



Enhancing Community-based Management through Set-net Fisheries: A Regional Fishery Collaborative Venture

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Although the Japanese-type set-net was first introduced to many countries in Southeast Asia in the late 1990s, such attempts did not deliver good results not only because of technical and management concerns, but also due to the abundance of the region's coastal fishery resources at that time and the belief of many fishers that the coastal fishery resources are infinite. However, with the advent of findings that the region's fishery resources are dwindling, fishers and other stakeholders started to recognize the importance of sustainable fishing practices that reduce pressure on the resources. Therefore, the effort of SEAFDEC to modify the set-net fishing technology which was developed in Japan, to conform to the complexity and specificity of the region's fisheries, and its re-introduction in the countries of the region starting with some pilot project sites in Thailand, was a much welcome strategy for the sustainable development of coastal fisheries in the region. One of the most significant impacts of the process of adapting the set-net technology in the region is the enhanced capacity of fishers in community-based coastal fisheries management.

Recognizing that efficient fishing gear is an important tool in coastal fisheries management, the Training Department of the Southeast Asian Fisheries Development Center

(SEAFDEC/TD) initiated a two-year project to re-introduce the set-net fishing technology operations in Southeast Asia from 2003 to 2005 (Munprasit, 2010a). Thus, the project on Sustainable Coastal Fisheries Management in Southeast Asia was carried out starting with a case study in Thailand (SEAFDEC/TD, 2005) in 2003 with funding support from the Japanese Trust Fund and comprehensive technical support from Himi City, Japan under the JICA Grass-root Partnership Program and the Tokyo University of Marine Science and Technology (TUMSAT) under the Core University Program of the Japan Society for the Promotion of Science (JSPS) as well as from the National Research Council of Thailand (NRCT).

The set-net technology had been re-introduced in the Southeast Asian countries as means of improving the catch of fishers not only in terms of quantity but most of all in the quality of the catch, in the midst of the region's declining coastal fishery resources. The technology also paved the way for enhancing the capacity of fishers in community-based management for sustainable coastal fisheries development and management. The improved set-net fishing technology which had been successfully verified in Thailand could be adapted in Southeast Asian

countries with similar geographic characteristics and conditions. Moreover, the re-introduction of the set-net technology which is environment-friendly could also serve as an avenue for raising the awareness of fishers on the role of set-net technology in the conservation of coastal fishery resources for the benefit of future generations.

Set-net Pilot Project Sites in Thailand

Implementation of the modified set-net technology was launched in 2003 in the coastal waters of Mae Rumpheung (latitude 12°34.5'N to 12°36.0'N and longitude 101°20.5'E to 101°21.5'E) in Rayong Province in the Gulf of Thailand. The physical geographic characteristics of the fishing ground which is 3-5 km away from shore line (Fig. 1), include a 12-mile (21-km) stretch of beach area, flat-sandy bottom with few spot-rocks on the sea floor, depth of 11-14 m with generally long shore current of 0-35 cm/sec in the northwest and southeast (300°-120°) directions, mixed tide area with 2 m tidal range, sea water temperature between 26°C and 30°C, salinity ranging from 29 to 30 ppt, and sea water transparency at 3-11 m.

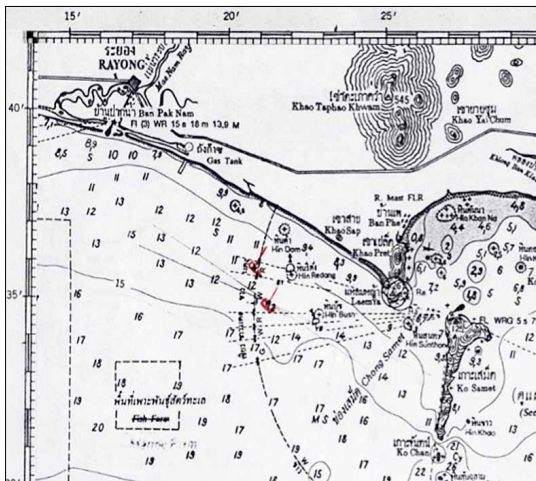


Fig. 1. Set-net project site in Rayong Province, Thailand

Generally, the sea condition of the fishing ground is fanned by the northeast and southwest wind with 0-1 meter wave height during the fishing season from October to April (Laongmanee *et al.*, 2005; Booncherm, 2005). The flat-sandy bottom and long-shore coastal waters of Mae Rumpheung made it a very suitable site for the set-net project. The waters of Mae Rumpheung used to also serve as fishing ground for crab bottom gill net, mackerel gill net, squid trap, squid jigging, fish hand line, anchovy purse seine, light fishing for squid and anchovy. Bottom pair trawl had also been operating in these waters oftentimes causing damages to the fishing gear of local small-scale fishers (Manajit, 2005).

During the period from 1940s to 1970s, bamboo stake trap was the most popular traditional fishing gear in Thailand

targeting the coastal pelagic species notably the Indo-Pacific mackerel, *Rastrelliger neglectus* (DOF Thailand, 1969). Made of bamboo and parts of palm trees, bamboo stake is a passive and stationary fishing gear which is fixed on the sea bed. After the Second World War in 1949 and when people from Southeast Asia established contacts with Japan, the set-net fishing technology which was developed in Japan was introduced to Thailand for the first time. This 1949 set-net fishing technology made use of the Masu-ami, and later in 1953, Otoshi-ami was used. The introduction of the set-net fishing technology in Thailand was made possible through the efforts of *Commander Sawang Chareonpol*, former Director-General of the Department of Fisheries of Thailand after he graduated from Hokkaido University in Japan (DOF Thailand, 1969). Unfortunately, the technology was not embraced by the fishers at that time may be because fish was still plentiful in the waters of Thailand that even with the use of simple fishing gear and methods, fishers were able to derive bountiful harvests from the coastal fishery resources.

In the 1960s, bottom trawl operation expanded throughout the Gulf of Thailand within a short period of time (DOF Thailand, 1969). Since the bamboo stake trap could not compete with the trawls, its existence from the coastal waters of Thailand was reduced year by year. Thus, bamboo stake trap operations remained only with limited numbers in Trad Province and in the inner Gulf of Thailand, with most operations focusing on the green mussels as main products.

Nowadays, when most of the coastal waters of Thailand had been opened for all kinds of gear that operate legally or illegally, the fishery resources especially in the Gulf of Thailand had been reported to have sharply declined. Therefore, when the latest set-net technology was promoted during the International Set Net Fishing Summit in Himi City, Japan in 2002, it was envisioned that such technology could be re-introduced to Thailand as means of addressing the degrading fishery resources in the Gulf of Thailand. Thus, two units of Otoshi-ami were installed in the Rayong set-net project site while another set was introduced in southern Thailand in 2009.

The shallow water set-net or Choko-ami which had been tried in 1983 at the coastal waters of Samet Island, Rayong Province, was tried again in 2009 in the coastal waters of nearby Sriracha in Chonburi Province to study the near-shore resources and conditions of fishing grounds that are 5 m in depth and 1,000 m away from the shoreline. Choko-ami has been considered as one type of set-net which could be promoted to small-scale fishers under the concept of community-based fisheries management, as it has less impact to the environment and resources.

In October 2010, a similar project was introduced by the Department of Fisheries of Thailand to the eastern coast of the southern part of Thailand in Bangsaphan, Prachuap Khirikhan Province. After obtaining satisfactory results from the set-net technology, the fishers considered it as the most suitable fishing gear for the coastal waters of Bangsaphan, that prompted them to develop their own management scheme for community-based set-net fisheries (Fig. 2).

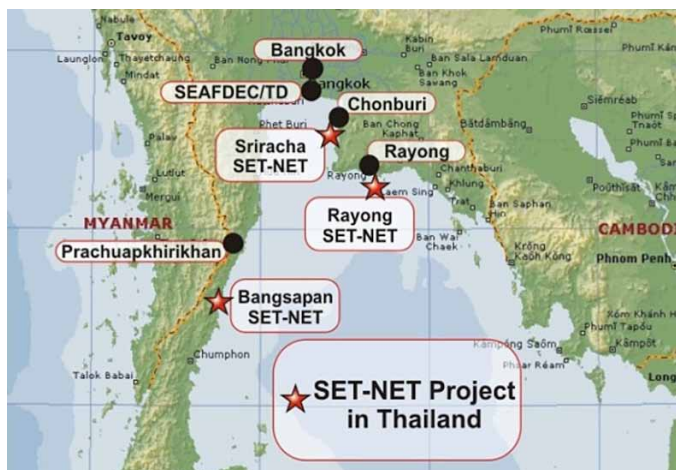


Fig. 2. Set-net pilot project sites in Thailand

The introduction of the Japanese-type of set-net to the local fishers in communities through enhanced collaborative efforts, mainly aims to provide a form of social barrier that could stop or reduce pressures from active gears' operations in the communities' coastal waters. Consistently, the awareness of fishers on the need to rehabilitate the coastal environments and resources is enhanced as part of their responsibilities resulting in reduced pressure on the fishery resources.

Redesigning the Set-net for Southeast Asian Waters

The original set-net developed in Japan was modified and developed to suit the fishing ground conditions of the region through the collaborative research efforts of experts from Himi City and TUMSAT as well as researchers from SEAFDEC/TD. In the modification of the deep and narrow chamber entrance, pulling ropes have been installed at six bottom corners of the chamber and two sub-leader nets on both sides of the main leader net. This was based on the original design of Otoshi-ami and the technical manual for set-net fishing considered during the International Set Net Fishing Summit in Himi City in November 2002 (Inoue *et al.*, 2002).

The first design of the Rayong set-net consisted of 45 m wide and 140 m long playground and chamber net with 250 m main leader net. The entrance chamber net was 5 m

deep and 14 m wide for the outer entrance and 3x5 m for the inner net. Most parts of the gear were fixed on the sea bed by 75 iron anchors (Fig. 3). The mesh size of the net at each parts were 25 mm, 85 mm, 185 mm and 320 mm at the chamber, playground, sub-leader and main leader net, respectively. Net materials consisted of nylon at the chamber and polyethylene at the playground and leader net, while the ropes are polypropylene (Munprasit *et al.*, 2005). After its first trial year however, the catch obtained from the set-net was very poor at an average of only 178 kg per operation, which was mainly due to technical problems during the set-net operations such as loosened frame rope which later sank, leader net became entangled with the iron anchors, and fish were unable to swim easily into the catching chamber.

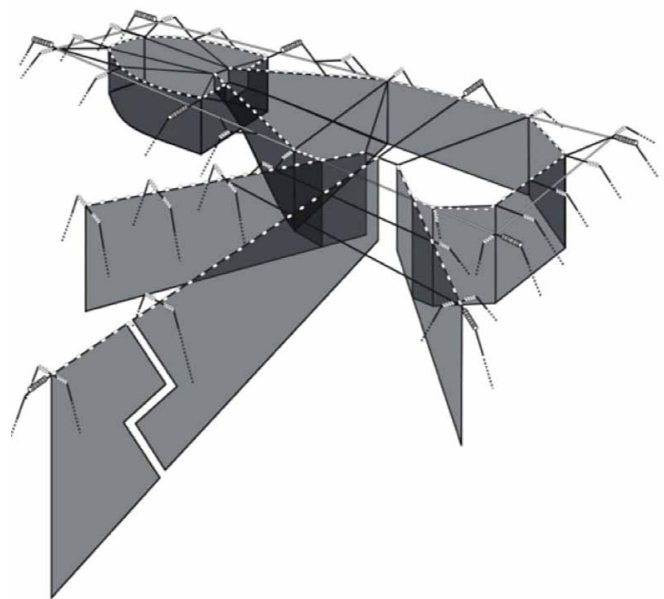


Fig. 3. Otoshi-ami type of set-net used in Rayong, Thailand

In order to address such constraints, the set-net gear was modified and improved for the second year experiment in 2004, with three main parts adjusted: (1) the slender shape of the body was modified to reduce current resistance, *i.e.* 30x155x250 m body net size was considered to be more appropriate; (2) all iron anchors were replaced with 1000 pieces of 60-kg sand bags; and (3) entrance of the chamber net was made deeper and narrower, *i.e.* 0.7 m wide and 9.0 m deep for the inner entrance, and 8.0 m wide and 11.0 m deep for the outer chamber entrance. The outer slope nets of the playground were also made deeper and shorter in order that the slope net of the improved gear was 11 m deep and 15 m long (1/10 at 13 m sea depth). The improved design was found successful since the average catch increased to 255 kg per operation. In the improved design, most parts of the gear were completely fixed on the sea bottom by 1000 pieces of 60-kg sand bags.

In 2005-2006, the Rayong set-net fishing operation was affected by the *El Niño* phenomenon and storms in the

South China Sea that changed the current conditions of the coastal waters of Rayong Province with irregular patterns in terms of direction and speed. This also affected the shape of the chamber net including the entrance, resulting in significant decrease of the catch. In order to improve the situation, 6 bottom pulling ropes of the chamber corners were added (SEAFDEC/TD, 2008). Thus, the latest design of the Otoshi-ami of the Rayong set-net project consisted of 4 parts, namely: chamber, playground, sub-leader net and main leader net, which could also be separated into two main components, *i.e.* the frame rope and net. The frame rope consists of 3 lines of 30-mm diameter polypropylene rope attached with rugby-shape plastic buoy, Ø: 350 mm and L: 400 mm at 2.5 m interval (Fig. 4).

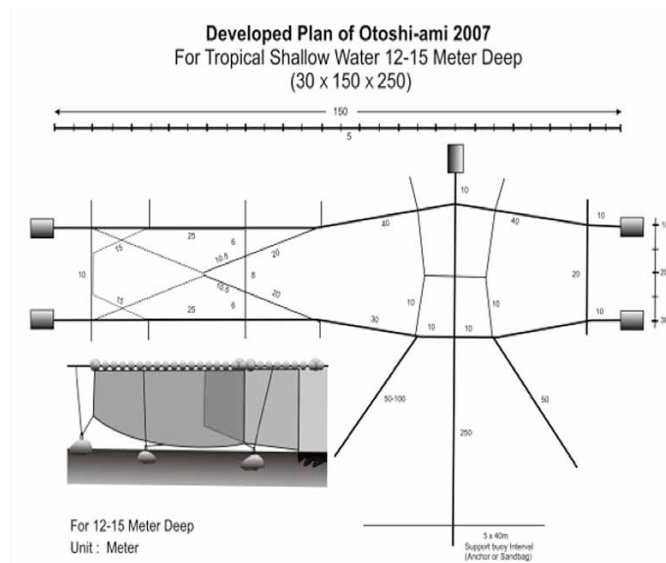


Fig. 4. Improved design of the Rayong set-net

Each end of the main frame ropes is fixed on the sea bottom by 2x40 pieces of 60-kg sand bags using a sand bag rope and a main buoy (200-liter plastic drum-shaped containers). Construction of the net such as the chamber, playground, sub-leader and main leader nets requires suspending the main frame rope which has a fixed shape from the sea surface. Made of 25-mm mesh size nylon net (PA 210 d/24) with 40x20 m dimension, the chamber net is box-shaped with inner-slope entrance. The playground is rectangular and made of 85 mm mesh size polyethylene net (PE 380 d/24) and 110x18 m, which is put into shape by a 15 m outer slope connected to the chamber entrance. The playground and chamber parts are set along the direction of the water current.

The main leader net is rectangular and made of 320 mm mesh size polyethylene net (PE 700 d/80), 250x18 m, which is placed inside the playground towards the direction of the shore and normally perpendicular with the direction of the current, while the 50 m and 100 m sub-leader nets are

made of 185 mm mesh size polyethylene (PE 700 d/18), 50x18 m and 100x18 m, respectively and set on both sides of the main leader at the entrance of the playground. Over all, the Rayong set-net size is 30x150x250 m which is suitable for fishing grounds 10-15 m in depth (Munprasit *et al.*, 2008). The bottom corner pulling rope of the chamber and sub-leader nets are specially designed for shallow waters with (plain) flat-bottom topography like the coastal waters of Rayong Province. The estimated cost of the local materials used in the construction was about 500,000 Baht for one set, while the cost of labor was minimized through the collaborative efforts of fishers. In this case, 45 fishers were involved, 16 of whom worked alternately within one day on volunteer-labor basis, making it possible for the construction to be completed within two months (Munprasit *et al.*, 2008). Improvements in the design of the modified set-net resulted in increased catch in 2010, with production of 317 kg per operation. Thus, the fishers were able to earn an average income of about 11,119 Baht while the average operating cost per trip was 5,000 Baht (EMDEC/DOF, 2008). Moreover, the fishes caught were commercially- and economically-important commanding relatively high price in local markets with high demand for very fresh fish.

Fishing Operations and Maintenance

Since it is crucial that the set-net installation process must be well planned, preparation of all parts and materials needed should be completed in advance before proceeding to the sea. Site survey of the prospective sea area must also be done prior to the planned installation which is usually undertaken step-by-step until completion. The site survey should be carried out with more details, with the prospective installation site identified by using 5-6 mark buoys fixed on the surface to serve as guide mark for the installation. At least 2-3 boats with corresponding designated functions and 10-15 fishers are required for the installation, with the boats serving as guide, signal and carrier boats.

At the start of the installation, 2 main frame ropes are set along the direction of the water current based on the position of the guide mark buoys and the third main frame rope is set towards the direction of the shore or perpendicular with the direction of the current as indicated by the mark guide buoys. The Otoshi-ami is then fixed together with primary supporting sand bags and all net parts are hung on the main frame rope starting with the playground, main leader and sub-leader nets, and chamber nets. All parts of the gear are adjusted and fixed into the designed Otoshi-ami complete-shape using secondary supporting sand bags, and three mark buoys with light signal fixed at the end of the

playground, chamber and main leader as shown in **Fig. 4**. The installation process could take two weeks to complete (Munprasit *et al.*, 2005).

Set-net fishing operation is usually conducted by 14-16 fishers using four local small-scale fishing boats (6-8 m in length with 18-60 Hp inboard engines (Manajit and Petchkham, 2005)). Two boats function as net operating boats, one for hanging the net entrance and the last for bunt or catch support. Each boat carries 1 or 2 pieces of 200-liter ice boxes to preserve the catch onboard. Fishing operation is carried out in the morning at around 0600-0800 hours, with fishers leaving shore at 0530 hours as it could take at least 30 minutes to sail for the set-net site and be able to arrive at around 0600 hrs. Actual fishing operation which takes about 30-60 minutes depending on the abundance of fish, starts by closing the entrance, releasing the bottom chamber corner pulling rope, washing the inner entrance net panel, hauling the net chamber, transferring the catch from the bunt to the ice box, then resetting all parts back to their regular shape. In the case of the Rayong set-net fishing, since it takes about 30 minutes to return back to shore, sometimes the fishers also take another 15-30 minutes for maintenance, so in a day, the fishing operation takes about 3-4 hours at sea, and marketing at shore by 0900 to 1000 hrs. Almost all the operational steps are done manually through the cooperative effort of the members of fisher groups where at least 10 fishers are involved in each fishing operation.

Maintenance is considered an important factor as it gives much benefit from set-net fishing. With regular maintenance big catch could be expected from the set-net fishing while handling of the gear could become much easier. In the Rayong set-net fishing gear, maintenance could be classified into 3 categories, namely: general, periodic and annual maintenance. General maintenance is a simple activity during the fishing day such as net mending at sea, adjusting the loose frame ropes, removing all entangled objects, and over all observation of the condition of the gear through ocular inspection. Periodic maintenance involves changing the net parts, especially the catching chamber which should be changed every 2-3 weeks, the playground every 2 months and the leader net every 3 months. The used nets are cleaned and net mending is done onshore. Annual maintenance is usually done at the end of the seven-month fishing season from October to April, up to the monsoon period. Therefore, before the southwest monsoon starts in May, the net part and frame rope should be retrieved and brought to shore, to be cleaned and repaired during the monsoon season from May to September. The set-net gear could then be re-installed at the same place on the last week of September every year. Based on a 9-year experience in set-net fishing, the volume

of catch was found to be related to the maintenance of the net, where better catch had been obtained after each maintenance period (Munprasit *et al.*, 2008).

Gear Improvement

From the lessons learned through the Rayong set-net fishing operations in nine years, the gear and fishing techniques could be modified and improved considering the problems encountered during previous operations. These include:

- 1) Slimmer shape of body part, playground and chamber, *i.e.* from 45 m to 30 m wide, to reduce resistance with the water current of 35 cm/sec at maximum speed (Laongmanee *et al.*, 2005).
- 2) Deeper and narrower chamber entrance and slope net, *i.e.* 0.7 m wide, 9 m deep at the inner end, and 8 m wide and 11 m deep at the outer entrance while the length of the slope net of the playground shortened from 30 m to 15 m. The ratio of the chamber entrance should be 5/6 of the sea depth to make it easy for the fish that comprises not only pelagic but also demersal species, to get into the chamber but making it difficult for fish to escape (**Fig. 5**).

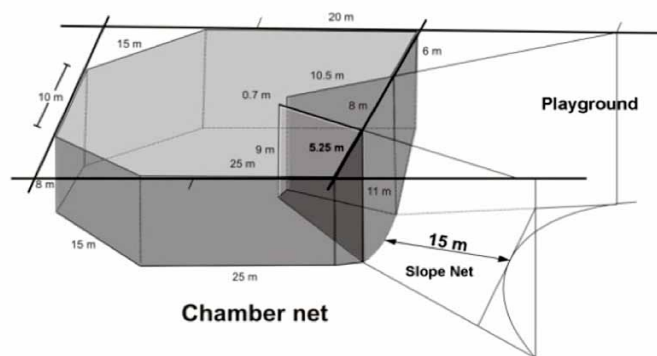


Fig. 5. Modified chamber of the set-net

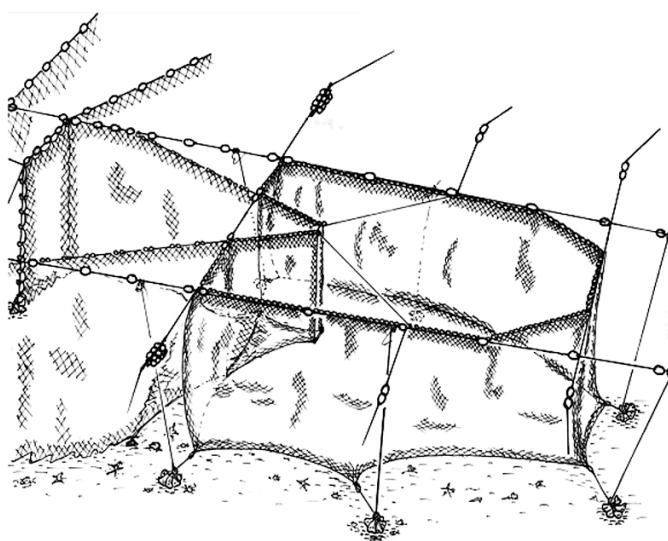


Fig. 6. Bottom pulling rope of chamber corners

- 3) Replacing all iron anchors with sand bag mooring system to avoid loosening of the frame rope and entangling of the anchors with the leader net.
- 4) Using 4-6 bottom pulling ropes attached to the bottom corners of the chamber net (**Fig. 6**) to maintain the net's regular shape during fluctuating current patterns which usually occur from January to March (Munprasit *et al.*, 2009).
- 5) Using flat fiber glass boat for the fishing operations and for the main activities of the set-net fishing to optimize resource use, *e.g.* the 2.5x10.5 m FRP boat from Himi City proved to be the most convenient type for the manual operation of small-scale set-net. The Rayong set-net was operated with only one flat fiberglass boat and another two local fishing boats, while maintenance trip makes use of the flat FRP boat.
- 6) Installation of high pressure water pump, cap stand winch and bow net roller onboard the flat FRB used for the maintenance of the set-net to make fishing operations and maintenance more convenient and time-saving.
- 7) Portable fishing signal lights attached at the mark buoys of the end of the main leader net and both ends of the playground and chamber net to prevent the set-net from being damaged by passing boats.

Such improved techniques made the Rayong set-net activities efficient and effective. Meanwhile, the set-net fisher groups are now able to operate and manage all the activities by themselves without any logistics support from the Eastern Marine Fisheries Research and Development Center of the Department of Fisheries (EMDEC/DOF) of Thailand or SEAFDEC/TD. Nevertheless, the Rayong set-net which is now fully operated by the set-net fisher groups of Mae Rumpheung, Rayong Province under the Rayong Micro-enterprise Program, continues to receive technical support from EMDEC/DOF.

Catch and Income

Catch from the Rayong set-net comprises fish species which are similar to those of the bamboo stake trap. While the catch composed of mostly pelagic species such as sardines, mackerel, trevally, gar fish, squid among others, the catch also includes some demersal species such as snappers, sea bream, and siganids. However, different species could be caught from different locations and fishing grounds. While the catch from bamboo stake traps installed in muddy bottom of the Bay of Trad in Trad Province could include trash fish (about 22% of total fish catch) such as pony fish and tharapon (Munprasit *et al.*, 2007), the catch from the Rayong set-net did not include any trash fish.

Box 1. Species composition of the catch from Rayong set-net

Pelagic fish species dominated the catch from Rayong set-net, such as: *Selaroides leptolepis*, *Amblygaster clupeioides*, Belonidae and Hemiramphidae (*e.g.* *Hemiramphus far*, *Tylosarus acus-melanotus*, *Ablennes hians*), *Rastrelliger brachysoma*, and *Sardinnella gibbosa*. The demersal catch comprised *Sphyreana* spp., *Nemipterus* spp., *Scolopsis* spp., *Trichiurus lepturus*, *Lutjanus* spp., *Siganus* spp., while the cephalopods included *Loligo* spp., *Sepiotheuthis lessoniana*, and *Sepia* spp. Some high value species such as *Parastomateus niger*, *Alectis indica*, *Sphyreana jello*, *S. putnamae*, *S. obtusata*, squid and cuttlefishes also formed part of the catch (Phuttharaksa *et al.*, 2008).

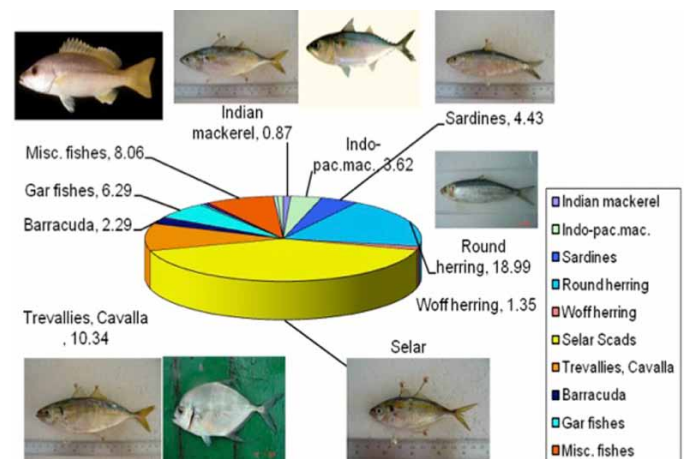


Fig. 7. Catch composition of the Rayong set-net project

Specifically in 2008, the catch from the Rayong set-net (**Box 1** and **Fig. 7**) composed of about 91% pelagic species, 7% demersal fishes, and 2% cephalopods. As the technology of the Rayong set-net improves through years of operation, catch and income had also improved. Although trend of the catch volume may have not increased considerably, the income derived from the fish catch of the Rayong set-net has continuously increased especially from 2003 to 2011.

This was an improvement of the catch during its first year of operation in 2003-2004, when the design was not yet appropriate, and later was modified. Since fishers were still unskilled and inexperienced at that time, the average catch of the set-net project was only 175 kg per fishing operation.

During the first year of the set-net operation, the price of fish at the local market was quite cheap while marketing depended on local fish dealers therefore the average income obtained by the fishers was only Baht 2,100 per operation. In its second year in 2004-2005, the set-net project received technical advice and assistance from *Prof. Dr. Takafumi Arimoto* of TUMSAT and experts from Himi City set-net project, namely: *Mr. Tadashi Hamaya* and *Mr. Isao Hamano*, leading to the improvement of the gear and training of the fishers to enhance their skills and knowledge not only in fishing but also in marketing. Thus, the catch

and income improved significantly at an average catch of 254 kg per operation with total average income of Baht 5,160 per operation. The fisher groups not only improved their management skills but also ventured into marketing of the catch.

Moreover, the fishers also gained experience in fish handling, especially in arranging the catch in ice boxes with sea water immediately after collecting the fish from the net. The improved techniques and skills of the fisher groups resulted in improvement of the catch and income during the succeeding years of operation until 2011. As a result, the trend of the catch in terms of average catch and income per operation per year has improved. In 2006 for example, the average catch was 225 kg valued at Baht 5,610; 214 kg valued at Baht 6,340 in 2007; 288 kg valued at Baht 7,820 in 2008; 298 kg valued at Baht 10,010 in 2009; 352 kg valued at Baht 10,410 in 2010; and 333 kg valued at Baht 11,420 in 2011 (Fig. 8).

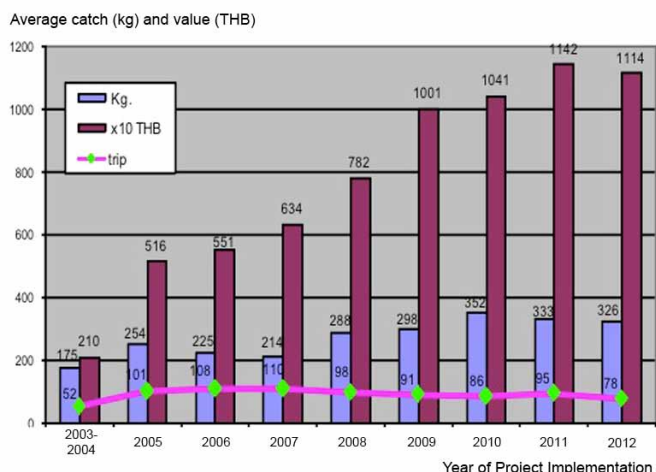


Fig. 8. Average catch and income from Rayong set-net

Thus, the average catch of Rayong set-net rapidly improved starting in its second year (2005) but slightly decreased until the fourth year (2007), then increased on the fifth to the eighth year (2008, 2009, 2010, 2011). The increased catch on the fifth to the eighth year could be a result of the joint operation and combined total catch with the second set-net of Rayong. Nonetheless, the average income of the Rayong set-net fisher groups had increased continuously, which could be also due to the increased price of fish in markets near the set-net project considering its freshness. Therefore, the set-net fisher groups have been able to improve their incomes throughout the years of continuous set-net fishing operations (Munprasit *et al.*, 2008).

Community-based Management

While set-net technology transferred to Southeast Asia is mainly aimed at promoting sustainable coastal fisheries management, it is also meant to develop the capability

of local fishers. Specifically, the Rayong set-net project puts great emphasis on the participation of local people especially the local small-scale fishers. In an interview of the concerned fishers which was intended to share and exchange ideas, knowledge and experiences in set-net fishing operations, the local small-scale fishers agreed with the idea and concept of the set-net fishing technology.

While recognizing the importance of collaboration with other local fishers and people, the fishers also expressed the view that collaboration among the local government units and institutes in the vicinity of the set-net area, is also of equally utmost importance. During the visit to local government units and institutes to seek their cooperation in the Rayong set-net project before its launching in August 2003, the officers agreed that the set-net project should be carried out as a collaborative effort among three parties, the local small-scale fishers as the main actors, the Rayong fisheries office as the administrative supporting party, and EMDEC/DOF and SEAFDEC/TD as the technical supporting parties.

With its main objective of promoting sustainable coastal fisheries management of Mae Rumpheung coastal waters in Rayong Province, the launching ceremony of the set-net project in August 2003 gathered about 85 small-scale fishers from 7 fishing villages (SEAFDEC/TD, 2005). At that time, the fishers committed their services for the project, the results of which could be gleaned from the net construction which was carried out by 16 volunteer-local fishers working alternately everyday in 4 days a week until the construction was completed in October 2003. Meanwhile, the one-month (32 days) work to complete the gear construction and another two weeks for the installation of the whole gear in the sea, served as on-the-job training for the fishers.

Boats provided by EMDEC/DOF and SEAFDEC/TD were used as carrier boats and 5-8 local fishing boats served as working boats. From 25 October 2003 until the end of February 2004, a total of 52 operations in 4 months were carried out during first fishing operation by the implementing members of Set Net Fishing Administrative and Management Committee (SNAMC) which was established with certain agreement among the implementing members of the set-net fisher groups (Fig. 9). With its Chairman, Vice Chairman, General Affairs, Fishing Manager, Financial and Accounting groups, the Mae Rumphung Beach Set Net Fishing Group Committee is being supported by five fishing teams from 7 fishing villages, where each fishing team consists of 12-15 fishers who also provide four fishing boats for the set-net fishing operations.

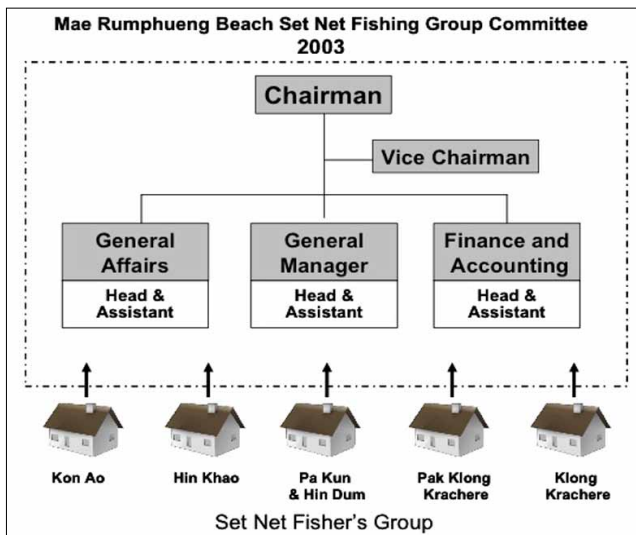


Fig. 9. Set Net Fishing Administrative and Management Committee (SNAMC) during the first year of the project

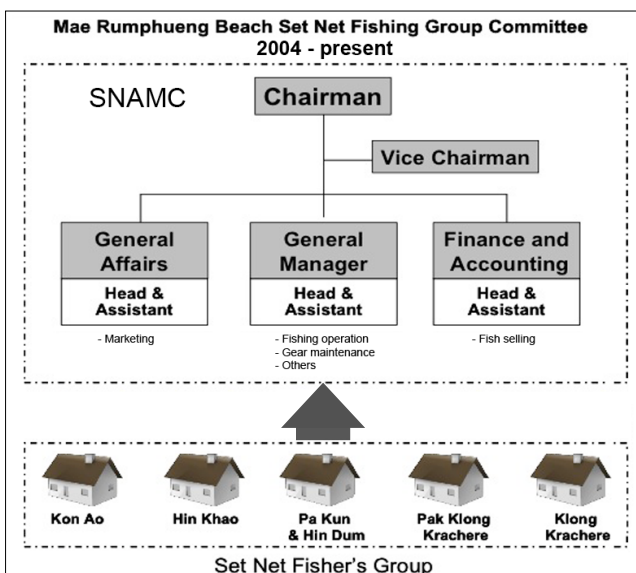


Fig. 10. Improved Set Net Fishing Administrative and Management Committee (SNAMC)

Management of the fishing operation of the first year seemed difficult and complicated. Thus, efforts were made by the fishers to address the concerns, by designing their own system using practical ways. Under this system, five fishing teams conduct alternate fishing operations every two days, of which income from the catch is evaluated as soon as two rounds of each team's operations are completed within the designated one-month period. Moreover, with lessons learned from past operations, the fishers also exerted efforts to address the problems not only in fishing techniques but also in managing the fisher groups. As recommended during an evaluation, reorganization of the Set Net Fishing Administrative and Management Committee (SNAMC) was made where all implementing members of the fisher groups were placed under the management of the Fishing Operation and Profit Management Section.

The newly introduced scheme which also included a provision for 2 fishing teams to operate the gear under the management of the Fishing Operation and Profit Manager, proved to be effective. Most importantly, improved marketing system was also set-up by the fisher groups at the central market of Rayong Province. Moreover, financial management and accounting systems were strengthened resulting in better results during the second year of set-net operation.

Although there were no reported negative impacts of the set-net fishing to the other small-scale fishing activities in the area, some conflicts had been noted with pair trawler operators from other provinces due to the effect of the barriers that were installed as part of the set-net construction. Nevertheless, local small-scale fishers in the area were very satisfied with the set-net project as it spared their fishing ground from being exploited by other fishers as this area had also been used for squid jigging by artisanal fishers (Fig. 11). The set-net project area has therefore been turned into a trawler-free zone (Munprasit *et al.*, 2009).

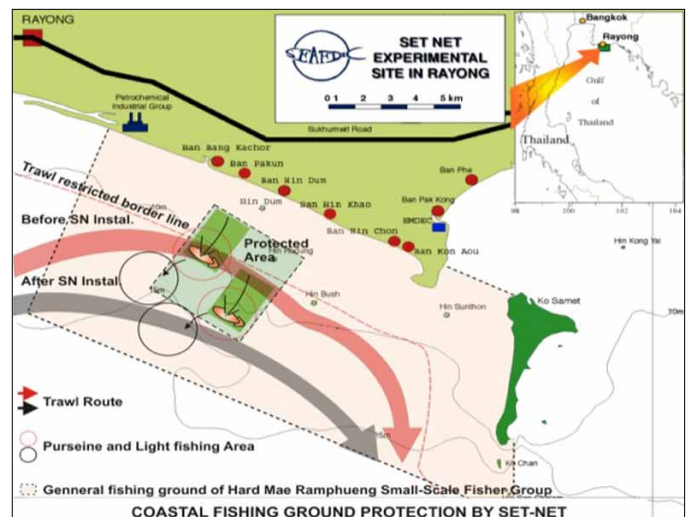


Fig. 11. Fishing ground protected by the set-net project

Impacts of Improved Set-net Fishing Technology

The performance of the Japanese-type set-net technology transferred to Thailand has been considered very satisfactory, specifically after modifications and improvements of some parts of the construction to suit the conditions of coastal fishing grounds of Southeast Asian countries, especially in the Gulf of Thailand which generally has a shallow-flat bottom. The Otoshi-ami type set-net with 2 sub-leader nets, deep and narrow chamber entrance (5/6 of sea depth) and bottom pulling rope in 4-6 bottom corners of the chamber, was adopted in the coastal waters of Rayong, where two sets of Otoshi-ami had been operated under the set-net project until 2012.

Aside from enhancing the fishers' regular catch with improved income year by year, the members of Rayong set-net fisher groups gained knowledge and experience from the set-net fishing operations. The fishers also improved their skills and capability in handling and managing the Japanese-type set-net with minimal support from the technical supporting partners (*i.e.* EMDEC/DOF and SEAFDEC/TD). As a result, the fishers are able to complete one round of fishing operation within 30-60 minutes depending on the catch and sailing time for one trip which takes 2-3 hours. With such efficiency, the fishers' remaining time of a day could be spent for other relevant activities.

The almost nine-year experience from the Rayong set-net project has amassed data and information which the local and central government could use to manage the coastal fisheries in terms of both human and coastal resources development taking into consideration the environmental impacts of fisheries. The set-net fishing gear, which is not only environment-friendly, has also established good cooperation among the local small-scale fishers through their participation in the set-net fishing operations. Therefore, set-net fishing technology serves not only as means of improving the incomes of fishers but also in promoting collaboration for resource conservation.

The gear which could be used in coastal fishing grounds with due consideration to the environment, is also a tool for protecting the bio-diversity of the coastal areas and conserving the fishery resources. The small-scale fishers group participating in the project in Mae Rumpheung expressed maximum satisfaction in the adoption of set-net fisheries especially during the eight years of the project implementation, where the average catch from operating two sets of Otoshi-ami was about 333 kg per trip and an average income of over 11,400 Baht while the average operating cost was 5,000 Baht. On the overall, the fishers' income in 2010-2011 was over 1,000,000 Baht (Munprasit *et al.*, 2008 and 2011).

While catch from the Rayong set-net recorded no trash fish, another near-shore set-net experiment using Choko-ami in Sriracha, Chonburi Province reported about 58% trash fish of the catch, comprising tharapon and pony fish, and some juveniles of high-value economic fishes. In this regard, it is recommended that a distance of about 1.0 km from the shore must be set aside as a free zone for set-net, 2-3 km from the shore could be considered for set-net fishing, and 3-5 km from the shore could be highly recommended for set-net fishing as shown in **Fig. 12** (Munprasit *et al.*, 2009). In 2009, a set-net project similar to that of Rayong's was introduced to the eastern coast of the southern part of Thailand in Bangsaphan, Prachuap Khirikhan Province.

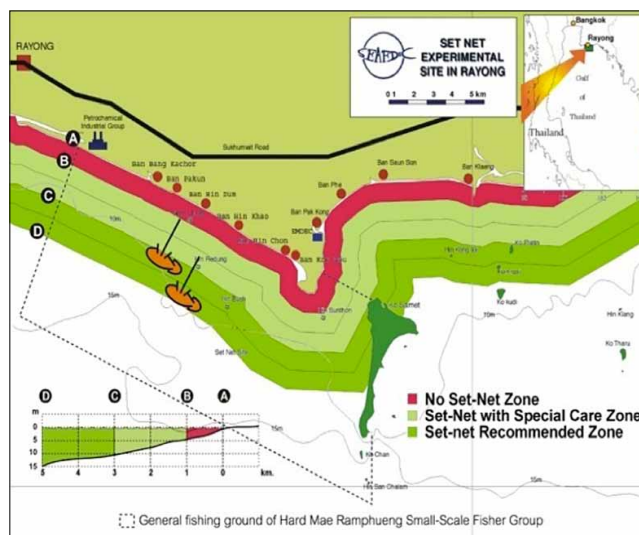


Fig. 12. Recommended set-net fishing zone

The first operation of the Bangsaphan project which was carried out in 2012, yielded an average catch per haul of over 500 kg of mackerel, sardines, trevally, and squid. The Bangsaphan small-scale fishers attempted to improve the technology for their future fishing operations after noting that as a tool for coastal fisheries management, set-net has various advantages (**Box 2**), while set-net fishing operation under the community-based management could bring about ancillary activities that benefit the communities in the set-net area, such as developing of local central market by the fisher groups, establishing a cooperative working system, value adding of fish products by members of the fisher groups' families, promoting eco-tourism, and so on. Community-based set-net also raises the awareness of local small-scale fishers and local communities on the significance of sustainable utilization of coastal resources and on the need to take good care of the environment.

Box 2. Advantages of the set-net fishing technology

- An efficient fishing method for the community without endangering the environment because its construction requires floats, ropes and nets;
- Big-scale of the gear requires the full cooperation among fishers;
- Life-span of set-net is longer than the bamboo stake trap which necessitates reconstruction every year;
- Installation is easier and could be finished within a short period (2 weeks) while bamboo stake would take about 2 months;
- In the long run, investment cost is much cheaper, *e.g.* the cost of materials of the Rayong set-net was about Baht 452,180 and can be used for nine years while one set of bamboo stake trap of the same size would cost about Baht 150,000 which should be reconstructed every year (SEAFDEC/TD, 2005).

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