

Aquaculture and fishing management in coastal zone demarcation: the case of Thailand

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Policies on fisheries management

The Department of Fisheries (DOF) of Thailand proclaimed the fisheries area nationwide into three management zones legalized under the National Fisheries Law of 1947. Zone 1 covers the coastal areas from the shoreline to a distance of 3 km. Zone 2 includes the inshore areas covering the distance from 3 km to 12 km of offshore. Zone 3 is the exclusive economic zone covering 200 nautical miles from the inshore line. Such fisheries management zones however, have not effectively reduced the conflict between commercial and small-scale fishers who compete to exploit the fisheries resources in specifically in Zone 1. Recognizing this problem, the DOF promoted the concept of territorial use rights in fisheries and a fishing rights system to strengthen the defined coastal zone management boundaries.

Theoretically, the fishers and stakeholders take their role as resource managers seriously. They participate in decision-making processes on coastal resource management in their own areas of responsibility. They make use of accessible infrastructure to develop their respective fishing community's economies. Such actions have led to the improvement of the fishers' and stakeholders' livelihoods and security while also empowering them to participate in the responsible and exploitation of the marine resources.

The fishing rights pilot project implementation

The DOF formulated the Fishing Rights Pilot Project under the Eighth National Social and Economic Development Plan to address conflicts between commercial and small-scale fisheries in Prachuabkirikhan Province, Thailand. This pilot project was broadly based on the concept of Territorial Use Rights in Fisheries (TURFs) and the fishing rights system of Japan. In practice, the

concepts of both systems are similar, clearly defining coastal zone management boundaries with exclusive use rights for fisheries. In Japan, the fishing rights system belongs to the Fisheries Cooperative Associations (FCA), of which Japanese fishers should be members in order to gain the right to access fisheries.

The Fishing Rights Pilot Project was implemented in the coastal zone at Bang Saphan Noi and Bang Saphan Districts, Prachuabkirikhan Province in 1997. The coastal areas of these two districts, covering a distance of up to 5 km from the shoreline, were demarcated. Small-scale fishers are free to fish inside the designated zone, however irresponsible fishing gears and particular trawls and light luring purse seines using mesh size smaller than 2.5cm are legally prohibited inside the zone (Yamao and Suanrattanachai 2002).

Coastal zone demarcation in Chumphon Province

A locally-based coastal resource management project was implemented in Pathew District in Chumphon Province, Thailand (LBCRM-PD) as a collaborative project of the DOF and SEAFDEC Training Department (TD). Comprising a number of activities, Activity 2 which included zone demarcation, was encouraged and extended in the district under the LBCRM-PD (Yamao and Suanrattanachai 2002). The zone demarcation activity made use of the experience from the zone demarcation in Bang Saphan and Bang Saphan Noi Districts, but covered a distance of only 3 km of coastal areas as defined in the National Fisheries Law, 1947. The zone demarcation was aimed at alleviating the conflict between small-scale fishers and commercial fishing boats that operate such gear as trawls and push nets.

The fishers and stakeholders' participation in the coastal resource management was guided by the legal framework of the Constitution of the Kingdom of Thailand, 1997. The constitution defined that these stakeholders have the right to participate in decision-making processes on local resource management. The Chumphon Provincial Office of Fisheries officials took a leading role in conducting public hearings on the zone demarcation at Pakklong Sub-district, after which the fishers and stakeholders of the Sub-district agreed on the marked position and areas of the zone demarcation.

The Pakklong Sub-district Administrative Organization (Ao Bo To) submitted the community's consensus on the zone demarcation to higher authorities of the government agencies. After the Cabinet approved the zone demarcation, Chumphon Province made a proclamation on the zone demarcation on October 4, 2002, which was made effective one month later on November 4, 2002. The zone demarcation consisted of two areas. Area I covers forty-six km² from Bang Bird Mt. to Khao Lamyai Mt. while Area II is 70 km² from Khao Lamyai Mountain to Khao Bang Jak Mountain. (Auimrod et al. 2003). Since Area I and Area II are not defined as an exclusive use rights area, both local and non-local small-scale fishers conventionally utilize its fisheries resources. The zone demarcation was an outcome of the local fishers' and stakeholders' participation in hearings that achieved a community consensus on coastal zone management.

Zone management for fishing and aquaculture

The local fishers, fish farmers and other stakeholders benefit from the utilization of the coastal area in the demarcated zone, through fishing, boat cruises and engaging in fish cage and shellfish culture (Suanrattanachai et al. 2003), particularly in Area II. However, while the Area II conflict between small-scale fishers and commercial fishing

boats was alleviated, new conflicts between the fishers and fish farmers also became a serious problem. Fish farmers including the newcomers tried to expand their fish cage culture areas. The newcomers marked certain areas and reserved these areas for their own use for fish cage culture. Some of these marked areas encroached into the conventional cruising lane of fishing boats. Additionally, some of these marked areas have been used as safe anchorage for fishing boats during the monsoon season to avoid disasters from strong winds.

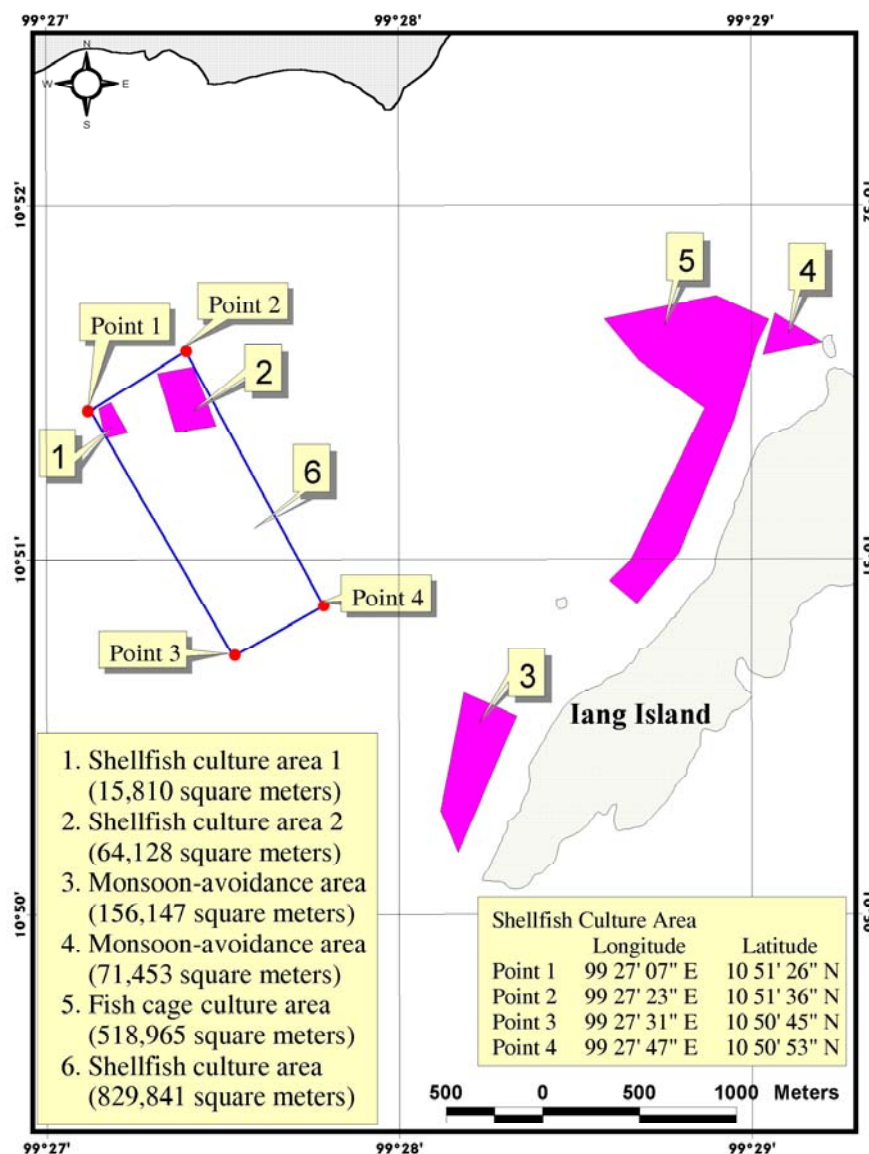
To alleviate the conflict between the fishers and fish farmers, the Chumphon Provincial Office of Fisheries and the LBCRM project staff proposed to implement the concept of zone management for fish and shellfish culture. The main objective was to reduce the conflict between the fishers and fish farmers in utilizing the fishing grounds in Thungmaha Bay, Pakklong Sub-district, and to control the number of fish farmers and fish cages and farming area. After stakeholders adopted this concept, the Provincial Office held the first pre-consensus meetings with all seven villages of Pakklong Sub-district. The elected representatives of each village joined the Provincial Office and the project staff to conduct site selection using a global position system (GPS). The elected representatives fully supported the move to mark the site selected based on their local knowledge and customary life in the fishing grounds.

The marked site selected was divided into three areas corresponding to their main usage. One area intended for fish cage culture covering Area No. 3 and No. 5, is 300 rais (48 hectares); the second area for shellfish culture covers Area No. 6, which is 600 rais (96 hectares); and the third area (Area No. 4) is reserved as a monsoon anchorage place to provide a safe place for the fishers.

In 2004, the Provincial Office tried to formally propose the zone management for aquaculture under the Seafood Bank Program. However, this program was stopped after the Thailand political crisis in September 2006.

In practice, all stakeholders particularly the fishers and fish farmers respected the rules and complied with the provisions of the zone management for aquaculture. Thus, the newcomers

Fig. 2. Final draft of the designated zone management for fishing and aquaculture, Pakklong Sub-district



Arranged by Sukchai Arnupapboon and Siriporn Pangson, Research Division Southeast Asian Fisheries Development Center, Training Department, February, 2003.

Provided by Sukchai Arnupapboon and Siriporn Pangson, Capture Fisheries Technology Division, SEAFDEC/TD.

stopped expanding and reserving the coastal areas for their own use for fish cage culture. The fishers conveniently cruise their boats for their fishing operations in the area surrounding the Thungmaha Bay. The zone management for fishing and aquaculture does not exclude outsiders, but they have to obey and comply with the community's rules on zone management especially on where to fish and where to operate their fish culture cages.

The implications of the zone management

Major conflict

A major conflict between crab trap fishers and the fish farmers using push nets for collecting fish bait (trash fish) became a serious problem of the zone management in Pakklong Sub-District. Crab trap fishers claimed that they lost their crab traps due to the push net operations for fish bait. Thus, the fish farmers, operating push nets for fish

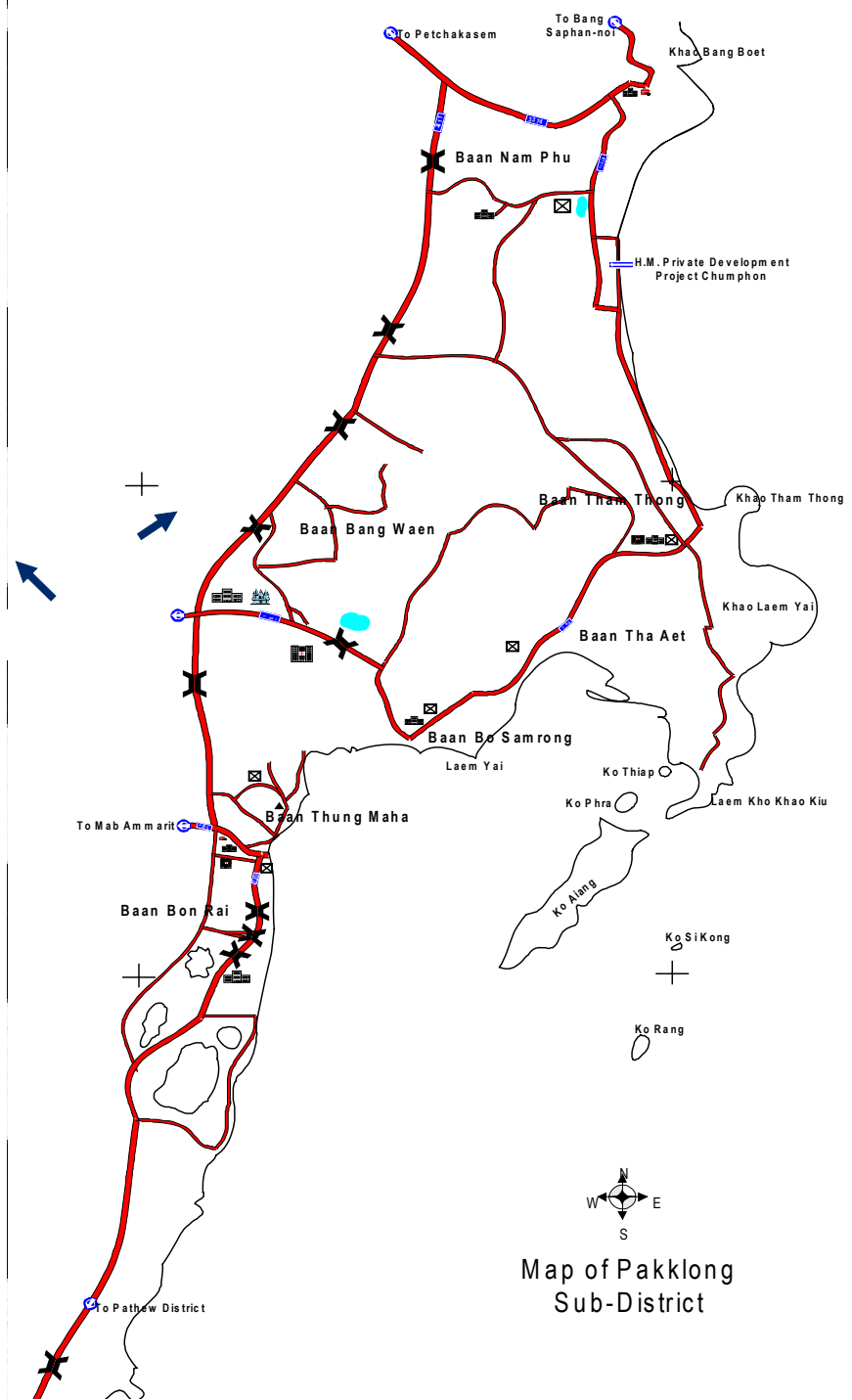
bait, had to pay certain compensation to the crab trap fishers for the traps destroyed.

Push net and crab trap fishing are actually illegal fishing operations. In practice, fish farmers still continue to operate the push net to catch fish bait because they claimed that the fish caught helped them reduce the cost of feed for their fish cage culture ventures. The price of fish bait sold in frozen fish plants are not affordable due to their high price. Meanwhile, the crab trap fishers also continue to trap the crab resources whole year round except from October to December as regulated under the National Fisheries Act, 1947, Section 32, which prohibits taking of gravid crabs such as *Scylla serrata*, 2) *Portunus pelagicus*, and 3) *Charybdis ferriatus* during that period (Bureau Office of Fisheries Administration and Management 2007).

Conflict resolution

The stakeholders particularly the crab trap fishers from village no. 7 and the fish farmers using push nets for catching fish bait from village nos. 1 and 6 of Pakklong Sub-district convened a meeting to solve their respective conflicts. The rationale of the meeting was to end the problems of fishing gear loss and destruction of both push net and crab traps on one hand, and the alleviation of the expected declining coastal resource on the other hand. The head of village no. 7 was the chairperson of the meeting. Crab trap fishers and fish farmers living in all the villages participated in the meeting.

During the meeting, the fish farmers proposed that they would continue to engage in push net operation in the boundary of 200 m only, which surrounds their respective fish culture areas. Such agreed limited area for push net operation fully supported the reduction of crab trap destruction. The fish farmers also proposed to assign certain fishing days for each group, so that crab trap fishers could have their fishing days during odd number calendar dates while the fish farmers could have fishing days on even number dates. The fish farmers also offered to allow the crab trap fishers to set their traps inside the 200 m boundary of their fish culture areas on odd dates (Chart 1), and agreed that push net operators that did not follow this arrangement and caused destruction of crab traps would have to pay compensation to crab



Map of Pakklong Sub-District

fishers. Stakeholders agreed on these arrangements as rules. However, these rules could be cancelled whenever government agencies consider such rules as not applicable. Since the social endorsement of the community rules on fishing operational management has been fully respected by the stakeholders concerned, non-local stakeholders who come to fish around the zone management area also obey these rules. Such rules have been put in effect and practice from May 2003 until the present.

This is a traditional practice of self-governance in fisheries by the local stakeholders in Pakklong Sub-district, which has become part of the LBCRM project implementation. The local stakeholders initially solve their conflicts in fishing in the same area using their own ways, making use of the regulations on zone management for fishing and aquaculture to alleviate the conflict. Thus, they applied a form of “sharing the fisheries” by assigning particular fishing day or fishing time for their respective fishing operations.

However, the Pakklong Ao Bo To Council and the higher authorities of the government agencies have not officially approved the community rules on fishing operational management. At the same time, the stakeholders concerned also recognized the vulnerability of such community rules, but they appreciate the rules just the same to help them control and manage the stakeholders' utilization of the fishing ground.

Opportunity and linkage to traditional-and-legal practices

The stakeholders have taken advantage of the geographic boundary of the fishing zone management to settle their conflicts and share resources. As demonstrated, this initiative strongly supports the concept of community-based fisheries management (CBFM) with clearly defined boundaries (Petchkamnerd et al. 2003). However, as demonstrated through the CBFM project in Pakklong Sub-district, uncertain implications became obvious as some stakeholders continue to irresponsibly operate push net and crab traps. These types of fishing gear operations are not legally recognized and defined by the Thai National Fisheries Law, 1947, Section (7) and (32) to operate in a restricted fishing ground and fishing season.

The Pakklong Sub-district Administrative Organization Council has the full authority and function to manage and control the use of the coastal resources in its own boundary. This authority and function is defined in the Ao Bo To Act, 1994 (Ratchagool and Tambol). The Council has not submitted the community agreement to higher authorities such as the District Office and Provincial Office of Fisheries for approval. This is because such means of fishing operation by the concerned stakeholders are also not legitimized. Therefore, the community's compliance with the agreed rules may not be sustainable. For such reasons, the gap between traditional and legal practices certainly remains wide, leading to less opportunity of combining and institutionalizing both stakeholders to have jurisdiction with any community agreement under a community-based organization or entity.

The institution of community-based organization or body should come first. Then, the community-based organization will be delegated the right to fish including (World Humanity Action Trust 2007):

Table 1. Number of respondents by type of engagement in fisheries sector

Type of respondents	Village No. 1	Village No. 6	Village No. 7	Total
Engaged in fishing only	0	0	22	22
Engaged in both fishing and aquaculture	3	1	1	5
Total	3	1	23	27

Table 2. Households engaged in coastal aquaculture and their capacities

Village	No. of farming household	Experience on average (years)	Grouper		Sea bass	
			No. of cage (cages)	No. of fish (tails)	No. of cage (cages)	No. of fish (tails)
No. 1	3	10	9	233	10	317
No. 6	1	9	3	450	2	350
No. 7	1	0.5	1	300	1	200

Table 3. National Fisheries Act, 1947 legally controlled push net and crab fisheries resources

Item	Ministerial Notification	Provincial Notification
Push net [7],[8]	Section 32 (2) and (4): prohibits push net fishing gear operated by powered boat having length longer than 14 m, from fishing operations in territorial waters of Prachuabkirikhan Province, Chumphon Province and Surattani Province (Annex II)	MOA 0528/10491 on September 18, 2002: prohibits all kinds of push net fishing gear from fishing operation in the demarcated coastal zone of Chumphon Province (Annex IV)
Fertilized crab fisheries resource [7]	Section 32 (7): prohibits anybody from fishing gravid crab species, namely: 1) <i>Scylla serrata</i> , 2) <i>Portunus pelagicus</i> , 3) <i>Charybdis ferriatus</i> from October to December annually, but allowed governmental officials to fish the fertilized crab fisheries resources for experimental purposes (Annexes I and III).	
Crab trap [9]	The crab trap fishing gear was not defined in Section 4 (13), (Annexes I and III)	
Fish farmer[9]	Section 5, Ministerial regulation No. 5 (1947): culture of fishes in allowable areas (Annex V)	

- The right of exclusion, ie. the right to limit access to a territory. These rights are anticipated to bring security, exclusivity and permanence to community-based organization to manage the coastal resource in a certain defined boundary [18]. The practice of CBFM in Pakklong Sub-district without doubt showed that both stakeholders have not received the right to fish as suggested.
- The right to determine the amount and the nature of the use right in a territory.
- The right to extract benefits from using the resources within a territory.
- The right to the future returns from the use of the territory.

Practice and awareness to sustain resource use

Both fish farmers and crab trap fishers recognized that their means of fishing operation may have contributed to the vulnerability of the sustainable resources. Each user has his way of sustaining the use of the fisheries resources to secure their livelihood and employment. The fish farmers have tried buying fish bait more frequently than doing push net operation. Now, they operate the push net in the surrounding area within 200 m distance from their cage culture establishments.

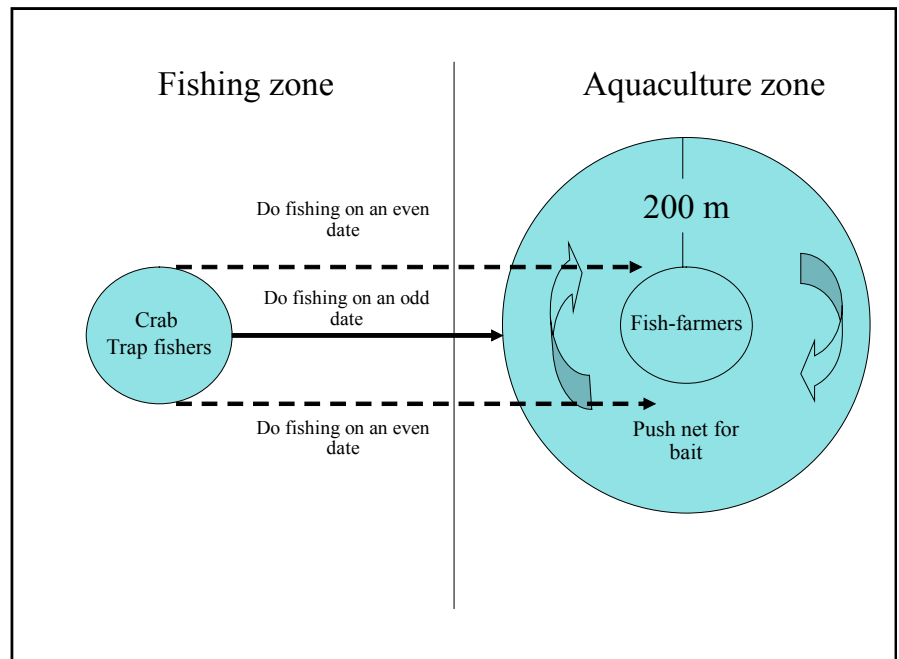
Crab trap fishers have also their own means of strengthening the manner of sustainable resource use. Actually, the crab trap fishers organized themselves into a fishers' group using crab trap, as suggested by a local Thai non-governmental organization, the Thai Environmental Institute. The constitution of the group received technical support from the Chumphon Marine Fisheries Development Center (CMDEC) and SEAFDEC/TD. The main activity of this group is to operate the crab bank. Thus, every member of this group has been requested to donate and put gravid crabs in the crab bank cage. Moreover, every member has to use crab trap with 2.5 inches mesh size of the bottom net.

The releasing of gravid crabs into the cages is meant to enhance the crab resources. In return, this activity gives a good experience to crab trap fishers who are members as well as non-members of the crab trap fishers' group. They cited that releasing gravid crabs into the cage is effective in enriching the recruitment of the crab resources. They get more yields now compared with the pre-conducting crab bank activity. To strongly contribute to the group activity, SEAFDEC/TD extended assistance to the chairperson of the fishers' group using crab trap to enable him to visit the crab resource enhancement activity in Japan. Now many members of the fishers' group using crab trap release gravid crabs voluntarily in their own crab cage. Such action shows that the members are aware of the sustainable use of the crab resources.

Conclusion

The clear defined division of coastal area in Thailand has been undertaken to reduce conflicts between small-

Chart 1. The designated boundary of fishing zone with clearly defined fishing days practiced in Pakklong Sub-district



scale fishers and commercial-scale fishers. Community-based fisheries management (CBFM) is an appropriate approach to encourage stakeholder's participation in managing the coastal areas and can help reduce social conflicts in the fisheries sector.

The practice of coastal zone demarcation in Chumphon Province is an outcome of the locally-based coastal resource management project. The coastal zone demarcation was originally based on the consensus of the stakeholders' democratic participation in zone management of a designated coastal area under the legal framework of the Thai National Fisheries Law, 1947. The coastal zone demarcation of Pakklong Sub-district, Pathew District, Chumphon Province became a legal legislative by notification to the Chumphon Provincial Office since on 4 November 2002.

Within the boundary of the coastal zone demarcation of Pakklong Sub-district, a fishing zone management for fishing and aquaculture has been implemented. The zone management is a mechanism to control the number of newcomers and their capacity on fish cage culture that is friendly to coastal environment. The local stakeholders conventionally operate in the territory of the recognized zone management areas reserved for coastal aquaculture establishment and as cruising lane for fishing boats.

The community agreement could secure the efforts of the fish farmers to do push net operations for fish bait within the 200 m boundary of their fish cage culture areas on even calendar dates. Similarly, crab trap fishers are safe to do crab trap fishing on odd dates of the calendar without any destruction from any push net operation. However, the community agreement may not be effective much longer because it has no legislative framework especially that push net operation for fish bait is not legally recognized. Therefore, both stakeholders may not be legitimized to establish community-based organization to take the function of managing the coastal resources.

Fortunately, the fish farmers and crab trap fishers still have the sensible awareness of the sustainable use of the coastal resources. Fish farmers try to buy fish bait more often for fish cage culture to replace their catch from push net. Crab trap fishers release gravid crabs into crab cages to enhance the stock of the crab resources.

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Reservoir fisheries of freshwater prawn – success story of an emerging culture-based giant freshwater prawn fishery at Malampuzha Dam in Kerala, India

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The Department of Fisheries of Kerala State in India stocked 600,000 post larvae of the giant freshwater prawn, *Macrobrachium rosenbergii* (also known as 'scampi' in India) in Malampuzha Dam in Palakkad District during September–November 2005 and began harvesting medium and large sized prawns in April 2006. The fishing operations are being done by newly formed fishers Self Help Groups (SHG). The fishers harvest 30-50 kg daily, the large sized prawns sold at about Rs. 300/kg to an exporter at farm gate. This fishery has brought considerably higher income to the 122 tribal and settler fisher families, including 47 SC/ST families (underprivileged communities protected by legislation), in the hill tracts.

M. rosenbergii is not endemic to the Malampuzha - Bharathapuzha river system, though it occurs in southern Kerala. In the past where Vembanad Lake connected to the Arabian Sea there was a flourishing fishery, now dwindling due to barrage construction, pollution and other anthropogenic factors.

Prior to the formation of the SHGs the tribal people and settlers around the dam were engaged in fishing in the 2,320 ha reservoir (the main objectives of damming the Malampuzha river in

1952 were for irrigation and potable water), but the landings were poor due mainly to poaching and lack of motivation and participation of local fishers. The newly organized SHGs were motivated and cooperative with the participatory approach adopted by the DoF, allowing the 'poachers' to join as SHG members, which had a healthy effect on management and fish yield.

A survey of the reservoir catches conducted on 16/06/2006 showed that until about 10 am 719 kg of finfish (stocked Indian major carps, common carp and naturally recruited wild fishes, mainly minor cyprinids and catfishes) and stocked prawns were landed and sold at the DoF fish sales counter, of which 41.8 kg (fetching Rs 10,450) were from the prawns. *M. rosenbergii* males and females (all berried) caught ranged from 200 to 350 g and 25-30 cm, and about 100-150 g and 20-24.5 cm, respectively.

A total of 53.53 tonnes of fish and prawns amounting to Rs. 14.75 x105 were caught during the year 2005-2006. The average annual production from Malampuzha reservoir for the past 15 years was 3.76 kg/ha, the highest being 9.4 and the lowest 0.07 kg/ha. The production for the year 2005-2006 was 23.14 kg/ha, showing a 20 kg/ha



SHG fisherman using a tire tube as a float to sit on while fishing for prawn/ laying gill nets. Both fish and prawn are caught with the monofilament net of mesh size 12, 15 & 20 cm.



M. rosenbergii from Malampuzha Dam.