

**Sustainable Management Measures for Blue Swimming Crab (*Portunus pelagicus*)
Fishery: A case study in Sikao District, Trang Province, Thailand**

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ABSTRACT

Swimming blue crab fishery is a mainstay of small-scale fishers in Sikao District. Two fishing gears are mainly employed, i.e., crab gill net (CGN) and crab trap (CT). The socio-economic conditions of the fishers are varied to fishing ground, type of fishing gear and marketing. The average total cost of CGN was higher than CT due to the fishing grounds of CGN are further than those of CT and maintenance including replacement costs of CGN were rather high. However, the total revenue of CGN was higher than CT.

The catches composition of CT mainly is small size crabs, thus the fishers have to boil and picking the meat for value added. In contrast, the catches composition of CGN mainly is medium and large size. Thus, it may conclude that the marketable size of crab can be found in the deeper sea areas. The average catch per trip is varied to seasons, the catch in rainy season was higher than dry season significantly.

At present, the management of crab fishery is not well established. Any proper management measures did not apply to this fishery and results to the declining of swimming blue crab stock in the study area. Thus, in order to sustain crab fishery in Sikao District, appropriate management measures should be urgently implemented. The recommended measures are mesh size limit, size of crab to be caught, limit amount of fishing effort of individual fisher, and seasonal and area closure. However, all of the measures should based on fishery biology of the crab and livelihood of small-scale fishery households.

Key words: Management measures, swimming blue crab fishery in Thailand

Introduction

Swimming blue crab (*Portunus pelagicus*) is an important economic aquatic species of Thailand. It is utilized by both small-scale fisher and commercial fisher. The production is used for local consumption and export. The export statistic has shown that in 2002 Thailand exported frozen and canned crab at the quantity of 4,936.43 MT with the value of 1,403.57 million bath (35 million US\$ approximately). However, in 2003 the export is dropped rapidly due to low production of crab and the size of caught crab was smaller than the previous year (Tiensongrassamee, 2003). This results from the increasing of total amount of fishing effort of crab fishery which derived from the increasing in number of fishing gears and improvement of its efficiency. In addition, the fishers use a small mesh size of net to catch crab then the small size crab is easily to be caught (Nitiratsuwan and Juntarashote, 2003). Furthermore, the habitat of crab is degraded by environmental changes and operation of trawler and push net (Tiensongrassamee and Pratumchart, 1999).

So far, the management of crab fishery in Thailand is based on scientific evidences. Thus, there is only one management measures that has been implemented for crab fishery is mesh size limit of crab gill net and crab trap because the knowledge on biology of crab is rather limited. However, the mesh size limit measures is established without the consideration on distribution of crabs which the small size crab will live in the sea area 2-3 km from shore whereas the big size live in the deeper area. In Australia, the management of crab fishery is developed from crab stock assessment in 1994 and set a management strategy (Baker and Kumar, 1994 and Baker, 1998). The total allowable catch is determined and management measures on catch quota is established (Boxshall et al, 2000).

Crab fishery in Sikao District, Trang Province, a province in the coastal area of the Andaman Sea, has been mainly practiced by small-scale fishers who have low education and income for more than three decades. Majority of small-scale fishers rely on income from crab fishery and they try to catch crab as much as possible at any size of crab (Nitiratsuwana and Juntarashote, 2003). Thus, the implementation of mesh size limit measures is hardly accepted by them and result to failure of management. Therefore, under the constraints of scientific evidence limitation, a new approach for crab fishery management should be considered. The management measures may develop from the economic conditions and fishing activities of the fishers. Therefore, this study intends to clarify the fishing activities and economic conditions of small-scale fishers in Sikao District and the factors that relate to crab fishery production. Then an appropriate management measures will be introduced.

Objectives

To clarify the economic conditions and crab fishery operation of small-scale fishers in Sikao District, Trang Province.

Methodology

Krejcie and Morgan's Table is applied for determine sample size and samples are selected randomly from all villages around Sikao Bay. The 136 small-scale fishers were interviewed through prepared questionnaire from March to May 2003. The information on economic conditions of small-scale fishers, crab fishery operation, and cost and return of crab fishery by type of fishing gear will be collected. The data will be analyzed by using chi-square, percentage, means, t-test, one-way ANOVA and post-hoc by Scheffe's.

Results

There are 7 fishing communities in Sikao District, Trang Province that engage in crab fishery. They are Changlang, Pakmeng, Toban, Bangkangkao, Lammakam, Tungtong and Lamsai (see Figure 1). The main fishing gears employ by the small-scale fishers in this area are ordinary crab trap, collapsible crab trap and crab gill net (see Figure 2).

Crab Fishery In Sikao District

Fishing Boat

The fishing boat that use in crab fishery is outboard powered boat with the average length of 8.5 m. The average price of the boat was 21,613 baht with the average lifetime of 12 years. The average maintenance cost was 5,161 baht per year. The average engine (8 HP) cost was 18,780 baht with the average lifetime of 11 years and its maintenance cost was 1,656 baht per year. In each trip, the fishers use fuel for 4.7 liter per trip in average. The number of fishing days was 148 days in dry season and 130 days in rainy season. The main fishing grounds are the sea areas around Hai Island, Lamsai Beach and Sikao Bay.

Fishing Gears

Originally, the fishers caught crabs by using a fishing gear that similar to long line. When the crabs eat the bait the fishers collect them by using a scoop net. The production mainly used for daily consumption. This type of gear is disappeared at present.

In 1980, the middlemen introduced crab gill net that using nylon net to fishers in Sikao District. The mesh size of the net was 4-4.5 cm with a length of 180 m per piece and 1 m in depth. There were 4-6 pieces in a set of crab gill net with the total length of 1,440 – 2,160 m. The structure of the crab gill net has shown in Figure 3. The fishers employed 3 sets of gill net per trip. The cost of gill net per set was 2,948 baht with a lifetime of 4 months. The fishers set the net at the water depth of 4 – 12 m.

In 1996, the ordinary crab trap is introduced to this area. It constructs with iron wire in box shape with the dimension of 30 x 60 x 20 cm. The red color net with mesh size of 1.8 cm is used for the trap (see Figure 2 (a)). The cost of trap was 50 baht per trap with a lifetime of 7 months. A fisher employed 80 traps per trip and used 4.9 kg of bait with the value of 47.2 baht. The fishers set the traps at the water depth of 2-5 m.

In 2003, the collapsible trap is introduced to Changlang community. It constructs with aluminum wire with the dimension of 30 x 60 x 20 cm and use green nylon net with the mesh size of 1.4 cm. The cost of trap was 60 baht per trap. The traps are attached to a main rope (1 km in length), each trap has an interval of 20 m. In each trip the fishers employed 200 traps and used 10 kg of bait with the value of 85 baht. The fishers set the traps at the water depth of 6-10 m.

Operation of Crab Fishery in Sikao Bay

The operation of crab fishery in Sikao Bay was varied from community to community. However, in general the operation is more or less the same the differences are fishing ground and size of caught crabs. The activities in each community are described as follows.

Ban Chanlang

Crab Traps (ordinary and collapsible traps)

There were 19 fishers who employed this gear and their houses are located 350 m from Changlang canal. Crab fishery is their solely income and their fishing grounds are Pakmeng Beach, Chaomai Beach, Changlang Beach, Yao Beach and Pling Island. The fishing grounds cover the lowest tide area to 1.5 km from shore. The caught crabs are mainly small-size crab that

the price is very low in the market. Thus, the fishers have to boil the caught crabs and picking the meat for market. Therefore, the income of these fishers was in low level and they have to obtain loan for daily consumption. They mainly obtain loan from middlemen for daily consumption and fishing operation.

Regarding fishing operation, the fishers leave from their house at 5.00 AM to collected crabs from the traps that have set in the sea and back to shore around 8.00-10.00 AM. The marketable size of crab will be sold to middlemen and the non-marketable size will be boiled for 30 minutes and picking their meat. Then the fishers buy bait for crab traps and back to the sea at 1.00 PM and move the traps with fresh bait to a proper fishing ground. The fishers finish the operation around 2.00 PM.

In this community, there are 2 middlemen who collect crabs one is the large-scale that deliver the crabs to collectors in Nakon Sri Thammarat Province and the small-scale deliver the crabs to town for local consumption.

Crab Gill Net

There were 6 fishers who employed this gear and their houses are located at the mouth of Chanlang canal. Their fishing grounds are the sea around Muk and Hai islands that is 4-6 km from shore. The size of caught crab is medium and large sizes. The fishers start the fishing from 5.00 AM and back to shore around 8.00-9.00 AM. The crabs will be removed from the net on shore after that the net will reset at sea in the afternoon. There is one middleman in this community. The fishers also operate fish gill net in some season.

Ban Pakmeng

Ban Pakmen is located in Pakmeng Beach a famous tourist spot of the Province. There were 16 fishers who engaged in crab fishery and they employed crab gill net as a main. Some fishers employed squid trap in some season. Their fishing grounds were Hai island that locate 14.5 km from their houses and Meng island. The caught crabs are medium and large size.

There was no middleman in the village thus the fishers sold their catches to collectors from Toban village. Some fishers sold their catches to restaurants at Pakmeng Beach and could obtain a better price particularly the live crabs.

Ban Toban

Ban Toban is located along the Toban canal 1.5 km from the mouth of canal. There were 33 fishers in the village of which 18 fishers employed gill net and 15 fishers employed crab trap. In addition, they employed other types of gear, i.e., shrimp gill net and fish gill net. Their fishing grounds were Sikao Beach, Ralamangala Beach and Ya island. The income of fishers is in low level thus they had to obtain loans from middlemen for their daily consumption and fishing expenses. There were 2 middlemen in the village, one of them collect crabs for canning crab factory in Songkhla Province.

Ban Bangkangkao

There are two groups of fishers engaged in crab fishery in Ban Bangkangkao. The first group is located 850 m from the mouth of Tanode canal and there were 8 fishers. They employed ordinary crab trap and collapsible crab trap. They are in poor economic condition. The second group comprises of 5 fishers who employed crab traps as a major gear. They also employed shrimp gill net and squid trap. The fishing grounds of both groups are the coastal area of Krabi Province and Lamsai. There is one collector in each group and the collected crabs are sent to main collectors in Ban Chaomai, Kantung District, Trang Province.

Ban Lammakam

Ban Lammakam is located 1.9 km from the mouth of Kalase canal and there were 42 fishers who engaged in crab fishery. Nearly all of them employed crab trap (only one fisher employed crab gill net). Their fishing grounds are the sea area of Sikao Bay, Lorlor island, Pluak Beach and mouth of Lammakam canal. The caught crabs mainly were small size. There are 2 large-scale middlemen and 3 small-scale middlemen.

Ban Tungtong

In Ban Tungtong, there were 29 fishers who engaged in crab fishery. They employed crab trap and their fishing ground is the sea area of Lamsai. They also employed squid trap, fish gill net and shrimp gill net. There are 2 middlemen in the village.

Ban Lamsai

There were 43 fishers who engaged in crab fishery and they employed crab gill net (only one fisher employed crab trap). Their fishing grounds are the sea areas around Hai island, Lamsai and Muk island. There is one middleman in the village and the collected crabs are sent to processing plant in Ranong Province or other collectors. The fishers in this area also employed shrimp gill net and fish gill net.

Income from Crab Fishery

The caught crabs can be divided into 2 sizes, i.e., marketable size and non-marketable size. The marketable size can be classified into large size (>200 gm per piece) and medium size (100 – 200 gm per piece). The non-marketable size is the crab with the weight of less than 100 gm per piece, they will be boiled and picking the meat (1 kg of crab meat = 3.8 kg of fresh crab).

The monthly average income of the fishers who employed crab gill net and crab trap was 6,160 and 5,031 baht, respectively. These derive from selling crab in fresh form and its meat. The income of fishers is varied according to the following factors.

1. Size of fishing boat and engine. The study revealed that the fishers who use bigger boat and high horse power engine obtained higher income because they can go the deeper areas where medium and large size crabs are available.

2. Type of fishing gear. The crab gill net production is mainly composed of medium and large size crab whereas the crab trap mainly caught the small size crab.
3. Fishing ground. The fishing ground in the deeper area is better than the shallow water area because there are more medium and large size crab.
4. Fishing season. The catch per trip and size composition is varied from season to season. The catch in rainy season is higher than dry season and in the rainy season the fishers caught more large size crab than in the dry season.
5. Price of crab. The price of crab is varied according to the location of the community. The price of crab in Ban Bangkangkao, Tungtong, Lamsai, Lammakam and Toban is lower than Ban Pakmeng and Changlang.

Conclusion and Recommendations

The crab fishery in Sikao District is open access fishery with poor management. Owing to the increasing of crab price, the fishers tend to catch more crab although the size may not market in fresh form because it is too small. This results to the declining in stock size of crab and lead to the low level of fisher income. The mesh size limit measures that implemented for crab fishery management can not get any success due to the low cooperation of fishers. Therefore, a new approach of management should be established for the sustainable crab fishery. The followings may be implemented.

1. Establishment of fishing right system for crab fishery. The open access fishery of crab fishery should be terminated and only the fishers who have fishing right can do fishing.
2. The shallow sea water area should be closed area because it is the nursery ground of small size crab. The researchers should find a new fishing ground of crab for the fishers who presently operate fishing in shallow water areas.
3. Improve crab trap for deep water operation. At present, the crab trap is mainly operated in shallow water and caught premature crab that result to the declining of new parental stock. Thus, crab trap should be modified for deep water fishing.
4. Introduction of crab bank program. The crab bank program that implemented in many fishing communities should be introduced to this area. Under the program, any fisher who caught a gravid female crab should release this crab in the cages that belong to the community for egg release. After release the egg, the crab will be sold to middlemen and the money is pooled as a revolving fund or donates to temple, mosque or school.
5. A proper mesh size should be established under the consideration of fishers and their economic conditions.
6. The self-regulation program should be implemented. In order to get a better cooperation from all fishers in crab fishery management measures, the government should encourage the fishers to establish management measures by themselves.
7. Any management measures should keep the economic conditions of fishers into account.

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