

HARD CLAM (*Meretrix* sp.) AND RIDGED VENUS CLAM (*Paphia crassisulca*) FISHERY IN KAPOR BAY

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Introduction

Ao Kapor or Ranong Lake in Ranong province is located on Andaman coast of southern Thailand. Ao Kapor is one of international wetlands which are locations of floras, terrestrial faunas, and aquatic animals. It is also considered to be one of high fishery resources productive areas of Thailand. Main utilized aquatic resources in the area are mud crab, swimming blue crab, banana prawn, mullet fish, oyster, hard clam, and ridged venus clam. Fishery resources utilization both in fishing and aquaculture were found around Ao Kapor. Hard clam and ridged venus clam were found in high density at Lam Pho Ta in Kapor Bay. Fishers collected clams from natural habitats using simple gears which result in low cost of fishing operation. This allowed most of small-scaled fishers who earn small income to operate this fishing. However, clam resources are considered as common property which makes it to be utilized by all fishers with their full capacity. Fishers collected clams by hand dredging. Though hand dredging has less impact than engine dredging, the continuous operating would result in natural clam abundance and its habitat. Most of clam product was

sent to sell in touristic place in Phuket which result in increasing of fishing effort and decreasing of clam in natural, consequentially. Non-government organization (NGO) and Department of Fishery (DOF) with cooperation of local community had announced some area in Lam Pho Ta to be a conservative zone for clams and had released clam seed in the area.

The research aimed to study clam fishery, compare average clam production between seasons, and to study the opinion of fishers on resource management and development approach in order to maintain natural clam resources in Kapor Bay further.

Material and methods

Study site

Clam fishery information was collected by interviewing with fishers and middleman. Species of clam and its production was studied in area of Lam Pho Ta which located in Kapor canal. The sampling of hard clam and ridged venus clam were taken throughout the year from 2 middlemen in order to measure size and weight. Each species was sampled at least 300 clams. Production per fisher of total 881 trips which was composed of 148 trips of hard clam's production and 733 trips of ridged venus clam's production was recorded from production list of the middleman. Furthermore, the study of clam's abundance was performed in area of Kapor canal with 20 stations which compose of 17 stations and 3 inferential stations (Figure 1). Collection time was operated in 3 seasons: post-monsoon (November-February, 2009), pre-monsoon (March-June, 2010) and monsoon (July-October, 2010). Data collection of each station was performed in area of 2×2 square meter with fishers who operate clam fishery in the area. Total 3 replications were performed in each station. The fisher's opinion about clam resources management were studied with 15 fishers in sub-district of Muang-gluang, Kapor, Banghin and Naka, Kapor district and Ranong province. This sample size obtained from the formula for determination the sample size to estimate a population proportion at 90% confidence interval and ± 5% precision (total population was 1,059 fishers with 12.0% of fishers who operate clam fishery).

Data analysis

Descriptive statistics such as percentage mean and standard deviation, median and quartile deviation was used to describe general information. Data analysis was performed with statistical package program. The difference comparison was tested with Hotelling's t statistic and one way analysis of variance when data distribution is normal and its variance is homogeneity. Non-parametric statistics of Mann-whitney U and Kruskal-wallis H test was

used to test the difference comparison when data distribution is not normal. The correlation analysis was analyzed with Spearman's rank correlation coefficient.

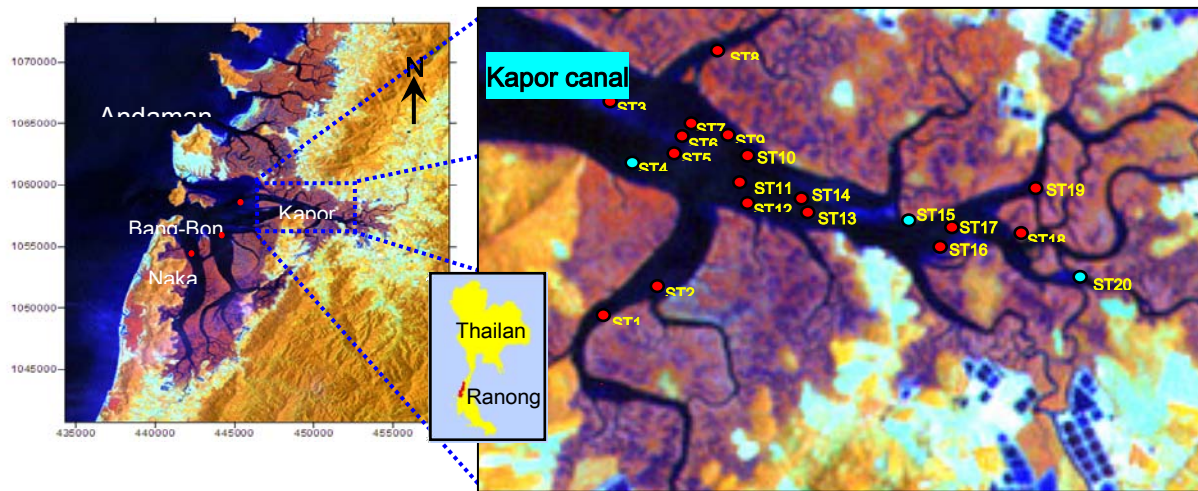


Figure 1 Location of study sites in Kapor Bay, Ranong Province, Thailand

Results

Clam fisheries

Fishers can operate clam fishery all year round when the tide is lowest for 12-15 days/month. Fishers collected clam 2 times per day when the tide is low at day time and night time. Hard clam had buried themselves down in the sediment at 5 cm depth so the fishers need to use a spoon to dig the clam up from both side of Kapor canal. Ridged venus clam was found in the area where is characterized by sand, coarse sand, and mud. This clam was collected by the gear called “Macro” which was composed of steel stick connected with dredge at one end where net was tied at the end (Figure 2). Fishers used their feet to check if there is clam on the sand, under water in the area. After that, hand-dredging were used to collect clam for about 5 minutes of each time of dredging. The clam was then released in the boat and was sort out from the gravels by fisher family member. The clam, which was less than 2 cm in size, was released back to the water with the gravels. Only some fishers had collected clam of small size (<2 cm). The clam product was then gathered by middleman and send to Phuket province.



Figure 2 Fishing gear, *macro*, used to collect ridged venus clam

Clam product

Hard clam product

Hard clam fishing ground was situated in Kapor canal. The lowest catch per unit of fishing effort (CPUE) was 1 kg when the highest was 61 kg with an average of 14.7 ± 10.9 kg/person. The median of hard clam products were significantly different ($p < 0.05$) between seasons (monsoon and post-monsoon seasons). The median of clam product in monsoon season was 11 kg with quartile deviation of 6.9 kg and the median of product post-monsoon season was 12.5 kg with quartile deviation of 5.7 kg.

The smallest hard clam sample was 0.8 cm in length when the biggest was 6.0 cm. The overall median length was 4.6 cm with quartile deviation of 0.6 cm. An average length post-monsoon season was 4.8 ± 0.4 cm with the smallest size of 3.0 cm and the biggest size of 6.0 cm. An average length in monsoon season was 3.7 ± 1.1 cm with the smallest size of 0.8 cm and the biggest size was 5.4 cm. In monsoon season, hard clam product of >50 clam/kg (46.3%), 30-50 clam/kg (29.2%), 25-29 clam/kg (13.8%), 20-24 clam/kg (9.2%), and 10-20 clam/kg (1.8%) were collected. In post-monsoon season, hard clam product of >50 clam/kg (6.3%), 30-50 clam/kg (21.4%), 25-29 clam/kg (17.9%), 20-24 clam/kg (30.6%), and 10-20 clam/kg (23.8%) were collected. Sizes of hard clam were significantly different between seasons ($p < 0.05$).

The result on hard clam population of Kapor canal in the year 2010 showed that the length of shell was 1.8-6.1 cm with the most found of 4.2 cm, especially at the station of 16, 18, 19, and 20 in Kapor Canal and station 1 in Chaklee canal. For the area where hard clam were found at sandbank was in the middle of the canal (station 3 and 6) and at the side of the river

(station 9 and 10). Station 15 and 20 was claimed for hard clam habitat when station 17 was a conservative area for hard clam (Figure 3).

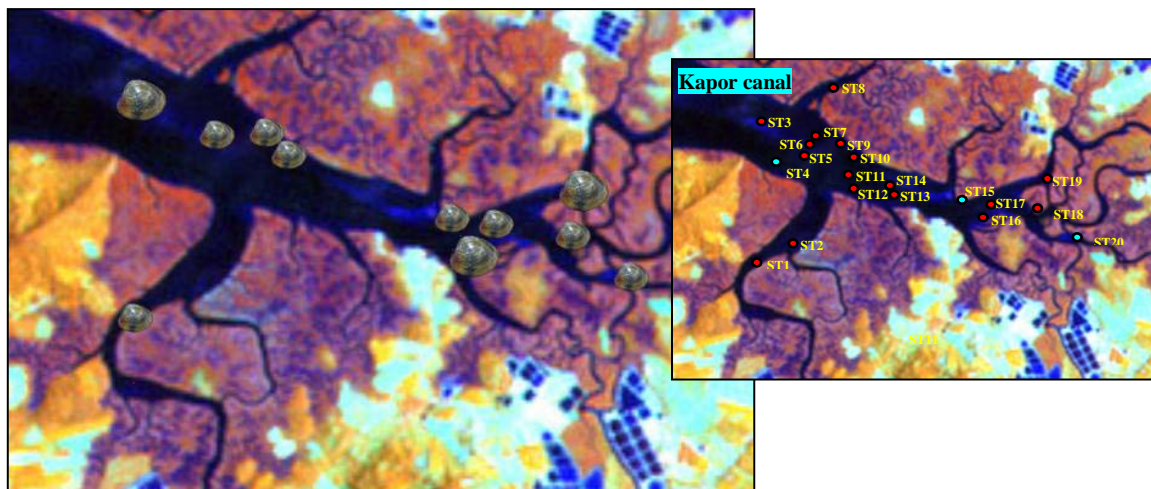


Figure 3 Sampling stations for hard clam

Ridged venus clam product

An average CPUE of ridged venus clam was 42.5 ± 23.7 kg/person with the lowest CPUE of 4.5 kg/person and the highest of 160 kg/person. Fishers collected ridged venus clam in Kapor canal all year round. The products were significantly different between seasons ($p < 0.05$) by Kruskal-wallis H test. In pre-monsoon season, the median of CPUE was 42.5 ± 12.5 kg/person which was significantly different from the product in monsoon and post-monsoon seasons (37.0 ± 19.5 and 35.0 ± 15.0 kg/person, respectively) by Mann-whitney test ($p < 0.05$).

Utilized ridged venus clam had size of 2.5 ± 0.3 cm in width with the median of length, thickness, and weight of 3.6 ± 0.4 cm, 1.5 ± 0.4 cm, and 10.0 ± 5.0 gram, respectively. The smallest clam was 2.5 cm when the biggest one was 4.5 cm in length. In post-monsoon season, utilized clam was in size of 3.6 ± 0.4 cm in length with the smallest size of 2.5 cm and the biggest size of 4.5 cm. In monsoon season, the average size was 3.5 ± 0.3 cm with the smallest size of 2.7 cm and the biggest size of 4.2 cm. Sizes of ridged venus clam were not significantly different between seasons ($p < 0.05$). Utilized clam in monsoon season was 25-50 clam/kg (18.4%), 51-75 clam/kg (36.8%), 76-100 clam/kg (42.2%), and >100 clam/kg (2.6%). In post-monsoon season, clam was utilized at size of 25-50 clam/kg (2.1%), 51-75 clam/kg (18.3%), 76-100 clam/kg (51.8%), and >100 clam/kg (27.7%). Sizes of clam were significantly different between seasons ($p < 0.05$).

Ridged venus clam in Kapor canal in the year 2010 was found to be in size of 0.9-4.6 cm with the length of 3.8 cm the most, especially at the raceway of the canal. Clams were found in the station 12, 13, and 14 with the medium size and large size in monsoon season. In the conservative area, clams at size of medium and small were found. Clams were found in station 1, 5, 6, 7, 8, 9, 11, 16, and 19. Station 15 and 20 were claimed for small clam. Clams were hardly found in each station when 1 clam was found in station 15 and 16 at the small size (Figure 4).

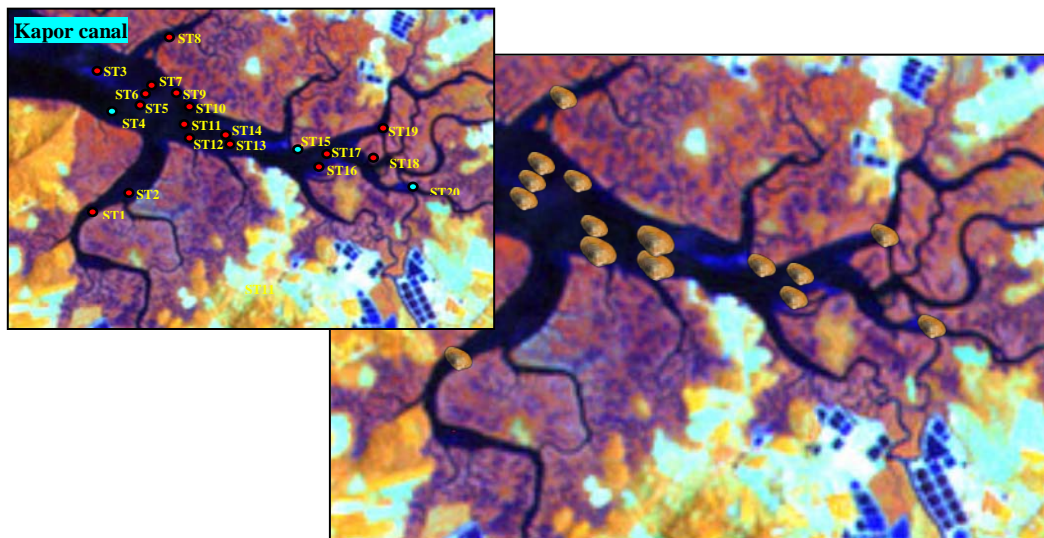


Figure 4 Sampling stations for ridged venus clam

Clam resource management

For the opinion of 15 fishers who operated the hard clam and ridged venus clam fishery in area of Kapor bay, the result showed that most fishers (73.3%) thought that though the obtainable production from Kapor bay is appropriated, the utilization management for resource is also needed. About half of fishers (53.3%) thought that present management of community is appropriated. About one-fourth of them (26.7%) also thought that the cooperative between government and community in resources attendant is appropriated but the plentiful of hard clam and ridged venus clam resource was at low level. Furthermore, 73.3% of fishers thought that both clam fisheries had slightly affected to the coastal resource.

The result of fisher's opinion to natural resource management found that most fishers (73.4%) think their community had medium readiness to manage the natural resources. The rest of fishers thought that the communities readiness on natural resource management was at low and high level (proportion in each group was 13.3%). Fishers believed in community's

capacity that the community could create consciousness and cooperative between members to organize their resource. Fishers expressed their opinion that local organization had knowledge, competency and attention in resource management but they thought that fishers do not have engrossed in resource management operation and lacks of leadership.

Two-third of fishers had moderate agreed to natural resource management approach and 26.7% and 6.7% of them had strongly agreed and slightly agreed with the approach. Fishers thought that community's member should have co-learning and analyzing the problem of resource together. Furthermore, community should assign activity and establish management approach e.g. determining the regulation together and research study in order to have a guiding for decision making in resource management. Thus the fisher's opinion about readiness on natural resource management approach had positive correlation with the opinion about natural resource management approach ($p < 0.01$) and the level of relationship was 83.3%.

Discussion and conclusion

The result of study showed that hard clam had been found most in delta area, especially, the inner area of Kapor bay which is collision front between fresh and marine water. This factor had affected to nutrient concentration in increasing and then the success of plankton which result in appropriate area for growing up of hard clam resource. Though the area may obtain the freshwater effect, hard clam was a resistant species for salt variation and it can live in the area. However, an average production of hard clam obtained from fishing in pre-monsoon season and monsoon season was not difference while an average length of hard clam obtained from fishing in monsoon season and post-monsoon season had a significantly different at significant level 0.05.

Ridged venus clam was found to be abundant in the middle of the canal due to the characteristic of the sediment (sand with mud) which are appropriated for burying of ridged venus clam (Touycharaen and Prompay, 1991). Fishers thought that though ridged venus clam had less abundant in the area, but with simple fishing method and last for only 3-4 hrs of low tide, the product of this clam was still worth the effort. For the opinion of fishers on readiness of fishers on natural resource management, most fisher agreed that community member had readiness on natural resource management at medium level. Community member had attend the activity about natural conservative management without initially

creative of the activities. Most fishers agreed with the natural resource management approach at medium level e.g. an establishment of clam conservative area in Kapor canal which affect to clam fishery. The opinion of fishers on readiness had positive relationship with opinion of management approach at high level (83.3%). This indicated that fisher had readiness on natural resource management at high level corresponding with the optimal of natural resource management approach.

Fishers operated clam fishing from the 12th of waxing moon to the 2nd of waning moon all year round. CPUE were different between seasons. Ridged venus clam had the shell width in dry season larger than rainy season when hard clam had the shell width in rainy season larger than dry season. Fishers thought that natural resource management in the area had result in good production of clam fishery when most of them thought that the area had less abundant of hard clam and ridged venus clam. Conservative zone establishment for parental stock should be done in the area. Most fishers (73.4%) thought that community member had readiness on natural resource management at medium level. Community member could be encouraged their awareness on natural resource conservation and cooperation on resource management if the local institute staff had knowledge, ability, and interested in resource management. However, fishing community was still lack of intention and lack of leader who had ability on natural resource management. Fishers of 66% agreed with the natural resource management approach at medium level which they thought that community member should learn and analyze the problem of resource utilization together, including creating of activities and establishing resource management e.g. cooperation on regulations establishment and collaborative learning for decision making on resource management. Opinion on fisher readiness had positive relationship with opinion on resource management approach at high level (83.3%). However, fishers still lacked of cooperation though the conservative zone for clam resource had been established. Increasing of collaborative learning of fishers had effect to fishery resource management ($p < 0.05$). Establishing the approach for clam resource management would result in increasing of collaborative exchanging of fishers on news and information, problem solving, and establish alternative choices for fishers in order to obtain the corresponding of clam utilization with the natural resource in the area and sustain the fishing in long term.

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