

**PRELIMINARY STUDY ON THE INTRODUCTION OF SET-NET FISHERY TO DEVELOP THE SUSTAINABLE COASTAL FISHERIES MANAGEMENT IN SOUTHEAST ASIA: CASE STUDY IN THAILAND**

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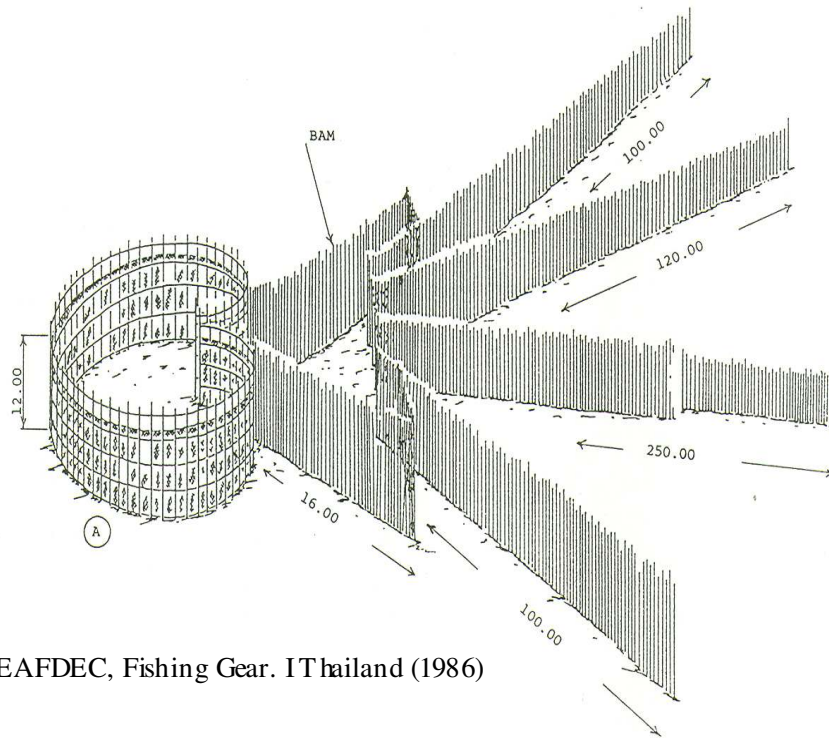
**ABSTRACT**

Over exploitation of the coastal fisheries resources in Southeast Asian region is the cause of many problems either conflict among the fishermen or depletion of the coastal environment. In order to find out the way to solve those problems, Set-Net fishing was proposed to be used as a kind of tool for the coastal fisheries management development. Set-Net does not function only to harvest fisheries resources but its construction also provide shelter and substrate for living marine organism to create their communities in the food chain of coastal marine ecosystem. Seven small scale fishermen groups of Mae Rumpheung beach which located on the east coast of the Gulf of Thailand, were selected as the experimental samples and site for case study in Thailand. Over two hundred fishermen have generally earned their lives on this coastal waters with seven types of fishing gears: crab bottom gillnet, crab trap, squid trap, squid jigging, fish trap, handlines and fish gillnet. Some commercial fishing boats from other area are also presently operated anchovy purse seine and anchovy fishing with light on this area. So that they should pay high responsibility on their own coastal resources and environmental conservation under the concept of decentralization policy. One set of set-net "Otoshi-ami" was constructed and installed at 14 meters depth fishing ground of coastal waters, five groups of fishermen were arranged for fishing operation alternately under control of the Set-net Operation Administrative and Management Committee. It could harvest various species of their coastal resources mainly yellowstrip scad, round herring, sardine, indian mackerel, Indo-Pacific mackerel and squid. There are also a lot of fishes and others marine organism gathering and living around and on the set-net construction both pelagic and demersal species. It is shown that the coastal resources communities were developed around the set-net area more than other empty area of this waters. So that, the vicinity area around set-net construction is become a good fishing ground for small-scale fishing activities, however it should be managed by the committee or the cooperative in future.

**Keywords:** Set-net, Otoshi-ami, Coastal fisheries management, Resource enhancement, Thailand

**INTRODUCTION** The coastal fishery resources in Southeast Asian region are over-exploited. Most of the coastal fishermen in the region classed as small-scale fisheries and are vulnerable to competition and conflict in fishing operation together with the decreasing resources. It is now urgent for fishery management authorities in the region consider and develop various alternative approaches to existing fishery activities and fishery management, taking into account the reality of problems in fisheries.

Looking back to the former fishing of the region, various types of traditional stationary fishing gears had been used by local fishermen for a longtime, some of their existing gears is going to finish themselves little by little, due to highly competition among active fishing gears on the limited fishing ground and declination of coastal fisheries resources. Then when we carefully consider on their fishing mechanism and function of those gears, some of them are consider as the passive fishing gear and their construction also function as fishes shelter and substrate for resources enhancing. They could be promoted with modification to be suit with the present fishing situation and environmental conservation, such as fish coral in the Philippines, fishing stake in Malaysia and Indonesia, bamboo stake trap in Thailand (Fig. 1), etc. [1,2, 3]



From SEAFDEC, Fishing Gear. Thailand (1986)

**Figure 1. Bamboo stake trap of Thailand**

Subsequent to the requirements of the ASEAN-SEAFDEC Millennium Conference on “Sustainable Fisheries for Food Security in the Region” in Bangkok, November 2001. SEAFDEC/TD presented a pilot project on the “Introduction of Set-Net Fishing to develop Sustainable Coastal Fisheries Management”, the introduction of the set-net under collectively operated by fishermen transferred from existing fisheries is one alternative approach to alleviate severe competition in the congested fishing grounds and pressure fisher resources. This was presented to the 34<sup>th</sup> SEAFDEC Council meeting in 2002 and it was agreed upon and approved as a 2 years project. The project started in 2003 and will be continued until the end of 2004.

**Project Objectives** The project is aimed to support the idea of “Sustainable Fisheries for Food Security in the Region”, detail as follows:-

1. To reduce fishing pressure on coastal fisheries resources through the introduction of set-net as a passive fishing gear.
2. To alleviate fishing competition in the congested fishing grounds by organizing collective fishing operation of Set-Net through the pilot project area.
3. To develop common policy concept in fishery management for fishing gear occupying wide fishing grounds like the set-net through the pilot project.

- To enhance the coastal fishery resources by the installation of large stationary fishing gear like Set-Net and to assess the feasibility and environmental impact.

**PROJECT SITE**, The coastal waters of Mae Rumpheung beach, Rayong Province of Thailand which is located on the East Coast of the Gulf of Thailand was selected as the project site or project area. The Mae Rumpheung beach coastal fishing ground cover 140-160 square kilometers of the coastal waters of Rayong Province, with in the area of 20 kilometers along the shore and 7-8 kilometers away from shore. There are seven fishermen's groups located in this area, about 200 fishermen generally conduct their fishing activities in these waters. Those fishermen's groups are Ban Pak Klong Kachor, Ban Klong Kachor, Ban Pakun, Ban Hin Dum, Ban Hin Khao, Ban Chon and Ban Kon Aou. (Fig. 2) SEAFDEC/TD considered this area as the project site because it is located in the country of the Implementation department of SEAFDEC (Training Department), not so far away from SEAFDEC/TD, just 180 kilometers from Bangkok and very close to The Eastern Marine Fisheries Research and Development Center of the Department of Fisheries, Thailand which is being used as the project base.

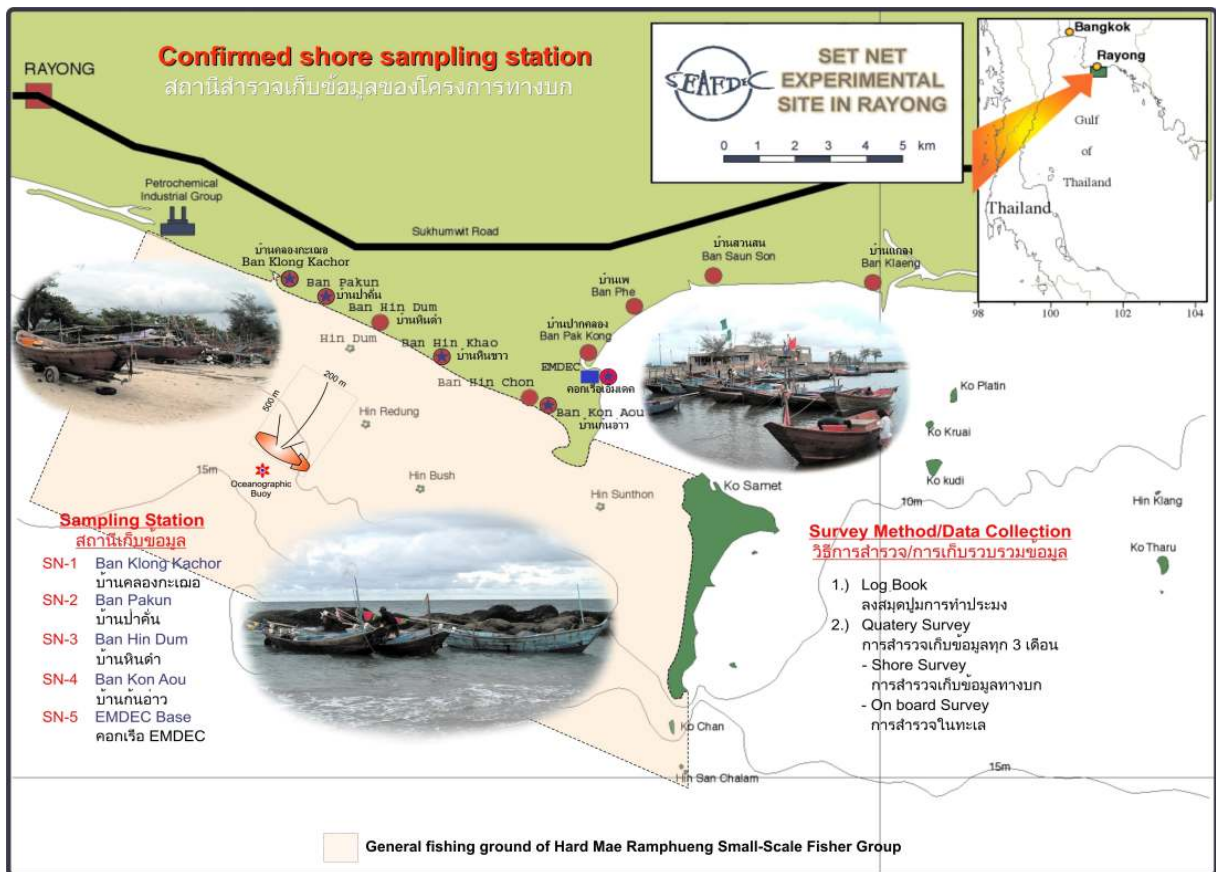


Figure 2. The project site and area, Mae Rumpheung beach coastal Fishing Ground.

The implementation of the project is conducted under the collaborative basic among the Department of Fisheries, Thailand, Rayong Provincial Fisheries Office, 7 fishermen's groups in the area and the Training Department of Southeast Asian Fisheries Development Center.

**Project Activities** The project was conducted on the collaborative basic among local fishermen, local fisher extension officers and technical fishery officers. They were formed into the working groups of the project, then it was carried out under three main activities, together with **on the job training** for the fishermen.

**Activity 1. Survey and Monitoring**, Working groups consist of 4 sub-teams, the fishing gear, the fishing ground, the fisheries biology and the fishery Socio-economic. Each team conducts surveys, data collection and compiles information relative to their field to use for adjusting and designing the project implementation. Including monitoring of informative factors, condition of the project implementation and analysis of all data and information to evaluate the project.

**Activity 2. Installation and Operation Management of Set-Net**, The activity has tried to design an appropriate type of Set-Net gear suitable to the fishing ground that includes surrounding condition considerations. Monitoring the efficiency of the Set-Net for adjustments on the net design and set-net installation position, harvesting operation, maintenance and cleaning. Additionally, to specify appropriate fishing gear to be used in surrounding set-net areas, size selection and re-introduce fishing activity in set-net areas.

**Activity 3. Information Transfer Program for Set-Nets**, This activity has provided an understanding on set-net project implementation, gathering local fishers and leaders for participation in set-net preparation, installation, harvesting. Including the provision of information related to fish management and incentive allocation through fisher's group establishment, release collected data and results of experiments to local fishers and will arrange a series of technical manuals for set-net and technical seminars.

**RESULTS** Implementation in the first year of the project has covered most of the activity 1 and activity 2. Some of the activity 3 was conducted only among the members of the project. However, the first year implementation has given a lot of knowledge and experiences to the local fishermen of both the project members and non project members who conducted their fishing in the project area and around the set-net construction. The fishermen group's leaders and the Set-Net Fishing Administrative and Management Committee was satisfied, and they would like to continue the set-net fishing in the further years. Results of each activity are described as follows:

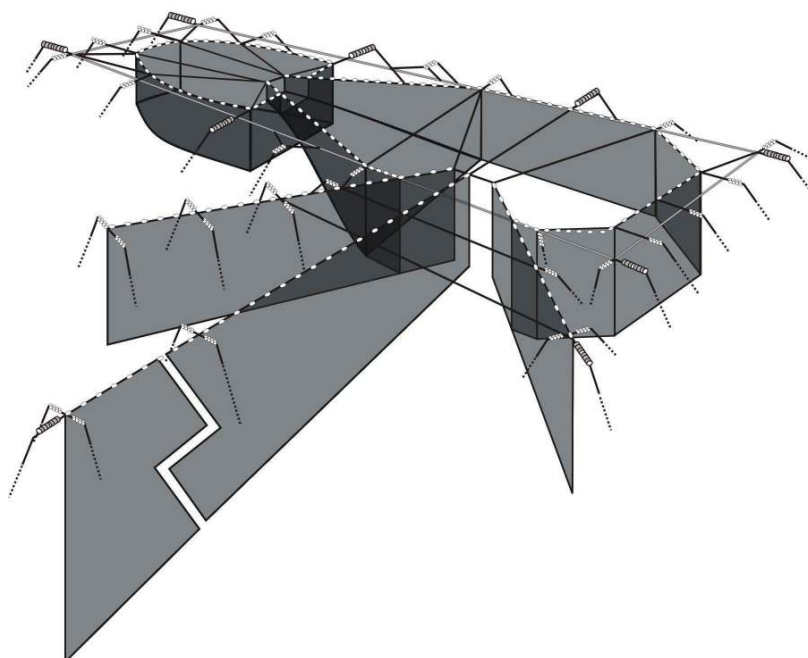
### **Survey and Monitoring**

**Baseline survey onshore** The project was aimed to introduce to the fishermen who generally conduct their fishing activities in the project area, coastal waters of Mae Rum Pheung Beach. There were 7 groups of fishermen distributed along the 20 kilometers coastline of the beach which compose of 150-200 fishermen engaging in small-scale fishing. Of those, 70% were bottom gill net and squid trap operation, 20% were squid jigging and handlines, the remain are fish trap, crab trap, etc. Almost their fishing boats were small, 6-7 meters long with 18-65 HP inboard engines; high speed diesel engine were popular among the fishermen. One or 2 fishermen were on each boat for fishing activity, almost of which were daily operation. Of those fishermen, 60% were full time fishermen and 40% were part time ones. Their catches were mostly sold to fish dealer, some were directly sold to the tourist in the area. Their average income were 8,000-12,000 baht per month. Fishing operation could be done throughout the year; however, the peak season was during the Northeast monsoon season (October to May).

**Baseline survey onboard** The baseline survey both onshore and onboard was conducted in July 2003. Onboard survey by 20 gross tonnage research and training vessel, MV. Plalung 1. The survey included oceanographic survey and fish sampling by 3 kinds of fishing gears: trammel net, collapsible trap and handline. Of the contour of 10 meters depth, significant contour was found between the latitude of  $12^{\circ} 34.6'N$  and the longitude of  $101^{\circ} 21.8'E$ . This location was also recommended by the local fishermen. Water depth at highest tide was 13 meters; bottom sediment was medium sand and coarse sand. Maximum current speed was 0.45 meters per second with direction of  $120^{\circ}$  at ebb tide and  $280^{\circ}$  at flood tide. Water temperature, salinity and transparency were  $30^{\circ}C$ , 22.4 ppt and 9 meters, respectively. Major composition of benthos was polychaete (63%) following by crustacean, mollusc, echinoderm and chordate, the average biomass of which was 5.929 grams per square meter. Organisms sampled were sea bream, tread fin bream, sillago, big fin reef squid, squid, swimming crab and shrimp. Apart from demersal fish, the pelagic fish was also found by shore survey team, they were Indo-Pacific mackerel, Indian mackerel, sardine anchovy and travelly. Monitoring survey was further carried out quarterly in October 2003, January and April 2004. Data are being analyzed.

#### Set-net installation and operation

A set-net, Otoshi-ami type was designed according to the data and information from the baseline survey, and also go along the "Technical guide for set-net fishing, International Set Net Fishing Summit in HIMI" [4]. The net was designed for mackerel and sardine target catch, so 25 mm. mesh size of nylon net is used for the bag net (box chamber). Size of bag net plus play ground was 45 meters wide and 140 meters long, play ground and slope net were made of 80 mm. mesh size polyethylene net. Three leaders was designed for the open fishing ground condition, two sub-leader net 50 and 100 meters long were constructed with 180 mm mesh size of polyethylene net and 250 meters long of main leader was made of 320 mm. mesh size of polyethylene net too. (Fig 3).



**Figure 3.** Set-net, Otoshi-ami type

The net was constructed by 40 volunteer fishermen working 3 days a week. The construction was finished in 2 months. Set-net installation was done by 20 volunteer fishermen; it was finished in 10 days. First fishing trial was carried out on October 16, 2003. Fishing operation was started on October 22, 2003.

**Fishing operation,** The set net operation teams was arranged by the Set-net fishing Administrative and Management Committee. Idea in principle each team was arranged from each fisher group by their own leader, but some fisher group have not enough volunteer so the combine with others. Then finally there were five operation teams, each team was consisted of eleven fishermen and four fishing boats. The operation schedule was arranged to conduct in every two days and rotated through the five teams. Maintenance of the set-net was very hard because their fishing boat are quite small, however they tried to do by their own cooperation and also along the instruction and supporting of technical fishery officers. There were a lot of problems occurred during the 5 months operation from October 2003 until the end of February 2004. The Fishermen had learn a lot of problems, experience and tried to solved those problems with the technical officers. So they gained knowledge and experience through their practice in the Set-Net Fishing operation and maintenance. However They are the beginner in Set-Net fishing, they still need more advise from Set-Net experts. Therefore the Training Department of the Southeast Asian Fisheries Development Center has requested and got approved for the technical assistance from Himi city, Fishery department to dispatch two Set-Net experts to the set-net project in Thailand for the second year of the project.

The first year operation had been carried out with 52 fishing operations, with the total catch about nine tons, and total income of about 109,100 baht. The main catch were travallies, sardine, mackerel, herring, garfish, squid and etc. (Table 1.)(Fig.4 and 5).

**Table 1. Catch of Set-Net of Hard Mae Rumpheung Small-scale Fisherman Group, Rayong Province.  
Month October 2003 - February 2004**

| Serial | Catch Species      | October 2003 |           | November 2003 |           | December 2003 |           | January 2004 |           | February 2004 |           | Total    |            |
|--------|--------------------|--------------|-----------|---------------|-----------|---------------|-----------|--------------|-----------|---------------|-----------|----------|------------|
|        |                    | Kg           | Baht      | Kg.           | Baht      | Kg.           | Baht      | Kg.          | Baht      | Kg.           | Baht      | Kg.      | Baht       |
|        | <b>Fishes</b>      |              |           |               |           |               |           |              |           |               |           |          |            |
| 1      | Indian mackerel    | 75.00        | 2,085.00  | 11.40         | 452.00    | 4.50          | 95.00     | -            | -         | 2.00          | 60.00     | 92.90    | 2,692.00   |
| 2      | Indo-pac.mac.      | 20.00        | 515.00    | 190.50        | 1778.00   | 16.00         | 255.00    | 32.00        | 485.00    | 4.20          | 99.00     | 262.78   | 3,131.88   |
| 3      | King mackerel      | 8.00         | 800.00    | 1.20          | 120.00    | 1.00          | 100.00    | 7.60         | 717.00    | -             | -         | 17.75    | 1,737.07   |
| 4      | Sardines           | -            | -         | 105.00        | 920.00    | 12.50         | 185.00    | 52.00        | 600.00    | 7.80          | 117.00    | 174.07   | 1,822.00   |
| 5      | Round herring      | -            | -         | 87.50         | 1591.00   | 250.50        | 4,512.00  | 975.00       | 13,265.00 | 381.30        | 5,176.00  | 2072.36  | 24,544.02  |
| 6      | Woff herring       | 38.40        | 608.00    | -             | -         | 2.00          | 24.50     | 1.00         | 20.00     | -             | -         | 41.36    | 652.32     |
| 7      | Selar Scads        | 148.00       | 1,402.00  | 935.85        | 9,793.00  | 240.50        | 2064.00   | 2,472.00     | 5,492.00  | 131.40        | 1,294.00  | 3927.71  | 20,063.08  |
| 8      | Trevallies Cavalla | 39.00        | 2,242.00  | 18.60         | 392.00    | 3.00          | 240.00    | 16.30        | 1,175.00  | 28.90         | 2,182.00  | 105.71   | 6,229.42   |
| 9      | Barracuda          | 9.00         | 570.00    | 14.70         | 944.00    | -             | -         | 4.60         | 300.00    | 3.30          | 244.00    | 31.62    | 2,051.47   |
| 10     | Sailfishes         | -            | -         | -             | -         | 20.00         | 400.00    | 15.00        | 300.00    | -             | -         | 35.00    | 700.00     |
| 11     | Gar fishes         | 48.00        | 780.00    | 94.70         | 1,053.00  | 27.50         | 340.00    | 87.00        | 1,180.00  | 56.00         | 637.00    | 313.65   | 3,990.00   |
| 12     | Hairtail           | -            | -         | 9.00          | 45.00     | -             | -         | 12.50        | 250.00    | 50.50         | 565.00    | 71.96    | 850.00     |
| 13     | Pomfret            | -            | -         | -             | -         | -             | -         | 1.30         | 130.00    | 4.20          | 294.00    | 5.46     | 424.00     |
| 14     | Leartherjacket     | -            | -         | -             | -         | -             | -         | 30.00        | 900.00    | 31.30         | 939.00    | 61.86    | 1,830.00   |
| 15     | Misc. fishes       | 227.50       | 1,632.00  | 1,110.00      | 7,386.00  | 171.00        | 1915.00   | 85.50        | 11,844.00 | 74.00         | 590.00    | 1,667.88 | 23,366.00  |
|        | <b>Squid</b>       |              |           |               |           |               |           |              |           |               |           |          |            |
| 16     | Loligo sq.         | 28.00        | 1,180.00  | 6.60          | 473.00    | 2.50          | 80.00     | 4.00         | 200.00    | -             | -         | 38.04    | 1,932.95   |
| 17     | Big fin reef sq.   | -            | -         | 49.65         | 3,113.00  | 17.00         | 1650.00   | 47.50        | 4,569.00  | 41.60         | 3,680.00  | 155.36   | 13,011.96  |
| 18     | Cuttlefishes       | -            | -         | -             | -         | -             | -         | -            | -         | 1.00          | 60.00     | 1.00     | 60.00      |
|        | <b>Total</b>       | 641.40       | 11,614.00 | 2,635.70      | 28,060.00 | 768.00        | 11,860.50 | 3,843.30     | 41,427.00 | 817.50        | 15,940.50 | 9,076.74 | 109,108.56 |

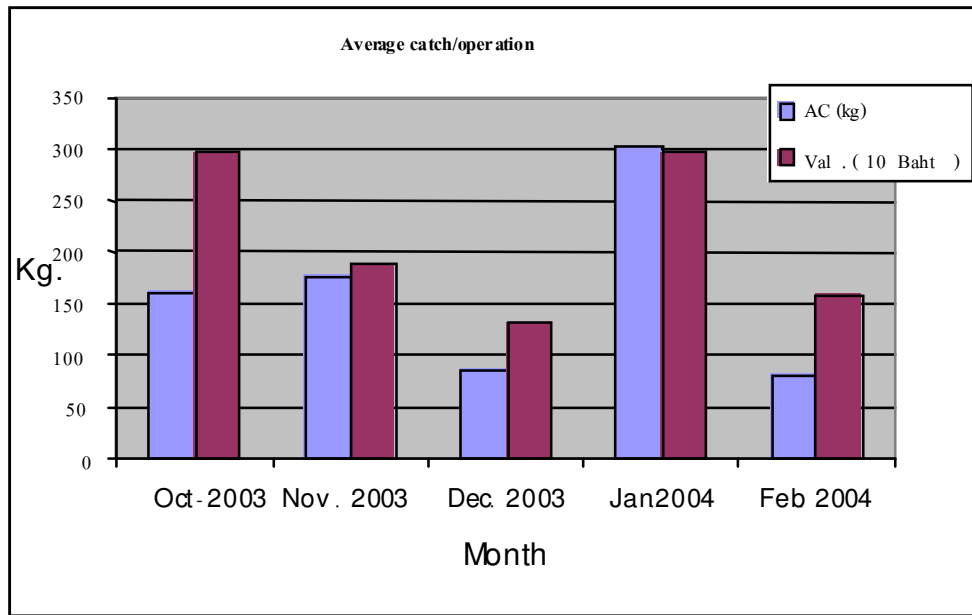


Figure 4 Average catch and income from Set-Net operation October 2003- February 2004

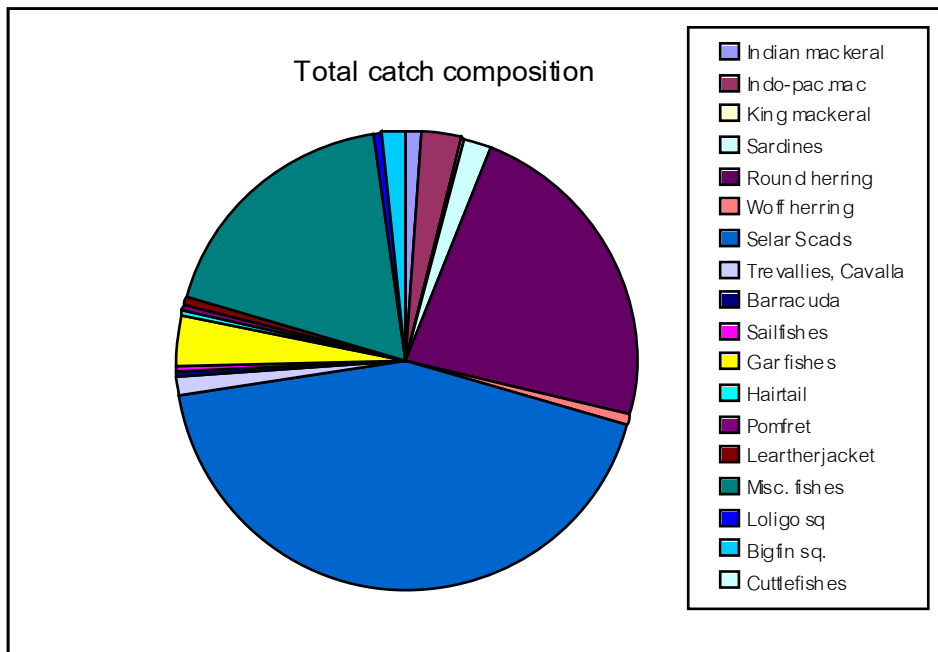
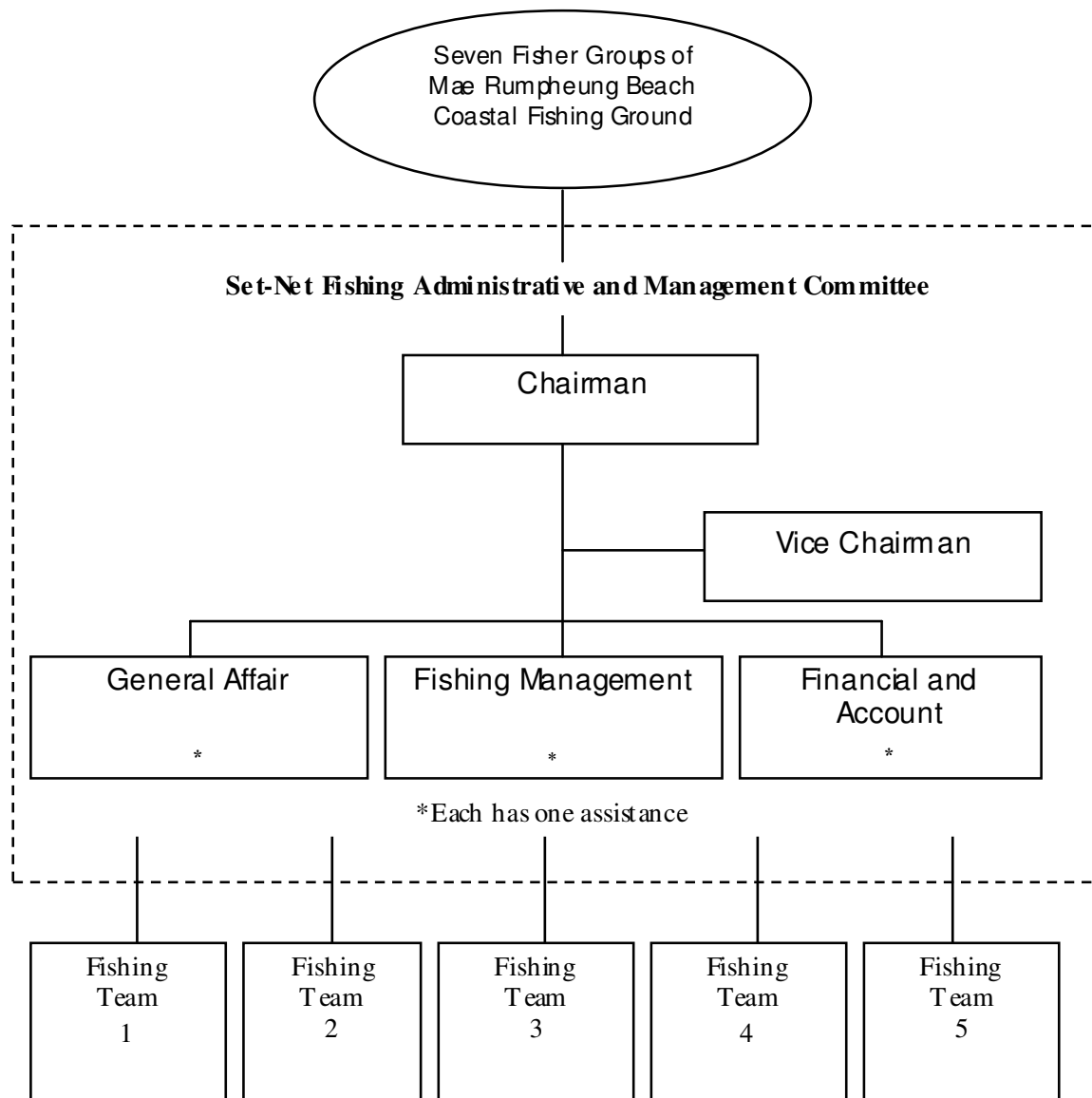


Figure 5 Catch composition by Set-Net



**Information Transfer and Fishermen Committee Forming** This activity is very importance for the successful of the project, to group and educate the fishermen is very hard job for the extension officer. However, they need to be educated and trained little by little through the practical work. The set-net project started by grouping the local fishermen to work on net construction, installation, operation and maintenance. Through those activities the fishermen had learnt how to work and think together, then they came close to the most importance step, howto manage together. Normally almost of the fishermen in Southeast Asia are familiar with individual operation in the first year implementation of the project, the Set-Net Fishing Administrative Management Committee could not function as well as planned, practical (Fig. 6).

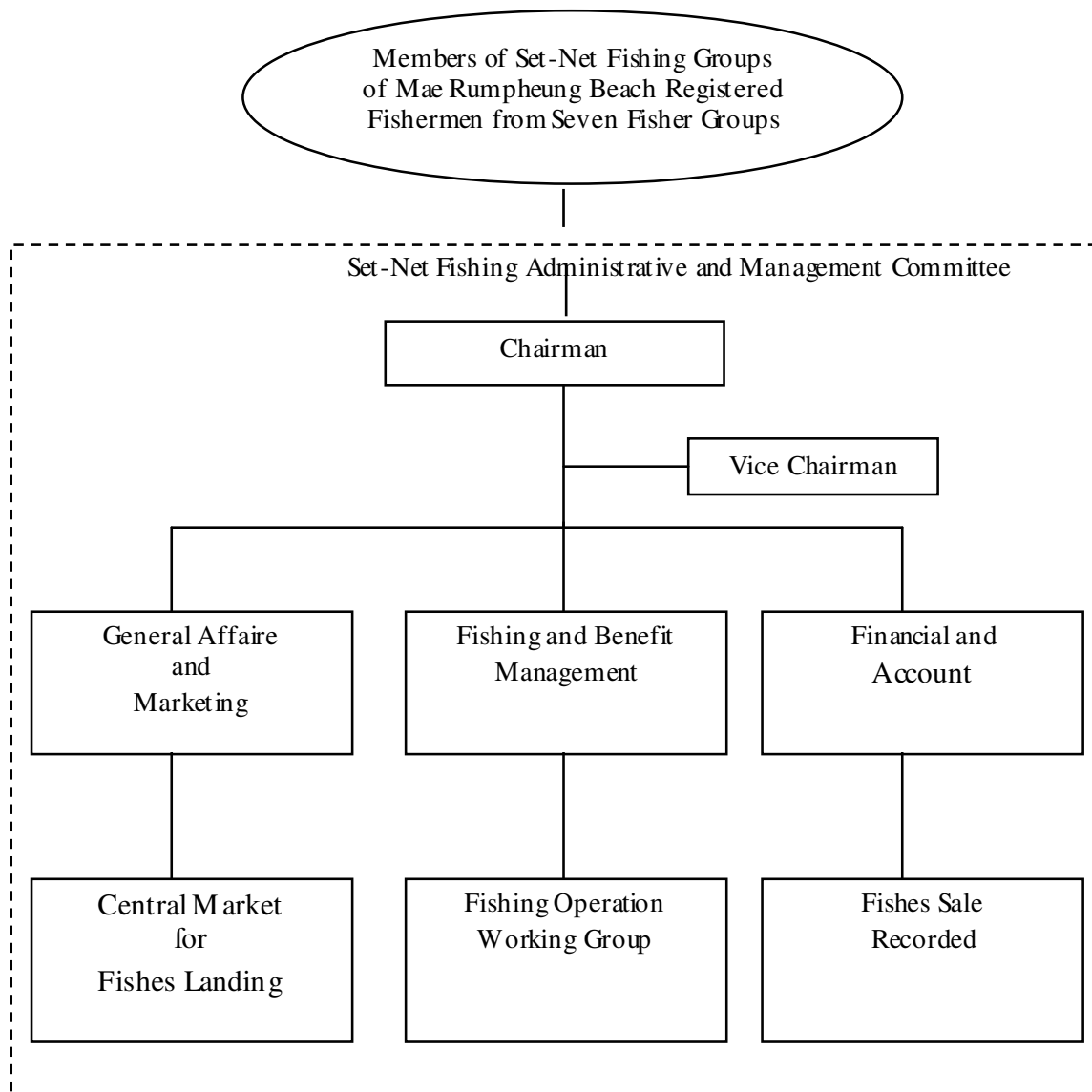


**Figure 6** Diagram shown tactical work of the committee in 2003

There were two main problems occurred,

1. The committee could not control the Fishing operation Teams.
2. Financial and account section has shown poor function, due to financial personal has no financial knowledge and the committee have left considered.

Those problems have made unsatisfactory and unclear financial report even they had no corruption. Then the Set-Net Fishing Administrative and Management Committee have to be revised for the second year fishing operation in 2004 (Fig 7).



**Figure 7** Revised Set-Net Fishing Administrative Committee.

**Resources Enhancement aspect** Main function of set-net is to harvest the migratory species of fisheries resource but at the same time it's construction also provide shelter and substrate for marine living organism to create their communities in the food tropic level of natural ecosystem. Most of the coastal waters environment was damaged by various factors. We have found that during 5 months installing of set-net in the sea, many fisheries resources has created themselves on and around the set-net construction such as Yellow-strip trevally (*Selaroides leptolepis*), Gar fish (*Ablennes hians* and *Tylosurus acus melanous*) Big-fin reef squid (*Sepioteuthis lessonaeana*), Swining crab (*Potunas pelagicus*), Cruciate crab (*Charydis cruciata*), Oyster (*Crassostrea* sp.), Peal shell (*Pinctada* spp) etc.

**DISCUSSION** Set-Net is a kind of stationary fishing gear which should be promoted to the coastal fisheries of Southeast Asian. The permission should give to the group of Small-scale fishermen, fishery-cooperatives with strictly regulation and management awareness. National government should give strong support to their activities in order to meet with the policy of decentralization for fisheries Management. The national policy on zoning of small-scale fisheries and commercial fisheries should be implemented as fast as possible, so the small-scale fishermen will keep more awareness on the own fishing ground and resources.

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