moved into alternative or supplementing occupations (particularly tourism in areas where this is an option)

Following the tsunami disaster, DOF policy has been to rebuild the fishing industry and restore number of fishing boats to pre-tsunami levels. The implicit assumptions are: 1) fishing capacity before the tsunami was at an appropriate level, and 2) fish stocks were not affected, in the long term, by the tsunami. The restoration of capacity has focused largely at the small-scale fishing vessel part of the fishery, principally because the larger sized vessels were repaired by the owners and far fewer large vessels were actually damaged or destroyed by the tsunami wave. Thus capacity restoration (or even increased capacity) has taken place in the small vessel (below 12 m) part of the fishery.

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The many issues and recommendations laid out above suggest that there is a pressing need for a more holistic approach to sustainable management of the Andaman fishery.

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**Report of the Final Workshop with the
Department of Fisheries**

Report No. 3

**A Technical Assessment for Determining
the Level of Fishing Capacity, Impact of
Tsunami on Fishery Resources and
Identification of Resources Access and
Other Fishery-Related Issues in the
Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

June, 2006

1. Introduction

This policy workshop was the final workshop in the implementation of the Project “*A technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources access and other fishery-related issues in the impacted area*”.

The workshop was conducted during 5-6 June 2006 at the Conference Room, Faculty of Fisheries, Kasetsart University, Bangkok, Thailand with the ultimate objective of establishing recommendations for the sustainable use of coastal marine fishery resources in the area and the commitment of the Department of Fisheries to improve its fisheries management plan. The Workshop provided the opportunity to present summaries of the main survey findings to a range of Government and non-Government stakeholders and then to discuss the policy and management implications of the survey findings on sustainable fishery management in the Andaman Sea. Unfortunately, on this occasion it was not possible to distribute documents summarising the main survey findings, to the workshop participants, in advance of the workshop.

2. Participants

Forty eight participants participated in the workshop giving valuable comments and recommendations for improved fisheries management in the area. Participants were small scale fishers, representatives of Tambon Administrative Organization, fish monger, researchers from universities, NGOs, representative of Fisheries Association of Thailand, Food and Agriculture Organization of the United Nations (FAO), Southeast Asian Fisheries Development Center (SEAFDEC) and government officers from Department of Fisheries (DOF), Department of Marine and Coastal Resources (DMCR), Pollution Control Department (PCD), Marine Department (MD), and the Office of Natural Resources and Environmental Policy and Planning (OEPP). A full list of the participants can be found in the Appendices F. Unfortunately, most of the senior DOF officials were not present for the most important sessions and so it was difficult to discuss the policy implications of many of the issues presented.

3. Proceedings

The workshop started with the opening remarks by Associate Professor Dr. Kungwan Juntarashote, Project Principle Investigator (Appendix A) and Mr. Suebpong Chatmalai, the representative of the Director General of the Department of Fisheries (Appendix B). Mr. Hiroyuki Konuma, the Deputy Regional Representative of FAO Regional Office for Asia and the Pacific Office delivered the welcome address to greet all participants (Appendix C).

The Director General of the Department of Marine and Coastal Resources presented his point of view on the management of Andaman fisheries (summary in Appendix D). Mr. Rangsan Chayakul, the Director of the Marine Fisheries Research and Development Institute pointed out the policy of the DOF (summary in Appendix E).

Summary of existing information of the fisheries and related industries in the Andaman area (Report # 2) and results from the field level discussion (Report # 3) and field consultation workshops (Report # 4) were then presented to give all participants an overview of the post Tsunami status of the Andaman Fishery. All participants were informed of 10 principle problems based on secondary data and information from reliable sources and primary data from the RRA studies, the field level discussions, and 2 regional consultation workshops conducted in Phuket and Trang as, the starting theme for discussion. These principle problems and proposed recommendations for solving them were presented as follows:

1. A lack of up-to-date and accurate Andaman fishery related information and statistical data.
2. A lack of technical data and information for confirming the potential fishing capacity being exceeded by current fishing capacity
3. A relocation of 'Thai Gulf' fishing vessels to the Andaman coastal area for fishing purpose and a group of Myanmar immigrants that have joined the fishery resource utilization race.
4. Fishery law enforcement
5. The 'Top Down' type of administrative system.
6. A rising in fuel price.
7. A stagnant fish price compared to a rising cost of fishing.
8. A change in environment and coastal resources due to the tsunami event.
9. A Government project refutation
10. A lack of unity in the community.

The problems were immediately accepted by all participants whilst a number of other crucial problems were also added.

After a separated afternoon brainstorming session on June 5, the summarized recommendations were presented to all participants for final discussion and comments in the morning session on June 6. This was done through a presentation of a 'Mind Map' of the issues and solutions, (developed by the workshop organizers during the evening of June 5th), which facilitated useful discussion and comments. The mind map, (see Appendices H) that was produced in the evening of the first day and which was presented clearly by Dr. Suvalak Sathumanasphun from Mahidol University on the morning of the second day of the workshop. The participants were given opportunities to discuss and agree on the 'mind map' draft, and the document, projected onto a screen, was amended as the comments were received. This seemed to be a very useful methodology for a workshop such as this one. The workshop participants seemed to be quite comfortable with the 'mind map' format and there was a lively discussion. An adapted version of the 'mind map' turned out to be a useful document, for orientating discussion with DOF policy makers on Andaman fishery related issues.

In the mind map diagram, the problems in the Andaman Sea fishery were categorized into 2 groups: chronic (or indigenous) problems and post-tsunami problems (Figure 1). It is noted here that in this report the major problems along with the recommendations were recorded from the consensus of the participants in the workshop. However, upon the discussion within the consortium, a more appropriate

form of problem grouping and recommendations was finalized and will be presented in the final report.

Indigenous (or chronic) problems are divided into 5 major categories as follows:

- a. Enforcement of laws and community orders
- b. Incomplete and out of date data base
- c. Loose community participation
- d. Degraded resources
- e. Others

Post-tsunami problems are divided into 5 categories as well as follows:

- a. Uneven distribution of aid.
- b. Physical change of ecosystems.
- c. Overlapping of aid provision from different organizations.
- d. Land use rights.
- e. Migration.

All problems were elaborated, followed by recommendations for alleviation

4. Summary of the Indigenous Problems and Recommended Solutions

4.1 Enforcement of laws and community orders

4.1a. Trawlers and large push netters were still fishing within the 3,000 m from the shoreline even though these practices are prohibited by law, indicating inefficient law enforcement.

Recommendation

It is therefore recommended to introduce local stewardship by having the local communities work closely with DOF and DMCR to patrol the nursery area with support from the DOF and DMCR on fuel and patrol boats. Through this process, local fishers will be empowered to become active members of the management team. Zoning was also raised as an appropriate measure for better law enforcement. This could be done with the application of light signal and coastal radar station to monitor intruders.

4.1b. Conflict on the standard mesh size of crab trap.

The small scale fishers who are using crab gill nets, accused the commercial fishers who also fish with crab traps, for using too small mesh size resulting in catching too many small crabs which might affect the crab population in the future.

Recommendation

Appropriate mesh size for the crab trap should be set to avoid growth overfishing on blue swimming crab. Participatory research on this particular topic should be carried out by government and local fishers in understand the effect of mesh size on crab populations over time, in order to allow both small fishers and commercial fishers who use the trap to fish in a more sustainable manner.

4.2 Incomplete and not up-to-date data base

4.2 a. Inappropriate data base management

This problem was obvious as the data obtained from different offices within the DOF did not correspond with each other, as mentioned in the review of existing information. The data were not up-to-date; the statistics published in 2006 were still reporting the fishery status in 2003. Moreover, data presented in the statistics were not useful for proper management of the small scale fishers as they tended to underestimate production in the fisheries.

Recommendation

An improved standard method for data collection should be introduced. More details on small scale fisheries such as numbers of fishing vessel and gears, fishing grounds, number of small fishers, yields from small scale fisheries and from commercial one within the national jurisdiction should be collected. Local community participation will be important in such a data collecting process. Local academic institutions will also be necessary in this data collection. Training in standard data collection will be needed at the initial stage.

4.2 b. Lack of data on fishing capacity

The conflicting numbers of the fishing vessel in the area from different sources pose a difficulty in the determination of the present fishing capacity of the area. Besides, estimated maximum sustainable yields in the Andaman Sea might not include all information from the small scale fisheries, resulting in a general underestimation of the MSY. This is supported by data which suggest that catch per unit of effort in the small scale fisheries obtained in the area, were rather steady even though the numbers of fishing vessels was increasing each year. It is noted that since Thailand is under the effect of the monsoon, the fishers have to stop fishing for certain period of time which may allow fishery resources to recover, especially the short-lived species.

Recommendation

Allowable catch assessments should be done separately in coastal areas and within the EEZ before over-fishing in the area can be declared. Participatory research is urgently required in this particular matter in order to have the better understanding of the fishery status in the area.

4.2 c. Lack of data dissemination to local community

Small scale fishers have not been informed by the DOF on the fishery related data making it difficult for them to adjust their fishing practice according to the resources.

Recommendation

Local community data center should be established.

4.3 Loose community participation

At present, cooperation between government sectors responsible for fisheries management and local community is not well established even though in the fisheries policy developed for the period from 2002 to 2005, included a focus on the involvement of stakeholder groups in the management and development of fisheries.. This may be due to the lack of understanding of both small scale fishers and government officers on current government policy. Therefore, fishers are not playing a role in management decisions whilst most government bodies are not attempting to get the fishers involved in the process.

Recommendation

Local network should be set up to have the local communities working closely with the government organizations responsible for fishery resources such as DOF and DMCR. Local communities should include local government bodies, provincial branch of the Fisheries Association of Thailand and local fisheries network. This network should also cooperate with and support the local data center mentioned in 1.2c.

This network will ultimately play a role in management decision making processes and the development of co-management approaches. However, this will require training workshops, including coastal zone management and co-management process, already being implemented in several areas by CHARM, DOF and NGOs. This will help clarify the role of fishers and government bodies in the co-management scheme.

4.4 Degraded resources

The problem of resources degradation is categorized into 3 groups according to the responsibility of the parties: degraded coastal habitats, degraded fishery resources, and disordered fishing method.

4.4a Degraded coastal habitats

Coastal habitats degradation has been widely accepted due to human activity and natural causes. Major coastal habitats in the Andaman area are coral reef, seagrass bed, and mangrove forest are important nursery ground for many marine organisms. Some coral reefs were destroyed by the tsunami to a certain extent, although not as much as was originally forecast while mangrove forest and seagrass beds also suffered less impact. However, as these habitats are valuable for the fishery in the area, recommendations for the better management of these habitats are urgently needed apart from the Marine and Coastal Resources Management Act (the exact name of the act is not yet established,) now being prepared by the DMCR.

Recommendation

Data base for coral reefs, seagrass beds, and mangrove forest in the GIS form should be established. Some of these already exist in certain areas. Training for the coastal protection volunteer is also needed. Further support on patrol boat, officers who have legal right for enforcement, and radio network would be most valuable. Protected area and/or conservative area should be established using local involvement for law enforcement.

4.4b Degraded fishery resources

Similar to coastal habitats, fishery resource degradation is widely recognized in certain areas of the country. DOF who is responsible for the health of the fishery resources has already implemented several projects to try and restore the fishery resources: blue swimming crab bank project, artificial reef project, and restocking of the indigenous fish species.

Recommendation

Local community should be consulted for artificial reef deployment through stakeholder meetings. There should also be better collaborative work among government agencies: DOF, DMCR MD, and the Royal Thai Navy so that a GIS data base for the artificial reefs can be completed. Local government bodies should not have the right to set artificial reef in their area without the permission of the responsible agency. Closure of some fishing areas is also proposed by the representative from Satun province, to allow fishery resources in the area to recover. To reduce pressure on fishery resource, several way to increase income of the small scale fishers were proposed; alternative profession (tourism, value added fishery products), improvement of infrastructure (fishing pier, revolving fund, boat repair garage), and local networks set up as cooperatives. The reduction in the number of destructive fishing gears or methods being used, should be implemented socially. Improvement of the Fisheries Act B.E. 2490 to introduce a legal basis for co-management would allow greater community participation in fisheries management.

4.4c Disorganised fishing method

In several areas, fishing aggregating devices (FADs) have been set in the disorganised manner, making it difficult for fellow small scale fishers to engage in their normal fishing way. As there is no law on the FADs settlement, community regulation will be the only way to manage this uncoordinated way of fishing but co-management will have to be enacted first.

Recommendation

Studies should be carried out by participatory research to allocate the suitable area for FADs set up.

4.5 Other problems

These problems include rising fuel cost, foreign labor force, low fish price, non-systematic way of problem solving, dual flag fishing vessel, and rejection of government project.

Recommendation

- a. Subsidy from government should be provided to alleviate the higher cost of fuel and other measures.
- b. No recommendation on ways to improve the non-systematic way of problem solving has been proposed.
- c. Community central fish markets were seen as a way to solve the low fish price as fishers would have more direct contact with the consumer.

- d. Related government agency should become more involved in fish marketing for the community
- e. Fishing fee and fishery zoning should be initiated to reduce problem involving the foreign fishing labors who had received fishing vessels from the international organization.
- f. DOF should reconsider the continuation of Sea Food Bank Project as most small scale fishers objected to the idea of converting common property into private property.
- g. Double flag fishing vessels were objected to by many small scale fishers but opposite opinion was also noted.

5. Post-tsunami problems

5.1 Uneven distribution of aid

From the field level discussions, consultation workshops, and the policy workshop, it is noted that excessive aid has been provided to certain groups of fishers and aquaculturists, whilst certain groups did not receive any aid or received very little, due to the failure of collaboration between organizations. Inappropriate or corrupt arrangement in aid distribution by the local community leaders was also noted, to a certain extent. This inequity, had resulted in the erosion and breakdown of unity in the community.

Recommendation

Local community aids distribution center should be set in each community to ensure that aid provision is a transparent process.

5.2 Physical change in the area

From the field level discussion, the research team was informed about the changes in sea topography and waterways in certain areas, causing difficulties to small scale fishers as they have had to change their access routes to the sea. Physical changes in some areas also caused changes in the tidal cycle to certain extent, shifting their fishing pattern. In another area, artificial reefs set by many organizations had been moved by the tsunami and resulted in fishermen moving fishing areas.

Recommendation

Further studies on these physical changes should be carried out so the fishers could redevelop access routes and artificial reefs. This will correspond to the community data center proposed in 1.2c. In cases where artificial reefs are needed, the DOF should provide the community with new ones (see also 1.4b).

5.3 Overlapping of aid provision from different organizations

This problem is similar to the one listed in 2.1. The FAO/DOF Post-Tsunami Rehabilitation Coordination unit is now setting up the data base of the aid provided from different organizations, to help solve the problem.

5.4 Land use rights

As most small fishers have settled in the coastal area without legal documents of land ownership, in some cases, fishers have been forced to move from their prior settlement area, whilst legal documents were issued to land developers. This matter urgently needs the consideration from the government sector.

Recommendation

Department of Lands and Royal Thai Police should engage in clearing up the right in land use of the resident in the area.

5.5 Migration of small scale fishers and foreign immigrant

After the tsunami incident, some small scale fishers have been moved from their original settlement area to the higher elevated area making it difficult to look after their fishing vessels, gears and boat engine resulting in loss of their properties. Some foreign immigrants have also settled in the area and received fishing vessel donated from donor organization as well even though these immigrant have never owned fishing vessels before.

Recommendation

There should be monitoring system and legal measures to ensure that all these settlements are proper as these increased number of immigrant fishers will pose higher pressure on the fishery resources in the area.

6. Wrap Up

The Workshop was concluded by Dr. Kungwan just before lunch on the second day. Again, the non attendance of senior DOF staff at this time, critically constrained the key workshop objective of facilitating policy debate on the issues.

7. Conclusions

Overall, the Workshop was successful in allowing CDC and their partners to present the large amount of information and data that they have collected through the course of their studies. This information generated useful discussion, on the issues facing the Andaman fishery amongst the stakeholders. However, due to the limited involvement of the DOF at the workshop, it was not possible to discuss the implications of these findings in terms of the need for Central Government policy revision or development. Nonetheless, the Mind Map produced looks to be a useful document for engaging with the DOF on policy related issues. In retrospect, in order to elicit a more positive approach from the DOF to the workshop, it may have been wiser to have asked them to host and organize the event, rather than have them attend as invitees.

Appendix A

Summary of the Opening Remarks

By

Associate Professor Dr. Kungwan Juntarashote

Director, Coastal Development Center

Faculty of Fisheries, Kasetsart University

June 5, 2006

Conference Room, Faculty of Fisheries, Kasetsart University

Associate Professor Dr. Kungwan Juntarashote reported that Coastal Development Center had received grant from FAO to conduct a study “ A technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources and other fishery-related issues in the impacted area” in order to establish the appropriate fishery management after the tsunami incident in the Andaman sea area for the sustainable use of the resources. The study was conducted under the cooperation among researches from Kasetsart University, Chulalongkorn University, Prince of Songkla University, and Rajamangala University of Technology Srivijaya. The study comprises compilation and analyses of existing resources and environment secondary data, primary field data collection including use of RRA technique, field level discussion, consultation workshops, and finally this policy workshop. The objective of today workshop is to establish practical recommendations. Today we have 50 participants composing of government officers from Department of Fisheries, Department of Marine and Coastal Resources, Pollution control Department, Marine Department, Office of Natural Resources and Environmental Policy and Planning, and representatives from FAO, SEAFDEC, Mahidol University, Rajamangala University of Technology Srivijaya, Thai Fisheries Association, Local government body, NGOs, and small scale fishers.

Appendix B

Summary of the Opening Remarks
by
Mr. Suebpong Chatmalai
Fisheries Expert
On behalf of Director General, Department of Fisheries

Director General of the Department of Marine and Coastal Resources, Mr. Hiroyuki Konuma the Deputy Regional Representative of FAO Regional Office for Asia and the Pacific Office, all participants

On behalf of the Department of Fisheries, I would like to thank FAO for granting the research project entitled “A technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources and other fishery-related issues in the impacted area” to Coastal Development Center as the executing agency with the objective to establish an appropriate post-tsunami fishery management in the Andaman Sea. The outcome of the project will be useful for both subsistence and commercial fisheries because the proper management will enable us to have the sustainable use of the renewable fishery resources. Department of Fisheries realizes its duty in carrying the sustainable fishery management and has developed several appropriate measures for managing fisheries in Thailand such as zoning, prohibit of using light in combination with certain gears, mesh size regulation, and season closure. The objectives of these measures are to prevent resources degradation and the better living condition of fishers. However, fishery resources are still in degraded condition due to several constraints. Department of Fisheries sincerely hopes that the outcome of the policy workshop will result in useful recommendations Department of Fisheries can apply for the better fishery management in the Andaman Sea.

Appendix C

Welcome Address

by

Mr. Hiroyuki Konuma
Deputy Regional Representative
FAO Regional Office for Asia and the Pacific

“A technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources and other fishery-related in the impacted area”

5 June 2006

Mr Suenpong Chatmalai, Representative of the Director-General
Department of Fisheries,
Dr Kungwan Juntarashote, Director, Coastal Development Centre, Faculty of
Fisheries, Kasetsart University
Distinguished participants,
Ladies and gentlemen,

It is my pleasure to welcome all participants to this policy workshop titled “A technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources and other fishery-related in the impacted area.”

This workshop is an important output of the project “Strengthening the Coordination and Assessment of Fishing Resource and Inputs Provided by Tsunami Emergency Relief.” The project consists of two components, of which one is the joint DOF/FAO Post-tsunami Rehabilitation Coordination Unit. The other component, which is the focus for this workshop, is a technical assessment for determining the level of fishing capacity, impact of tsunami on fishery resources and identification of resources and other fishery-related in the impacted area, implemented by a consortium of four universities coordinated by the Coastal Development Centre (CDC).

An important role for FAO is to facilitate its members in following the recommendation of the Code of Conduct for Responsible Fisheries, which among other offers support to sustainable management of fisheries resources to the benefit of fisher livelihoods. The December 2004 tsunami severely disrupted the livelihoods of coastal fishers and their families. In response to the disaster, a commendation rehabilitation effort, with the stated goal “to build back better”, has been carried out by the Government of Thailand. The rehabilitation has generously been supported by donors, NGO’s and civil society.

Now, some 18 months later, it is time to review the situation. There is some concern that the rehabilitation efforts as a whole has led to and increase in fishing pressure that

may impact the sustainability of the fishery and bring about a decline in the quality of fishers livelihoods.

The studies carried out by FAO and CDC is intended to clarify the background as well as the current status of the fishery and its rehabilitation. It is now time to reflect on the implications of this information for fisheries management and fisheries livelihoods. The aim for this workshop is to develop and agree on sound recommendations for policy and, most importantly, the action needed to insure that coastal fisheries continue to provide their valuable services to fishers and their families. As concluded by the recent meeting on “Progress in Post-Tsunami Rehabilitation in the Fisheries Sector in Thailand”, there is, among others, a need to strengthen the capability of DOF in maintaining records on registered fishing vessels as well as other important data such as the number of various fishing gears used by fisher folk and fish catch of different spaces in different locations through the establishment of an effective data collection system at central, provincial, district and village levels. There are an essential management data which will allow policy makers to monitor and take appropriate policy decisions. On the other hand, building the community capacity to implement community base participatory fisheries resource management should be fully pursued with the promotion of effective collaboration and cooperation between the Government and civil society.

On behalf of FAO, I sincerely hope that today’s policy workshop will provide all participants with opportunity to carefully consider current fisheries policy and how the information from these field studies may require amendment of specific interventions.

Thank you.

Appendix D

Summary of the Speech

**Dr. Maitree Duangsawadi,
the Director General of the Department of Marine and Coastal Resources**

Coastal area is the target area for human settlement, tourism, and fishery activities. It is estimated that 40% of Thai population lived in the coastal area which accounts for 20% of the country's area. Marine coastal fishery resources have been exploited in the Andaman area for a long time. In the past, as fishery resources were abundant, fishery development in the past 20-30 years caused no trouble at all. However, in the past few years, the problem of over-fishing is then realized due to the common property of the resources along with the development of the fishing related technology. Conflict on limited resources was evident between the small scale fishers which accounted for higher percentage of total fishers and the commercial ones. Moreover, coastal habitats which served as the protected and nursery areas were also hampered due to human development. The Department of Marine and Coastal Resources (DMCR) also has the same objective that is to conserve and rehabilitate the degraded resources. The missing parts of these processes are the carrying capacity of the ecosystem which can be agree upon by all stakeholders and the partnership in management. I would like to emphasize that our marine resources are very diverse and high in species resulting in the very stabilized ecosystem. Therefore, what we really have to do is to protect them and let them heal or recover themselves

Appendix E

Summary of the Speech

Mr. Rangsang Chayakul

At present, marine capture production is 2.6 million tons. Half of this is from the Thai water while the other half is from outside Thai waters. In the past, the number of fishing vessel was not so high but according to the record of the Department of Fisheries in the recent years, the total number of fishing vessels (both small scale and commercial ones) is approximately 58,000, a very high number compare to the limited fishery resources. In the past the CPUE was 200-300 kg.hr⁻¹ while at present the number is 23 kg.hr⁻¹. This fact reflects the degradation of the fishery resources. The major problems of fishery in the area are 1) high number of fishing vessels, 2) high effort (due to high number of fishing boats), 3) high fishing cost due to rising fuel price, and 4) lack of labor. At present, in some commercial fishing vessel, the only Thais in the boat is the fishing master while the rest are Myanmar (Burmese) which has created problem sometimes. Another problem Thai fishery industry is now facing is the trade sanction. The example of the later case is the mandatory installation of TEDs which so far has been rejected by most large scale fishers. Even though this TEDs is not enforced in small scale fishery but it is difficult to pinpoint the source of shrimps if they are caught are from small scale or commercial fisheries. The other problem is the food standard. At present, to be able to sell fishery products, there are several standard criteria to be met. The exact source of fishery products has to be identified.

To solve the problem of resource degradation, Department of Fisheries has restocked the indigenous species and has deployed artificial reef in several areas. The next step is to reduce debris from fishing vessel and reduce fishing effort by controlling number of trawler and push net.

Appendix F

List of Participants

Department of Fisheries

1. Mr. Artit Namasondthi
Deputy Director General
2. Mr. Suebphong Chatmalai
Senior Fisheries Inspector
3. Mr. Rungsun Chayakul
Director, Marine Fisheries Researches and Development Bureau.
4. Dr. Mala Suphongphan
Senior Marine Fisheries Expert
5. Mr. Sumate Tantikul
Director, Fishery Information Technology Center
6. Mr. Taweep Boonwanich
Director, Marine Fisheries Research and Development Center
7. Mr. Pairoh Sutthakorn
Chief, Phuket Provincial Fisheries Office
8. Dr. Praulai Nootmorn
Director, Andaman Marine Fisheries Research and
Development Center

Department of Marine and Coastal Resources

9. Dr. Maitree Duangsawasdi
Director General
10. Mr. Sombat Poohvachiranont
Senior Researcher

Food and Agriculture Organization of the United Nations (FAO)

11. Mr. Hiroyuki Konuma
Deputy Regional Representative
12. Mr. Ricky Gregory
13. Mr. Niklas Matton
14. Mr. Simon Wilkinson
15. Dr. Attaya Kungsuwan

16. Dr. Suchint Detae

17. Mr. Chayaporn Seckao

18. Ms. Tiraphorn

Southeast Asian Fisheries Development Center (SEAFDEC)

19. Dr. Supaporn Anuchirasheva

Office of Natural Resources and Environmental Policy and Planning

20. Ms. Niravan Pipitsombat

21. Ms. Kanikanun Koshchadate

22. Mr. Pimon Pongsasanongkul

Department of Marine

23. Ms. Charuayphorn Yaikail

Department of Pollution Control

24. Ms. Siriwan Larptiyama

Mahidol University

25. Dr. Suvaluck Satumanaspun
Associate Professor
Faculty of Environment and Resources Study

Rajamangala University of Technology Srivijaya, Trang Province

26. Mr. Apirak Songrak

Tambon Administrative Organization (TAO)

27. Mr. Suriya Busabong
Tambon Sri Bor Ya Administrative Organization,
Phang Nga Province

28. Mr. Aroon Soros
Tambon Rawai Administrative Organization, Phuket Province

Fish Mongers

29. Mr. Vorachard Nuntabuth
Manager, Central Community Fish market, Phang Nga Province

Fishing Community Leader

30. Mr. Gordeth Inton
Suksamran District, Ranong Province

Fishermen

31. Mr. Teerayut Vongri
Phang Nga Province
32. Ms. Russadee Prasertdum
Ranong Province
33. Mr. Yurad Madamsai
Satun Province
34. Mr. Tanyakate Yavaharb
Satun Province
35. Mr. Anurak Wammasu
Trang Province
36. Mr. Somboon Kingkaoyang
Trang Province

NGOs

37. Mr. Paitoon Nongnuan
Satun Province
38. Mr. Kittiphong Pronraksa
Krabi Province

Krabi Fisheries Association

39. Mr. Manit Dumkul
President

Fisheries Association of Thailand

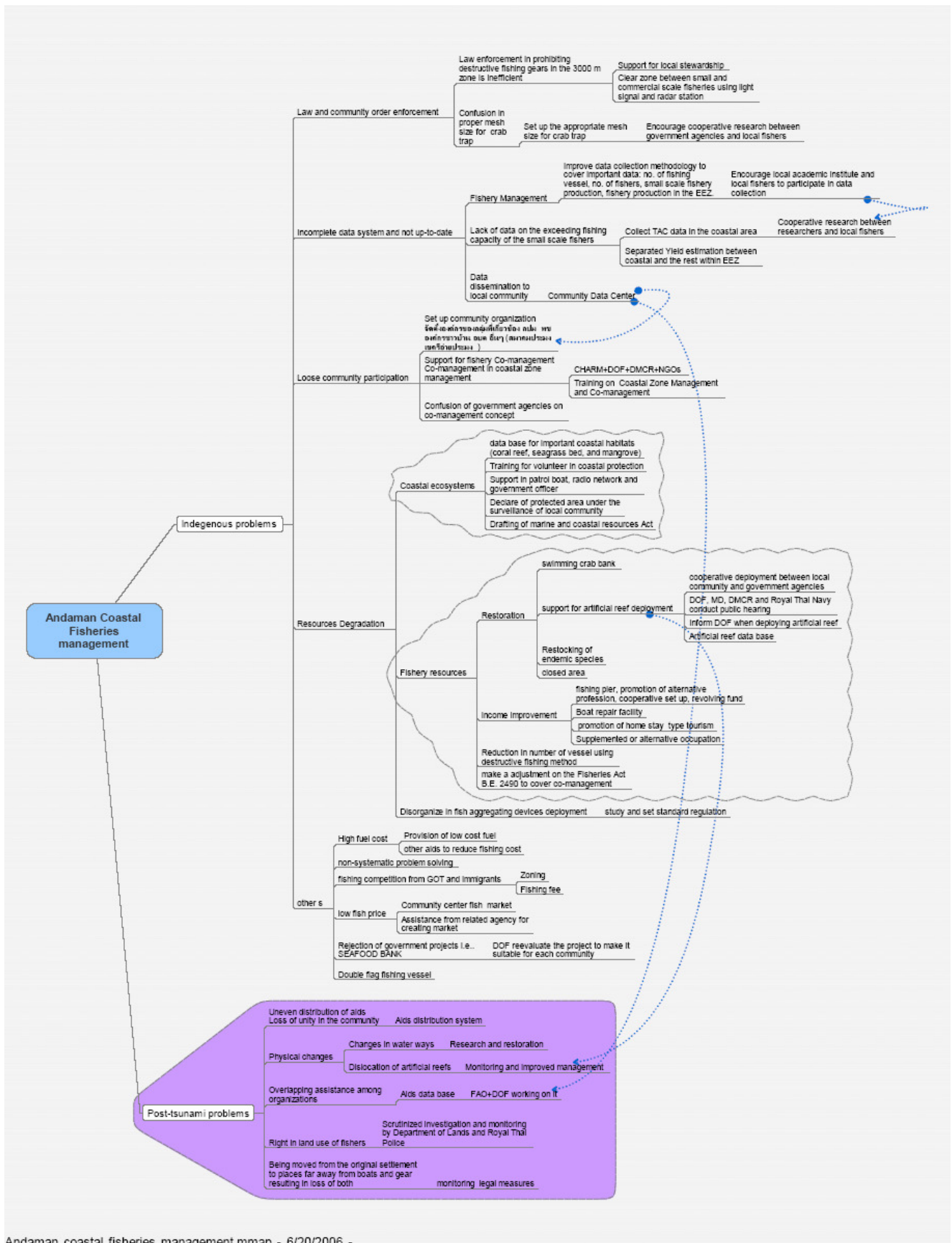
40. Ms. Siriphorn Kongnark

Coastal Development Centre

41. Mr. Kungwan Juntarashote
42. Mr. Ruengchai Tunsakul

43. Mr. Charoen Nitithamyong
44. Ms. Sangtien Ajjimangkul
45. Ms. Jarunee Chiayvareesajja
46. Mr. Somkiat Piyatirattivorakul
47. Mr. Varunthat Dulyapruk
48. Mr. Thongchai Nitiratsuwan

Figure 1. Mind Map



**Synthesis of the Information from the
Background Assessments and
Consultations and the Fisheries Review**

Report No. 4

**A Technical Assessment for Determining the
Level of Fishing Capacity, Impact of Tsunami
on Fishery Resources and Identification of
Resources Access and Other Fishery-Related
Issues in the Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

May, 2006

1. Introduction

This report is a synthesis of the research outcomes from the project titled ‘Technical Assessment for Determining the Level of Fishing Capacity, Impact of Tsunami on Fishery Resources and Identification of Resource Access and Other Fishery-Related Issues in the Impacted Area.’ It is based on the results of the following reports: review of existing information, the field level discussion, survey reports in the six provinces affected by the tsunami (i.e., Ranong, Phang Nga, Phuket, Krabi, Trang and Satun), and 2 consultation workshops held in Phuket (20-21st April 2006) and Trang (27-28th April 2006).

In this report, a summary of the assessment of two important aspects related to Andaman Sea fisheries, namely resource availability and fishing capacity, is provided. The assessment of resource availability covers coastal natural resources and environment directly or indirectly related with fishing activities (e.g., coastal forest, water quality, mangrove, coral reef, seagrass and potential fishing ground). In terms of fishing capacity, factors supporting all types of fishing activities, including those related to fishing vessels and gears, and factors affecting CPUE and landing statistics are assessed. Factors concerning coastal aquaculture in the areas and those related to fishing community and household are also reported. In all cases, the problems are classified into two types; ‘chronic (or indigenous)’ problems for problems that have been persisted from the past, and ‘post-tsunami’ problems for those resulted from the tsunami.

The final section of the report provides a summary of main problems and recommendations concerning resource availability, fishing capacity and other related factors. These problems and recommendations were identified based on primary data gathered during in-depth interviews, Rapid Rural Appraisal (RRA) and the local workshops. This final section was presented at the final workshop (held in June 2006) to facilitate discussion about policy recommendations for the management of Andaman fisheries and coastal resources.

2. Assessment of resource availability

Table 1 summarizes information about status, damages and availability of fisheries, coastal and environmental resources in the Andaman sea based on data obtained and presented in the ‘Fisheries in the Thai Indian Ocean: Pre- and Post- Tsunami Review’, the six provinces ‘field level discussion & survey’ reports and all the Stakeholder Workshops.’ Overall, extents of damages to coastal resources and environment had been reported by many related government and private parties after the tsunami. The rapid assessment techniques had been mostly employed to measure short-term impact. However, it is likely that the tsunami impact on these resources and environment may cause changes in ecosystems which may take several years to properly identify. These changes may not be completely noticeable by the short-term rapid assessment technique. In order to provide consistency and validity of short-term assessment results, long-term tsunami impact study is required. In addition to the post-tsunami problems, some coastal natural resources and environment may have persistently been suffered from the chronic (indigenous) problems as indicated in the table. The

summary of damages by type of coastal natural resources and environment is described as follows.

2.1 Coastal forests: Some extents of the damage to beaches, coastal forests and trees including several national parks have been reported from several sources, but without clarification in terms of long-term impact. These damages include the giant wave impacts on all physical structures, relocated fauna and flora, sediment load increased and saltwater intrusion. Further study for long-term post-tsunami impact is required.

2.2 Sea water quality: Generally, there is no post-tsunami report on seriously negative effects on water quality, except for problems of muddy water and tidal changes that have been noticed by the community. A close examination of the actual causes of polluted water (e.g., untreated effluent and garbage from highly polluted areas) is purposed.

2.3 Mangroves: The intensity of impacts on mangrove varies between areas due to degree of tsunami collision. Overall, only about 0.2 % of the total Andaman mangrove areas in the six provinces were reported as being damaged from the tsunami. Compared to the annual loss of Thailand mangrove, which has been a chronic (indigenous) problem, estimated at 15% of the total Thailand mangrove area during 1980 -2000, the post-tsunami problem is considerably less. The issue of mangrove forest re-plantation has been raised as coastal area protection against future natural threat and destruction. A study of long-term change in the mangrove ecosystem is required.

2.4 Coral reefs: The overall extent of damages to the coral reefs based on the rapid assessment was much less than anticipated (approximately less than 20 % were seriously damaged). As reported, 50% of 169 coral cover sites in the Andaman are considered to be of 'poor' condition. Therefore, a conclusive result of the tsunami impact the coral reefs cannot be produced and further study for long-term change in coral reef ecosystem recovery is required. Issue regarding coordination problem among government agencies and private sectors has been raised as a chronic (indigenous) problem.

2.5 Seagrass: Only 5 % of the total Andaman seagrass beds have been affected from the tsunami. After six months, these seagrass beds have been recovered at a satisfactory rate.

2.6 Fishery resources and habitats: In general, problem of decline in Andaman fishery production has been persisted from the past. The post-tsunami problems have been identified from many sources to include changes in proportion of trash fish and economically important species, changes in marine fish abundance in some areas and changes in some dominant species. To properly assess impacts on fisheries and determine whether they are short-term or permanent change, a comprehensive study on long-term changes in the Andaman fishery resource is required. The issue about the overestimated Thailand fish landing statistics, due to inclusion of fish captured from outside Thailand water, has been raised as a chronic (indigenous) problem.

Table 1. Evaluation of resource availability and status by type of coastal natural resources and environment, with summary of existing data and information and their sources.

Type of Coastal Natural Resources and Environment	Summary of the Existing Data and Information	Source of Data and Information	Remark(s)
<p>1. Coastal forests</p> <p>1.1 Chronic (indigenous) problem</p> <p>1.2 Post-tsunami problem</p>	<p>N/A</p> <p>1.2(a) The extent of the damage to beaches, coastal forests and trees including several national parks is still unclear.</p> <p>1.2(b) The damage of 900 ha of agricultural lands was reported.</p>	<p>N/A</p> <p>1.2(a) Kendall et al. (2006), Chotiyaputta (2005), Chulalongkorn University (2005), FAO/MOAC (2005) and United Nation Country Team in Thailand (2005)</p> <p>1.2(b) FAO (2005)</p>	<p>N/A</p> <p>For 1.2(a) – 1.2(b), the study of long-term effect of changes in topography, soil salinity and coastal forest ecosystem is required.</p>
<p>2. Sea water quality</p> <p>2.1 Chronic (indigenous) problem / post-tsunami problem</p>	<p>2.1(a) No serious negative effects of post-tsunami impact on sea water quality is reported.</p> <p>2.1(b) Some minor impacts (e.g., muddy water and tidal changes) from tsunami was reported by local communities</p>	<p>2.1(a) DMCR (2005)</p> <p>2.1(b) The field level discussion & survey reports</p>	<p>2.1(a)-(b) A close attention is needed for the actual main causes of polluted sea water (i.e. untreated effluent and garbage from highly polluted areas).</p> <p>2.1(b) The study of long-term tsunami impact may be required.</p>
<p>3. Mangroves</p> <p>3.1 Chronic (indigenous) problem</p> <p>3.2 Post-tsunami problem</p>	<p>3.1 Generally, Thailand had lost approximately 15% of the mangrove areas each year during 1980 – 2000.</p> <p>3.2 Only 1,912 rai (approximately 0.2% of the total Andaman mangrove forest areas) of mangrove forests in six provinces was damaged by tsunami. Damages were most serious in Phang Nga and Satun provinces.</p>	<p>3.1 Harakunarak and Aksornkoe (2005)</p> <p>3.2 FAO/MOAC (2005) and Chotiyaputta (2005)</p>	<p>For 3.1 – 3.2, A study on long-term change in the mangrove ecosystem is required.</p> <p>For 3.1 - 3.2, A large scale mangrove forest plantation for protecting coastal areas against the future destruction is proposed.</p>

Type of Coastal Natural Resources and Environment	Summary of the Existing Data and Information	Source of Data and Information	Remark(s)
<p>4. Coral Reef</p> <p>4.1 Chronic (indigenous) problem</p> <p>4.2 Post-tsunami problem</p>	<p>4.1 Based on the proportion of 'live to dead' coral cover during 1995 – 1998, 50% of Andaman 169 reef sites were reported as 'poor' condition.</p> <p>4.2(a) The overall extent of damage to coral reefs was much less than anticipated (approximately less than 20 % which had reported a serious damage).</p> <p>4.2(b) Some coral reefs had received an impact from tsunami.</p>	<p>4.1 Pongsuwan et al. (2006)</p> <p>4.2(a) DMCR (2005), Pongsuwan et al. (2006) and the independent surveys done by the Dive Operators Club Thailand, Phuket and the New England Aquarium, USA</p> <p>4.2(b) The field level discussion & survey reports</p>	<p>4.1 A problem of poor coordination among government agencies and private sectors has been reported.</p> <p>4.2(a)-(b) A study on long-term change in the coral reef ecosystem recovery is required.</p>
<p>5. Seagrass</p> <p>5.1 Chronic (indigenous) problem</p> <p>5.2 Post-tsunami problem</p>	<p>N/A</p> <p>5.2(a) Only 5 % of the total Andaman seagrass beds had been affected. After six months, the seagrass beds have been recovered at a satisfactory rate.</p> <p>5.2(b) Some seagrass beds had received a serious impact from tsunami.</p>	<p>N/A</p> <p>5.2 DMCR (2005)</p> <p>5.2(b) The field level discussion & survey reports.</p>	<p>N/A</p>

Type of Coastal Natural Resources and Environment	Summary of the Existing Data and Information	Source of Data and Information	Remark(s)
6. Fishery Resources and Habitats			
6.1 Chronic (indigenous) problem	6.1 From 1998 to 2003, the Andaman sea fishery productions had declined. Major reduction of species captured was observed in tuna, sardines and Indian mackerel.	6.1 FAO (2006)	6.1 Generally, being unable to exclude fish captured from the 'outside' Thailand water, the Andaman sea fishery production statistics have been overestimated.
6.2 Post-Tsunami problem	6.2(a) No difference in catch compositions before and after tsunami had been reported. However, an increase in the proportion of juvenile economically important species with a decrease in the proportion of trash fish respectively had been reported in some areas. Only in that seriously impacted areas that a decrease in marine fish abundance by 50% was reported.	6.2(a) Nootmorn et al. (2005)	For 6.2(a) -6.2(e), a study on long-term change in the Andaman fishery resources and habitats is required to produce a conclusive result.
	6.2(b) Changes in some dominant species were reported.	6.2(b) LIPI (2006)	
	6.2(c) Decreased catches and slight change in catch rates were reported for some commercial fisheries (purse seine, surrounding net with light luring)	6.2(c) Nootmorn et al. (2005)	
	6.2(d) No direct investigation on the damage to fishery habitat.		
	6.2(e) Changes in number of some species has been reported by local communities.	6.2(e) The field level discussion & survey reports.	

Note: N/A = Not available at the time of the study.

3. Assessment of fishing capacity and related factors

Table 2 presents the evaluation by type of fishing capacity and related factors based on the same data sources as in Table 1. For fishing capacity, among other necessary information and data, both fishing vessel and gear and fishing technical data are evaluated as follows.

3.1 Fishing vessel and gear: A decline in the total number of ‘registered’ fishing vessels has been reported since 1994. The changes in Andaman fishing vessel types have been observed with 67% decrease in non-powered fishing vessel and 54 % and 5 % increase in outboard and inboard powered fishing vessels, respectively. The chronic (indigenous) problems such as ‘unregistered’ fishing vessels, multi-purposed vessels and multi-nationality fishing vessels have been reported. The presence of ‘unregistered’ fishing vessels may indicate a failure of fishing vessel registration system operated by DOF. After the tsunami, due to a presence of unclear and non-uniformed data by type, size, quantity, value and technical definition problems, the different figures of number of damaged and tsunami-remedy-assistant fishing vessels and gears were not unanimously reported from several sources. It was not possible thus to draw any concrete conclusion. Nevertheless, all communities in six provinces commonly believe that the number of fishing vessels post-tsunami is greater than or equal to the pre-tsunami period. Further, an issue with immigrant fishing community utilizing the same resource as local communities has emerged after the tsunami. For estimating the optimal fishing capacity, the updated fishing vessel and gear data gathered using standardized data collection process and recording system is seriously required.

3.2 Fishing technical data: There is no recent assessment of MSY for the Andaman fisheries at the time of the study (the most recent MSY estimate was calculated in 1980s). However, some CPUE fluctuations were observed in Phang Nga Bay during 1993 – 1995. After the tsunami, slight changes in CPUE were observed in some areas. For both chronic (indigenous) and post-tsunami problems, the continuous monitoring and data collection system for all important fishery statistics are seriously required as fundamental for estimating the optimal fishing capacity.

3.3 Related factors: After the tsunami, different figures of damage / tsunami-remedy-assistance to fishing community and household were reported from several sources. No conclusion can be drawn at this time in terms of actual damages.

Table 2 Summary of assessment of fishing capacity and related factors

Type of Fishing Capacity and Related Factors	Summary of the Existing Data and Information	Source of Data and Information	Remark
<p>1. Fishing capacity</p> <p>1.1 Fishing vessel and gear</p> <p>1.1.1 Chronic (indigenous) problem</p> <p>1.1.2 Post-tsunami problem</p>	<p>1.1.1(a) A decline in total number of 'registered' fishing vessels has been reported since 1994.</p> <p>1.1.1(b) Un-powered fishing vessels in Andaman region decreased by 67% while 54% and 5% increase is found in outboard and inboard powered fishing vessels respectively.</p> <p>1.1.2(a) Different figures of number of damaged / tsunami-remedy-assistant fishing vessels and gears were reported in several sources. It is currently not possible to produce unanimous data.</p> <p>1.1.2(b) The number of fishing vessels after tsunami is reported to be equal to or greater than the pre-tsunami period.</p>	<p>1.1.1(a) DOF (2006) and DOF (2005a)</p> <p>1.1.1(b) Poonnachat-Korsieporn (2000)</p> <p>1.1.2(a) Pongsuwan et. al. (2006), Chotiyaputta (2005), Save Andaman Net Work (2005), DDPM¹, FAO/DOF² and FAO/MOAC (2005)</p> <p>1.1.2(b) The field level discussion & survey reports.</p>	<p>For 1.1.1(a) to</p> <p>1.1.1(b), presence of unregistered fishing vessels and multi-proposed vessel problems has been indicated as well as the problem of failure of fishing boat registration system. The multi-nationality fishing vessel is also reported as a problem.</p> <p>1.1.2(a) A presence of unclear and non-uniformed data by type, size, quantity, value and technical definition problems lead to a confusion. Thus, it is not possible to draw a clear conclusion based on existing data.</p> <p>1.1.2(b) Reported problems of allocation of assistance and immigrant fishing community utilizing the same resource.</p>

Type of Fishing Capacity and Related Factors	Summary of the Existing Data and Information	Source of Data and Information	Remark
<p>1.2 Fishery technical data (CPUE and MSY calculations)</p> <p>1.2.1 Chronic (indigenous) problem</p> <p>1.2.2 Post-tsunami problem</p>	<p>1.2.1(a) No recent estimate of MSY is available for the Andaman sea. Calculated MSY for pelagic and demersal species in 1980s was equal to 50,000 and 20,000 tons, respectively.</p> <p>1.2.1(b) From 1993 to 1995, the fluctuations of CPUE for Phang Nga Bay had been observed.</p> <p>1.2.2(a) Slight decreases or increases in CPUE were observed in some areas.</p> <p>1.2.2(b) Average CPUE and stock density in 2005 were higher than in 2004.</p> <p>1.2.2(c) Some positive changes in CPUE were reported in some species.</p>	<p>1.2.1(a) Phasuk (1987)</p> <p>1.2.1(b) Chantavong et al. (1996)</p> <p>1.2.2(a) Nootmorn et al. (2005)</p> <p>1.2.2(b) LIPI (2006)</p> <p>1.2.2(c) The field level discussion & survey reports</p>	<p>1.2.1(a) Capture fisheries production has exceeded the MSY catch level and Andaman fish stock assessment being mixed up with catches taken from outside Thai water</p> <p>1.2.1(b) Continuous monitoring and data collection for CPUE are required.</p> <p>For 1.2.2(a) – 1.2.2(c), continuous monitoring and data collection for CPUE are required.</p>
<p>2. Related factors</p> <p>2.1 Fishing community and Household</p> <p>2.1.1 Chronic (indigenous) problem</p> <p>2.1.2 Post-Tsunami problem</p>	<p>2.1.1 N/A</p> <p>2.1.2 Different figures of damage / Tsunami-remedy-assistance of fishing community were reported from several sources.</p>	<p>2.1.1 N/A</p> <p>2.1.2 Save Andaman Network (2005) and DDPM¹</p>	<p>2.1.1 N/A</p> <p>2.1.2 A presence of unclear and non-uniformed data by type, size, quantity, value and technical definition problems lead to confusion and therefore, the inability to draw conclusion based upon existing data.</p>

aquaculture does conform to an original intention that coastal aquaculture should be promoted to reduce pressure on captured fisheries. Other mollusk species cultured also have been reported, but with problem of inconsistent data collection method and unit measurement. After the tsunami, many marine fish cultured cages had been severely damaged. However, due to a presence of unclear and non-uniformed data by type, size, quantity, value and technical definition problems, the figures of number of damaged/tsunami-remedy-assistant of coastal aquaculture activities from several sources were not unanimously reported, leading thus to the inability to provide concrete conclusion.

4. Main problems and recommendations

Main problems and recommendations are identified based on key findings from both resource availability and fishing capacity and related factors evaluation summaries, as well as from primary data gathered during the in-depth interview via Rapid Rural Appraisal (RRA) and the local workshops.

4.1 Main problems (the first four points were derived from the assessment above, while the rest were obtained from field surveys and workshops)

1. *Lack of up-to-date and accurate Andaman fishery related information and statistical data:* The lack of up-to-date and accurate data and information for fishery (e.g., vessel number, number of fishers, small-scaled fishery production, Thailand EEZ fishery production, etc.) is one of the key factors contributing to poor performance of fishery management in the area.
2. *Lack of technical data and information to assess whether current fishing capacity is excessive:* Although problems with overfishing and excess fishing capacity are recognized by both domestic and international scientists, currently there is not sufficient data on Andaman optimal fishing effort to verify these effects. The result from the study indicated that all small-scale fishers recognize the problem of excessive amount of local fishing vessels with number of fishers, themselves, being identified as 'no problem.' Instead, they have reported a problem of fishing vessels from other areas competing for the same fisheries resources.
3. *A transfer of fishing vessels from Gulf of Thailand to the Andaman coast for fishing purpose and a group of Myanmar immigrants that have joined the fishery resource utilization race.* Fishing boats that operate in the Gulf of Thailand are transported to the Andaman coast during the monsoon season, causing thus an increase in fishing effort. The number of migrant fishers, especially from Myanmar, has also increased.
4. *Change in environment and coastal resources due to the tsunami:* Changes in watercourses, potential fishing grounds and marine biodiversity in many areas have been reported after tsunami. The indicated changes cause difficulties for small-scale fishers who have to adapt their fishing practices, in addition to having to adjust to the changes in quantity of fish catch per trip.

5. *Weak fishery law enforcement:* Based on the in-depth interview data and the workshop summary, most of small-scale fishers agreed that the current law enforcement for prohibiting all destructive fishing gears within 3 km from shore has been ineffective and resulted in conflicts among fisher groups.
6. *Ineffectiveness of the 'top-down' type of administrative system:* The majority of small-scale fishers indicated that the policy and law legislation has been solely handled by the government with a limited opportunity for all stakeholders to participate.
7. *Rise in fuel price:* The rising fuel price has resulted in an increase in cost of fishing. Some fishermen have to quit fishing or reduce their days of fishing.
8. *Stagnant fish price compared to rising cost of fishing:* While fuel price continues to rise, fishers do not receive higher prices for their catches.
9. *Refutation of a government project:* Most small-scale fishers do not agree with the 'Sea Food Bank' project since it causes conflicts in their community.
10. *Lack of unity in the community:* The unorganized and ill-planned 'After Tsunami' assistance to a community offered by the government and other organizations has resulted in destroying the community unity.

4.2 Recommendations

1. *Collaboration in statistical data collection:* Since the DOF has faced deficiency problem of manpower for fishery statistical data collection, the task should be allocated to local academic institutions for collecting these data, complying strictly with the DOF specified method. DOF authority would only be required to monitor the data collection process and to verify data. This would lead to an up-to-date fishery statistical data and information.
2. *Specific data collection on small-scale fishery:* The annual small-scale fishery data should be collected as well as data from the commercial fishery. These data can be used to promote effective small-scale fishery management.
3. *Boundary setting and license fee charged to the Gulf of Thailand fishers relocating to the Andaman coast:* The DOF should speed up the project of fishing boundary setting, which had already been initiated, especially for the Andaman and other prepared coastal areas. Fishing license fee should be charged to fishers from Gulf of Thailand and other areas for relocating to the Andaman coast.
4. *Fishery co-management promotion:* Both DOF and DMCR should quickly promote fishery co-management system in respond to small-scale fishers' need and to promote sustainability of fishery resource and community. The promotion can be extended from the CHARM project by enhancing the potential and strength of the community and the government activities.

5. *Supporting the community central fishery market establishment:* It is aimed to raise fishery commodity price (e.g. in Phang Nga Bay). The market mechanism can be used for determining measures of fishery management in the area.
6. *Conduct a technical study to determine the Andaman optimal fishing effort:* The cooperation between researchers and fishers may be required to gain the acceptance for all parties.
7. *Resolving issue of increased fishing cost due to rising fuel price:* The government should find an alternative way to reduce fishing costs other than providing subsidy for a fuel price since this may go against the WTO agreement on fishery subsidy issue.
8. *The DOF reconsideration for the 'Sea Food Bank' project:* In order to match with the community need and resolve conflicts in some communities, the DOF should reconsider 'Sea Food Bank' project. The project can be carried out in the areas where community approval is received.
9. *Studying changes in environment and coastal resource recovery management and paying attention to the Government projects which have an impact on environment and coastal resources.*
10. *Developing a systematic mechanism for a natural disaster victim assistance which does not cause disagreement and conflicts in communities and that generates an equal spread of assistance to real victims.*

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**Report of
2 Field Consultation Workshops**

Report No. 5

**A Technical Assessment for Determining
the Level of Fishing Capacity, Impact of
Tsunami on Fishery Resources and
Identification of Resources Access and
Other Fishery-Related Issues in the
Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

May, 2006

1. Introduction

In order to obtain comments and recommendations from stakeholders in the study areas, the collected data and information from field level discussion were grouped and analyzed for stakeholders verification.

2. Dates and venues

Two workshops were conducted in April 2006. The first workshop was conducted in Phuket from 20 to 21 April at Phuket Royal City Hotel and the second workshop was conducted in Trang from 27 to 27 April at Thammarin Hotel.

3. Number of participants

The total number of participants of Phuket workshop was 35 participants and 46 participants for Trang. These stakeholders included fishermen, fish mongers, government officers in the provinces who involved in fishery and marine environmental management and coordination of tsunami rehabilitation, representatives of local administrative organization and NGOs.

4. Workshop program

The workshop began with the provision of participants with existing information and summary of the field level discussions. The collected data and information and outcomes from the field level discussion are analyzed and several tables were prepared and presented to the participants. These tables are:

1. Percentage of representative groups reporting fishing resources problems
2. Percentage of representative groups with environmental problems
3. Percentage of representative groups with economic problems
4. Percentage of representative fishing groups with social problems
5. Percentage of representative fishing groups with resources problems before and after Tsunami
6. Percentage of representative fishing groups with environmental problems before and after Tsunami
7. Percentage of representative fishing groups with economic problems before and after Tsunami
8. Percentage of representative fishing groups with social problems before and after tsunami

9. Percentage of representative groups that agree the activities needed to survive another Tsunami
10. Analysis of fishing community problems in Ranong: Tambon Muang Gluang, Kapur District and Tambon Kumpuan, Suksumran District.
11. Analysis of fishing community problems in Phang Nga: Tambon Klong Kian, Takua Tung District and Tambon Kura, Kuraburi District.
12. Analysis of fishing community problems in Phuket: Tambon Chueng Tale, Talang District, Tambon Bangkon Tee, Ra Wai District and Tambon Park Krok, Talang District.
13. Analysis of fishing community problems in Krabi: Tambon Koh Lanta Noi, Tambon Koh Lanta Yai, Koh Lanta District.
14. Analysis of fishing community problems in Krabi: Tambon Nua Klong, Nua Klong District.
15. Analysis of fishing community problems in Trang Province: Tambon Koh Sukon, Palian District, Si Kao District and Kan Tung
16. Analysis of fishing community problems in Satun province: Tambon Korn KLAN, Tung Wah District, Tambon La Ngu, Tambon Park Nam, La Gnu District and Tambon Sahagorn, Tar Pear District.

After data and information presentation, the participants were divided into 3 groups to discuss on the following issues.

1. Institutional arrangement and capacity building for fishery co-management.
2. Ecosystem management for balance of nature and maintain bio-diversity.
3. Policy, law and regulation for appropriate coastal fishery management particularly for fishery co-management.

5. Workshop results

The interesting results from both CDC/PSU stakeholder workshops held in Phuket (20-21st April 2006) & Trang (27-28th April 2006) can be concluded as follows:

5.1 Stakeholder workshops held in Phuket during 20-21st April 2006

The workshop title ‘Andaman small-scaled fishery management’ had been held at Phuket Town Inn, Phuket province during 20 – 21st April 2006. The participants were from the government sectors representatives such as the Department of Fisheries, Department of Forestry, Andaman Sea Fisheries Research and Development Center and all related academic institutions, and representatives from private and NGO parties in Ranong, Phang Nga and Phuket provinces. The workshop had been divided into three groups; community management group, ecosystem and natural resource group and policy & regulation group.

5.1.1 Community Management Group

Table 1 has shown a guideline for community management and capability enhancement by levels of community and network. Table 1 also includes specified indicators and activities with the responsible parties.

5.1.2 Ecosystem and Natural Resource Group

Table 2 has summarized the important problems in the areas related with ecosystem and coastal resources (e.g. rubbish in a community, wasted water, a deterioration of fishery resource and coastal aquaculture expansion). The group has identified the guideline to resolve each issue with plan, activities, indicator and responsible parties.

5.1.3 Policy & Regulation Group

Table 3 has shown the group summary on the issue of policy and regulation. The table has been divided into 3 levels for resolution; the first level which is concentrated on fundamental data and information reform, the second level which is aimed at the community participatory and the third level which is aimed at community value and 'abide by law' building. The group also provides some examples of fishing regulation and punishment in Table 4.

5.2 Stakeholder workshops held in Trang during 27-28th April 2006

The workshop title 'Andaman small-scaled fishery management' had been held at Thammarin hotel, Trang province during 27 – 28st April 2006. The participants were from the government sectors representatives such as the Department of Fisheries, Department of Forestry, Andaman Fishery Protection and Law Enforcement Center, Environmental Division from Ministry of Natural Resources and Environment and all related academic institutions, and representatives from private and NGO parties in Krabi, Trang and Satun. The participants in workshop had been divided into 3 discussion groups; namely community management group, ecosystem and natural resource group and policy & regulation group respectively.

5.2.1 Community Management Group

The important issues from the workshop (Table 5) can be summarized as follows:

- Krabi province has identified the fishing ground conflict resolution by a natural boundary control point.
- Trang province has addressed the sustained recovering of coastal resources by aquatic juvenile release program, artificial coral reef, mangrove re-plantation and an increase in coastal aquaculture to reduce the fishing pressure and community participatory role on setting agreement for fishing.
- Satun has addressed the community poverty resolution, local economy strength and sustained coastal resource management.

5.2.2 Ecosystem and Natural Resource Group

The important issues from the workshop (Table 6) for resolving ecosystem and coastal resources can be summarized as follows;

- Building fishermen's awareness for fishing
- Implementing law and regulation
- Increasing a community participatory role in mangrove ecosystem recovery
- Increasing a community participatory role in coastal zone development
- Reducing wasted water released from local factory and shrimp pond
- Keeping community clean
- Water resource development

5.2.3 Policy and Regulation Group

The important issues from the workshop (Table 7) for policy and regulation can be summarized as follows;

- Prohibiting all destructive fishing gears
- Preserving community natural resources
- Reducing cost/increasing revenue by controlling fishing factor prices
- Promoting an alternative occupation for fishing household
- Strengthening community

Table 1. The Guideline for Community Management and Capability Enhancement by Levels of Community and Network: The Phuket Workshop Title ‘Andaman Small-scaled Fishery Management’

Target Level	Indicator	Activity	Responsible Party	
			Local	Central
Strengthening “group-party- community” -Community level -Network level	1. Strong Leadership with moral, vision, generous and sacrifice devotion	1 Fairness in leader election	Community member	- Central and local Government representatives - NGOs
	2. Well designed community plan	2. regular community meeting and public hearings	- community committee	- Central and local Government representatives (DOF, DMCR) - NGOs
	3. Research study in community history, tradition and resource	3. Internal and external learning arena 4. Field trip for learning and exchanging knowledge	- Committee - Expert as a member - Committee - Expert as a member	- Central and local Government -Academic Institution - NGOs - Central and local Government -Academic Institution - NGOs
	4. Community awareness and value on community resources	5. Regular training 6. Community research and study	- Committee - Expert as a member - Committee - Expert as a member	- Central and local Government -Academic Institution - NGOs - Central and local Government -Academic Institution - NGOs
	5. Community law and regulation implementation	7. Well-designed community plan from all dimensions (occupation, local economy, education and etc.) 8. Local law and regulation implementation	-Committee - All community members	- Central and local Government -Academic Institution - NGOs - Central and local Government -Academic Institution - NGOs
	6. Community welfare establishment	9. Providing a welfare benefit (scholarship, medical welfare and etc.)	-Committee - All community members	- Central and local Government - NGOs
	7. Community group integration (fund and loan group, career group and etc.) 8. Community Participant	10. Group integration activity	-Committee - All community members	- Central and local Government - NGOs - Financial institution
	9. Monitor and Evaluation	11. Developing a mechanism for monitor and evaluation	- All community members	- Central and local Government - NGOs

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Phuket Town Inn, Phuket province during 20 – 21st April 2006

Table 2. The Guideline for Community Ecosystem and Resource Management: The Phuket Workshop Title ‘Andaman Small-scaled Fishery Management’

Goal	Indicator	Plan	Activity	Responsible Party
1. A reduction in community rubbish	- Community rubbish management and rubbish disposal facility - More community garbage pail	Community rubbish management plan	- A campaign on the right garbage disposed place - A proper community rubbish disposal system	Local government, NGOs and community
2. A reduction in wasted water released	- Releasing wasted water which not exceeded the ‘wasted water’ standard		- Community monitor group - Inform related authority - Training 1. Tool and Technique 2. Raising community awareness	Community and local & central Government
3. An increase in fishery resource abundance	- Coral reef - An increase number of fish from having more Mangrove area	- A program for increasing an area for breeding and nursing grounds and habitat	-Artificial coral reef program - Mangrove re-plantation program	Community and local & central government
4. A reduction in all destructive fishing gear	-Large-sized fish from harvesting -An increase in number of aquatic animal and mangrove area	Change in destructive fishing gear	- A Meeting to set a community agreement on proper fishing gear used - ‘Buy back’ program for all destructive fishing gear - Community monitor group	- Community, local & central government and private party - Community member and leader
5. Lower an impact from fish cage culture expansion	- An increase in biodiversity level		- Providing information and knowledge about the impact (both short/long runs) - Building a fish pellet factory	Mr. Sutha Prathip Na Tha-lang Community and DOF

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Phuket Town Inn, Phuket province during 20 – 21st April 2006

Table 3. The Guideline for Community Policy & Regulation: The Phuket Workshop
Title ‘Andaman Small-scaled Fishery Management’

Target Level	Indicator	Plan	Activity	Responsible Party
1 st	- Updated data and information available	- Updating fundamental data and information	- Public relation - Public hearing for community problem - Information collected/ find the resolution and settlement - Monitor - field trip to the impact area and succeeded area for exchanging knowledge and information - Community research (to identify the capability of the area for appropriate occupation) - Resource utilization mapping - Grouping the similar goal altogether - Community plan designed specially by each community	- DOF Provincial/District offices - Community committee - NGO - Community leader/ leader - TAO and Scholars (fishery/law)
2 nd	- Operation plan	- Designing a community management plan	- Obtaining agreeable and harmonious understanding - Gathering the community thought, current situation - Learning and exchanging experience, and finding additional data and information - Public relation	- DOF Provincial/District offices - Community committee - NGO - Community leader/ leader - TAO and Scholars (fishery/law) -All community members
3 rd	- Increase in community resource abundance - Strong community	- Establishing value of community law and abiding by the law	- Arranging a meeting, a study, an analysis and criticism for finding a conclusion and settlement - Trying to make friends and relatives understand the concept - Arranging a distribution and announcement - Developing a community curriculum in schools, women groups and others - Conclusion for an adjustment or change	

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Phuket Town Inn, Phuket province during 20 – 21st April 2006

Table 4. The Example of Law and Punishment Provided by the Policy & Regulation Group from The Phuket Workshop Title ‘Andaman Small-scaled Fishery Management’

Example	Punishment
1. Controlling/Prohibiting any vessel from other area for fishing from ‘Lam Ti-Good’ to ‘Klong Son’	1. A punishment by confiscation - Fishing net confiscation - Fish confiscation -> Selling to the group -> Discarding at sea -> The informer or enforcer’s right to claim the property in dispute
2. Prohibiting commercial ‘wing shell’ fishing of both community residence and others in the mangrove area from ‘Lam Ti-Good’ to ‘Klong Son’ and only allowing a fishing activity for household consumption purpose	2. A Punishment by Confiscation - Only the household consumption purpose can be allowed meanwhile the rest of the capture can be discarded.
3. Prohibiting the small-sized crab or mature crab with eggs	3. No assistance from the community -A community loan

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Phuket Town Inn, Phuket province during 20 – 21st April 2006

Table 5. The Guideline for Community Management and Capability Enhancement by Levels of Community and Network: The Trang Workshop Title ‘Andaman Small-scaled Fishery Management’

Goal	Activity	Responsible Party	Indicator
Krabi Gulf expansion with natural boundary control point	-‘Provincial level’ meeting for exchanging knowledge and information -Providing a the knowledge about the gulf expansion benefit to small-scaled fishery community	-Community leader -TAO -DOF -DMCR -NGO -Media	1. Clear and explicit control point 2. An increase in aquatic resource quantity
Trang Group strategies -Household survive -Community survive -Coastal resource being managed sustainably Building community strength	1. Arranging a meeting 2. Learning area for network establishment 3. Artificial coral reef program 4. Juvenile release program 5. Mangrove re-plantation 6. A resolution on land and housing 7. Supporting the authority to resolve illegal fishing activity 8. Fishery saving group establishment 9. Encouraging the ‘community forest’ act 10. Assistant coordination for Tsunami victims	1. Group member 2. Group Representative 3. NGOs 4. Scholars 5. Government authority (DOF, DMCR and RFD)	1. Strong community and continuous activity 2. Community members obtain more information and news 3. More abundant mangrove 4. A guideline for solving the land conflicts of 8 fishery community 5. Problem of Tsunami victim living at ‘Koh Mook’ being resolved 6. Government and private parties coordination 7. A reduction in illegal fishing activities 8. Trang coastal zone management plan developed with both community and provincial level

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Thammarin hotel, Trang province during 27 – 28th April 2006

Table 5. (Cont.)

Goal	Activity	Responsible Party	Indicator
Satun Regaining the coastal resource abundance and sustianability	1. Juvenile release program (e.g. banana shrimp, bass and crab)	1. Satun small-scaled fishery group/group itself and member, -TAO -DOF/Marine aquaculture center	1. Continuous activity and plan
	2. Artificial coral reef in a canal	2. Satun small-scaled fishery group/group itself and member, -Community mangrove group -Local office (RFD) -TAO -District chief	2 Increase potential fishing ground area -Higher fisherman's income -More member cooperation
	3. Coastal zone aquaculture	3. Satun small-scaled fishery group/group itself and member, - DOF/Marine aquaculture center - TAO -Government office(district and provincial levels)	3. Increase in aquatic animal number -Higher fisherman's income -More member cooperation -More government office cooperation
	4. Mangrove re-plantation -Rhizophora	4. Satun small-scaled fishery group/group itself and member, - Community mangrove group - TAO - Government office(district and provincial levels)	4. Increase Mangrove abundance -Community cooperation -Cooperation between government office and community -More occupation related with mangrove -Community fund establishment
	5. Fish cage culture for preserving mangrove	5. two fish cage culture groups/ member -TAO -DOF	5. Higher revenue - Community fund establishment -Community rule establishment -More member applied
	6. Community rule establishment on boundary control point and fishing gear	6. Satun small-scaled fishery group - DOF - District chief/provincial governor -Community	6. Clear boundary - Increase in aquatic animal number -Continuous decreasing in destructive fishing gear
	1. nine community fish house	1. Satun small-scaled fishery group -9 community fish house groups -members -TAO	1. Higher fish price -Debt decreased for a member -Fish house expansion - rule establishment via community participation
	2. Network business -Central fish house -Fishing gear shop for the community	2. Satun small-scaled fishery group -19 network groups -Members	2. Better price bargaining with other group -Group fund for member loan - Strong group/firm
	3. Establishment of closed season during spawning season in gulf area	3. Satun small-scaled fishery group -19 small-scaled fishery community group -TAO - District chief/provincial governor -Satun DOF -DOF	3. A reduction in number of destructive fishing gear -Supported by laws - Increase in aquatic animal number -Strong community/firm - Higher revenue for small-scaled fisherman
	Develop community economy		

Source: The workshop title 'Andaman small-scaled fishery management' had been held at Thammarin hotel, Trang province during 27 – 28st April 2006

Table 6. The Guideline for Community Ecosystem and Resource Management: The Trang Workshop Title ‘Andaman Small-scaled Fishery Management’

Goal	Activity	Responsible Party	Indicator
1. Fishermen’s awareness of ‘fishing activity’ establishment	Increase in aquatic animal quantity harvested	- Training(fishermen/youth/group) - ‘Crab’ bank established - Circulating fund provided - Specified conservation area	- DOF - Community - TAO - Govt/NGO
2. Social and law enforcement	Reduction in illegal fishing gear quantity	- Continuous monitor and enforcement - Volunteer network established for conserving the resource	- Authority (water police, local police, DOF and MD) - Community member
3. Abundant mangrove from community participation	- Increase/maintain the mangrove area - Increase in aquatic animal quantity - Balanced ecosystem	- Arranging a mangrove recovery activity - Building an awareness of mangrove conservation - Cooperation among the authority and community to manage mangrove area -Providing information and knowledge about law - Clear mangrove boundary specified	- Government - Community - Scholar - Expert
4. Coastal system development with community participation		- Arranging a field trip to an area that being achieved success in management and an area that receive an impact - Studying an impact of the project in an area with a community participation - Public relation - Community participatory role in making decision	- Scholar
5. Reduction in pollution from a factory and shrimp farm discharge	- Ecosystem improvement - Increase in aquatic animal quantity	- Tightened law and enforcement - ‘Community watch’ program	- DEQP(Provincial office) - TAO - DMCR
6. Maintaining community cleanliness	- Environment improvement - A reduction in rubbish quantity	- Building an awareness (fishermen/youth/group) - Rubbish kiln/ community rubbish disposal management	- TAO - Community - DEQP(Provincial office)
7. Water resource management	- Deep watercourse for naval navigation safety - Provide an occupation to aquaculture and agricultural group	- Deep watercourse provided - Allow community participation for watercourse monitor & preservation	- MD - RID - Community - DOF

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Thammarin hotel, Trang province during 27 – 28st April 2006

Table 7. The Guideline for Community Policy & Regulation: The Trang Workshop
Title ‘Andaman Small-scaled Fishery Management’

Goal	Activity	Responsible Party	Indicator
1. Permanent Prohibition for all destructive fishing gears (Trawler and pushnetter)	<ul style="list-style-type: none"> - Revising law & regulation with the meeting among related parties (Hosted by FAO) - Setting a natural boundary (coastal boundary) and agreement on a natural boundary with the ‘sustainable resource’ goal - Providing and supporting an alternative occupation for all destructive fishing gear user (from the government support) - Closed season for a gulf - Tightening law & enforcement for encroachment upon mangrove area 	<ul style="list-style-type: none"> - DOF, DMCR - FAO - Counselor committee - Small-scaled fishery group - Monitor committee established for outcome evaluation 	<ul style="list-style-type: none"> - Increase in number of fish - Clear boundary specified - Working team established between the government and community to monitor/evaluate the outcome - Issuing a law
2. Community resource conservation (Small swimming crab and trash fish)	<ul style="list-style-type: none"> - A resolution and agreement obtained from a community level meeting - Establishment of community law and agreement (e.g. standard mesh size) - Aquatic juvenile release program (Crab bank) - Community watch for mangrove conservation - Building community awareness - Community cooperation with the government for establish a community network 	<ul style="list-style-type: none"> - Government unit (Mangrove related) - Small-scaled fishermen - TAO - ONEP - Scholars - Trawler operator - Commercial fishermen - Water police - Lawyer (to clarify the issue related with national park, mangrove and community) 	<ul style="list-style-type: none"> - Community must know a clear coastal resource boundary
3. Reduction in fishing cost/Increase fishing revenue through an aquatic commodity price control - Reduction in fuel price - Reduction in all fishing gears and items	<ul style="list-style-type: none"> - Value added from fish processing - Provide a support on technique and machine for fish processing - Support a local factory establishment for producing fishing gears - Meeting among fishermen, government party and middlemen (fish house) - Support a community fish house 	<ul style="list-style-type: none"> - Department of Career Extension - FAO (fund and market for export connection) - Community and small-scaled fishery - Middlemen (Fish house) - Small-scaled fishermen association - TAO, Developer 	<ul style="list-style-type: none"> - Community Product and brand - Establishing a product quality standard for exporting/capable of community grouping/a group for exporting a community product - Increase revenue for all community member - Reduction in unemployment rate
4. Promote and support an alternative occupation during a closed season (for both fishermen and housewife)	<ul style="list-style-type: none"> - Support the establishment of community cooperative - Support a fuel price subsidy program for small-scaled fishermen - More support from the government to community - Provide an alternative occupation for compensating the loss from high fuel price - Community project feasibility analysis 	<ul style="list-style-type: none"> - DOF - HD - Scholar 	<ul style="list-style-type: none"> - Cooperative group established for fuel - All fishing License applied by all boat owner
5. Strong community - Fish price - Fuel fund - A change in fishing gear	<ul style="list-style-type: none"> - Community group established with group-self fund raising - Continuous work and capable of producing a summary and development plan - Community cooperation with all (FAO, DOF) feasible & practical plan 		

Source: The workshop title ‘Andaman small-scaled fishery management’ had been held at Thammarin hotel, Trang province during 27 – 28st April 2006

Report on the Field Level Discussions

Report No. 6

**A Technical Assessment for Determining the
Level of Fishing Capacity, Impact of Tsunami
on Fishery Resources and Identification of
Resources Access and Other Fishery-Related
Issues in the Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

April, 2006

1. Introduction

Update and reliable data and information are the key factor for a sound fishery management policy establishment. However, in most developing countries this kind of data and information is hardly found. Then if any natural disaster happen in these countries it is very hard to provide an efficient assistance to the victims.

Thailand is one of the countries that the real figures of number of fishing boats and fishermen are unknown although Marine Fishery Census has conducted every 5 years. Therefore, in order to obtain an acceptable data and information for specific area, a rapid field data collection technique is applied for. Rapid Rural Appraisal (RRA) is one of the technique that researchers use for obtain data and information from communities. This study used many tools under RRA to collect required data and information from the 6 provinces along the Andaman Sea coast.

2. Objective

The objective of field level discussion is focused on obtaining first hand data and information in terms of qualitative on fishery resources, fishing activities and problems and fishery management as well as effect of tsunami on fishing communities from the stakeholders in 6 provinces.

3. Methodology

To conduct field level discussion the followings steps has been done:

- 1) General community information such as population, occupations, basic infrastructure is collected by using secondary data from various sources. For primary data such as fishing activities are collected from head of the communities and representatives of fishers.
- 2) Households were interviewed by using structure questionnaire. The information from households included opinions on fishing activities and effect of tsunami on fishing communities and fishing activities.
- 3) Two fishing communities in each province were selected for field level discussion.
- 4) Field level discussion in each fishing community is conducted by using RRA technique. The tools under RRA that applied for this study are time line, seasonal calendar, problem matrices, trend diagram and Venn diagram.

4. List of fishing communities that field level discussion was conducted

4.1 Ranong

Tambo Muang Gluang, Kapur District.
Tambon Kum Phuan, Suk Samran District

4.2 Phang Nga

Tambon Klong Khian, Takua Tung District
Tambon Kura, Kura Buree District

4.3 Phuket

Tambon Chueng Tale, Ta Lang District
Tambon Chalong, Muang District

4.4 Krabi

Tambon Koh Yao Noi, Koh Yao District
Tambon Koh Yao Yai, Koh Yao District
Tambon Nua Klong, Nua Klong District

4.5 Trang

Tambon Koh Sukorn, Pa Lian District
Sikao District, Kan Tang District

4.6 Satun

Tambon Khon Klan, Bang Hwa District
Tambon La Ngu, La Ngu District
Tambon Pak Num, La Ngu District

5. Issues that discussed in the field level discussions

5.1 Fishing activities, natural resources and environmental issues

- 1) Catches by type of fishing gear
- 2) Number of fishing boats
- 3) Number of fishermen
- 4) Fishing grounds and fishing effort
- 5) Fishing gears

5.2 Economic Issues

- 1) Fishing cost
- 2) Fuel cost
- 3) Cost of fishing gear
- 4) Price of fish
- 5) Debt
- 6) Cost of living of households

5.3 Social Issues

- 1) Feeling of giving up on fishing as a livelihood
- 2) The working of community leaders
- 3) Participation of society (community) in management of fisheries resources

5.4 The effect of the tsunami on fishing communities

- 1) Natural resources and the Environment
- 2) Economics
- 3) Society

6. Outcomes from field level discussion

6.1 Fishing activities, natural resources and environmental issues

Average catches: All of the interviewed fishermen in communities perceive a situation of decline CPUE (catches per unit of effort). In Satun, all the fishermen interviewed thought that this was a problem and in Krabi & Trang virtually all thought that this was a problem. The province least affected by this problem appears to be Ranong the reason is its fishing grounds are rather wide and coastal fishery resources are not overexploited. During monsoon season In ranking the problem in terms of severity, a high percentage of fishermen from Phang Nga, Phuket, Trang & Satun, rated this problem at the high level or very high level. The majority of fishermen in Ranong & Krabi whilst agreeing that there was a problem, rated its significance at the low or very low level (see Table 1).

Numbers of fishing boats: Despite the high number of fishermen agreeing that catch per fishing effort was declining, the data collected suggests that few of them seem to attribute this decline, to the numbers of boats fishing. Only in Krabi, Trang and Satun was this problem of ‘too many boats’ considered significant. However, some of the data in this section of the table may not represent the real situation as fishermen, may not be totally honest about the question regarding numbers of boats, as they may think that a more honest answer, may lose them the opportunity to receive any free boats available through the ongoing humanitarian efforts (see Table 1).

Numbers of fishermen: Some of the data in this section appear to contradict the ‘numbers of fishing boats’ section. For example, whilst none of the fishermen interviewed in Krabi thought that the number of boats fishing was a problem, 81.2% of them thought that there were too many people fishing! Data from Trang and Satun is more consistent suggesting that both the numbers of boats and the number of people fishing, are too high. Data from Phang Nga, Phuket and Ranong suggests that the majority of fishermen do not perceive an increase in the numbers of fishermen as a problem (see Table 1).

Access to fishing grounds: These data suggest that in Ranong there has been no perceived change in access to fishing grounds. In Phang Nga and Phuket around 1/3rd of fishermen thought that access was now a problem, whilst 2/3rds of fishermen in Trang, Satun and Krabi, thought so. In Trang 31% of fishermen thought ranked this problem at the very high level. These may result from the changes of seabed and sailing route (see Table 2).

Changes in tidal cycles: The data would seem to nullify claims by a few fishermen made earlier, that the tide times have, in some way been affected by the Tsunami. None of the fishermen interviewed seemed sure on this and there are no data available for Trang Satun and Krabi because the fishermen in these provinces were unable to answer this issue (see Table 2).

Changes in water quality: Data are also missing for Trang Staun & Krabi provinces with the same reason as mentioned above. However changes in the quality of water and the seabed, have been noted by fishermen in the other three provinces. Phuket seems the most seriously affected with a many fishermen reporting that sea water turbidity had increased since the Tsunami and still not returned to pre-disaster clarity levels (see Table 2).

6.2 Economic Issues

The outcomes from the field level discussion on economic issues are as follows:

Cost of fuel: Fishermen in all the provinces surveyed were virtually unanimous in agreeing that fuel prices were now a problem and affecting the economic viability of fishing as a means of livelihood. A large majority of fishermen in Ranong, Phang Nga, Phuket, Trang and Satun ranked this problem as severe whilst fishermen in Krabi seem to be less severely affected by fuel prices. Whilst this is certainly creating hardship for many fishing communities, none of the fishermen interviewed seem to have considered the possibility that a high cost of fuel may well deter commercial scale fishing boats from outside of their area, encroaching on the coastal fishery, which might result in reduced fishing pressure on stocks and increased catches by the small-scale fishing fleet, in the longer term. In conclusion, the rising of fuel cost creates both negative and positive effect to small-scale fishermen and it seems that the positive effect is greater than the negative. The fuel subsidy program for fishing boats of the government may consider carefully (See Table 3).

Cost of fishing gears: The fishing gear mainly employed by the small-scale fishery in the 6 provinces are gill nets and traps. Although the production cost is not high but the fishing gears can be lasted in a short period or be destroyed by trawlers or push net. Therefore the cost of fishing gears was also considered a problem by a large percentage of the fishermen interviewed. In Satun seems to be the least affected province in terms of this problem with 2/3rds of fishermen ranking the problem at the low or very low level (see Table 3).

Price of fish: Most of the fishermen in the 6 provinces sold their catches to the fish mongers or fish collector in the community. In general, the fishermen have a debt relationship with fishmongers in the community and it has an agreement that the fishermen have to sell their catches to specific fish mongers. The price of fish is determined by the fish mongers or fish collectors with low bargaining power of small-scale fishermen. In addition, there were some studies concluded that the marketing cost of fish is very high. Although, in some provinces where tourism has well developed, the price offers to the fishermen is higher than the other areas. Thus fishermen in the three provinces Krabi, Trang and Satun, appear to see low fish prices as a bigger problem than those in Ranong, Phang Nga and Phuket (see Table 3).

Debt: Most of small-scale fishermen in the country obtain loans from fish mongers and/or fish collectors for buying fishing boats and fishing gears as well as for daily consumption. The fish mongers may provide fishing boats and fishing gears to small-scale fishermen as a loan without interest under a condition that the fishermen have to sell their catches to them. Therefore, the majority of fishermen in all provinces, see debt as a key problem, and it is particularly severe in Phang Nga where 96% of fishermen rank the problem at the very high level. Satun's fishermen seem the least affected by debt with 61% ranking the problem at the very low level. The other provinces show fishermen ranking the problem on a wide scale, from very low to very high levels (see Table 3).

Savings: Many small-scale fishermen in the 6 provinces are a member of Community Saving Group. They have to deposit a certain amount as their saving to the group monthly. Thus, saving is a regular practiced for the fishermen. From the discussion it was found that saving is not a particularly highly recognized problem in the provinces of Ranong, Phang Nga, Phuket and Satun. A higher percentage of fishermen ranked savings as a problem in Krabi and Trang, but mainly at the low/very low levels (see Table 3).

Cost of household living expenses: Fishermen in all the provinces with the exception of Phuket, ranked this problem highly. Ranong, Phang Nga, Krabi and Trang had significant numbers of fishermen ranking the problem at the high level or above. Only in Satun was the

problem perceived as a low or very low significance. The low value for Phuket is considered odd due to the high commodity prices associated with the large scale tourist industry on the Island (see Table 3).

6.3 Social Issues

Feelings about giving up fishing as a livelihood: It has an assumption that the effect of tsunami may result to some fishermen give up fishing as a livelihood. From the discussion, it was found that in Phang Nga, around $\frac{3}{4}$ of fishermen would like to give up fishing as a means of livelihood. In Phuket, Trang and Satun, this figure is roughly $\frac{2}{3}$ ds. Less than $\frac{1}{4}$ of fishermen would like to give up fishing in Ranong and Krabi provinces. The outcomes from this issue discussion may not reflect the real effect of tsunami this may include the reason on rising of the fuel cost and low fish price received (see Table 4).

Performances of the community representatives: Generally, the fishermen interviewed seemed satisfied with the performance of the community representatives although in Krabi, a high percentage of fishermen saw this as a problem, but at the low or very low level. The same is true to a lesser extent in Trang and Phang Nga. The community representatives seem to be doing a relatively good job in Ranong, Phuket, & Satun

Performance of Government officials: Similar findings for Krabi and Trang where significant numbers of fishermen thought there was a problem with the performance of Government officials in their areas, but at the low or very low level. Few fishermen perceived there to be a problem in Satun and Ranong.

Participation of community: Fishing communities along the coast line of the Andaman Sea have a long experience on coastal environment and resources conservation programs. The members of communities have participated in several programs, i.e., mangrove forest reforestation, seagrass conservation, coastal fisheries resources conservation and pollution control. However, it has a doubt that from community members point of view they have any problem in participation. The fishermen in Krabi and Trang perceived as a low or very low level problem but not a problem at all, in the other provinces.

6.4 Effect of the tsunami on fishing communities

In order to understand the effect of the tsunami on fishing communities, the field level discussion has discussed on the issue of effect of the tsunami on fishing communities. The tables that follow compare the attitudes of fishermen to a range of resource, environmental, social, and economic issues, before and after the Tsunami.

Fishing Resources: In all the six provinces fishermen perceive the current level of fisheries resources, as being lower than before the Tsunami. In Ranong, Phang Nga, Phuket and Krabi less than 20% of fishermen thought there was a fisheries resource problem, before the Tsunami. In each of these provinces, more than one third of fishermen now perceived a problem, with Krabi showing the most marked increase. In Trang and particularly Satun, significant numbers of fishermen perceived there to be a fisheries resources problem, even before the Tsunami. More than three-fourth of fishermen in these provinces now consider there to be a fisheries resources problem. In Satun this is now a unanimous view (see Table 5).

Biodiversity: In Ranong, Phang Nga, Phuket and Krabi, biodiversity was not considered a problem, or was a very minor level problem, prior to the Tsunami. In all of these provinces, the problem now seems to be more acute and in Krabi, a much higher percentage of fishermen now perceive there to be biodiversity problems in the fishery. In Trang more than one-third of fishermen perceived a problem with biodiversity prior to the Tsunami. This has now risen to nearly three-fourth. The data from Phuket is something of an anomaly as biodiversity problems seem to have reduced since the Tsunami, but still exist at a relatively high level (see Table 5).

Mangrove: There does not appear to be a great deal of differences in fishermen perceptions before or after the Tsunami, with regards to the status of mangrove forests. Only in Krabi was there a marked increase in concern. High levels of concern also exist in Trang and Satun, but these were already there, before the Tsunami (see Table 5).

Shalowness of canals: In communities in four of the six provinces studied, the Tsunami appears to have slightly increased canal access problems to the fishery, due to siltation. In Trang, more than half of the fishermen perceived this to be a problem, although this may be localized (see Tale 6).

Moorings and piers: No problem with this issue in Phuket, either before or after the Tsunami. Slight increases in the severity of the problem in Ranong, Phang Nga, Krabi. A more significant increase in the seriousness of the problem, appears to exist in Trang and Satun.. This is rather odd, as these areas did not suffer extensive infrastructure damage, when compared to Phuket, Krabi and Phang Nga (see Table 6).

Rubbish in the community: An emerging problem that existed before the Tsunami, in many of the provinces. In Krabi, there was unanimous agreement regarding the scale of the problem, even before the Tsunami. In Ranong, Phang Nga and Satun, close to half of the fishermen interviewed consider this to be a long standing problem. In Trang the severity of the problem seems to have increased after the Tsunami, whilst in Phuket the problem has slightly decreased, perhaps due to the large scale clean up efforts in the tourist areas that followed the disaster (see Table 6).

Waste water from the community: This appears to be more of a problem in four of the six provinces, with Trang, and Ranong experiencing the most severe increase in the problem, with a doubling of fishermen's awareness. Satun also showed a significant increase in the scale of the problem. In Phuket and Krabi, the scale of the problem remains unchanged, although in Phuket, the problem is at the low level whilst in Krabi, the problem is perceived as much more severe. Of particular concern in many communities was the effect of waste water from shrimp farms contaminating land and discharging piscicides and molluscicides into cage culture areas (see Table 6).

Fishing cost: With the exception of Satun province, all the provinces showed a marked increase in the costs of fishing, following the Tsunami, although this may be more attributable to the steep increases in the cost of fuel and fishing gear, that have occurred over the past 18 months. Phang Nga, Ranong and Phuket in particular, show large changes in fishermen's perceptions of this problem. In Krabi, Trang and Satun, the problem appears to have been apparent, even before the Tsunami (see Table 7).

Income from fishing: The returns from fishing show a similar trend to that above with more fishermen experiencing problems following the Tsunami, in Ranong, Phang Nga and Phuket (see Table 7).

Cost of household living: Marked increases in post Tsunami problems associated with the cost of household living in Ranong, Phang Nga, Phuket and Trang, with the problem already being highly significant in Krabi and Satun, before the Tsunami (see Table 7).

Debt in the family: Debt in the family was a widespread problem in Phang Nga, Satun and Krabi before the Tsunami, and remains so. The problem has increased in severity in Trang and Phuket, whilst in Ranong it has increased from a very low level, to one much higher (see Table 7).

Performance of Government Officials: There was little change in the fishermen's perceptions of the performance of Government in Ranong and Phang Nga, following the Tsunami. In Phuket, Trang and Satun, fishermen were critical of the performance of Government officials following the Tsunami, whilst in Krabi, the majority of fishermen did not highly regard Government official's work, either before or after the Tsunami (see Table 8).

Performance of the Community representatives: A similar data set to the paragraph above with the exception of Phang Nga, where community representatives are perceived as performing poorly after the Tsunami (see Table 8).

Fear of the Sea: Not surprisingly, fishermen in all the provinces now have a fear of the sea. This has changed dramatically in the provinces of Ranong, Phang Nga and Phuket. Fishermen in Trang and Satun were more cautious of the sea, even before the Tsunami but this level has also risen significantly (see Table 8).

Hope for the future: In all provinces, the Tsunami appears to have affected peoples optimism for the future. In Phang Nga, Phuket, Trang and Satun more than 2/3 of fishermen are now worried about the future, following the Tsunami. Only in Krabi are fishermen more optimistic (see Table 8).

Mangrove conservation: In the provinces of Ranong, Phang Nga Krabi and Trang, the protection that mangrove forests provide in the event of a disaster like a tsunami, is now widely appreciated by fishing community members. This is less well understood in Phuket and Satun (see Table 9).

Emergency plan for Tsunami: In Phang Nga., Phuket, Krabi and Trang, a high percentage of fishermen are aware of emergency plans in the event of another Tsunami disaster. In Ranong this is a lower figure, whilst in Satun only 7% of fishermen have an idea or awareness of an appropriate emergency plan (see Table 9).

Knowledge of Tsunami survival methods: This is very well established in Phang Nga and Phuket, two provinces which were very badly affected by the Tsunami. A majority of fishermen in Ranong, Krabi and Trang are also aware of survival

techniques in the event of another Tsunami. In Satun, perhaps because it was least affected, only a low percentage of fishermen have any idea on survival methods.

Community broadcasts: The importance of community broadcasts is highly appreciated in all of the provinces, with the exception of Satun (see Table 9).

Have an evacuation route: A relatively high percentage of fishermen in Phang Nga, and Krabi have an escape plan or route. This is less well developed in Phuket and Trang and not developed at all in Ranong and Satun (see Table 9).

Building of protection in the mangrove area: There is an idea from government agency to construct a building of protection in the mangrove area. Only in Trang and to a lesser extent, Phang Nga is this considered an appropriate measure to plan for.

Table 1. Percentage of representative groups reporting by type of fishing problem and by province

Type of problem	Ranong	Phang Nga	Phuket	Krabi	Trang	Satun
Catch per unit of effort (CPUE)	76.0 ¹ very high =8 high = 8	96.4 very high =3.6 high = 35.7	87.1 very high =16.1 high = 38.7	93.7 very high =0 high = 12.5	97.3 very high =13.5 high =45.9	100 very high =0 high=38.9,
Numbers of fishing boats	24.0 very high =8 high =4	28.6 very high=10.7 high =7.1	6.5 very high=3.2 high =0	0.0	74.3 very high =8.6 high =25.7	44.4 very high=16.7 high =0
Numbers of fishermen	8 very high =0 high =4	7.2 low =3.6 very low =3.6	6.5 very high=0 high =0 low =3.2 very low =3.3	81.2 very high =12.5 high = 12.5	64.9 very high=37.8 high = 13.5	38.9 very high=0 high = 5.6 low =5.6 very low =27.8

¹ The first figure in each box represents the percentage of fishermen in that province, who thought that the issue described in the left hand column was a problem. This figure is then broken down into those who ranked the problem as very high, high, low or very low. In this case, 76% of fishermen interviewed in Ranong thought that ‘the amount of fish caught relative to fishing effort’ was a problem. 8% of fishermen thought that the seriousness of the problem was very high, and a further 8% thought it was high. The composition of the remaining 60% is not shown in the table but it is implied that they ranked the problem as low, or very low. 24% of fishermen did not think that the issue was a problem.

Table 2. Percentage of representative groups with environmental problems by province

Type of problem	Ranong	Phang Nga	Phuket	Krabi	Trang	Satun
Fishing grounds	0.0	32.1 very high=7.1 high =14.3	32.3 very high=16.1 high =3.2	66.7 very high =11.1 high = 11.1	65.7 very high =31.4 high = 11.4	66.7 very high =11.1 high = 11.1
Changes in tides	Not sure	Not sure	Not sure	No data	No data	No data
Changes in water quality	Quality of seabed changed	Quality of seabed changed	Water muddy, high sediment content	No data	No data	No data

Table 3. Percentage of representative groups with economic problems by province

Type of problem	Ranong	Phang Nga	Phuket	Krabi	Trang	Satun
Cost of fuel	100 very high=80	100 very high=96.4	100 very high)=100	100 very high=6.3 high=56.3 low=37.5	97.2 Very high =52.8 high=30.6	100 Very high =0 high=22.2 low=61.1
Cost of fishing equipment (gear)	96 very high =0 high=72	100 very high =21.4 high=60.7	100 very high =22.6 high=74.2	100 very high=0 high=18.8 low=43.8 very low=37.5	88.9 very high=19.4 high=55.6 low=5.6 very low =8.3	77.8 very high=0 high=11.1 low=27.8 very low=38.9
Price of fish	12 very high=0 high=4	50 very high=0 high=72	3.2 very high=0 high=72	100 very high=6.3 high =12.5 low=68.8 very low=12.5	97.8 very high=19.4 high=52.8	94.4 very high=5.6 high=5.6 low=5.6 very low=77.8
Debt	88.0 very high=8 high=36	100 very high=96.4 high=0	77.4 very high=29 high=19.4	100 very high=25 high=68.8	91.7 very high=17.1 high=40	72.2 very high =0 high=5.6 low=5.6 very low=61.1
Savings	4 high=4	7.1 very high=0 high=3.6	3.2 very high)=3.2	87.5 very high=0 high=0	57.1 Very .high=2.9 high=0	11.1 Very high=0
Cost of household living expenses	100 very high=0 high=48	92.9 very high=0 high=28.6	3.2 very high=3.2	100 very high=0 high=62.5	82.9 Very high=17.1 high=40	88.2 Very high)=0 High=5.9

Table 4. Percentage of representative fishing groups with social problems by province

Type of problem	Ranong	Phang Nga	Phuket	Krabi	Trang	Satun
Feelings about giving up fishing as a livelihood	20.0 low=4 very low=16	75.0 high=7.1 low=14.3 very low=53.6	64.5 high=6.5 low=16.1 very low=41.9	25 very high=0 high=0 low=0 very low=25	66.7 Very high=22.2 high=27.8 low=5. very low=11.1	66.7 Very high=0 high=0 low=16.7 very low=50
(Performances of community leaders) The work of the community representative	16.7 very high=0 high=4.2	43.0 very high=3.6 high=3.6	32.3 very high=6.5 high=0	93.7 very high=0 high=6.3	58.8 very high=2.9 high=2.9	22.2 very high=0 high=5.6
Performance of Government officials	16.0 very high=8 high=4	14.3 very high=7.1 high=3.6	32.3 very high=6.5 high=0	93.7 very high=0 high=12.5	64.7 very high=2.9 high=5.9	16.7 very high=0 high=0
Participation of community	0	3.6 low=3.6	0	62.5 low=6.3	61.1 very high=2.8 high=5.6 low=16.7	0

Table 5. Percentage of representative fishing groups with resources problems before and after tsunami by province

Province	Fishing Resources		Biodiversity		Mangrove	
	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami
Ranong	4.0	44.0	0.0	8.0	4.0	4.0
Phang Nga	10.7	35.7	3.6	10.7	3.6	10.7
Phuket	3.2	35.5	3.2	30.0	0.0	3.2
Krabi	18.7	81.2	12.5	75.0	18.7	43.7
Trang	38.9	77.1	37.1	74.3	22.9	40.0
Satun	75.0	100.0	80.0	68.4	50.0	52.6

Table 6. Percentage of representative fishing groups with environmental problems before and after tsunami by province

Province	Shallowness of canals		Mooring and piers		Rubbish in the community		Waste water from the community	
	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami
Ranong	8.0	16.0	8.0	20.0	40.0	48.0	12.0	24.0
Phang Nga	14.2	21.4	14.3	21.5	46.4	46.4	25.9	35.7
Phuket	6.5	6.4	0.0	0.0	22.6	16.2	19.4	19.5
Krabi	25.0	31.2	37.5	43.7	100	100.0	93.7	93.7
Trang	35.3	54.3	20.6	60.6	38.2	67.6	20.6	40.0
Satun	45.0	42.1	25.0	47.4	40.0	42.1	25.0	42.1

Table 7. Percentage of representative fishing groups with economic problems before-after tsunami by province

Province	The cost of fishing		Returns from fishing		Cost of household living		Debt in the family	
	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami
Ranong	4.0	88.0	4.0	52.0	4.0	92.0	4.0	82.8
Phang Nga	21.4	100.0	17.9	100.0	25.0	100.0	100.0	100.0
Phuket	3.2	93.5	6.5	83.3	3.2	100.0	51.6	77.4
Krabi	87.5	100.0	93.7	100.0	100.0	100.0	100.0	100.0
Trang	32.5	71.4	50.0	91.1	41.7	72.2	54.7	88.6
Satun	90	89.5	90.0	100.0	80.0	84.2	85.0	84.2

Table 8. Percentage of representative fishing groups with social problems before-after tsunami by province

Province	Performance of the Government		Performance of the community representative		Fear of the Sea		Feelings about hope for the future	
	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami	Before Tsunami	After Tsunami
Ranong	16.0	12.0	20.0	20.0	0.0	48.0	0.0	40.0
Phang Nga	14.2	17.8	17.9	42.8	0.0	75.0	0.0	71.4
Phuket	29.0	35.5	29.0	40.0	0.0	90.3	0.0	71.0
Krabi	87.5	93.7	81.2	93.7	6.2	37.5	0.0	6.2
Trang	42.9	71.4	41.9	68.6	39.4	74.3	34.3	65.7
Satun	21.1	35.5	31.6	40.0	42.1	90.3	47.4	71.0

Table 9. Percentage of representative groups that agree activities needed to survive another tsunami by province

Activities	Ranong	Phang Nga	Phuket	Krabi	Trang	Satun
Mangrove conservation	84.0	92.9	31.0	62.5	62.2	26.7
Emergency plan for Tsunami	36.0	85.7	100.0	93.3	67.6	6.7
Knowledge of Tsunami survival methods	64.0	92.9	96.6	75	56.8	13.3
Community broadcasts	36.0	92.9	96.6	100	67.6	86.7
Have an evacuation route	16.0	78.6	34.5	68.8	51.4	6.7
Building of protection in the mangrove area	0.0	21.4	10.3	0.0	45.9	0.0

**Table 10. Analysis of fishing community problems in Ranong:
Tambon Muang Gluang, Amphur Kapur, Tambon Kumpuon, Ging
Amphur Suksumran**

Problems	Solutions
Number of fishing boats increased by 40-80% in some specific communities.	Aid monitoring by community groups: villagers
Increase in numbers of fishermen e.g. Burma/Thai ethnic people, from 20 families to about 200 families and number of fishermen from the Gulf of Thailand came to fish during closed fishing season in the Gulf of Thailand	Control of Thai ethnic (Burmese) groups ¹
Fish cage problems. e.g. theft, lack of fund and only 10% of government aid covered the damage	Advice community to form group representative
The amount of rubbish increased, no regular collection only when get help from outside on a regular basis.	Issue rubbish regulations and organize regular collection
Private /NGOs assisted by setting up organizations but fund management sometimes caused community conflict.	Form a strong community system with capable leader.
Debt increased- loans being misused. Sometimes funds not used for reinvestment e.g. purchase of mobile phones and motorcycles.	Build understanding and provide advice on fund management
Water in some areas were contaminated from shrimp farms waste water.	Government should have a strong monitoring and inspection.
Irregular tides	Get information on cause of tide change from the fishermen and assess impact.
Sea bed changed from muddy- sand to hardy white sand	-
The number of fish increased straight after the Tsunami but declined later on Increased number of shellfish, sea urchins, hoy chak den', 'hoy warn', 'blood cockle , white shell and jellyfish.	-

Table 11. Analysis of fishing community problems in Phang Nga: Tambon Klong Kiann, Takua Tung District and Tambon Kura, Kuraburi District.

Problems	Solutions
Catch per unit of effort (CPUE) has much declined and there is no guarantee if the catches will recover.	Investigate new fishing grounds and examine if artificial reefs exist.
Conflicts with trawlers	Strengthen law enforcement
Some species of fish have increased e.g. 'Blah Be Nang', Hilsa and sharks	-
Fishing grounds changed	-
Increased in shellfish cage problems due to water contaminated from shrimp farms	The communities should be informed of water quality and advice on aquaculture Should organize a community police boat Strong penalty to those who break the law
Changes in the tides, wind direction and water currents	Research on changes in current and environment and inform communities
Increasing debt problem	Evaluate performances of NGOs and strengthen the participation of community
Number of bamboo stake traps decreased from 40-50 sets to 15 sets.	-
Increase in occupation to rubber tapping has increased, (this way is only open to people with land) but those with a tourist business has decreased.	-
Increase in amount of rubbish	-
Increase in debt	-
Low level of community education	-

**Table 12. Analysis of fishing community problems in Phuket:
Tambon Chueng Tale, Ta Lang District, Tambon Bangkhun,
Ra Wai District and Tambon Pa Krork, Ta Lang District.**

Problems	Solutions
Increase in number of fishing boats from 50 to 130, but some used for tourism. Fuel expensive	The community needs assistance from government and promote community participation on fishing boats control. Some groups have been set up but no activities have taken place due to lack of funding support from government. Groups have to collect funds from membership. Promote information on conservation Control the price of fuel for fishers
Fishermen migrating to area, increased by 20%	-
Boats that are made from soft wood are easily damaged.	-
Declining in fish catches. Lots of catching of ornamental fish	-
Changes in fish species e.g. fishing for sharks	Research on fishery environment and feedback to the people.
Too many commercial boats operated close to the shore.	Government has to strengthen illegal fishing.
High costs for fishing. Increase in debt.	-
Coral and sea grass damage 30%	-
Muddy water, lots of sediment	-
Fear of Tsunami	-
Low participation of fishers.	-
Theft	-
Some fishermen have still not received assistance. Some fishermen not affected received assistance. The aid hasn't gone to the most needy fishermen	Have investigation into the giving of assistance

**Table 13. Analysis of fishing community problems in Krabi:
 Tambon Koh Lanta Noi, Tambon Koh Lanta Yai,
 Koh Lanta District.**

Problems	Solutions
Quality of water in the area of the coast polluted from the discharge of water from shrimp fields.	Government should monitor water quality strictly
Fishing equipments were destroyed by push net trawlers and light luring fishing (most of which come from outside of the area)	Officials must be strict with people who break the law.
Low fish prices from middlemen	-
Declining in fish stock	-
Costs for fishing increasing	-
Villagers don't have land title/land that they depend on is within the forest conservation area	Re-forestation of the mangrove forest

Table 14. Analysis of fishing community problems in Krabi: Nua Klong District

Problems	Solutions
Trawlers from Phuket, (Krabi people don't use)	Specify areas of no destructive fishing equipment use. (contact fishermen association from Krabi province)
Anchovy light luring fishing	Establish new fishing grounds. Close the Phang Nga Bay (more than 3,000 metres) with close consultation with officials and fishers.
Collapsible crab trap	Increase mesh size of collapsible crab trap to 3 inches.
Degradation of fisheries resources	Placing of more artificial reefs
The effect of polluted water from shrimp farms on fish cages ¹	-

Table 15. Analysis of fishing community problems in Trang Province: Tambon Koh Sukorn, La Ngu District, Si Kao District and Kan Tung District.

Problems	Solutions
After the Tsunami, villagers changed profession from fishing to other occupations or were free from work because they were scared of the sea. Fishing equipment and boats damaged.	-
After shocks made the strong currents and turbid water.	-
Owe money to the middlemen forced to sell fish cheap to pay back loans	-
Catch per unit of effort has declined a lot. And its not sure when it will improve.	-
Shallow water bamboo stake trap collected juveniles of economic species.	-

Table 16. Analysis of fishing community problems in Satun province: Tambon Khorn Klan, Tung Wah District, Tambon La Ngu, Tambon Pan Nam, La Ngu District and Tambon Sahagorn, Ta Pear District.

Problems	Solutions
Number of light fishing boats has increased mostly from other provinces.	<p>Close the bay to large fishing boats for 6 months between September – March and involve the community together in specifying the area</p> <p>Specify the area for no destructive fishing</p> <p>Stop the dual national registration of boats</p>
Number of fishing boats has increased from unemployed people from the Pee Pee islands, coming home and buying a boat for fishing	-
Environmental conditions have changed. Beaches have been destroyed, boat channels have become more shallow. Sea water has become more turbid.	-
Amount of fish has declined but some species have increased e.g. Pomfret, Hilsa, blood cockle.	-
Increase in the numbers of foreign labors and commercial fishing boats operating in the area.	Increase the number of officials for checking the fishery and give TAO responsibility for looking after coastal areas and arranging rescue services.
Foreign labors get work permits but then move to work somewhere else.	-
Government policy specifying economic zones or seafood banks conflicts with the lifestyle of communities	<p>The management of resources by communities and local administrative organizations. To work with Government on budget arrangement and provide knowledge on management.</p> <p>Support villagers for group formation in order to strengthen the community</p>

**Report on
the Review of Existing Information**

Report No. 7

**A Technical Assessment for Determining the
Level of Fishing Capacity, Impact of Tsunami
on Fishery Resources and Identification of
Resources Access and Other Fishery-Related
Issues in the Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

April, 2006

1. Introduction

The six coastal provinces on the Andaman coastline of Thailand were along the path of the devastating Indian Ocean Tsunami that took several lives as well as caused great grievance and economic hardship to those who survived. Disaster relief efforts and aids poured in from within the country and all around the world to help provide basic needs and temporary and permanent shelters to coastal habitants. Coastal fishers, one of the main stakeholders affected by the tsunami, received assistance through several boat and gear replacement programs. Undoubtedly, Thailand had seen one of its worst catastrophes, which is likely to have lasting impact, not only in terms of direct losses and damages to coastal people, but also to fisheries and coastal ecosystems.

Assessing the extent of losses and damages caused by the tsunami is a daunting task. Impacts on fisheries resources, for example, include those that took place immediately and that resulted directly by the tsunami. Medium to long-term impacts may cause by the tsunami itself and by the rehabilitation effort. In the former, both the level of damage to natural ecosystem and the rate of natural recovery are difficult to gauge. In the latter, it remains to be examined whether fishing capacity and fishing effort have increased from the period before and after the tsunami.

The fisheries review presented here is conducted as part of a technical assistance (TA) to FAO² that attempts to determine the level of fishing capacity and impacts of tsunami on fisheries resources in the impacted areas of Thailand, among other things. Based on published and unpublished sources, the review aims mainly to provide summary information about fisheries and related industry in the six Andaman provinces, namely Ranong, Phnang Nga, Phuket, Krabi, Trang and Satun. Historical fisheries data collected by the Thailand Department of Fisheries (DOF) are shown to demonstrate catch and effort trends prior to the tsunami. Information about post-tsunami fisheries, although sparsely available, is also presented.

This review is only the first step in an attempt to provide information that would facilitate formulation of improved fisheries policy for sustainable utilization of fisheries resources and conservation. It should be used complementarily with subsequent reports under the same TA that describe research results from field observation, rural rapid appraisal and regional workshops. Further, it serves as background document for the upcoming national stakeholder workshop, to be held on June 5, 2006.

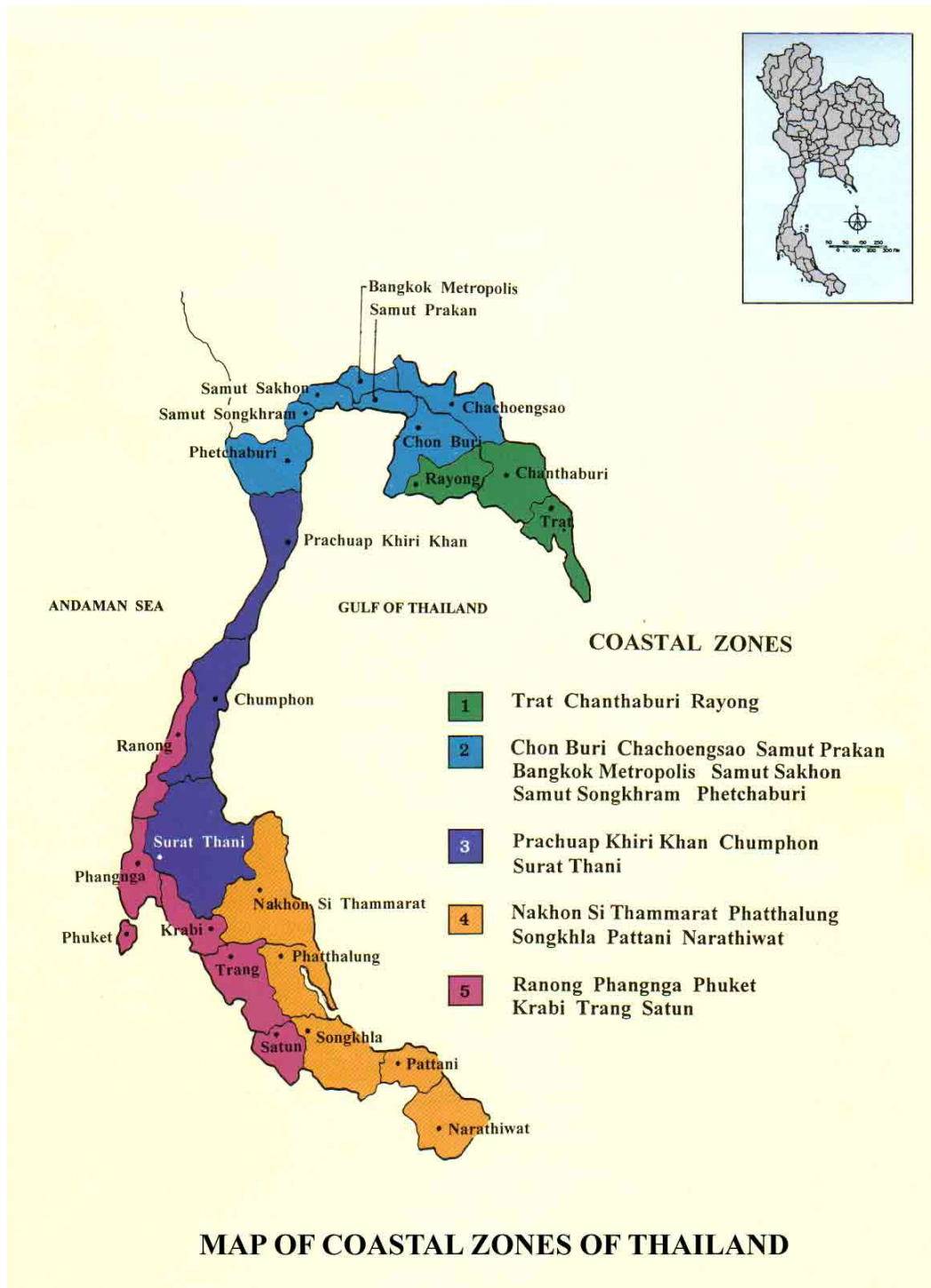
In the next sections, we provide brief description of the study areas, followed by the summary of the main sources of information used in the review. Next, we present details about fisheries, including capture, aquaculture and fish processing and marketing, prior to the tsunami. The following two sections are directly related to the tsunami. Section 5 describes tsunami damages to coastal environment, habitats, fisheries resources, fishing activities, coastal aquaculture, and coastal communities. Section 6 provides details about different types of assistance provided to fishers from the affected areas. We conclude by providing key recommendations that may be useful to inform future fisheries management and policies.

² Reference number LOA/RAP/2005/39

2. Brief description of the study areas

The six provinces affected by the tsunami are located on the Andaman coastline (Figure 1). Each province has its own characteristics as follows.

Figure 1 Study area showing the six Andaman provinces



Ranong is located 586 km south of Bangkok and is renowned as the province with the highest rainfall in Thailand. All districts in the province are located on the coast. The narrowest part of the province is only 44 km, hence named Isthmus of the Malaysia Peninsula. The economy of the province is very diverse but fisheries still plays an important role of the economy. Ranong is Thailand's least populated province.

Phang Nga is a coastal area south to Ranong at approximately 788 km from Bangkok. Apart from mountainous forest on mainland, the province bordered by the 293 km coast line and comprises over 105 islands.

Phuket, the only province with the geographical characteristics of an island and known as the pearl of Andaman, covers the area of 543 km² and comprises 32 nearby islands. Fishery values are estimated at 3,417 million baht (www.phuket.go.th) or 1/20 of total value from the southern provinces.

Krabi is located 814 km from Bangkok, covering an area of 4,708 km². The province consists of mountains, hills, plains, and mangrove forests, including more than 130 large and small islands with white sandy beaches, crystal clear seawater (www.krabi.go.th). Krabi is aimed to be a hub of historic and eco-tourism and a province of sustainable agro-industry.

Trang, approximately 828 km from Bangkok, covers an area of 4,941 km². Trang's coastline of about 200 km is considered very beautiful and relatively pristine compared to other provinces since it has not yet been heavily explored. The province also plays a major role in facilitating trade to other provinces and in the past was the major port for foreign trade. Similar to Krabi and Phang Nga, Trang has 46 breathtaking islands and astounding beaches along the Andaman coast.

Satun, the southern border province on the Andaman coast of Thailand, occupies an area of 2,479 km² with approximately 105 islands and 145 km of coastline. It is known as one of the fishery important provinces.

3. Data collection and main sources

DOF, under the Minister of Agriculture and Cooperatives, is the main government agency responsible for fisheries management. One of its mandates is to conduct systematic data collection in order to produce statistics about fisheries of Thailand. Each year, DOF reports key fisheries information, including captured and cultured fisheries production (by species, by gear and by province), number of fishing vessels (by type and by size) and production values. Census on number of fishers and other socioeconomic data is also available periodically. DOF fisheries statistics are official data submitted to FAO, which then provides both printed and web-based version of these statistics that can be readily compared with other countries.

For the pre-tsunami period (from 1970 to 2003), we used summary of catch statistics, which were readily available and easily accessible at one of the FAO websites (<http://www.fao.org/tsunami/fisheries/thailand.htm>). These data were randomly checked with DOF published statistics to ensure consistency. To gauge the level of fishing efforts taken place in the Andaman Sea, we used available published data on

number of fishing vessels in 1994 and from 2000 to 2004. As will be shown in the later section, a trend showing changes in fishing efforts can be observed through this set of data.

The impacts of the Indian Ocean Tsunami on the coast of Thailand received high global attention due to the high number of death of foreigners. This is partly why information about tsunami damages is publicly available through various Internet resources. The key sources used in this fisheries review were the government and intergovernmental websites, including the Thailand Department of Disaster Prevention and Mitigation (DDPM) and FAO. Additionally, we have access to publications by the Department of Fisheries, reports by the Department of Marine and Coastal Resources and Chulalongkorn University. Other information was obtained from NGOs, particularly the Save Andaman Network and through field observation and personal communication with fishers in the affected areas.

4. Fisheries in the Andaman Sea

4.1 Capture fisheries

In all provinces in the study area, fisheries have long played an important role in the economy. According to the National Statistics Office, there are about 440 fishing villages in the six provinces, with at least 20,000 households relying on capture and culture fisheries (Table 1).

Table 1 Number of fishing villages and fishing households in the six Andaman provinces

Province	Number of fishing villages ¹	Number of fishing households ²	
		Capture only	Capture and aquaculture
Ranong	59	2,143	136
Phang Nga	58	4,395	272
Phuket	55	953	9
Krabi	111	4,819	89
Trang	81	3,775	14
Satun	86	3,911	187
Total	440	19,996	707

Sources: ¹National Statistics Office 2004 statistics at http://service.nso.go.th/stat_tab/index.jsp

²National Statistics Office (2001)

Although catches from Andaman Sea are smaller than those from the Gulf of Thailand, their share in the total production has increased significantly from about 5% in 1970 to 27% in 2003 (FAO 2006). Figure 2 shows capture fisheries production from the Andaman Sea area during this period.

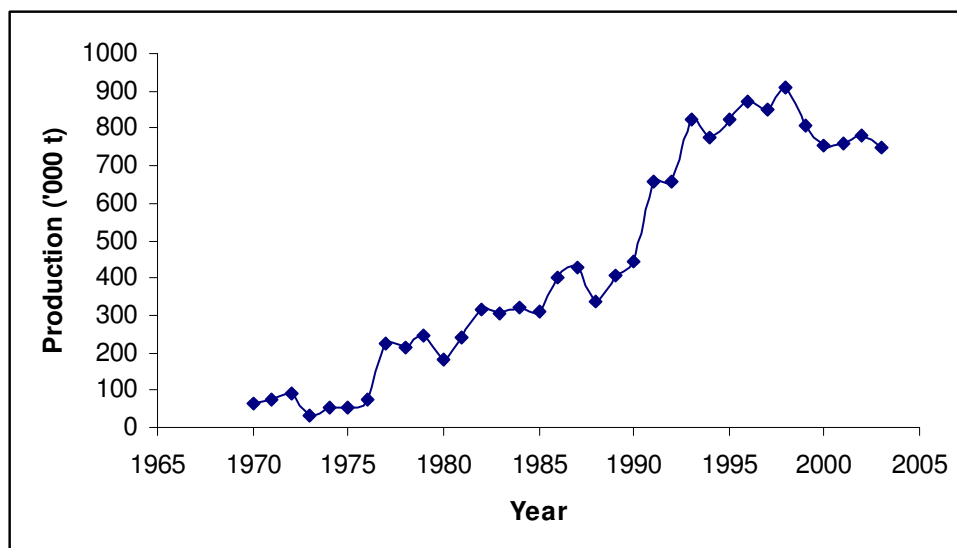


Figure 2 Capture fisheries production from the Andaman Sea Area from 1970 to 2003 (Source: FAO 2006).

Since 1970, production from capture fisheries from the Andaman Sea has gradually increased. The steady rise from 1988 to 1998 was due partly to the heightened interest in tuna fishing that resulted in 14 times increase in tuna catches (mainly longtail tuna; *Thunnus tonggol*). This was due mainly to the expansion of tuna fleet, with the purchase of big purse seines by a major fishing company in the area. Another major change was observed in catches of treadfin breems (*Nemipterus* spp.), croakers (*Sciaenidae* spp.) and anchovies (*Engraulidae* spp.) from about 9,000 t in 1988 to more than 100,000 t in 1998. The largest increase (about 140%) was observed in anchovy catches, which remain significant, contributing about 4% to total production in 2003. Finally, a five-fold increase in squid (*Loligo* spp.), cuttlefish (*Sepiidae* spp.) and octopus (*Octopodidae* spp.) contributed to the overall rise in total production during the same period.

From 1998 to 2003, fisheries production from the Andaman Sea faced decline. Major reduction of species with significant contribution to total production was observed in tuna, sardines (*Sardinella* spp.) and Indian mackerel (*Rastrelliger* spp.). Fisheries production of the Andaman Sea generally includes catches taken from within and outside Thai waters. Fishing boats from the Gulf of Thailand, for example, are sometimes transported (by land) to fish in Andaman Sea during the monsoon season. Fishing outside Thai waters normally involves fishing access agreements. Changes in these agreements with neighboring countries, particularly Indonesia, took place during the past 10 years, contributing partially thus to catch decline (Butcher, 2002).

Statistics on fishing vessels collected by DOF show a decrease in the number of 'registered' vessels in 1994, and from 2000 to 2004 (Table 2). Further, the previous two marine fishery censuses in 1985 and 1995 show that un-powered fishing vessels in the Andaman region decreased 67% while outboard powered and inboard powered fishing vessels increased 54% and 5%, respectively (Ponnachit-Korsieporn, 2000).

Table 2 Number of registered fishing vessels by main gear types in the six provinces

Province	Gear	1994	2000	2001	2002	2003	2004
Ranong	Trawl	157	103	103	92	93	85
	Purse seine	55	29	35	66	66	51
	Gill net	46	100	132	92	105	80
	Other	36	37	30	57	59	53
Phang-Nga	Trawl	1	23	13	14	20	28
	Purse seine	7	84	51	69	71	91
	Gill net	195	223	115	169	89	135
	Other	38	176	161	86	144	81
Phuket	Trawl	238	245	249	215	213	199
	Purse seine	65	43	41	54	54	35
	Gill net	59	81	56	61	63	8
	Other	69	97	84	77	76	59
Krabi	Trawl	10	14	14	18	5	0
	Purse seine	17	0	2	24	21	46
	Gill net	314	103	115	115	144	34
	Other	39	0	6	51	6	49
Trang	Trawl	500	391	355	340	302	302
	Purse seine	68	55	120	105	53	53
	Gill net	231	26	73	12	16	14
	Other	12	14	12	13	24	28
Satun	Trawl	303	327	283	238	204	189
	Purse seine	124	157	166	129	131	125
	Gill net	595	297	258	180	497	403
	Other	111	12	12	106	99	106
Total		3290	2637	2486	2383	2555	2254

Source: DOF (2006), DOF (2005a), DOF (1996)

These changes in the number and type of fishing vessels in the earlier period may have resulted in an increase in catch and catch per vessel as catches continued to rise. It is more difficult to suggest, without additional data, what happened after 1998. The recent data from DOF based on the new fishing boat registration system provide thus useful insights. As part of the DOF's effort to regulate fisheries using zoning, it encouraged all fishing vessels, including small-scale boat of less than 12 m in length with outboard motor, to register. As a result, the number of reported registered boats has increased drastically (Table 3). In short, the number of fishing boats operating in the Andaman Sea has been largely under-reported. The under-reporting of small-scale fishing boats is not unique to Thailand. Many countries do not have official records on small-scale fisheries as they do large-scale. The new statistics on small-scale fishing boats suggest that sustainable management of fisheries requires close examination of all fishing sectors that contribute to extraction of fisheries resources.

Table 3 Number of fishing vessels including small-scale fishing boats

Province	Number of fishing vessels			
	2003		2005	
	Small (< 12 m)	Large (≥ 12 m)	Small (< 12 m)	Large (≥ 12 m)
Ranong	1,408	587	1,831	360
Phang Nga	2,782	825	3,746	443
Phuket	676	574	861	438
Krabi	2,669	312	2,858	123
Trang	2,365	626	2,619	389
Satun	2,172	783	3,283	544
Total	12,072	3,707	15,198	2,297

Source: DOF Database (www.fisheries.go.th/it%2Ddatabase/long%20boat.htm)

Assessment of fisheries stock is a responsibility of DOF. Unfortunately, no recent assessment data is available for the Andaman Sea. Data from 1993 to 1995 for Phang Nga Bay show variation in catch per unit effort (CPUE) from 92.62 kg/hr in 1993 to 76.22 kg/hr in 1994 and 255.89 kg/hr in 1995 (Chantavong et al., 1996). Maximum sustainable yields (MSY) were also estimated in the mid 1980s for the Andaman area at 50,000 tons for pelagic fishery production and 200,000 tons for demersal production (Phasuk, 1987). As shown in Figure 2, current level of catch is far greater than catches at MSY level. The declining trend observed during the past few years may well be an indication of unsustainable fishing in the Andaman Sea.

4.2 Coastal aquaculture

All provinces along the Andaman coast engage in coastal aquaculture with variable degree of intensity (Table 4). Shrimp is still the favorite cultured animal with *P. vanamei*, an exotic shrimp species, becoming the leading culture species in 2004 as black tiger prawn *P. monodon* were susceptible to disease. There are three important groups of fish that are cultured in the area either in pond or cage along the coastal area, namely groupers, red snapper and Asian sea bass. Blood cockle, green mussel and oysters are the mollusk species cultured in the area. It should be noted that pre-tsunami data on aquaculture could cause some confusion with inconsistent data collection method. For example in the Gulf of Thailand, area for oyster culture is presented in rai³ while that in the Andaman area is presented in number of cages. It is therefore easily to mix up the number of cages with areas resulting in the erroneous figures. Most cage culturists feed the cultured fish with trash fish which they normally acquire from their own push net. The intention of reducing pressure on capture fisheries by supporting fish culture should therefore be considered with great caution.

Table 4 Details of coastal aquaculture establishment and culture area in the six Andaman provinces.

Province	Shrimp culture ¹		Shrimp hatchery ²		Fish cage culture ³		Mollusc culture ⁴	
	# farm	area (rai)	# farm	area (rai)	# farm	area (rai)	# farm	area (rai)
Ranong	181	4,774	0	n/a	404	35	421	1,014
Phang Nga	341	5,000	115	n/a	771	32	260	158
Phuket	116	1,478	211	n/a	294	24	86	319
Krabi	591	6,647	20	n/a	279	13	309	1,130
Trang	436	3,294	153		558	20	65	1,004
	1,211*	9,213*	34*	39*	979*	25,725 m ² *		
Satun	500	6,387	26	n/a	680	39	11	4,224

Source: ¹Department of Fisheries (2005b)

²<http://www.cffp.th.com/progress.htm>

³Department of Fisheries (2005c)

⁴Department of Fisheries (2005d)

*Statistic in 2006 from www.trang.go.th

n/a = data not available

4.3 Fish processing and marketing

Phuket is the only province in the area that has almost all kinds of processing plants except canning factory (Table 5). Only two canning factories exist in the area: one in Trang and another one in Satun. Phang Nga has small processing sector with only one fish meal processing plant. In all provinces, small-scale fishers sell their products to fish mongers in their villages. Each of the three provinces, Phuket, Trang and Satun, has one fishing pier owned by Fish Market Organization (www.fishmarket.co.th). In 2003, there are 10 major fishing piers in Ranong, 27 in Phang Nga, 7 in Phuket, 12 in Krabi, 18 in Trang, and 15 in Satun (<http://www.md.go.th/static/static.htm>).

Table 5 Fishery related industries in the six Andaman provinces

Province	Cold storage	Canning	Fish sauce	Steaming	Smoking	Ice factory	Fish meal
Ranong	9	0	0	0	0	20	11
Phang Nga	0	0	0	0	0	7	3
Phuket	2	0	1	2	1	7	3
Krabi	1	0	0	0	5	2	0
Trang	5	1	1	2	4	7	7
Satun	3	1	0	0	0	3	2

Source: Department of Fisheries (2005e)

² 6.25 rai = 1 hectare

5. Damages due to tsunami

Tsunami in general had caused a very serious impact on the natural environment. Several marine and coastal national parks were severely damaged, coral reefs were destroyed by wave and debris, and agricultural land was affected by salt water intrusion. Tsunami impacts on the six provinces varied depending upon coastal orientation, topography, bathymetry, slope elevation and presence of natural barriers as well as anthropogenic factors such as coastal land use and development (Pongsuwan et al., 2006). The most affected province was Phang Nga. Phuket and Krabi provinces were also severely affected while Ranong, Trang and Satun provinces received less impact on the mainland but offshore islands sustained severe damage. While it may not be possible to fully assess the extent of tsunami impacts on resources and ecosystems, experiences from other types of damages caused by human-induced impacts such as trawling suggests that recovery is a slow process (Watling and Norse 1998). Future fisheries management plan and policies should therefore take into consideration potential and existing damages caused by natural and anthropogenic factors.

This section will briefly describe the impact of tsunami on coastal environment and ecosystems, fishing boat and gears, and aquaculture facility in the area. We first provide general overview of the situation in each province before discussing impacts to human, environment, habitats and natural systems in details as they are closely related to fisheries productivity and fisheries production.

Ranong

A total of 47 villages in 3 out of 5 districts were affected by the incident. The most affected areas were Bang Bain Beach, Ban Thale Noak Beach, Prapad Beach, Pha Yam Island, Haad Sai Dum Island, and Lao Island. House, fishing boat and gears, fish cages of local fishers, and the office of Laem Son National Park were destroyed. The mentioned beaches were eroded and waterways were altered.

Phang Nga

Phang Nga is the most severely affected (hardest hit) province by the tsunami. Takuapa, Kuraburi and Tai Muang were the worst hit districts. The most damaged coastal area were those in Pra Thong Island, Kho Khao Island, Bang Sak beach, Pak Weep beach, Pakarang Cape, Kuk Kak beach, Bang Neang beach, Nang Thong beach, Khao Lak beach, and Tai Muang beach. Many small-scale fishers in the province were affected.

Phuket

The devastation centered around many beaches along the west coast of the island frequently visited by foreign tourists such as Kamala beach, Patong beach, Karon beach, Kata beach, Bang Tao beach. Local residents in the east suffered tremendous economic and culture losses. Severe damage to house, fishing boats and gears were also observed.

Krabi

Thirty one out of 83 fishing villages were affected by the tsunami. The list of six villages severely hit by the tsunami were Ban Nai Rai, Ban Hua Laem, Ban Sung Ga Au, Ban Phi Phi, Ban Laem Thong, and Ban Koh Poo.

Trang

Trang was not severely affected by the incident except at Mook Island and Libong Island where the impact was severe. Most affected people in the province were small-scale fishers.

Satun

Satun was another province that was not severely affected by the tsunami. However, 37 villages in four districts were affected by the incident. Some beach areas disappeared with many deep split land area.

5.1 Coastal environment

Generally, the giant waves have damaged all physical structures, removed fauna and flora from their habitats, increased sediment load which cause fatality in coral and seagrass by smothering. The incident has also caused saltwater intrusion, raw sewage and decomposition of flora and fauna including un-recovered bodies, and increase of marine debris. Sandy beaches in some areas have been seriously damaged by the incident destroying nesting sites of sea turtle and tourist spots. Assessment of the impact on coastal environment has been carried out by several organizations. Some of the major findings are presented below.

Table 6 presents impact of tsunami on coastal environment in the six provinces. The extent of the damage to coastal forests and trees is still not clear and it might take some time before the final impacts are known because factors such as changes in topography and soil salinity may have adverse long-term effect. The main damage causing the death of plants as well as soil micro-organisms is due to saltwater infiltration and deposition of salt layer over the soil. The Normalize Different Vegetation Index (NDVI) was used to study LANDSAT images before and after the disaster to determine the effect of tsunami on coastal forests and the results are presented in Table 6 (Chulalongkorn University, 2005). About 900 ha of agricultural lands were damaged by sea flood affecting 1,080 farmers (FAO, 2005). Eighty percent of these lands were used for planting trees: rubber, oil palm and fruit trees. Beaches in all provinces were damaged to a certain extent (Table 6) with no consistent pattern of beach change but there is definitely a substantial loss of biota even though the key species are not disappear (Kendall et al., 2006). Kendall et al. (2006) also observed the eroded beach forest and removal of sediment from the upper shore. These changes will likely affect the coastal living ecosystem, although it may not disrupt fishery production. Coastline erosion was observed in all provinces at variable degree (Chulalongkorn University, 2005). Several national parks were severely damaged: Laem Son in Ranong, Sirinaad in Phuket, Surin and Similan in Phang Nga, Taan Boke and Nopparat Tara in Krabi (Chulalongkorn University, 2005).

Table 6 Effects of the tsunami incident on coastal environment in the six provinces

Province	Beach ¹	Mangrove ²	Beach forests ^{3,1}	Salt affected soil ¹
Ranong	230 rai slightly damaged	No damage	7,961 rai	412 rai damaged
Phang Nga	925 rai damaged	1,900 rai damaged slightly	59,235 rai	3,500 rai damaged
Phuket	212 rai slightly damaged	No damage	9,726 rai	22 rai slightly damaged
Krabi	77 rai damaged	No damage	8,369 rai	23.5 rai slightly damaged
Trang	33 rai damaged	No damage	4,772 rai	No damage
Satun	8 rai damaged	10 rai damaged	30 rai	No damage

¹ United Nations Country Team in Thailand. (2005)

² FAO/MOAC, (2005) and Chotiyaputta (2005)

³ Chulalongkorn University (2005)

Fifteen parameters of sea water quality were assessed from various routine monitoring sites along the Andaman Sea coast of Thailand. Compared to the pre-tsunami data, there were no negative effects of the tsunami on the coastal water quality, although some parameters such as total suspended solid was higher than normal at a few sites in the southern part of the Andaman coastline, *e.g.*, Laem Sak (Krabi), Pak Meng (Trang), and Pak Bara (Satun) (Department of Marine and Coastal Resources, 2005). Surprisingly, in the northern part of the peninsula (Ranong, Phang Nga and Phuket), some sea water properties improved after the tsunami. Prior to the tsunami, contamination of bacteria (faecal coliform and total coliform) was over the standard limit at several sites, but after the event high contamination only found at a single site at Laem Sak. Overall, the sea water quality along the Andaman Sea coast improved post tsunami. However, the main causes of polluted sea water, particularly untreated effluent and garbage from highly populated area, still needs close attention. All existing water treatment plants must be properly managed to ensure effective operation to protect coastal water against contamination and pollution.

5.2 Mangrove Forest

Mangrove forest contributes directly to rural livelihoods by providing wood and non-wood products and indirectly by providing spawning grounds and nutrients for fauna in the mangrove ecosystem. The mangrove forests along the Andaman coast of Thailand cover an area of approximately 2,093 km² in 2003 (RFD, 2003). According to FAO record, Thailand lost about 15% of its mangrove area each year during 1980-2000 (Harakunarak and Aksornkoae, 2005). Only 1,912 rai mangrove forest in the six provinces was damaged by the tsunami and only in Phang Nga and Satun Provinces where the impact was severe (FAO/MOAC, 2005; Chotiyaputta, 2005, and Table 6). The damage is less than 0.2 % of total mangrove forest in the Andaman area. Large mangrove forests mitigated the force of the tsunami in Phang Nga province where the inland territories were only slightly damaged. Therefore, there are calls for large scale mangrove

forests plantation to protect coastal areas against future destruction and several projects have been initiated. However, rehabilitation and management of mangroves, other coastal forests, and trees are components of an integrated approach to coastal zone management in which the need of people need to be balanced with environmental consideration and natural resources management. This will require stakeholders from community levels to work closely with government bodies.

It is noted that the area of destruction is likely to be under-estimated as no detailed study on long term change in the mangrove ecosystem such as changes in substrates, fauna and flora compositions have been done. The project “In-depth assessment of mangroves and other coastal forests affected by the tsunami in Southern Thailand” funded by the United Nations Office for Humanitarian Affairs (OHCA) is now executed by FAO as the executed agency but the final report has not yet disseminated.

5.3 Coral reef and seagrass bed

Status of coral reef before the tsunami:

During 1995-1998, 169 reef sites in the Andaman Sea was comprehensively assessed using manta tow surveys by the Department of Fisheries. Based on the proportion of live to dead coral cover, approximately 4% of the reefs in the area were classified excellent, 13% were good, 34% were fair, and 50% were poor (Pongsuwan et al., 2006). More up to date assessment is lacking or not complete due to minimal coordination among government agencies, private sector in management. Moreover, conflict of interest as well as overlapping jurisdiction and misunderstandings over responsibilities have led to ineffective control of destructive fishing and other damaging practices in coral reef area (Pongsuwan et al., 2006).

Status of coral reef post-tsunami:

Right after the tsunami incident, the Department of Marine and Coastal Resources (DMCR) in collaboration with 9 universities and the private sector conducted rapid impact assessment on coral reef, seagrass beds, marine endangered species, and water quality. The results of the rapid assessment which is published in Thai and English versions (Department of Marine and Coastal Resources, 2005) can be obtained from the DMCR and the Department of Marine Science, Faculty of Science, Chulalongkorn University, the coordinator of the assessment mission. Details of coral reef and seagrass beds damaged by the tsunami described in the next section are from the report mentioned above except noted otherwise.

The destructive impact of the tsunami on the coral reefs was found to depend upon the geographic location of the area, the islands, or the reefs (Department of Marine and Coastal Resources, 2005). The impact also varied according to the sea bottom depth and the physiographic zone on the reef. The type of damage to corals included 1) colonies which had been turned over or had fallen down, 2) branches or portions of coral colonies broken off, this appeared to have been caused directly by the waves or indirectly by heavy drifting objects or debris striking the corals, 3) sand-sliding along the reef slope, leading to breakage of corals, smothering of coral surfaces, or sand completely burying corals, and 4) heavy erosion of shallow sandy seabeds, which led to either smothering or burying of corals by sand. The first two types of damage were

generally found at the most impacted reef sites particularly in shallow waters. The third effect was commonly found on reefs of offshore islands, such as Surin and the Similan Islands. The fourth was typical of the reefs located on wave-exposed shorelines, such as on the west coast of Phang Nga Province and some small islands off the coast of Ranong Province.

The overall extent of the damage to the coral reefs was much less than had been expected. From a total of 174 sites (324 stations) representing the principal coral reef area in the Andaman Sea, up to 60% of the sites were either untouched (no sign of damage: 69 sites), or had very little damage (1–10% of corals affected: 36 sites, Table 7). Reefs with low (11–30% of corals affected) and moderate (31–50%) impacts amounted to 30 and 16 sites, respectively, and collectively comprised 26% of the total. Only 23 of the sites were severely impacted (>50% corals damaged), this being just 13% of the total sites surveyed. Areas with low impacts included coastal provinces mainly in the southern part of the peninsula, such as Phuket, Krabi (except Phi Phi Islands), Trang and Satun. Phang Nga Bay was well protected from the tsunami's hit. On the other hand, areas with relatively high impacts were in the upper part of the peninsula, such as Ranong, west coast of Phang Nga, Surin and Similan Islands. The degree of the tsunami's impacts varied greatly among locations of the reefs. Coral damage was greatest on 1) reefs in shallow water on highly exposed coasts of islands or shorelines (*e.g.*, Ranong, west coast of Phang Nga, and Phai Island of the Phi Phi island group), or 2) on shallow or deep reefs in the channels between two relatively close islands (*e.g.*, North Surin – South Surin, South Surin-Torinla, Similan-Bangu, Damhog-Damkhwan, and Rok Nai-Rok Nok). Debris also was a cause of damage to corals. This included fallen trees, damaged boats, and parts of damaged houses or other buildings which collapsed or were washed onto the reefs. Reefs in the proximity of highly populated area, *e.g.*, Phi Phi Don Island, and Patong Bay on Phuket Island, were badly affected by debris. Because only the overall extent of the physical damage was evaluated during this rapid assessment mission, the impacts of the tsunami at finer scales, *e.g.*, individual population, community, or ecosystem, are unknown and await further detailed investigations.

There were also other independent surveys done by the Dive Operators Club Thailand, Phuket and by the New England Aquarium, USA. The Dive Operators Club found that 73% of the 70 dive sites in Surin and Similan Islands suffer only slight damage, 9% suffered moderate damage, and 19% were heavily damaged (Pongsuwan et.al, 2006). The New England Aquarium assessed 56 sites and found 14% of the sites were severely damaged while 50% of the surveyed sites suffered moderate damage, and 36% of the surveyed sites received little or no damage (Pongsuwan et.al, 2006). Even the methodologies used in these two independent surveys are different from the survey reported by Department of Marine and Coastal Resources (2005), the similar conclusions have been drawn.

Table 7 Percentages of affected coral reefs categorized by impact level in the area

Province	No impact (0%)	Very low (1-10%)	Low (11-30%)	Medium (31-50%)	High (>50%)
Ranong	0	17	17	8	58
Phang Nga	29	17	22	14	18
- Surin Is.	0	24	33	24	19
- Simuilan Is.	29	18	21	13	18
Phuket	57	24	14	5	0
Krabi	40	27	13	13	7
- Phi Phi Is.	33	27	13	20	7
Trang	25	50	25	0	0
Satun	71	16	10	0	3
Overall	40	21	17	9	13

Sources: Department of Marine and Coastal Resources, 2005

Seagrass beds received little damage from the tsunami waves. About 72% (57.6 km²) of the total seagrass area along the Andaman Sea coast of Thailand was inspected post tsunami, of this only 5% had been affected (Department of Marine and Coastal Resources, 2005). The number was only 3.5% in the later report with higher coverage of the area surveyed (Pongsuwan et al., 2006). The sign of impacts included detachment of seagrass leaves, accumulation or deposition of sediments usually as a thin layer, and erosion of sand along the outer edges of the seagrass bed or on wave-exposed patches. The latter erosion to some extent resulted in habitat loss. However, this accounted only for 1.5% of the area investigated. The sites that experienced the highest degree of erosion and sediment deposition were Thung Nangdam and the northern part of Phrathong Island, in Phang Nga Province. The seagrass meadows in Talibong Island, Trang Province, the largest seagrass area in Thailand's Andaman coast did not suffer any habitat loss although 10% of the area was affected by siltation or superficial erosion. In several places, where the bottom sediment had been disturbed and dispersed during the course of tsunami, there had been abrasion of the seagrass leaves. After 6 months, the seagrass beds recovered at a satisfactory rate.

5.4 Fishery resources and habitat

Nootmorn et al. (2005) conducted studies on impacts of tsunami on fishery resources using standard fish trawler in the day time and shrimp trawler at night (22 stations on both studies). The results from the studies were then compared to results of the previous studies done before the incident (November 2004). They also conducted surveys of fish larvae (42 stations using plankton net) and fishery production (both commercial and small-scale) in the area from fish landing places and fish mongers. The studies showed no difference in catch compositions before and after the tsunami incident but suggested an increase in the proportion of juvenile economically important species and a decrease in the proportion of trash fish. From the standard fish trawler, they reported the decrease in marine fish abundance by 50% in the area where tsunami had a serious impact; off the west coast of Phang Nga and Phuket, after the incident (Table 8). Slight decreases in CPUE were observed in the other two areas (areas I and III) except in the area with little impact of tsunami (area IV) where the CPUE slightly increased (Table 8). Fishery Statistics Analysis and Research Group, Information Technology Center, Department of Fisheries has also projected the decrease in production of fishes, shrimps, and crabs in 2005 compared to those in

2004, with molluscs as the only groups with an anticipated high yield (pers. comm. DOF officer). This trend can also be observed from historical catches (Figure 2).

Table 8 Catch per unit of effort, percent of economically important fish species, percent of juvenile economically important fish species, and percent of trash fish before and after the incident from the standard fish trawler in the areas.

Area	CPUE (kg/hr)		Economic spp. (%)		Juvenile econ. spp. (%)		Trash fish (%)	
	Before	After	Before	After	Before	After	Before	After
I. West coast of Ranong to Tab Lamu of Phang Nga	41.94	33.91	36	40	40	55	24	5
II. West coast of Phang Nga & west coast of Phuket	72.69	34.92	47	70	40	26	13	5
III. Phang Nga Bay	121.29	99.59	18	33	57	65	25	2
IV. West coast of Trang & Satun	32.62	42.57	54	30	10	67	36	3

Source: Nootmorn et al. (2005)

A different study conducted later showed in March and May 2005 found that average CPUE and stock density were higher in 2005 compared to those in 2004 (42.72 kg/hr and 430 kg/km² in 2005 and 35.20 kg/hr and 345.08 kg/km² in 2004) (LIPI, 2006). Changes in dominant species from *Loligo duvauceli* to *Leiognathus splendens* were also observed, suggesting the decrease in cephalopods stocks in the area. Spatial distribution of stock density also showed the changes in abundance from demersal and low value trash fishes in Phang Nga Bay prior to the tsunami to cephalopod and shrimps after the incident (LIPI, 2006).

From the commercial fishery survey, Nootmorn et al. (2005) found that purse seining and surrounding net with light luring fisheries received the highest impact from the incident resulting in the decreased catches and slight change in catch rates in January 2005 (Table 9). In February, the catches and catch rates in Phuket and Krabi seemed to have increased.

No direct investigation on the damage to fishery habitat was carried out. As coral reef being the sanctuary for many marine lives, changes in the complexity of the reef such as loss of sand observed by Chavanich et al. (2005), could affect fauna community in the area. After one month, Chavanich et al. (2005) found an unknown diatom species grow on the surface of rocks which was covered by sand prior to tsunami. This diatom also overgrew on the corals impacted by the tsunami. Finally, coastal erosion and changes in waterway and seabed topography were reported (Chulalongkorn University, 2005). Change in seabed topography will definitely affect the benthic community in the area and consequently the fishery resources.

Table 9 Average catch of surrounding net with light luring in Phang Nga, Phuket, and Krabi provinces during December 2004 and February 2005.

Fishing Pier	Date	No. of fishing vessel	Catch (t)	Catch Rate (kg/day)
Phuket	Dec. 2004	35	1,741	2,073
	Jan. 2005	17	309	1,068
	Feb. 2005	27	2,295	3,541
Krabi	Dec. 2004	23	1,517	2,748
	Jan. 2005	23	893	2,285
	Feb. 2005	20	1,920	4,000
Tab Lamu, Phang Nga	Dec. 2004	31	1,932	2,597
	Jan. 2005	n/a		
	Feb. 2005	17	1,328	3,254
Nam Khem, Phang Nga	Dec. 2004	18	673	1,558
	Jan. 2005	n/a (due to damage of fishing pier)		

Source: Nootmorn et al. (2005)

n/a = data not available

5.5 Fishing community and household

Total damage to fishery sector in the area is much higher than other agriculture sectors. Opportunity cost that fishers and aquaculturists have to forgo during their forced inactivity should also be considered. According to a 9-month progress report of Save Andaman Network (2005) which based its information on GISDA dated 15 February 2005, among the 418 small-scale fishing villages in the area, 47 villages were severely affected, 360 villages were partly affected, and only 11 villages were not affected. The numbers reported were not categorized by province. It is noted that the number of small-scale fishing villages mentioned above is lower than the number presented in Table 1 acquired from the National Statistics Office. Regarding the damage to housing acquired from the Department of Disaster Prevention and Mitigation which is the coordinator of all government relief efforts, there was no separate report on fishing community. The numbers presented in Table 10 are then the damage to total household bearing in mind that the damage to fishery household is lower.

Table 10 Damage to fishing community and household

Province	Number of fishing village ¹	Number of household ²	
	affected	destroyed	damaged
Ranong	22	224	111
Phang Nga	73	1,904	604
Phuket	81	742	291
Krabi	123	396	262
Trang	51	34	156
Satun	36	2	80
Total	386	3,302	1,504

¹ Save Andaman Network (2005)

² DDPM website at <http://61.19.54.131/tsunami/overall.php?pack=report2>

5.6 Fishing vessel and fishing gear

Different figures of number of damaged fishing vessel were reported in several sources. Pongsuwan et.al. (2006) reported that 1,137 large fishing vessels and 4,228 small ones were lost. Chotiyaputta (2005) reported the damage of 1,214 large fishing vessels and 6,134 small ones, 1,797 of which were not registered with the Department of Fisheries. Different figures were also reported by other sources drawn from the internet. The discrepancy might be due to the definition of the word “damaged” in many sources may include the repairable vessels in addition to the lost ones. Save Andaman Network (2005) reported that number of damaged small-scale fishing vessel was 4,783, while that of commercial one was 1,202. The numbers given correspond to number presented in the DDPM website which also gives details on provincial level and are shown in Table 3.6. The numbers stated are different from those given by the Department of Fisheries. The numbers from FAO/DOF Post-Tsunami Rehabilitation Coordination Unit are also presented in Table 11 for comparison. The data from Save Andaman Network refers to figures in February 2005 while those of FAO/DOF Post-Tsunami Rehabilitation Coordination Unit are from March 2006. Small-scale fishers in Phang Nga received that highest damage. The number of small fishing vessels damaged in Phuket province is higher than the total number of small fishing vessel registered with the DOF in 2003 (see Table 11). This either indicates the over claim of fishers or failure of fishing vessel registration done by the Department of Fisheries in 2003.

In the 9-months progress report of Save Andaman Network, the network reported 6,668 damaged fishing equipments and the details on the damaged gears are presented in the first 3 columns of Table 12 (Save Andaman Network, 2005). The number of other traps was reported by FAO/MOAC (2005) and presented in the last column. Please bear in mind that the number of the last column will be higher finally as FAO/MOAC (2005) based the numbers on 7 January 2005. Pongsuwan et.al. (2006) reported approximately 3,313 push nets, 683 stake traps, and 2,537 bamboo traps were damaged. The same figures were reported by Chotiyaputta (2005). This again is another example of different information reported by different agencies.

Table 11 Number of damaged fishing vessel in the six provinces

Province	Total fishing vessel registered with DOF in 2003		Fishing vessel damaged ¹		Fishing vessel lost/damaged ²	
	< 12 m	≥ 12 m	< 12 m	≥ 12 m	< 12 m	≥ 12 m
Ranong	1,408	587	420	356	536	304
Phang Nga	2,782	825	1,544	332	2,195	369
Phuket	676	574	968	473	1,070	176
Krabi	2,669	312	1,034	10	1,246	18
Trang	2,365	626	816	1	869	1
Satun	2,172	783	1	30	652	26
Total	12,072	3,707	4,783	1,202	6,568	894

¹ Save Andaman Network (2005) and DDPM at <http://61.19.54.131/tsunami/overall.php?pack=report3>

² FAO/DOF Post-Tsunami Rehabilitation Coordination Unit (Pers. Comm.)

Table 12 Damaged fishing gear in the six provinces

Province	Fishing gear damaged			
	Stake trap ¹	Net ¹	Trap (bamboo) ¹	Other traps ²
Ranong	56	522	267	297
Phang Nga	-	477	514	514
Phuket	-	649	72	463
Krabi	345	643	402	575
Trang	200	761	322	412
Satun	274	580	584	11,429
Total	875	3,632	2,161	13,690

¹ Save Andaman Network (2005)

² FAO/MOAC (2005)

5.7 Coastal aquaculture

According to the report by the FAO/MOAC (2005), the most severe damage in the aquaculture sector was marine fish cages even though they are mainly located in the sheltered areas with the first estimated loss of 800 million baht. In case the fish stocks did not escape from the cages, they would be injured by the collision and subsequently died as the result of bacterial infection. Shrimp hatcheries in Muang District, Phuket, and Takua Pah and Tai Muang Districts, Phang Nga were abolished as the structures were mainly destroyed (FAO/MOAC, 2005). The damage to shrimp ponds was mainly in Krabi and Phang Nga with the damaged area of only 233 rai as most shrimp farm are located on higher ground. About 800 rai of seabed for cockles and mussels and 165,000 m² of mussel and oyster rafts/cages were damaged (FAO/MOAC, 2005). Save Andaman Network (2005) reported 6,275 of aquaculture establishments were damaged in the incident. Based on the Department of Fisheries assessment, 41,439 cages for marine fish culture were damaged covering area of approximately 1,100,000 m². Table 13 presents the details of the damage using two sources of information.

Table 13 Damage to aquaculture in the six provinces

Province	Fish Cage ¹		Shrimp pond ²		Shrimp Hatchery ²		Mollusc culture ²	
	# owner	(m ²)	# farm	rai	# farm	(m ²)	# farm	rai
Ranong	1229	856,128	nd	10.05	0	00	432	21.47 + 165,913 m ²
Phang Nga	1,733	184,250	17	105.5	180	10,718	n/a	400
Phuket	529	53,305	2	36.48	209	76,100	72	362.58
Krabi	890	64,806	23	114	0	0	6	30.37
Trang	480	23,916	0	0	144	n/a	2	5.25
Satun	1,126	84,526	0	0	40	n/a	0	0

¹ DDPM website at <http://61.19.54.131/tsunami/overall.php?pack=report3>

² FAO/MOAC (2005)

n/a = data not available

5.8 Change in small-scale fishing capacity

There is no actual report on the change in small-scale fishing capacity. However, as a large number of small fishing vessels were damaged by the tsunami, at least in the first few months, fishing capacity was likely decreased. However, as fishing vessels were donated by several donors, the fishing capacity would subsequently be increased and this would most likely affect the natural fish stock. Moreover, migrant workers from Myanmar, which become the significant labor force in the commercial fishing industry, also receive new fishing vessels which increase the number of fishing vessels, in some cases up to 100% (FAO/MOAC, 2005). It is noted that some small-scale fishers overestimate their claims in cases where there are no lost vessels and/or equipment available for inspection. Owners of large scale fishing vessels, on the other hand, might not bother to report as this requires a lot of paper work and little compensation expectation from the government (FAO/MOAC, 2005). These will create dubious numbers of damaged/lost fishing vessels. There is also report on push net damaged (Pongsuwan et al., 2006), and it should be emphasized that this type of fishing gear should not be replaced since Department of Fisheries has tried to ban this type of gear for decades. In the field level discussion done by our team, there were quite a number of new fishing vessels that were not used. Therefore, the number of new vessel provided may not be the best indicator for fishing capacity at the moment. Besides, we were informed that there were a lot of fishers who had never operated fishing vessel also received new vessel. These particular new operators will not keen enough to catch as much fish as the experienced one.

6. Assistance provided to tsunami affected fishers

The Royal Thai Government did not seek external financial assistance but requested support in term of technical expertise, equipment and capacity building. However, several foreign donors still donated through other means.

6.1 Housing and basic needs

New houses were offered to those who had lost their houses. Financial support was also provided to those who need house repair or build their own house. Table 14 presents number of houses and money provided in each province. Apart from housing, several donors had provided relief aids and assistance to restore livelihoods and jobs in order to enhance living conditions and ways of life.

Table 14 Number of new houses built and number of houses received financial support for repair.

Province	Number of new housed built		Number of financial support	
	Number of house	Value (baht)	Number of house	Value (baht)
Ranong	358	12,800,000	12	360,000
Phang Nga	2,016	202,270,000	50	1,380,090
Phuket	1,113	2,200,000	1	n/a
Krabi	309	11,900,000	66	1,980,000
Trang	203	4,100,000	1	12,270
Satun	3	200,000	4	120,000
Total	4,002	233,470,000	134	3,852,360

Source: DDPM at <http://61.19.54.131/tsunami/report.php?pack=pdf21pv> ; n/a = data not available

6.2 Fishing vessel

Compensation for damage to fishing vessel was offered by the Department of Fisheries. Several foreign donors had distributed fishing vessels to fishers either through the Department of Fisheries or by themselves. The problem faced in the review of existing information on number of fishing vessel donated is that the total number of fishing vessels received assistance acquired from the different agencies even within the same department does not correspond with each other. The number acquired from the Foreign Affairs Division, Department of Fisheries is 4,480 without detail on the province level while the number from the website of Information Technology Center, Department of Fisheries is 7,462 with detailed information in the provincial level. However, the numbers posted in the website of the Information Technology Center are the number of fishing vessel receiving assistance from the Department of Fisheries which might include repair and vessel retrieving as well (Table 15). It should be noted that in the FAO/MOAC (2005) report which based its data on January 10, 2005 contains more detailed information on input to the fishery sector than the later information disseminated to public. In general, no detailed information can be searched on the input to the fishery. Most information provided is in the form of total input without details. The assistance offered in the case of fishing vessel should also be broken down to repair and offering a new boat. The number of new fishing vessels provided to fishers reported by the FAO/DOF Post-Tsunami Rehabilitation Coordination Unit (figures as of March 27, 2006) is 4,480 and the final number is expected to be higher.

Table 15 Number of fishing vessels received assistance from Department of Fisheries database dated 28 December, 2005

Province	Total number	< 12 m			≥ 12 m		
		Total	Registered	Non-registered	Total	Registered	Non-registered
Ranong	840	536	218	318	304	162	142
Phang Nga	2,564	2,195	610	1,585	369	326	43
Phuket	1,246	1,070	400	670	176	148	28
Karbi	1,264	1,246	611	635	18	11	7
Trang	870	869	540	329	1	0	1
Satun	678	652	607	45	26	22	4
Total	7,462	6,568	2,986	3,582	894	669	225

Source: DOF at <http://www.cffp.th.com/tsunami> updated Dec. 28, 2005

6.3 Fishing gear

Several donors had provided fishing gears to small-scale fishers. The number of fishing gears provided to small-scale fishers by province is presented in Table 16. No details on number of fishing gear type distributed are available from the website of Department of Fisheries. Websites of the Save Andaman Network (www.saveandaman.com), Sustainable Development Foundation Thailand (www.sdfthai.org), or Andaman Forum (www.andamanforum.org) provide more detailed information on the communities under their coverage. In total (dated 27 March 2006) 1,382 new boat engines along with 18,750 units of traps and 3,320 units of shrimp gill net were distributed according to FAO/DOF Post-Tsunami Rehabilitation Coordination Unit. Please note that the number of traps distributed is higher than the number of damaged traps presented in Table 12. As mentioned in the

previous section on fishing vessel about the detailed information, the total number of trap provided should be categorized into fish, crab, and squid traps as there are size and cost differences among these traps. The more detailed information of the earlier date can be viewed from report of FAO/MOAC (2005).

Table 16 Number of fishers receiving fishing gears in the six provinces

Province	Number of fishers received gears		
	Total number of fishers	Number of fishers, registered	Number of fishers, not registered
Ranong	97	-	97
Phang Nga	1,150	313	837
Phuket	761	319	442
Karbi	1,694	1,286	408
Trang	1,646	-	1,646
Satun	1,650	-	1,650
Total	6,998	1,918	5,080

Sources <http://www.cffp.th.com/tsunami>, updated on December 28, 2005

6.4 Coastal aquaculture

Aid was also provided to owner of aquaculture establishment who was affected by the incident. Several sources of information have been reviewed but we decide to use the data posted on the website of the Department of Fisheries (<http://www.cffp.th.com/tsunami/>) and are presented in Table 17. FAO/MOAC (2005) provides more detailed information during January 2005 but is not presented here as the information is not up to dated. The better information management in the Department of Fisheries is urgently needed. The more appropriate pattern of data presentation should provide details on type and amount of items offered, number of individual receiving compensation, and other necessary information in each village. This information will be useful for draft estimation of production and amount of food or feed required in the process resulting in the better management of the industry. As reported by FAO/DOF Post-Tsunami Rehabilitation Coordination Unit, 1,240 fish cages, 180,000 fish fingerlings, 94 metric tons of rope, 2,170,000 plastic float for cage culture, and 408 pieces of wood were provided to aquaculture establishment owners (as of March 27, 2006)

Table 17 Number of aquaculture establishments receiving assistance from the Department of Fisheries

Province	Number of farmers received compensation			Total number of registered farmers	
	Total	Registered farmers	Non-registered farmers	# farmers	Area (rai)
Ranong	1,336	304	1,032	3,410	9,165
Phang Nga	2,749	889	1,860	3,278	19,402
Phuket	536	421	115	1,089	4,224
Krabi	1,162	793	369	1,983	9,027
Trang	619	413	206	7,329	26,008
Satun	1,174	240	934	1,447	10,121
Total	7,576	3,060	4,516	18,536	77,947

Source: DOF at <http://www.cffp.th.com/tsunami/>

6.5 Fishery infrastructure

During January to September 2005, 37 boatyards in the 6 affected provinces were set up under the cooperation between SAN and the affected communities (Save Andaman Network, 2005). Small fishing piers were also renovated: four in Satun, one each in Phang Nga, Trang, and Krabi (<http://61.19.54.131/tsunami>). Save Andaman Network (2005) in particular has assisted communities in the six provinces to develop long-term plan by encouraging affected communities to develop their own assistance plan under “self governance” and participate in designing their own recovery programs. Revolving community fund has been set to support the cost of vessel, engine, and fishing gears. As fishing vessel is the important asset of small-scale fishers, the Net Work has initiated 37 small/medium permanent boatyard in the six provinces. In addition, loans from government based agencies such as Krungthai Bank and Eduaction Fund Office have been offered.

7. Conclusions and recommendations

Fishing has traditionally been an important part of livelihoods of coastal communities in Thailand. In the Andaman Sea, production from marine capture fisheries had steadily increased since 1970, but started to decline slightly in 1998. While the production level is still high and comparable to the past 10 years, several factors can cause further reduction and unsustainability in fisheries catches. Tsunami impact on fisheries resources is one such factor, although not necessary from the disaster itself, but from the rehabilitation program to assist fishers in the affected areas.

Findings from the studies conducted to assess tsunami impacts on coastal environment, ecosystems and habitats were not sufficient to establish long-term impacts of the tsunami on the health of these ecosystems. It is highly probable, however, that habitat damages caused by the tsunami, as well as by other human-induced activities such as trawling, would result in changes in fisheries productivity. In terms of impacts on fisheries resources, the increase in the number of new fishing boats after the tsunami is of some concern. In effect, the number of replaced fishing boats seems to have exceeded the number of lost boats. For example, we learned from the field observation and discussion with key informants that some fishers received more fishing vessels than they had lost. Immigrants who have never owned fishing vessels received new fishing vessels. The potential issue of overcapacity must be recognized at this stage to avoid and/or halt unsustainable exploitation of fisheries resources.

Coordination between different government agencies and better communication are required such that repetitive and overlapping tasks are not conducted. More importantly, systematic data collection, monitoring and information system should be set up to gather information about fisheries. An emphasis should be made to assess impacts on small-scale fisheries as information about this sector is normally scant. As the Department of Fisheries has already established “Fisheries Rescue Center” for coordinating the collection of damage and loss information from the local fishery offices in the area, it should continue its role in gathering fishery statistics. Moreover, this center should collaborate with local NGOs and its coordinating body such as the

Save Andaman Network, which has worked closely with small-scale fishers. The collaboration would be useful for the DOF to have the complete list of fishing vessel and gears by voluntary registration of vessel and gears. Under the proper arrangement and full cooperation with small fishers, information about catch composition, fishing grounds, seasonal variation in gear used, price and catch composition and other valuable statistics can be collected. All these information will eventually allow the decision to be made on zoning for fishing vessel of different sizes and gears, and also enable appropriate formulation of future fisheries policies.

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Inception Report
Report No. 8

**A Technical Assessment for Determining
the Level of Fishing Capacity,
Impact of Tsunami on Fishery Resources
and Identification of Resources Access
and Other Fishery-Related Issues
in the Impacted Area**

Submitted to FAO RAP

**Coastal Development Centre
Faculty of Fisheries
Kasetsart University**

January, 2006

1. Introduction

The devastating tsunami that struck the Indian Ocean on 26 December 2004 has a massive impact on the six Andaman provinces of Thailand (Ranong, Phang Nga, Phuket, Krabi, Trang and Satun, Tables 1 & 2.). As of 01 August 2005, the Department of Disaster Prevention and Mitigation (DDPM), the Ministry of Interior, Thailand confirmed that 5,395 people lost their lives in the disaster, 2,248 of which were foreign nationals from 37 countries, while 2,817 people remain missing.

Table 1. Disaster areas in the South of Thailand

No.	Province	Disaster areas		
		Districts	Sub-districts	Villages
1	Phang Nga	6	19	69
2	Krabi	5	22	112
3	Phuket	3	14	58
4	Ranong	3	10	47
5	Trang	4	13	51
6	Satun	4	17	70
TOTAL		25	95	407

Table 2. Number of victims and households that their houses were destroyed by tsunami

Province	Number of victims and households		Destroyed houses (number)		Total number of houses
	Victims	Households	Whole	Partial	
Phang Nga	19,509	4,394	1,904	604	2,508
Krabi	15,812	2,759	396	262	658
Phuket	13,065	2,616	742	291	1,033
Ranong	5,942	1,509	224	111	335
Trang	1,302	1,123	34	156	190
Satun	2,920	414	2	80	82
TOTAL	58,550	12,815	3,302	1,504	4,806

The fisheries sector is severely affected by the tsunami. Most fishers have lost their fishing boats along with their fishing gears. DDPM's website reported on the damages of fishery sector in the 6 provinces that 6,275 aquaculture establishments lost their cages, ponds and hatcheries. For capture fishery, the fishers lost 5,985 fishing boats of which 4,783 were small fishing boats; and 6,668 fishery establishments lost their fishing gears. The total damages in term of value accounted for 1.8 billion baht. The details are shown in Table3.

Table 3. Fisheries damages by province

Province	Fisheries damages (from assessment)										
	Aquaculture (number of establishments)			Fishing boats (number of boats)		Fishing gears (number of establishments)			Estimated Value (baht)	Tour boat (number)	
	Cage culture	Pond culture	Hatcheries	Small	Large	Bamboo stake trap	Gill nets	Trap ^s		Small	Large
Phang Nga	1,733	7	67	1,544	332	–	477	514	913,218,491	33	18
Krabi	890	2		1,034	10	345	643	402	191,696,510	476	
Phuket	529	2	209	968	473	–	649	72	344,911,169	262	87
Ranong	1,229	–	–	420	356	56	522	267	170,737,983		
Trang	480	–	–	816	1	200	761	322	68,934,000	8	40
Satun	1,126	–	1	1	30	274	580	584	119,393,730		3
TOTAL	5,987	11	277	4,783	1,202	875	3,632	2,161	1,808,891,883	779	148

Note: Data on 25 July 2005.

Under this circumstance, the government on one hand will have to provide these fishermen fishing vessels and fishing gears so they can continue to earn their living. On the other hand, it is a good opportunity for the government to plan for a better strategy and management in fishery in order to ensure the sustainable use of the fishery resources via restoration of the biodiversity and proper fishing capacity in the area. The word “fishing capacity” is first raised in the light of a growing concern on the overcapacity, excessive fishing inputs, and overcapitalization in world fisheries. The FAO Code of Conduct for Responsible Fisheries (Article 6.3) recognizes this important issue and recommended criteria that all states should act to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization. There are several ways to define fishing capacity: the gross tonnage or engine power, vessel length, potential catch, and capital cost. However, there is no agreement on quantification of fishing capacity. As this study will focus on the small scale fisheries which generally fish in the coastal zone up to 5 nautical miles; therefore, fishing capacity will be defined as the number of fishing vessel as almost all small scale fishing boats in the area are mostly similar in size.

2. Objectives

The overall results of the study will be the development of policy recommendations and dialogue with the Department of Fisheries for a management strategy for the sustainable use of fishery resources in the coastal area of the Andaman Sea.

The main outputs of the assessment will be as follows:

1. Determining the level of fishing capacity in the tsunami affected areas in southern Thailand.
2. Evaluation of the impact of tsunami on fishery resources and the identification of resources access and other fishery-related issues in the area.
3. Dialogue with the Department of Fisheries on fishery management in the Andaman Sea.

Scope of work

The study will focus on the small scale fisheries part of the sector (i.e. those vessels fishing the coastal zone up to 5 miles) in the 6 provinces affected by the tsunami.

Long distance fishing vessels will not be the main focus as they are not fishing in the concerned area but their opinion of any changes in the open water will be taken into account.

Specific questions to be addressed by the assessment

- 1) What are the pre- and post-tsunami fishery statuses in the tsunami affected area?
- 2) What is the present fishing capacity of the area?
- 3) Who are the appropriate representatives of the stakeholders?
- 4) What will be the key issues in future planning and management?

3. Methodology

Under the limitation of time and budget, the study will focus on coastal fishery and purposive sampling technique will be used for verification of secondary data. Approximately 15 - 20 villages in each province will be sampled by the assessment teams before 2 field discussion in each province to be conducted. To obtain first hand information from the key stakeholders, rapid rural appraisal (RRA) is the main methodology for this study.

3.1 Data and data acquisition

- 3.1.1 Fishing capacity. In order to clarify the present coastal fishing capacity in the 6 provinces, the total number of fishing boats will be evaluated from various sources, i.e., provincial fisheries office, NGOs and donor agencies. The number of fishing gears will be estimated by sampling survey and in-depth interview to evaluate the present fishing capacity of the area.
- 3.1.2 Fisheries resources. The abundance of coastal fisheries resources will be reviewed from available publications. The information on fishery production, catch by type of gear and average size of fish in both pre and post tsunami incident will be obtained through in-depth interview to address the effect of tsunami on fishery status.
- 3.1.3 Fishing community. In-depth and RRA will be used for collecting information of fishing community. Fishing community will be classified into 2 main categories: affected and unaffected communities. The information on changes of locality, way of life and their professions will be collected.
- 3.1.4 Activities related to fishery sector. The information on fishery inputs, fish processing and marketing will be collected from secondary data and in-depth interview.

3.2 Key stakeholders identification.

Key stakeholders as the sources of data and information will be critically identified by the assessment team as well as consultation with FAO RAP technical fisheries staff. The potential candidates for key stakeholder are:

- 3.2.1 Representatives of fishers and fisher group from affected and unaffected area (small-scale, commercial, aquaculture establishment owners).
- 3.2.2 Representatives from the federation of small scale fishery.
- 3.2.3 Fishery officers from the Department of Fisheries.
- 3.2.4 Representatives of the Department of Marine and Coastal Resources.
- 3.2.5 Representatives of the Chamber of Commerce in the area.
- 3.2.6 Representatives of the organizations engaged in the provision of fisheries related relief and support to the affected area.
- 3.2.7 Representatives of fishery-related industry (fish processors, fish mongers).
- 3.2.8 Representatives from NGOs.
- 3.2.9 Community leaders.

3.3 Field level discussion

In each province, 2 field level discussions using participatory communication techniques will be carried out in order to gather essential information which will be used as baseline information and topics for the consultation workshops. The field level discussion will also be used to compile information from key stakeholders who might not be able to attend the consultation workshop. Ten to fifteen participants is expected in each field discussion. Issues covered in the field level discussion are as follows:

- 3.3.1 Perception of the community on the impact of the tsunami on the fishery resources, catch, market and socio-economics of the industry
- 3.3.2 Perceived changes in fish resources availability, fishing activities and practices
- 3.3.3 Changes in management arrangement, participation in fishing organizations, community-based management and/or co-management with government
- 3.3.4 Anticipation of future direction for the fishing industry
- 3.3.5 Key issues concerned for future planning and management

3.4 Consultation workshops on fishing capacity and fisheries resources

Two consultation workshops (in Phuket and Trang) will be organized in April 2006 (20-21 and 27-28 April) to discuss the appropriate measures to control and/or reduce fishing capacity and other key issues in future planning and management. Thirty five participants in each workshop will include but not limit to fishers (both small-scale and commercial), aquaculture establishment owners, community leaders, fishery officers, officer from the Department of Marine and Coastal Resources, NGOs, and researchers from assessment team.

3.5 Final workshop with the Department of Fisheries

The final workshop will be the forum for the fishers, fishery-related participants and the Department of Fisheries along with other related government agencies to discuss the key issues in future planning and management of the Andaman fishery. The workshop will be held at the Faculty of Fisheries, Kasetsart University. The participants in the important workshop are as follows:

- 17 fishers, NGOs, and representatives from related industries
- 2 representative from the provincial based government agencies (the Department of Fisheries and/or the Department of Marine and Coastal Resources)
- 3 representatives from the Department of Fisheries
- A representatives from the Pollution Control Department
- A representatives from the Marine Department
- A representatives from the Department of Marine and Coastal Resources
- A representatives from National Economic and Social Advisory Council
- 8 members from the assessment team

4. Work Plan

4.1 Data Collection and Field Level Discussion

Data will be gathered from the Department of Fisheries via the record of fishing vessel registration, provincial records on the affected fishing household, inventory survey conducted by CDC submitted to CHARM. These data will be verified in the area.

Research teams will be set up in each province to verify the above data in district and/or sub-district using in-depth interview with community leaders, fish monger, local government officers, and NGOs.

Changes in catch by type of gear, size of fish, and income from fishery, and change in occupation after the tsunami incident will be recorded from the in-depth interview from the sampled fishers, fish mongers. Each province will be divided into 2 clusters according to geographical condition before purposively sampling the fishing village. RRA technique will be used to investigate the fishing community change. Fishing community will be classified into 3 groups: severely affected by tsunami, partial affected, and not affected but community members are affected. Data acquired from RRA will be community changes, changes in locality and ways of life.

4.2 Review of Existing Information

The reviewing of the secondary data includes fisheries landings, fisheries industry marketing, national fisheries statistics and census, plans and activity reports on tsunami damage assessments, inputs provided to tsunami affected fishers. Most data will be acquired from the Department of Fisheries, Department of Marine and Coastal Resources, and from the final report "Project on Survey and Research Study for Rehabilitation of Natural Resources and Environment" submitted to Ministry of Natural Resources by Chulalongkorn University. Reports from donor agencies will also be reviewed. Consultation with Sustainable Development Foundation, Thailand, and Save Andaman will be conducted. The collected data and information will be used for writing a report.

The contents of the report may include the following:

- 4.2.1 Introduction of fishery industry in the 6 provinces.
- 4.2.2 Structure of fishery industry in the study areas
 - 1) Capture fishery (small scale and commercial fisheries)
 - 2) Coastal aquaculture
 - 3) Fish processing
 - 4) Marketing
- 4.2.3 Tsunami fishery damage assessment.
 - 1) Coastal environment
 - 2) Mangrove forest
 - 3) Coral reef and seagrass
 - 4) Fishery habitat and resources
 - 5) Fishing community and households
 - 6) Fishing boat and fishing gear
 - 7) Fish cage culture and hatchery
 - 8) Changes of small scale fishing capacity

4.2.4 Inputs provided to tsunami affected fishers.

- 1) House and basic needs
- 2) Fishing boat
- 3) Fishing gear
- 4) Fish cage culture
- 5) Fishery infrastructure

4.2.5 Conclusions and recommendations. This chapter is the most important part of the report. Recommended methodology on fishery data collection, fishing boat registration, boat marking and coastal fishery management measures could be suggested.

4.3 Consultation Workshop

Thirty five participants in each workshop (Phuket and Trang) will be identified by the assessment team. In Phuket workshop held in a selected hotel on 20-21 April 2006, participants will be those candidates from Phang Nga, Ranong, and Phuket. In Trang workshop held in a selected hotel on 27-28 April 2006, participants will be those from Krabi, Trang and Satun. Schedule and topics for the discussion will be drawn from the information and issues acquired from the filed level discussion and data collection. The results of the workshop will be used as the discussion topics in the policy workshop with the Department of Fisheries. The possible topics for the discussion include fishing capacity and the appropriate level of the capacity, the resources status and availability, sound regulations, action plan and management plan for sustainable fishery.

4.4 Policy Workshop

Thirty five participants (21 from outside Bangkok and 14 from Bangkok) is expected in this policy workshop. Before the workshop, draft policy and operational plans will be distributed to all participants. The purpose of this particular workshop is to formulate appropriate management measures for the sustainable fishery of the Andaman area. The recommendations shall include the following areas:

- community-based management,
- modernization of the fishery industry,
- reduction in fishing capacity,
- sound regulation,
- improve in fish handling at sea,
- appropriate technology with recognition of environmentally sustainable limits to harvest the resources,
- high quality on-shore facility
- rehabilitation of important coastal habitats,
- the functional management institutions to ensure equitable development and safety within the different parts of the sector.

Table 4 describes time schedule of the work mentioned above.

Table 4 Work Schedule

Activities	Jan.	Feb.	Mar.	Apr.	May	June
1. Secondary data collection	21 – 31					
2. Primary data collection via in-depth interview in 6 provinces		1 – 28				
2. Field level discussion in 6 provinces with 10-15 stakeholders by PSU & RMUTT, KU, and CU			14-15 Ranong 17-18 Phang Gna 20-21 Phuket 23-24 Krabi 26-27 Trang 29-30 Satun			
3. Review of existing information	21 – 31	1 – 28	1 – 31			
4. Field consultation workshops				20-21 in Phuket (participants from Ranong, Phang Gna, and Phuket) 27-28 in Trang (participants from Krabi, Trang, and Satun)		
5. Synthesis of the information			16 – 31	1-15		
6. Policy workshop with the Department of Fisheries					25 – 26 In Bangkok	
7. Submitting reports	18 (1 report)			18 (2 reports)	17 (2 reports)	19 (2 reports) 30 (1 report)

5. Report Submission

Under LOA/RAP/2005/39, 8 reports will be submitted to Mr. Hiroyuki Konuma, Deputy Regional Representative, FAO Regional Office for Asia and the Pacific. The reporting and dates of submission are as follows:

Report	Date of Submission
1. Inception report	19/01/06
2. Report on the review of existing information	18/04/06
3. Report on the field level discussions	18/04/06
4. Report of 2 field consultation workshops	17/05/06
5. Synthesis of the information from the background assessments and consultations and the fisheries review	17/05/06
6. Report of the final workshop with Department of Fisheries	19/06/06
7. Policy briefing note	19/06/06
8. Final report of major activities, progress, results, conclusions and recommendations	30/06/06

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<http://hazard.disaster.go.th/overall.php?pack=report6>

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<http://www.moe.go.th/inspec10/destroyschool.xls>