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The study on benthic litter around the coastal of Sri Racha, Chon Buri Province

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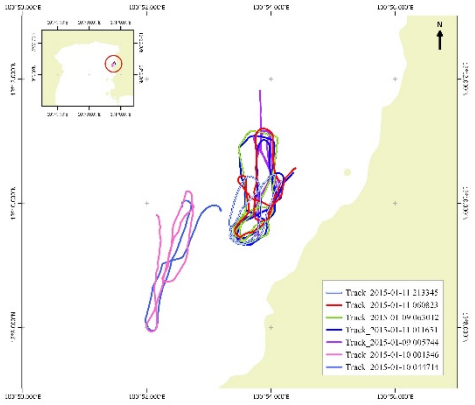
Introduction

Distribution and accumulation of litter in the marine ecosystem is important issue. Marine litter is an environmental, economic, human health and aesthetic problem. Marine litter has been found in all marine habitats and in all the oceans of the world, not only in densely populated regions, but also in remote areas far from obvious sources and human contact. Marine litter is defined as “any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment” (UNEP, 2009). The study on marine littler were conducted in recent years, particularly in European seas. Thailand has few information and study on marine litter. This study is the preliminary research to get the composition and density of marine litter.

Materials and methods

Study area

Data were collected from surveys conducted during collecting data of “Energy Audit Pilot Project Phase 2” from 7 – 13 January 2015. Study sites were located on the fishing ground of bottom trawl in in Sri Racha, Chon Buri province

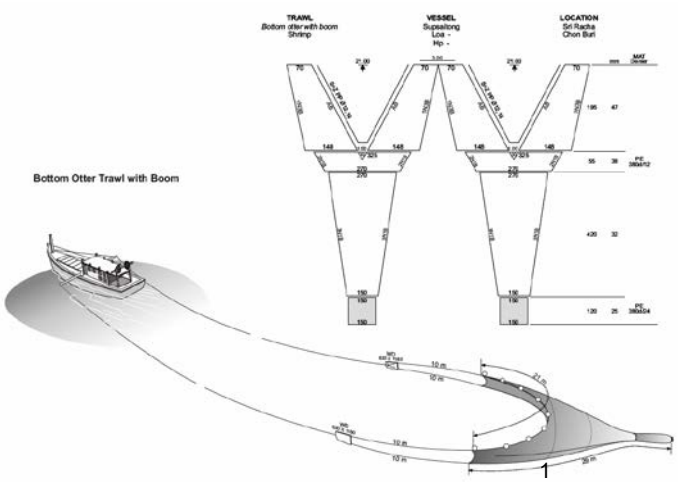


Sampling methods

Trawl samples were collected using two fishing boats with the nearly same side, 11 m and 11.2 m of overall length with 3.7 m of width. They are otter board trawl operated with boom. Fishing nets are same design and size, Length of head rope and ground rope are 21 m with overall length 29 m. The codend net is a 25 mm-diamond stretched mesh size. Fishing operations were conducted in night time. Towing time about 6 hours for each operation. Trawl tracks were gathered by GPS, after towing lines had been set until the fisher started retrieving.

Data analysis

All litter items were separated and classified into different material types and weighed, after excess water and mud had been removed. All litter were measured in weight, litter density was estimated as kg of litter per km^2. The area of which is the length of the path times the width of the trawl, called the "swept area". The swept area, **a**, can be estimated from:



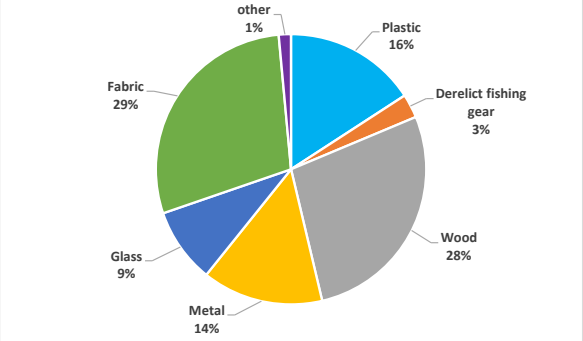
a = D × gr × 0.5 (Sparre P. and Venema S. C., 1998)

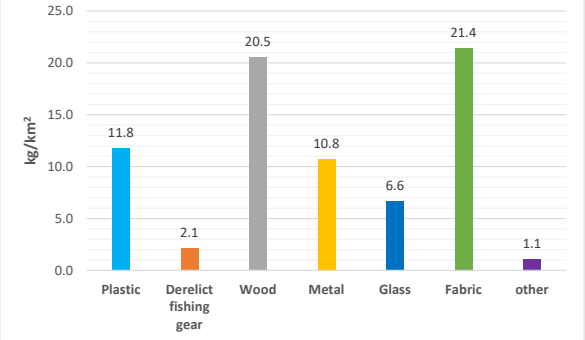
Where **D** is the distance covered, **gr** is the length of the ground rope.

Results

Total of 11 bottom trawl operations were conducted and covered the trawl swept area path about 1.9 km^2. All litter items were encountered throughout every operations. The composition of litter compose with fabric 29% of the litter items, follow by wood 28%, plastic 16%, metal 14%, glass 9%, whilst derelict fishing gear were the less abundant litter item for 3%. Items classified as ‘‘other items’’ accounted for 1% of the litter items included paper, rubber and coal.

Analysis of litter density from trawl surveys found fabric is the most abundant litter type (found in 21.4 kg/km^2), followed by wood (20.5 kg/km^2), plastic (11.8 kg/km^2), metal (10.8 kg/km^2), glass (6.6 kg/km^2), derelict fishing gear (2.2 kg/km^2) and other items (1.1 kg/km^2)





Discussion and conclusion

Trawl is the method used to provide data on benthic marine litter and can do as a parallel objective to surveys benthic organism sampling. Fabric, wood and plastic are encountered throughout all trawl operations. Under the studying quantity litter by weighting, fabric is the most common marine litter found in the study area follow by wood and plastic. This study methodology might be overestimated because some litters material for example, fabric and wood can absorb water more than plastic, metal and glass. While, they spit out water more slowly as well. The study on composition and density of benthic marine litter should consider among the analysis methodology by weight and by number of litter item to avoid overestimation. Most of marine litter will forever remain in marine ecosystem until decomposed over the time in case of degradable material. After fishers sort their catch, they will discard unwanted things that include marine litter to the sea. The Marine litter composition and density might difference depend on study location, distance from community and seasonal. Then, the future study on marine litter in Thailand should be done.

Catch analysis of squid trap fishing in coastal area of Rayong province, Thailand

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Introduction

Bigfin reef squid (*Sepioteuthis lessoniana* Lesson, 1830) is one of the important economic squid in Indo-Pacific waters including in the Gulf of Thailand and Andaman Sea. The catch in the Gulf of Thailand was 4,728 tons (fisheries statistics of Thailand, 2013). The squid is also important commercial resource for small-scale fisheries and the major fishing gear that fishers use to catch this species is squid trap, with the annual production was 1,665 tons (fisheries statistics of Thailand, 2013). It has high value for domestic markets in Thailand. In Rayong province, Eastern Gulf of Thailand, Bigfin reef squid production is higher than other provinces indicates that the squid trap fishery is important to the livelihood and economic of small-scale fishers. The squid trap is a traditional type of fishing gear widely used in Thai waters. It was modified from fish trap that represent one of the most effective fishing gear type. This trap has a high selectivity in order to catch squids for targeting Bigfin reef squid (Chotiyapuita and Yamrungreung, 1998).The catch compositions of squid trap composed Bigfin reef squid 86% (Udom and Nunthapon, 2012). This trap is usually deployed in the day time with the fishing ground of 3-40 m depth. It is set floating individually with the float line (Fig. 3). The operation methods, first place the squid eggs and white plastic bags in the trap after that shooting the trap, followed with the sinker and flag pole for marking position. After 1-2 days fishers approach to the fishing ground and trap positions, the fisher hauling up the rope line by winch. The traps are retrieved by moved up to sea surface onboard and scoop the catch out through the entrance and keep squids in the box, then fisher change the new squid eggs and continue deploy the traps in the same position for next shooting. The squids from the trap are very fresh and still alive. Squid trap fishery has a potential to make a significant seafood in Rayong province, but there are very few study reports and lack of data and information about this gear. The objectives of this study the catch of squid trap, catch species, catch compositions, relation between squid and fishing ground. Catch analysis of Rayong squid trap will be useful for fisheries data base and underwater observations to understand the capture process and the trap efficiency in the future.

Materials and Methods

This study was conducted in Rayong province. The fishing grounds was near Samet Island. The first trap was 15 km Semet Island shore and the last trap was 42 km. The round trip about 100 km from coastline. Squid traps were set at the depth of 10 to 40 m (Fig. 1) Rayong squid traps onboard surveyed was conducted on 13 March 2015. The trap made of wooden frame structure of 95 x 105 x 80 cm and covered with PE net of 70 mm mesh with one entrance funnel (Fig. 2). The trap floated above the seabed with the entrance facing upwards (Fig. 3) and soaking time 1-2 days. A portable GPS (Garmin-eTrex30) was used for tracking the fishing activity by

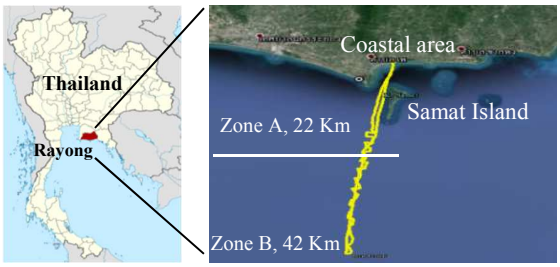

Fig. 1 Fishing grounds

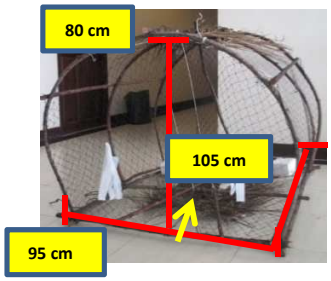

Fig. 2 Rayong squid trap

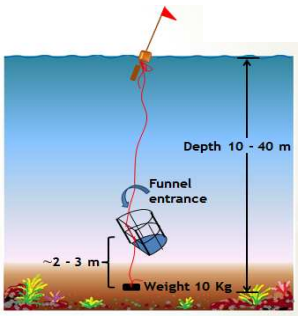

Fig. 3 Trap setting

handy depth meter (Hondex PS-7) to identify the depth for each trap in the fishing ground and in the research divide fishing ground by distance from the coastal, zone A from coastal 22 km (24-33 m depth), zone B from coastal 42 km (30-38 m depth) and random sampling 10 squids in a zone. The catch in each trap were recorded and identified. CPUE, catch compositions, numbers of caught squid were analyzed. For the squids, sexual and random sampling 70 % from total catch to measure the weight and mantle length (ML) were done. Data from the fisher log-book recording daily in Mar 2015 also were analyzed.

Results

The study results of catch analysis by squid trap on 13 March 2015, data from onboard survey the number of trap was 53 traps. The average CPUE was 2.64 individuals/trap. The total catch compositions of squid traps (% by No.) were 94% of Bigfin reef squid (*S. lessoniana*), 5% of fishes and 1% of Pharaoh cuttlefish (*Sepia pharaonis*). Bigfin reef squid were the main target of this gear and sexual composed 69% male and 31% female. Besides, 3 fish species were bycatch included Brownstripe red snapper (*Lutjanus vitta*), Longfin batfish (*Platax teira*) and Fan bellied leatherjacket fish (*Monacanthus chinensis*) (Fig. 4) The variations in the sizes frequency of the Bigfin reef squid by onboard survey random sampling 70 % from total catch were average squid size of male was larger than female. Average weight of Bigfin reef squid ranged 100-400 g, 306.3 g for male, 245.7 g for female. Mantle length (ML) of Bigfin reef squid were 15-29 cm (20.02 ± 3.53) cm for males, 10-24 cm (17.76 ± 3.27) cm for female. According to the data from the fisherman log-book in Mar 2015, the catch amount of main target was 659 kg and the fisher used 943 traps in total. The average CPUE was 0.70 kg/trap and 34.69 kg/day.

Relation between squid and fishing grounds, the numbers of trap in zone A 20 traps and zone B 33 traps. The average CPUE were 2.50 individuals/trap and 2.73 individuals/trap respectively (Table.1). Size of squid between zone A (shallower zone) and zone B (deeper zone), average weight were 295 g and mantle length 15-24 cm (19.80 ± 3.12) cm in zone A and average weight were 534 g and mantle length (ML) 22-29 cm (24.7 ± 2.11) cm in zone B.

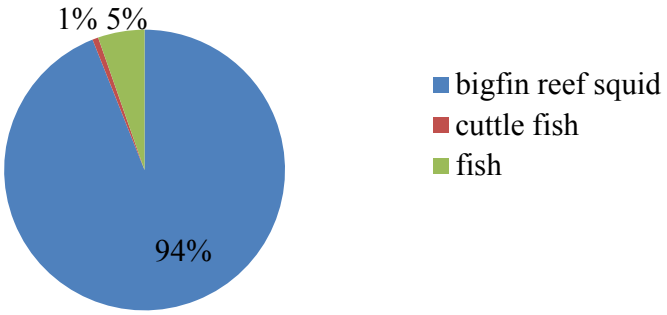

Fig. 4 Catch compositions

Table.1 The catch of Bighfin reef squid from zone A and zone B

Zone	Numbers of Bigfin reef squid				CPUE	Average size	
	Total	Male	Female	Trap	(individuals/trap)	Weight(g)	Mantle length(cm)
Zone A	50	33	17	20	2.50	295	19.80
Zone B	90	63	27	33	2.73	534	24.70
Total	140	96	44	53	2.64		

Discussion

The catch of squid trap in Rayong provice average CPUE was 2.64 individuals/trap. The Bigfind reef squid composed 94% by number as a major catch species in the compositions, followed with fishes and cuttlefish. This showed the similarly result as Anucha, et al, (2012); Udom and Nunthapon, (2012) who reported as 90% of the Bigfin reef squid. Moreover, bycatch species were also were reported such as crab (*Scylla* spp.) and blue swimming crab (*Portunus pelagicus*). Anyway, we did not find the 2 crab species that may because of different fishing ground and the deeper depth. The sizes of Bigfin reef squid male was larger than female, results were similar to those of Anyanee and Cherdchinda, (2005) showed 9.5 – 32.5 (17.77 ± 3.69) cm for male and 7.5 – 25.5 (15.75 ± 2.43) cm for female and as these result reported every month size of male was larger than female. According to fishing ground the sizes of squid in deeper water tended to be higher than shallower zones. There were relations between the catch amount and the depth of fishing ground, Anucha, et al, (2012) reported the suitable depth for squid trap was depth more than 20 m. This study suggests that in Rayong coastal area is suitable fishing ground of squid trap fishing with high selective function for target species. The observations by underwater camera to understand the capture process and to improve the catch efficiency are interesting to study in the future.

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Underwater Observations inside the Fish trap in Rayong Province, Thailand

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Introduction

Fish trap fishery is one of the most important small-scale fisheries in Thailand. Fish trap used all over the world. Fish trap is a type of passive fishing gear that allow fish to enter and then make it hard for them to escape. The main target species are fish. Rayong province is one that the fish trap widely used for small fishery. It is used throughout the coastal areas to catch a variety of coral reef fish. But there were very few of fish behavior underwater observations to understand the capture process of fish trap research in Thailand, Attempts to modify Fish trap or improve fishing efficiency in the fisheries future may prove more easy if understanding of fish behavior in Fish trap (Bardach and Magnuson, 1980) The study of fish behavior in Rayong fish trap have not been investigated by using underwater camera system. *In situ* Underwater camera observations have even been to use for fish behavior research work all over the world, Cole et al (2004) used video camera recordings of entries and exits from blue cod pots for improve the fishing efficiency, Renchen et al. (2014) studied on the fish behavior responses to fish trap by using underwater video camera. such underwater camera observations have not been conducted for Rayong Fish trap fisheries in Thailand. This study focused on the investigating fish shows behavior inside fish trap by using two underwater cameras surveillance in Rayong coastal area.

Materials and Methods

Two underwater cameras were set inside fish trap to take photos of fish inside fish trap. The Rayong Fish trap was a wooden frame box-shaped with one entrance funnel, structure of 1.2 x 2.3 x 0.7 m, covered with wire mesh and PE nets. Cameras were a Recolo interval recorder, IR7 and IR5 model with waterproof housing (IPX3). Time interval was 30 sec (photo could not see at night). The study was used two fish traps. Four cameras were setting inside two fish traps (two cameras/ trap). 1st and 2nd fish trap were located at a depth of 12 and12.4 m (12° 61' 49.93"N;101° 32' 10.60"E and 12° 61' 01.40"N;101° 34' 35.97"E) (Fig. 1 - 3). Setting time on 2 Oct 2014 at 07:17 AM, left cameras inside traps for 33 hours (Soaking times = 33 hours). Four cameras were retrieved from two traps on 3 Oct 2014 at 17.03 PM. Escaped fish species analysis were considered by fish species caught after trap retrieved and fish species in photos those took by cameras inside the trap.

Fig. 1. Location of observed fish traps, Rayong Province

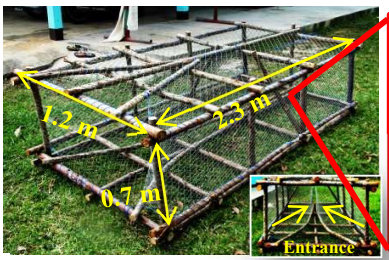

Fig. 2. Fish trap in Rayong Province, Thailand.

Fig. 3. Underwater cameras (Recolo) setting inside fish trap

Results

The new entrapped species observed from the photo taken by the 2 camera inside the 2 fish trap shown in Table 1. The species and numbers of escaped fish from the 2 traps considered from fish caught after trap retrieved compared with the numbers of fish taken by cameras inside the fish trap shown in Table 2.

Table 1 The new entrapped species in fish trap (observed from the photos taken by the 2 cameras inside each trap)

Fish trap No.1		Fish trap No.2	
Times (hr:min:sec)	New fish Species Entrapped	Times (hr:min:sec)	Fish Species Entrapped
2 Oct 2014		**2 Oct 2014**	
7:47:30 AM	*Chaetodon meyeri* (No.1-2)	12:15:00 PM	*Lutjanus vitta*(No.1)
9:26:30 AM	*Epinephelus coiodes* (No.1)	13:39:00 PM	*Monacanthus chinesis*
10:25:00 AM	*Epinephelus coiodes* (No.2)	**3 Oct 2014** 6:14:00 AM	*Epinephelus coiodes*
3 Oct 2014 5:17:00 AM	*Sargocentron rubrum Lutjanus vitta* (No.1)	7:12:00 AM	*Lutjanus russeii*
6:00:30 AM	*Rhynchostracion nasus*	7:21:00 AM	*Scolopsis monogramma* (No.1)
7:18:30 AM	*Lutjanus vitta*(No.2)	8:54:30 AM	*Cephalopholis formosa*
9:01:30 AM	*Scolopsis monogramma*	11:12:00 AM	*Diagramma pictum*
10:32:00 AM	*Siganus canaliculatus* (No.1)	12:13:00 PM	*Lutjanus vitta* (No.2-4)
11:10:00 AM	*Cephalopholis formosa*	12:34:00 PM	*Scolopsis monogramma* (No.2)
11:47:30 AM	*Siganus canaliculatus* (No.2)		

Table 2 Species and numbers of escaped fish from the 2 traps considered from fish caught after trap retrieved compared with the numbers of fish taken by cameras inside

Species	Number of fish (fish trap No.1)			Number of fish (fish trap No.2)		
	Caught after trap retrieved	Taken by cameras	Escaped	Caught after trap retrieved	Taken by cameras	Escaped
S. javus	-	-	-	1	-	-
S. canaliculatus	2	2	0	4	2	-
D. pictum	-	-	-	1	1	0
L. vitta	2	2	0	10	4	-
L. lutjanus	-	-	-	2	-	-
L. russeii	1	-	-	-	1	1
S. ciliata	-	-	-	1	-	-
S. monogramma	4	1	-	2	2	-
E. coiodes	2	2	0	-	1	1
C. formosa	-	1	1	-	1	1
P. ocellatus	1	1	0	-	-	-
C. meyeri	-	2	2	-	-	-
M. chinesis	-	-	-	1	1	0
R. nasus	-	1	1	-	-	-
S. rubrum	1	1	0	1	-	-

Discussion

From the result there were 15 fish species entrapped the fish trap. Five economic species were considered as escaped species. The escape indicated that the trap should be developed. Some species could not consider as escaped species due to numbers of fish caught after trap retrieved were higher compared with number of fish in photo took by cameras, that because of the camera visual could took photos in front of area about 1/3 of trap. For future study we will consider using video camera for improving the visual and clearly. Some escaped fish species were important marketable value species such like *E. coiodes* and *C. formasa*. Improve the catching efficiency to prevent the escape of fish species will be examined in the future.

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Study on bycatch and discards of bottom crab gillnet targeting blue swimming crab (*Portunus pelagicus*) in Rayong province, THAILAND

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Introduction

Crab gillnet targeting blue swimming crab (*Portunus pelagicus*) is a small scale traditional fishing gear that operates on seabed which the most widely used in Rayong province, Thailand. The net made from nylon monofilament (PA, mesh size 100 mm, 12 meshes depth, 450 meshes in horizontal/net). They are operated about 3-5 sets/day/fisher. The head rope made from polyethylene (PE) z twisted (dia. 3 mm, 2 ropes, length 450 m/set). The float is plastic (38×10 mm). The sinker rope is from polyethylene z twisted (dia. 4 mm, 1 rope, length 450 m/set). The sinker is lead (weight 10 g/lead). Hanging ratio of the net about 50% . The stone weights at the both side ends are about 5-8 kg. The net structure and net during operation shown in Fig 1.

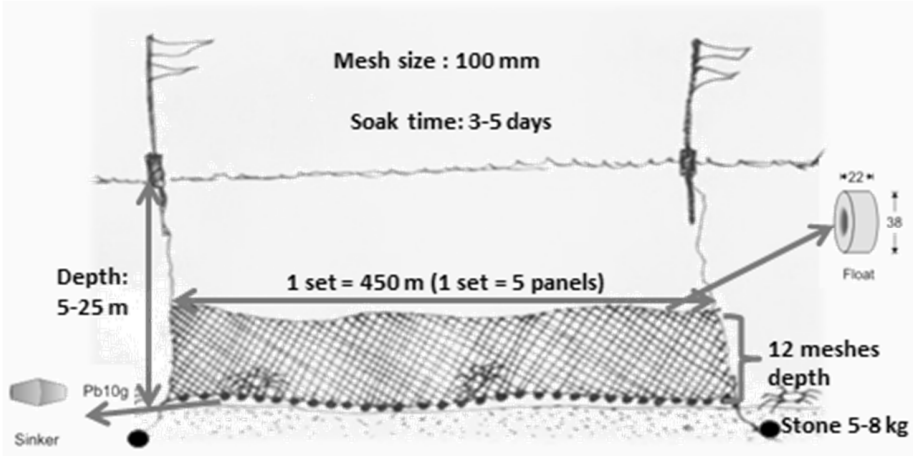

Figure 1 A set of bottom gillnet in Rayong province, THAILAND

Generally the crab gillnet fishing operates in early morning in the fishing ground of 5-25 m depth with the socking time of 3-5 days. It operates at sea bottom, target species is blue swimming crab. According to fisheries statistics of Thailand (Department of fisheries, 2012) reported that in year 2010 Thailand caught the blue swimming crab 22,800 tons in total, with the value of 2,520.7 million baht. The crab is very important economic for fishers. They have high price, about 100-300 baht/kg, depends on the crab size and season. However the crab gillnet can catch not only blue swimming crab but also other marine species which many of them become discards species. Puntip et al. (2013) surveyed the diversity of crabs from bottom gillnet, Rayong province, The species of crabs collected from bottom gill net at Banpae, Suanson and Makampom Bay in Rayong province were totally 83 species. The species richness in each station, Banpae, Makampom Bay and Suanson were 65, 52 and 48 species, respectively. The species of crabs as trash fish (discarded) was quite high comprising 81.93 % of total numbers of caught species. The fishers actually do not want to catch non- marketable value or undersize species**.** In order to reduce the bycatch and discards and protect the marine species, besides to find the possibility methods to reduce the discards species, this study was done to understand the catch species, catch compositions, bycatch and discards from this fishery.

Materials and Methods

Onboard data collecting with a crab gillnet fisher around Mea Rumphueng beach, Rayong province in the fishing ground of 5-23 m depth, the tracking by portable GPS (eTrex 30) during on 3 October 2014 were conducted. The catch from onboard survey was recorded. The catch species were identified, counted and weighted. Catch compositions were analyzed both in percent by number and percent by weight. The target species was calculated as catch per unit effort (CPUE) by weight. Discard ratio, discard rate by number and by weight were estimated by using the method of Alverson et al. 1994, as follow;

Discard Ratio = Discards/Retentions

Discard Rate = Discards/(Retentions+Discards)

We observed the discards and asked the reasons why they were discarded species from the fisher.

Results Discussion

CPUE of blue swimming crab as the target was 4.97 kg/set in 3 October 2014, through the onboard survey, 13 species in total were listed as bycatch with the discards (Table 1)

Table 1 the catch, discard ratio and discard rate from Rayong crab gillnet (1 set) on 3 Oct 2014

		Catch		Discard ratio by		Discard rate by	
No.	Scientific Name	number	weight(g)	number	weight(g)	number	weight(g)
	Target species (Retained						
1	*Portunus pelagicus*	41	4,970	-	-	-	-
	Bycatch (Retained)						
1	*Thenus orientalis*	4	400	-	-	-	-
	Bycatch (Discarded)						
1	*Parthenope longimanus**	69	1,600	1.53	0.29	0.30	0.09
2	*Dorippe quadridens**	35	1,200	0.77	0.22	0.15	0.07
3	*Dromidiopsis sp.**	22	2,200	0.49	0.40	0.09	0.13
4	*Calappa clypeata**	8	200	0.17	0.03	0.03	0.01
5	*Galene bispinosa***	8	200	0.17	0.03	0.03	0.01
6	*Demania scaberrima****	3	200	0.06	0.03	0.01	0.01
7	*Lutjanus johnii****	2	190	0.04	0.03	0.00	0.01
8	*Alectis indicus****	1	150	0.02	0.02	0.00	0.00
9	*Inegocia japonica***	1	40	0.02	0.00	0.00	0.00
10	*Murex trapa****	1	10	0.02	0.00	0.00	0.00
11	*Spondylus sp.***	30	1,700	0.66	0.31	0.13	0.10
12	Others (Coral)		3,000		0.55		0.18
	Total	225	16,460	4.00	2.06	0.74	0.61

Reason: *non-marketable, **too few catch, *** too small size

From the catch compositions, the blue swimming crab was caught only about 31% by weight (Fig 2) while 69% was the others that become bycatch and discard species. From 3 October 2014 fishing operation, the fisherman retained only 2 species. There were blue swimming crab and flathead lobster. The discards analysis results as other species were discarded.

By number, Discard ratio = 4.00, Discard rate = 0.74
By weight, Discard ratio = 2.06, Discard rate = 0.61

The discard ratio by weight from operation was 2.06, it means when fisherman to retained the catch 1 kg/set the other discards will be caught about 2.06 kg/set. The catches of white long-armed crab was more by number but low weight because this species is too small size and seem to be this fishing ground is habitat for white long-armed crab. In order to reduce those discards species, the one of possible method is modifying this fishing gear such increasing the mesh size of nets. Increasing mesh size can release more small size catch especially the species that be caught with gilled characteristic (Anukorn et al, 2007). However the impacts of mesh size increasing on the catch of target species should be considered.

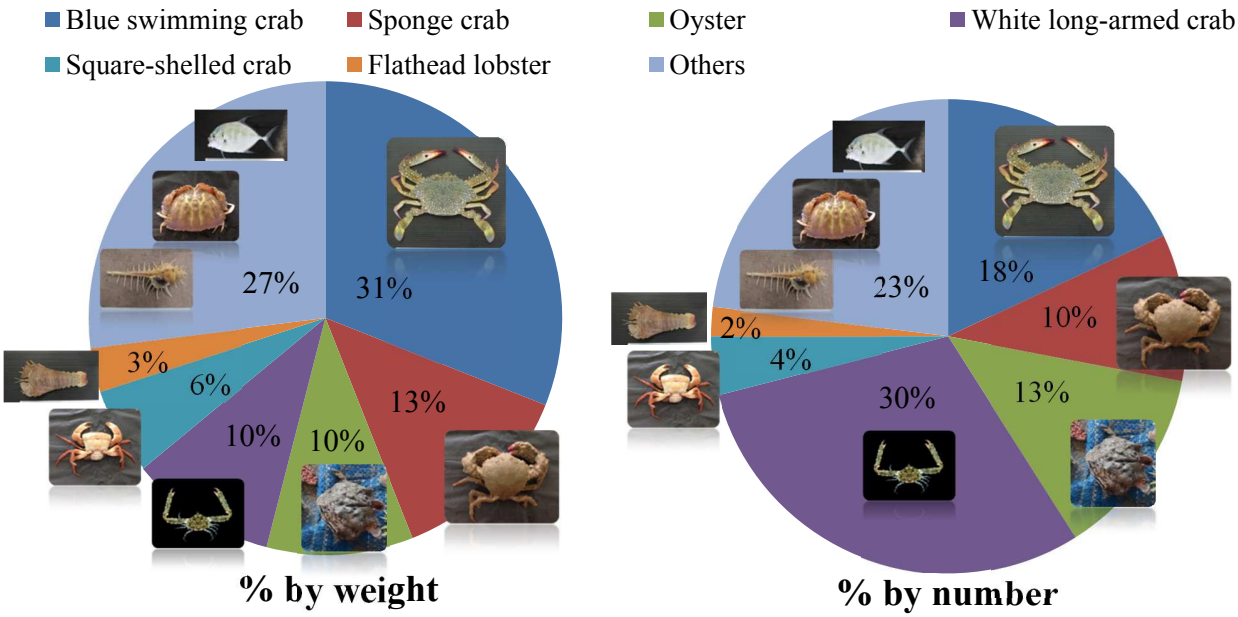

Figure 2 Catch compositions on 3 Oct 2014

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Baseline survey on monitoring and control of fishing effort and landing in the Southwestern Gulf of Thailand

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SuteeRajruchithong and BunditChokesanguan

Introduction

The SEAFDEC Training Department (TD) in collaboration with working team from the Department of Fisheries, Thailand conducted a baseline survey on monitoring and control of fishing effort and landing in the Southwestern Gulf of Thailand. This study is aimed to gather preliminary information regarding fishing effort which are focused on fishing vessels, (including gear, and people) and landing of catch, which would be used as basis to improve the monitoring and control of fishing activities in Thailand. This is an activity under the project of "Strengthening Malaysian and Thai Partnership in support of Joint Fisheries Planning and Management in the Western Gulf of Thailand" which supported by SEAFDEC-Sweden project.

Methodology

1. Sampling and factor control

The baseline survey on monitoring and control of fishing effort and landing in the Southwestern Gulf of Thailand was conducted in Songkhla province, Pattani Province, and Narathiwat province. The target of interview is owner, captain or master fishermen who engaged in fishing vessels with loading fish product at fishing port. A number of respondent in each province are 101, 310 and 16 respectively.

2. Design of questionnaire

The questionnaire was designed and developed in collaboration with working team from Thailand (6 from the Department of Fisheries and 3 from Fish Market Organization). The questionnaire was separated to two parts; first part concerned to vessels information and second part concerned to fishing operation and fish landing information. Moreover, the working team agreed, while interview should be take a photo of fishing vessels as reference and useful for second level data analysis.

3. Process of data analysis

The process of data analysis was separated to two levels; first level is general analysis into percentages and compares each other. Second level is advance analysis to assume IUU fishing vessel from questionnaire which consider by characteristic of fishing vessels, fishing gear feature on board, number of crew, nationality of crew, fuel consumption, provision, ice supply location and so on. In the second level analysis, all major data in questionnaire is important especially photography of fishing vessels.

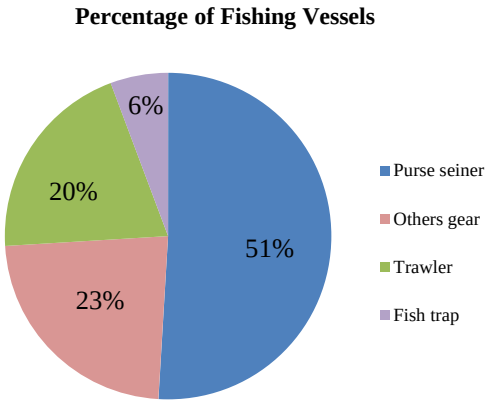
Result

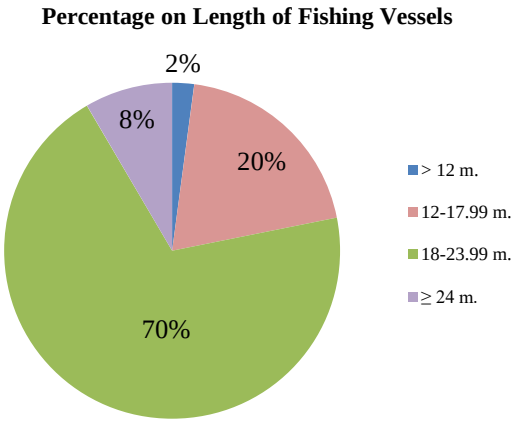
1. First level analysis

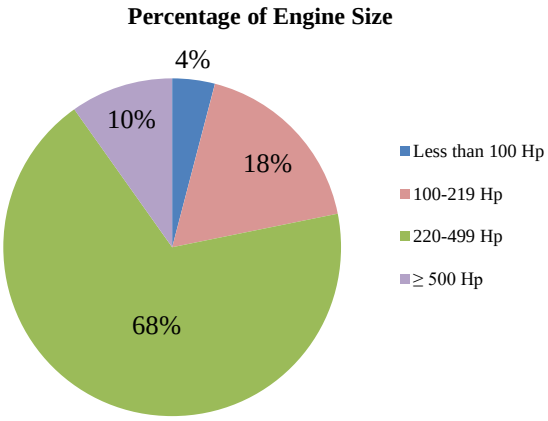
Vessel information

The most of fishing vessels that interview are purse seiner, others gear, trawler and fish trap. The percentage is 50.12, 22.72, 19.91 and 5.62 respectively. Just only 1.64 percentages is fish carrier vessel. Most of fishing vessels about 96.26 percentage register in Thailand and 3.75 percentages not reply in the questionnaire.

The length of fishing vessels was categorized to four ranges. There is less than 12 meters, 12 to 17.99 meters, 18 to 23.99 meters, 24 meters and over. The percentage is 2.11, 19.67, 69.55 and 8.43 respectively. The engine size was also categorized to four ranges. There is less than 100 Hp, 100 to 219 Hp, 220 to 499 Hp and 500 hp and over. The percentage is 3.98, 17.33, 66.74 and 9.6 respectively.







Fishing operation and fish landing information

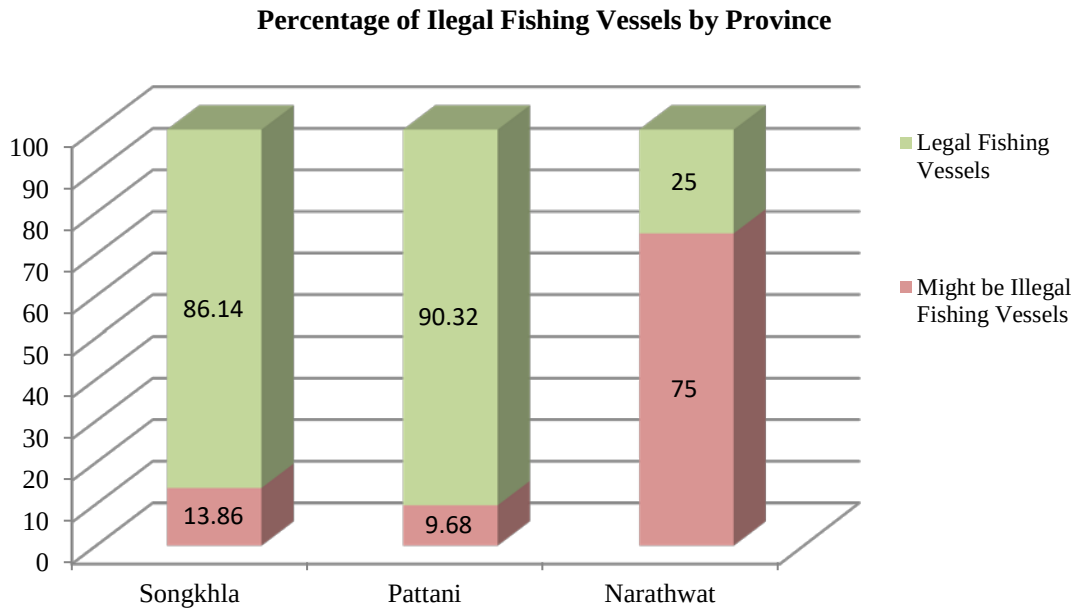
Most of fishing ground area is in Thailand (98.36%). However, some of fishing vessel operates in Malaysia, Thailand and Malaysia, and others area. The percentage is 0.47, 0.23 and 0.47 respectively. Most of fishing vessels is Thai flag (96.49%) but no reply in the questionnaire about 3.52 percentage.

In regard to nationality of captain/ master fisherman, most of them are Thai while the nationality of crews is Cambodian, Burmese, Thai and Lao. The percentage is 52.93, 27.71, 16.55 and 2.82 respectively.

For fish landing port, Most of fishing vessels is landing in Thai fishing port (94.61%) and 5.39 percentage not reply in questionnaire. Regarding to source of supply such as fuel, ice, provision, vessel maintenance, and fishing equipment was bought from Thailand.

2. Second level analysis

All information from questionnaire including photography of fishing vessels was considered to analysis in second level which assumes for IUU fishing vessel. The questionnaire from Songkhla Province, Pattani Province, and Narathiwat Province, we can assume IUU fishing vessel is 13.86, 9.68 and 75 percentage respectively.



Conclusion

The main of fishing vessels that interview are purse seiner. Most of fishing vessels register in Thailand. The length of fishing vessels is 18 to 23.99 meters. The engine size is 220 to 499 Hp. The main fishing ground area is in Thailand. However, some of fishing vessel operates in Malaysia, Thailand and Malaysia, and others area.Most of fishing vessels is Thai flag.In regard to nationality of captain/ master fisherman, most of them are Thai while the nationality of crews is Cambodian (52.93%), Burmese (27.71%), Thai (16.55%) and Lao (2.82%). Most of vessels are landing in Thai fishing port. The source of supply such as fuel, ice, provision, vessel maintenance, and fishing equipment was bought from Thailand. The assumes for IUU fishing vessel by consideration from all information from questionnaire including photography of fishing vessels found that IUU fishing vessel in Narathiwat is higher than Songkhla and Pattani. The relevant agencies can used the results from this survey as basis to improve the monitoring and control through reduce IUU fishing activities in Thailand.

SEAFDEC Roles and Involvement on Thailand Fisheries Observer Program

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Southeast Asian Fisheries Development Center Training Department/Training Department

Introduction

According to European Union Commission has declared a yellow card for Thailand on 21st April 2015 and assign a dateline to solving that problem in six month. The Department of Fisheries (DOF) has set plan to tackle Illegal Unreported Unregulated (IUU Fishing) such as the registration of all fishing vessel, Installation Vessel Monitoring System (VMS) on vessels over 30 tons gross, Established system for Port in – Port out and national plan of action and the importance one implementation of traceability by preparing and monitoring systems for marine products caught by fishing boat in Thailand an imported. In order to determine whether a product of IUU Fishing and monitor to the processing plant. It is necessary to establish an observer onboard as a part of Monitoring Control and Surveillance (MCS). Southeast Asian Fisheries Development Center Training Department (SEAFDEC/TD) is an organization that DOF has invited for consultants on this project due to the experience of fisheries including have Instructor and training vessel Namely M.V.SEAFDEC2 that potential sufficient to train the observers on board.

Fisheries Observer Program to make focusing the observer who can take a position on fishing boat in high sea, overseas fishing vessel and Thai flag carrier vessel. This project can support fishing law fully because the observer can control the size of product by fishing, identify endangered species although used true kind of fishing instrument. The program can serve as information provider fisheries dependent information on catch and effort, stock assessment and other fisheries regulation compliance.

Methodology

DOF and SEAFDEC/TD meeting with related organization to define the scope and plan for development of observer onboard program of Thailand. The main issue is the program on fisheries observer onboard. So, the meeting concluded to hold an orientation workshop in order to transfer knowledge and increase understanding on the scope observer onboard in RFMOs area to participants from DOF staff. Consequence, to develop Observer Program and implementation draft plan for the project observer onboard related to IOTC model course.

Training for the observers onboard was started during 17th November – 3rd December 2015. This is a pilot project in order to be trainer (training for the trainer) in the next generation at Maruay Garden Hotel in Bangkok. This project has four instructors from SEAFDEC/TD to give the knowledge in subject a fishing vessels and gears, Basic of Navigation. The total number of eighteen participants from DOF and two staffs from SEAFDEC/TD to attend the training course.

Outline of lecture for the training course.

- Legal and Regulation - International agreement (IOTC convention), Thailand fisheries law and regulations.

• Data Collections- Species Identification, Fish sampling, measuring and weighting techniques, Data collection code and data collection formats, Use of digital recorders.

• Recording forms and document –Techniques of verification of catch logbook, estimating catch and species composition, filling out the forms, verbal debriefing and Report Writing.

• Fisheries management- Monitoring, control and surveillance (MCS).

• Fishing vessel and gears -Vessel Identifications and markings, Gear Identification and marking: tuna long liners, trawlers, purse seiners, Electronic equipment and understanding their operations.

• Navigation - Knowledge of navigation (Latitude/Longitude, compasses, bearing, chart work, plotting a position etc.), Weather Observation.

• Radio Communications.

• Basic training of seaman- Fire Prevention, Personal survival technique, Elementary first-aid, Personal safety and social responsibility, Safety awareness.

For Shipboard Training, During 30th November – 3rd December 2015

The shipboard training was carried out by M.V.SEAFDEC2 the training and research vessel of SEAFDEC/TD. On 30th November 2015, at 08.00 hrs the 20 participants embarked the ship. At 11.00 hrs the ship was left SEAFDEC/TD's pier for fishing ground (Rin Island) in the upper Gulf of Thailand and during the ship was sailing a distance 40 nautical miles to fishing ground, the orientation of the shipboard training was started. Two kinds of fishing gears as Tuna Long line and Bottom Trawl were selected and prepared for fishing operation. The detail of activities as follows;

On 30th November 2015 after the ship arrived the fishing ground. Fishing trial was started at 14.50 – 16.15 hrs by Bottom Trawl with speed of ship 3.5 kts in the depth of 30 - 40 m. This fishing operation was caught amount 9.5 kgs of fish to species identification and measure. The kinds of fish such as Painted sweetlips (*Diagramma picta*), Golden trevally (*Gnathanodon speciosus*), Goatfish (*Upenes tragula* and *Upenes sundaicus*), Trumpeter fish (*Terapon theraps*) Squid (*Photololigo duvaucelii*) and others. In the evening, at 19.00 – 20.00 hrs has a presentation outline of Japan Observer Program and exchange information Japan's fisheries observer for development by Dr. Osamu Abe Deputy the Chief SEAFDEC of MFRDMD from Malaysia to participants.

On 1st December 2015, at 07.50 – 10.00 hrs the 1st fishing operation was started by Bottom Trawl. With speed of ship 3.5 kts in the depth of 30 - 33 m. This fishing operation was caught amount 145 kgs of fish to species identification and measure. The kinds of fish such as Snapper (*Lutjanus russelli* and *Lutjanus vitta*), Yellowtail Scad (*Atule mate*), Barracuda (*Sphyraena jello*), Painted Sweetlips (*Diagramma picta*), Golden Trevally (*Gnathanodon speciosus*), Rabbitfish (*Siganus janus* and *Siganus canaliculatus*), Fanbellied Leatherjacket (*Monacanthus chinensis*), Goatfish (*Upenes tragula* and *Upenes sundaicus*),

Trumpeterfish (*Terapon theraps*) Squid (*Photololigo duvaucelii*), Cuttlefish (*Sepia pharaonis*), Cat shark (*Chiloscyllium* sp.) and others. At 12.50 – 15.10 hrs the 2nd fishing operation was started by Bottom Trawl. With speed of ship 3.3 kts in the depth of 30 - 35 m. This fishing operation was caught amount 10 kgs of fish to species identification and measure. The kinds of fish such as Fanbellied Leatherjacket (*Monacanthus chinensis*), Goatfish (*Upenes tragula* and *Upenes sundaicus*), Squid (*Photololigo duvaucelii*), Cuttlefish (Sepia pharaonis), and others. In the evening, at 18.00 – 19.00 hrs has a summary for longline observer activities in practice and the training in Japan by Dr. Osamu Abe to participants.

On 2nd December 2015, at 05.00 – 10.00 hrs. Tuna Longline was to operate by total number is eighteen baskets, six branch lines per basket and bait is Bigeye Scad. Shooting speed 4 kts in the depth of 40 m. This fishing operation no fish to species identification and measure because of many fishing boats to operated fishing in this area. After that the ship was left fishing ground to pilot bar for anchorage.

On 3rd December 2015, at 08.00 hrs M.V.SEAFDEC2 was alongside SEAFDEC/TD's pier and the 20 participants disembarked the ship.

Result

This training, all participants have knowledge and experiences not only Fishing operation, Radio communication onboard, Navigation and seamanship. But also data recording method such as type of fishing gear, measuring mesh size and fish data collection. All of knowledge and experiences obtained by participants during shipboard training is suitable for observer onboard program according to RFMOs model course.

The DOF and SEAFDEC/TD will co-operate to establish the observer onboard program for the next generation and the observer onboard of this pilot project will be a trainer to support in the next program. The way of forward the observer onboard can be reduced the IUU fishing to the management and sustainable fisheries.

Preliminary Report on Oceanographic Survey in Sulu-Sulawesi Seas in Year 2015 by M.V. SEAFDEC2

This study provided information on the water properties of water mass including temperature, salinity, dissolved oxygen (DO) and fluorescence in Sulu and Sulawesi Seas. The aim was to determine schematic overview of the water properties in relate with fisheries resource to serve as a guide to the tuna fisheries management. The survey was conducted by M.V. SEAFDEC2, during 28 March - 1 May 2015 which Northeast monsoon play a significant role to study area. The water properties data were obtained using CTD, seabird 911 plus. Vertical and horizontal distribution and profile of temperature, salinity, dissolved oxygen and fluorescence were analyzed.

It was concluded that the difference of water properties between Sulu and Sulawesi Seas was observed, particularly DO and fluorescence at sub-chlorophyll max layer. Water intrusion noticeably effect to water properties in study area which North Pacific subtropical water mass leads to high DO, salinity and fluorescence in Sulawesi Sea. In regard with the relation between oceanographic parameter and tuna distribution, The results show that DO at sub chlorophyll-max layer is the most related.

Efficiency Comparison between Conventional and Vented Trap in Ghost Fishing Experiment, Si Racha Bay, Gulf of Thailand

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Introduction

Traps are an effective and economically important multi-species fishing gear used widely for harvesting crustaceans and finfish around the world. The collapsible trap targeting blue swimming crab (*Portunus pelagicus*) has recently becomes a major type of fishing gear and operated over year in the Gulf of Thailand. Small scale fishers operate their traps inshore with the numbers of 200-300 traps/boat while commercial scale fishers operate further (offshore) with the numbers of 2,000-5,000 traps onboard. Both fishing types have possibilities become lost or derelict as a result of several processes. Lost traps are widely thought to result in mortality because of "ghost fishing" a term used to describe the process by which derelict fishing gear continues to trap organisms and induce mortality in an uncontrolled manner (Matsuoka *et al*. 2005). The phenomenon of ghost fishing is a concern to fisheries managers and the fishing community interested in long term sustainability of the trap fishery. The ghost fishing effects on the blue swimming crab and other animals from the trap fishing in Thailand have been very poor evaluated and reported. Accordingly, the objectives of this study were to examine the ghost fishing characteristics of the conventional trap used by small scale fishers compared to the vented trap. Specifically, the rates of entrance and mortality of the target species and the by–catch species were assessed and compared between both trap types.

Materials and Methods

The study site was conducted in Si Racha Bay, Chon Buri Province, in the upper Gulf of Thailand. This site is about 0.8 km from shore with a depth of 4–6 m. The 24 new collapsible crab traps were obtained from a fisherman to simulate the lost traps in the study site. The traps have a box shape with dimensions of 360 × 540 × 190 mm and 2 slit entrances, trap structure was covered with green polyethylene net with a mesh size of 38 mm, and the hook was attached at the top panel for trap set up and collapse function. In this experiment two trap designs were used. The first type was the 12 conventional traps which are the same as the local fishers use (Fig. 1). The second trap type was the 12 vented traps with escape vent size of 35 × 45 mm located at opposite sides of the bottom panel of the trap (Fig. 2).

The traps were deployed with paired experiment to compare between conventional and vented traps from 6 Jan 2013 to 5 Apr 2014 (454 days) at the study site. Each trap was baited once only at the beginning with trevally (*Selaroides leptolepis*) at the center bottom trap panel. A diver surveyed the traps immediately after deployment to confirm that the traps were deployed on the seabed correctly. We were observed on each trap in the day time by SCUBA diving to monitor the situation after traps deployment as every day for the first 2 weeks, then continuously every 2–3 days or 3–4 days for 3 months, and about once a month afterward up to 454 days after traps initial deployment. At each diving, we tried to minimize interference in order to maintain the condition of ghost fishing as autonomous in environment. In each trap we recorded the baited and traps conditions, the number of new

entrapped, escaped or dead in each entrapped animals and estimated their size, we also observed their behavior and condition with underwater video recording.

The catch compositions and percent by number were analyzed. Catch rates of all animals and blue swimming crabs were calculated as CPUE by number (Bullimore *et al*., 2001). The potential numbers of commercial species entrapped per trap per year were estimated. We also estimate dead to ghost fishing from percentage dead of each species between conventional and vented traps in this experiment.

Fig. 1 The conventional trap

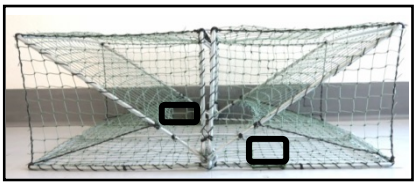

Fig. 2 The vented trap

Results and Discussion

In our underwater observations, the fish bait within traps was either consumed or decomposed rapidly within 3 days in vented traps and 4 days in conventional traps. This finding is similar with Al-Masroori *et al*. (2004) and Matsuoka *et al*. (2005), by contrast with Bullimore *et al*. (2001) who reported the initial bait was exhausted after 27 days. Throughout the 454 days of this experiment, at the simulated traps ghost fishing there were many entrapped animals including target and by-catch specie. The numbers of aquatic animals that entrapped in conventional trap was higher than vented traps. The conventional traps had 23 different entrapped species (548 animals), of which 379 (69.2%) animals were classified as commercial catch. Of these, rabbit fish (n=98), toad fish (n=70), spiral melongena (n=50) and catfish (n=45) dominated. While 169 (30.8%) were considered to have no commercial value for conventional traps, the sea urchin (n=126) and butterfly fish (n=23) dominated. The vented traps entrapped 23 different species (243 animals), of which 155 (63.80%) were classified as commercial catch. The dominant species of these were toad fish (n=44), rabbit fish (n=24) and blue swimming crab (n=17). Of these, 88 (36.2%) were considered as non-commercial catch such as sea urchin (n=64) and butterfly fish (n=12). However, mostly the commercial species such as spiny rock crab, mangrove stone crab, rabbit fish and toad fish for vented traps escaped at a higher rate than conventional traps.

The both traps can continue to ghost fishing for more than 1 year similar reported with Bullimore *et al*., 2001 and Al-Masroori *et al*., 2004. The CPUE of all animals entrapped in conventional traps was significantly higher than vented traps in each time observations (Fig. 3a), which were high in the first few weeks and gradually declined as an inverse function of time and reached an average maximum of 5.33±4.22 and 3.5±2.13 individuals/trap/day respectively. Over the course of the experiment, more entrapped any other species than target species as blue swimming crab, with relatively few retained in both traps. The CPUE of blue swimming crabs were calculated by average catch per trap per day. It was clear that The CPUE trend for blue swimming crabs was high entrapped at the first week, declined rapidly to a minimum rate until 119 days after, and then increased again before no more entrapped in both traps (Fig. 3b). The bait and trap condition had an effect to the catch rate (Stevens *et al*., 2000). However, the present study showed a low entrapped number of blue swimming crabs with a catch of 1.58±0.63 and 1.42±0.82 crabs/trap/454 days in conventional and vented traps, respectively.

The total entrapped number did not indicate the total mortality of animals associated with the traps ghost fishing. We were able to confirm the mortality by monitoring dead bodies of the entrapped animals remaining. According to diving observation, the total number of mortalities in conventional traps was higher than vented traps, 137 (25%) and 31 (12.76%) individuals in total number, respectively. The majority of dead for commercial species observed in conventional traps were finfish such as catfish (42 individuals) and rabbit fish (42 individuals), while the vented traps had a very small number of dead in same species as 1 and 4 individuals respectively. The main reason of animals were die may happen from starvation and/or eaten by predator (Stevens *et al*., 2000). The vented traps showed less entrapped and mortality number than conventional traps. These demonstrate the positive functions of escape vents in reducing the negative impacts of ghost fishing, not only the amount of entrapped but also the mortality.

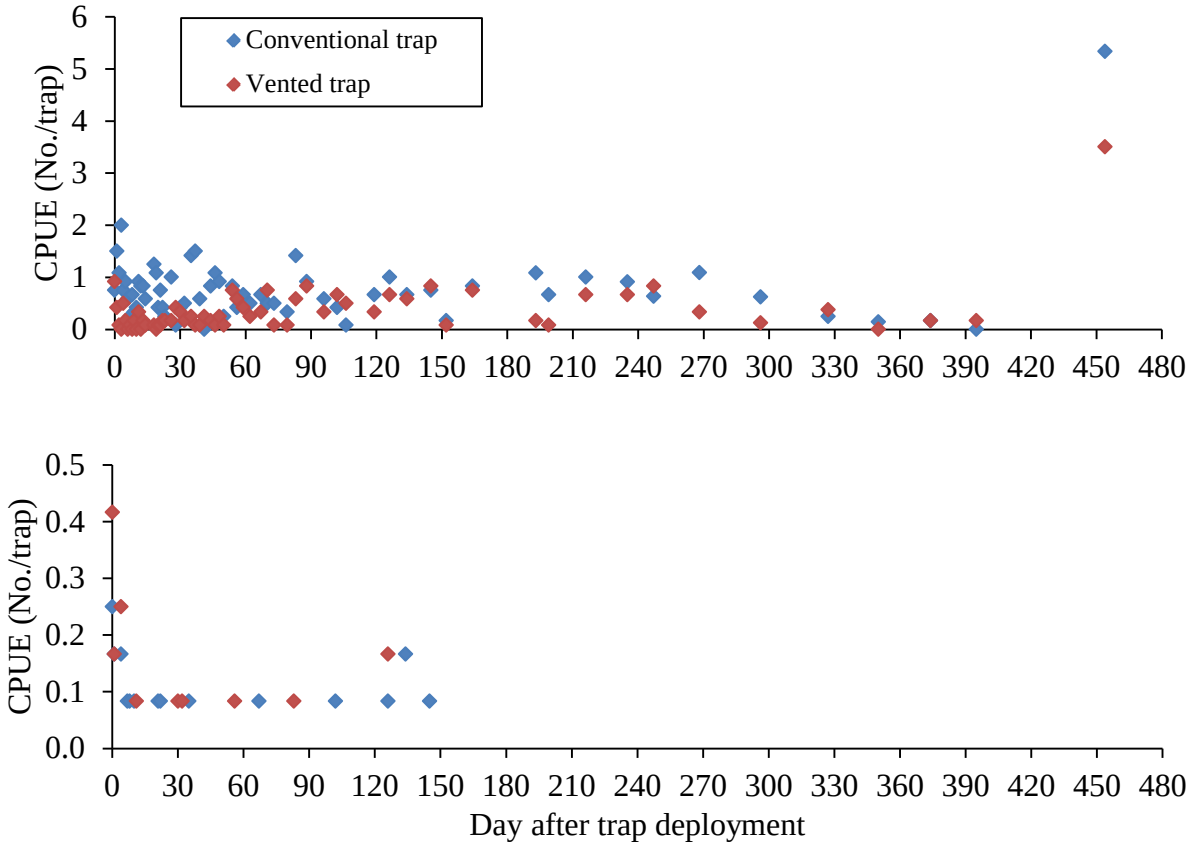

Fig. 3 The catch per unit effort (CPUE) of total entrapped animals (a) and blue swimming crabs (b) between conventional and vented traps

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FAO-SEAFDEC/TD ENERGY AUDITS PROJECT FOR THAI TRAWLERS (PHASE II)

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Abstract

Fluctuation fuel costs and raising environmental impacts from fishery activities, FAO and SEAFDEC/TD are recognizing on recent situation and have set up an energy audits project that target to improve energy efficiency on commercial fishing vessels resulting declining green house gas emission relieved into atmosphere for three years ago. Thai local trawler is a first target to be measured and analysis their fuel consumption pattern for fuel optimization. From energy audit results indicate that large trawler consumes fuel more than small and medium trawl fishing boats nearly two or three times at maximum fuel consumption rate and their fuel consumption rate at sea trial with or without net in water is rely on engine revolution only. In this case, improving fuel consumption rate of these three representative trawlers has only one way that is by keeping good condition of propulsion engine always. At normal condition, diesel engine can run at optimum fuel consumption leading to minimizing impact pollution emitted to environment.

Keyword: Energy audits, Energy audits for Thai trawl fishing boat, Fuel optimization on trawl fishing vessels

Introduction

Thailand is a country that is one of the world leaders in the fisheries sector. Especially for sea fishing which can yield up to 1.59 million tons, representing 56.18 percent. In the early 2000s world oil prices soared to the highest. This placed the global fishing industry under considerable pressure because their propulsion system relies on diesel oil resulting profitability of fishers under risk. Thus to maintain their income level, fishers have to operate fishing more often to increase amount of catching until overfishing. Consequentially, abundance of marine stocks has been diminished rapidly. Not only income consideration, but also green house gas emitted from fishing activities concerns climate changes and sea temperature raising that is negative impact to marine growth aggressively. The FAO in collaboration with the Southeast Asian Fisheries Development Center (SEAFDEC) launched a “Fishing Vessel Energy Audit Pilot Project” in late 2013.

The aim of this pilot project is to apply and develop the methodology and to preliminarily evaluate fuel consumption in the Thai trawler fleet, and to identify potential fuel savings through energy efficient fishing operations and practices. This included the application of energy audits to multiple trawlers in the single-boat trawl fleet.

Materials and Methodology

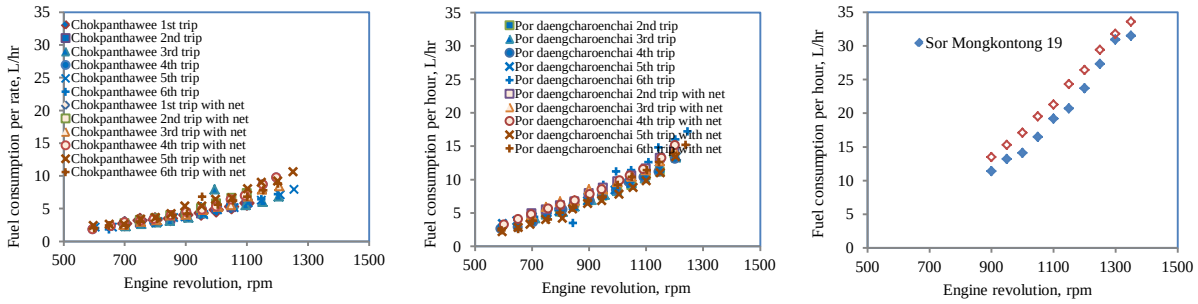
In order to estimate fuel consumption of trawlers used wide spread in Thai sea boundary, six on-site investigated trawlers, two small bottom trawlers less than 14 meter in Chonburi, two medium bottom trawlers among 14-18 meter in Satun, and two large bottom trawlers over 18 meters in Songkla, were representing trawl fleet sectors in both Gulf of Thailand and Andaman Sea.

Since each trawler has individual fuel consumption profile due to difference ship dimension, weight, hull surface resistance, etc. Two performance indicators of fraction of fuel consumption with ship speed (L/knot) and fraction of fuel consumption with sailing distance (L/nmile) were applied for characterizing fuel utilization performance of trawlers.

Preliminary recording data of trawlers including boat dimension, main engine horse power, diameter and blade number of propeller, shape and dimension of trawl net, number of crew onboard, handling equipment, and also investment cost of each fishing operation. All considered physical parameters were measured and recorded both onto log sheet and using CCTV recording system to capture screen of several equipments consisting of fuel flow meter installed onto fuel line, tachometer, wind speed and direction sensor, GPS navigator. Recorded information and data to be calculated and composed into several analysis charts to analyse fuel consumption characteristic and seeking appropriate solutions.

Results and discussions

One case study carried out during testing hull and net resistance experiment, from trend curve on fuel consumption rate via engine revolution charts, small trawl fishing boat has maximum fuel consumption rate up to about 10 L/hr while medium trawler at about 15 L/hr but large trawler at 30 L/hr. Along fuel consumption rata data having small variation gap during towing both with and without net in water indicated that fuel consumption rate rely only on performance of main engine. Solutions in improving this main problems is; main engine have to be keep at a good condition by periodic maintenance both prior and later trip.



(a) (b) (c)

Fig. 1 three representation charts of fuel consumption rate (L/hr) versus engine revolution (rpm)

Moreover, other cases found as some small and medium fishing boats use low efficiency heat transfer of water cooler or obstruction in shell and tube of cooler resulting raising high main engine temperature and engine room temperature nearly 50 ^{o}C. At this circumstance, intake air temperature was heated up nearly 50 ^{o}C, it is lean air combustion, which will drop output power of propulsion engine. In order to decline temperature on their engine, it was observed that skippers and owner of these trawlers has a simple method by installing an additional cooling water pump to increase flow rate of cooling water or cleaning shell and tube of their cooler leading temperature decreased and engine run in normal range at optimum condition which fuel will be used efficiently. This is one of case studies in energy audit experiment.

Conclusion

Results from energy audit experiment indicate that each trawl fishing boat has individual fuel consumption profile and their consumption rates are not rely on engine

revolution because low variation of data points at the same rpm but depend on performance of engine only. In order to optimize fuel consumption rate, propulsion engine should be maintained at good condition with maintenance often. However, in case of engine cooling system of some trawl fishing boats has been constructed or modified by their own experience with low heat transfer efficiency resulting high engine temperature and drop engine performance. Increasing water cooling flow rate and cleaning shell and tube will improve heat exchanging efficiency and maintain engine temperature at normal condition again. This is one case of energy audit activities in the second phase in the first six months of year 2015.

Overall Result from the Pre and Post Course Assessment on E-EAFM training course and the trainees as a factor that support the achievement of the training course's objectives

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Training department of Southeast Asian Development Centre, Thailand.

It is well known that the training is considered as one of the importance tool to strengthen knowledge, skill and attitude of employees/trainees which brings a positive change in the working of organization. Since that training is no longer a reactive function, planning and implementing it in its true sense becomes essential.

Training which aims at leading to transfer of learning and thereby promoting development of employees depends on how effectively it is been designed. It includes following parameters or factors: 1. Training needs assessment at individual, organizational and task level. 2. Appropriate identification of training objectives. 3. Identification of *trainees* - On the basis of age, experience, expectation, interest and learning capacity, 4 Selecting the right trainer -Taking on his experience, expertise, core areas, suitability and expected rapport with audience to give a new direction to trainees. 5. Selection of support tools- Training aids, methods and techniques, venue, study material, special equipments or labs, infrastructure, sitting arrangement, refreshments etc. 6. Preparing training budget –Including directed indirect expenses right from trainers fee to expenses including making of kit, study material , printing cost, refreshments, lunch, interiors, special equipments,. Along with considering the needs which involve indirect cost including employees absence from routine work during training also becomes a challenges to estimate but does matters to be included in estimating training budget

SEAFDEC/TD and the E-EAFM Training courses

The Southeast Asian Fisheries Development Center (SEAFDEC) has fostered the rolling out on both regional and the national training course on the Essential Ecosystem Approach to Fisheries Management (E-EAFM), the course and all course materials such as presentations, training toolkit, handbook, etc., were well designed by BOBLME, NOAA, APFIC,USAID, FAO,SWEDEN, IMA, and etc. The courses delivered by SEAFDEC Training Department team trainers (who were trained on the TOT E-EAFM). These were the several of regional and the national training courses that were conducted in 2015 namely:

Regional Training Courses	National Training Courses
1. Regional Training Course on E-EAFM 2-8 March, 2015	2. National Training on E-EAFM for Thai DOF officers at Songkhla province
2. Regional Training Course on E-EAFM and Extension Methodologies 6-16 October, 2015	2. National Training on E-EAFM for Thai DOF officers at Rayong province
	3. National Training on E-EAFM in Lao PDR
	4. National Training on E-EAFM in Myanmar

During conducted the training courses, all of the factors such as training needs assessment, appropriate identification of training objectives, team trainer, selection of support tools, preparing training budget are more or less as the same except the trainees who are difference which base on each course nature and the trainees composition, so that this study would like to find out that: Are the trainees from each course have gained and improved their knowledge on E-EAFM after wards?

The results from the pre and post course assessments which are filled up by all trainees from each course were used to calculate and compare for the difference value.

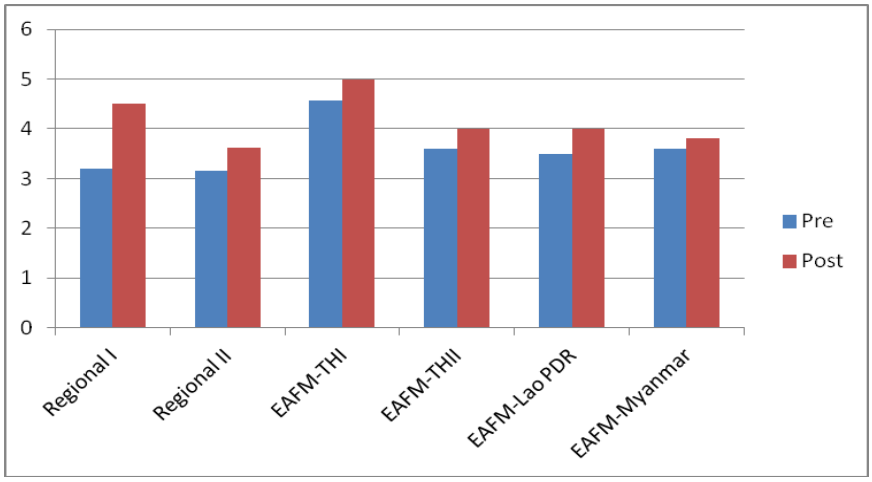

Figure 1: The pre and post course assessment from each of the E- EAFM training course

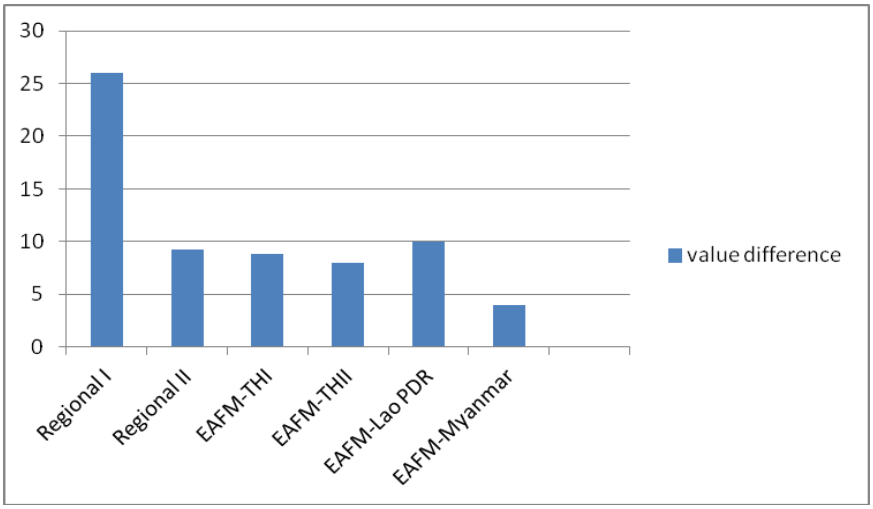

Figure 2: Percentage of increase from each of the E- EAFM training course

Conclusion

Base on the comparison results from the pre and post course assessment from every courses found out that there were the improvements of the participants' knowledge and their understanding on the course contents which can be seen from the difference value (increase) of the pre and post course assessment of every courses.

In comparison of the improving/understanding of each course participants found out that the regional training course on E-EAFM which was conducted from 2 to 8 March, 2015 got the highest value of the different between the pre and post course assessment follow which the national Training on E-EAFM in Lao PDR, then the two courses which are conducted as national training on E-EAFM for Thai DOF officers while the lowest of value different is from the national training on E-EAFM which conducted in Myanmar, which it might due to the difficulties in international language communication barrier which between the course trainers and the trainees. However, even if not too much in value difference from the pre-post course assessment if compared to others courses but we still see the gap of the difference which means that the trainees have gained some knowledge from the course.

Actual situation of livelihood of small-scale fishing household in Thailand –The case study in Eastern, Centre and Southern of Gulf of Thailand

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Keywords: **Fishing household, Livelihood, Rayong area, Prachuab and Chumphon area, Surathani area,**

Purpose

The data collection on actual situation of livelihood of small-scale fishing household in Thailand aimed to express current status and compare situation of fishing household of three area in gulf of Thailand are located in eastern part at Rayong province, Center part at Bangsapan Noi and Bangsapan district of Prachuab Kiri khan province and Pathew district of Chumphon provinc, and southern part at Surathani province.

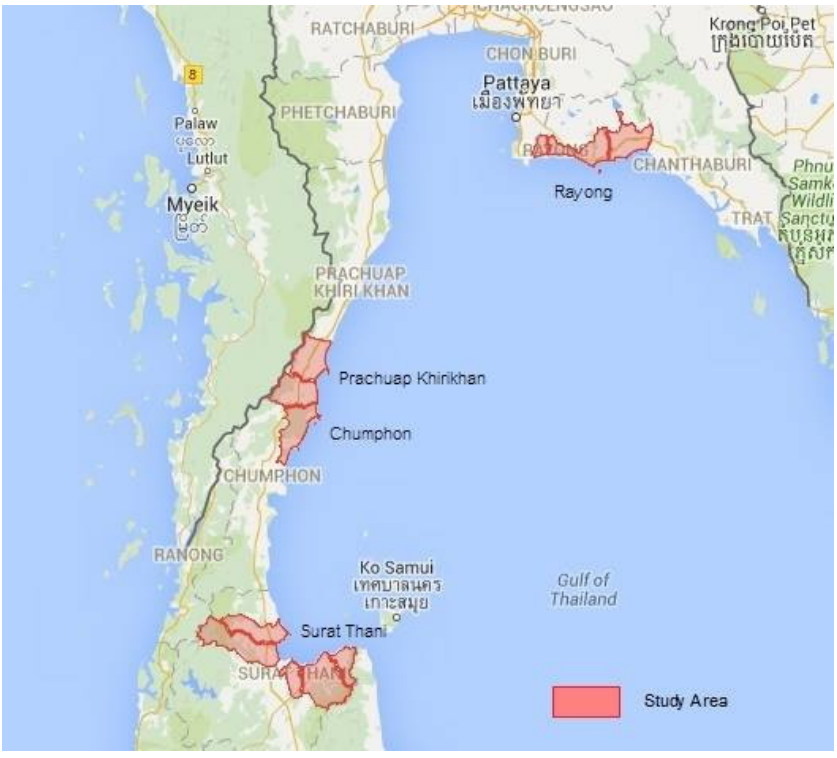

Fig 1: Area of data collecting

Data and materials

The dada were collected through semi structure questionnaire interview for 297 at Rayong, 286 at Prachaub and Chumphon and 316 at Surathani. The result focus on General information, Livelihood, Regarding business and Personal information of respondent.

Results and discussion

In part of general information in three areas were found that there are same information are following age of fishermen highest in during 41-50 year old, and respondents education are primary school, there are member in family mode in 4 and 3 people, and more than half of them are native people in the area , and main religion is Buddhism

Table 1 : General information of fishing household for three area

Data	Rayong area	Prachuab Kiri Khan and Chumphon area	Surathani area
Gender			
Male	97.60 %	97.90%	66.80%
Age			
41-50 year old	33.00 %	30.80%	36.70%
Education level			
Primary school	80.8 0%	75.40%	75.30%
Number of family's member	Mode : 4 ps	Mode : 3 ps	Mode : 3 ps
Former address			
Native province	81.50%	89.86%	59.00%
Other	18.50%	10.12%	41.00%
Religion			
Buddhist	98.65%	99.65%	84.80%

For livelihood and regarding business part found that fisheries are main occupation for three area and fishermen have fishing experiences around 26 years old. And income form fishing of three are area are 383,730, 520,483, and 521,458 respectively it was no significant difference at the 95% level confidence. They also have supplementary income by in Rayong area from agriculture same as in Prachuab and Chumphon area, however Surathani area, supplementary income from aquaculture.

Most of business will sale they product through middleman. In personal information part shown that fishermen's household income of each area are following; 20,928, 17,859, and 31,026 respectively, it is was no significant difference at the 95% level confidence for Rayong and Prachaub Kiri Khan while Rayong with Surat, and Prachuab Kiri Khan with Surat, there is significant difference at the 95% level confidence. Fishermen in three area have fundamental facility for they living e.g. television, washing machine,

refrigerator, fan mobile phone and motorcycle, also they health were identify in this survey by from fishermen perception more than half of them said they are good health anyway this survey also check they health on blood pressure, weight height and waistline when use data form survey on blood pressure found that average blood pressure in Rayong is 140/90, Prachaub Kiri Khan and Chumphon is 138/89, and Suratthani 138/89, it is in quiet high when compare with normal blood pressure(90 - 119 / 60 – 79) shown that average blood pressure of fishermen in three area quiet high. And for weight and high it use for calculate Body Mass Index (BMI) it found that average of BMI of each area as follow Rayong is 33.56, Prachaub Kiri Khan and Chumphon is 23.37, and Suratthani is 24.99 it show that fishermen in three area quiet fatness when compare with BMI standard(less than 18.5= Thin, during 18.5-22.9 = normal, 23.0-24.9= plump, and more than 25.0 = fatness). The situation of livelihood in fishing household show that fisheries are main occupation for three area and three area have similar situation on socioeconomic in fishing household.

The Establishment of Co-management approach at Nam Oon Dam, Sakon Nakhon Province, Thailand

Sumitra Ruangsivakul, Jariya Sornkliang, **Thanyalak Suasi**, Rattana Tiaye, and Kamthon Suaroon

I. Introduction

Typical characteristic of Inland and coastal fisheries in Southeast Asia are considered as "targeting multi-species and involving large number of small-scale fishers". Because of this nature, fishery statistics on these fisheries are recognized as inaccurate or under-reported. As fisheries statistics are basis of good fisheries management, it is necessary to improve data and information collection by utilizing suitable methodologies for these fisheries, e.g. by involving local communities, local officers, etc. For these reason, SEAFDEC have been supporting Member Countries by reviewing the problems and constraints in fisheries data collection in coastal small-scale and inland fisheries at national level, and identify the key issues in fisheries data collection that should be addressed by the countries.

In 2013 SEAFDEC supported Thailand with a very successful training course on Practical Approach for Enhancing Co-management in Inland Fisheries, with Training on Trainers (TOTs) courses, aimed at providing more clear and detailed concept and methodology on Co-management/Community-based resources management, and skills of establishment community fisheries organizations are extremely needed for Thailand.

Including DOF Thailand have new fisheries laws, Section 9 to promote the participation and support of local fishing communities to management, Maintenance, Conservation, Restoration and Sustainable use of aquatic resources within the fishery in coastal fisheries or Inland Fisheries. Department of Fisheries (DOF) action to assist or support the following: (1) Encourage the participation of local fishing communities in policy making, (2)Encourage group forming and provide registration of local fishing communities; (3) Advising local fishing communities to Management, Maintenance, Conservation, Restoration and utilization of aquatic resources. Including to support the operation or community activities in such matters, and (4) Knowledge or information about the deal. Maintenance, restoration, conservation and utilization of aquatic resources.

In this consistence, DOF Thailand collaborate with SEAFDEC to support on facilitating Co-management/Community-based resources management and gathering fisheries activity information for key persons of pilot site of Nam Oon Dam, Phang Khon District, Sakon Nakhon Province.

II. Methodology

This paper reviews activities to promote Co-management and community management in Nam Oon Dam, Sakon Nakhon Province. The activities have conducted by SEAFDEC in collaborate with DOF Thailand since July 2014 including 1) Baseline survey, 2) Training and election of fishing communities representatives, 3) Local workshop to define fisheries management measures at Nam Oon Dam 4) Announcement of Fisheries management measures around Nam Oon Dam by sign board, 5) Data collection on catch data by fishing logbook, and 6) Monitoring catch data and satisfaction on fisheries management measures.

III. Results

Baseline survey

Base line survey was conducted by interview the fishermen in 22 communities around Nam Oon Dam, which located within 5 District covering 8 Sub-district namely: Rae, Nanai, Nongbua, Nongpling, Nikomnam-oon, Kudhai, Warichaphum and Plahlo. The total number of fishermen interviewed is 139 fishermen. Most fishermen engage in fishery combine with agriculture, they operate paddy field, rubber tree and cassava. The main purposes of fishery are source of income and consuming, furthermore the main fishing gear is gill net and fish trap. There are 5 middlemen from Community consist of Dong Kham pho, Huay Bun and Ban Klang that were interviewed to clarify fish distribution in Nam Oon Dam area.

Training and election of fishing communities' representatives

The training aimed to build awareness on the important of Co-management, make understand on the conservation area in Nam Oon Dam. The election of the fisheries community representative to be the Inland Fisheries Management committee in Nam Oon Dam for establishment a network on Fisheries Management. There are 32 representatives were selected from 16 communities around Nam Oon Dam area.

Local workshop to define fisheries management measures at Nam Oon Dam

The workshops provide the lecture to the 32 community representatives and government officer in order to enhance knowledge on Inland fisheries Management as well as Fisheries Law and regulation for fisheries measurement setting. Then, the group discussion was conducted by divide participant into 3 groups to discuss on fisheries management measures for fishing gear, fishing ground and close season. The result of discussion as follow:

1. Fishing gear**:** Prohibit to use Giant lift net, Diving with air compressor and Shooting, Not allow to collect juvenile, however, Long line fishing is allow to operate during close season.

2. Fishing ground/conservation zone: Increase and clearly define the conservation zone.

3. Close season: the close season (spawning season) change period from 16 May-15 September to 16 April - 15 August in each year, during close season the fishers are allowed to fishing on the date 10, 20, and 30 in each month. In addition, this result will be set the Fisheries management measures for Nam Oon Dam area.

Announcement of Fisheries management measures around Nam Oon Dam by sign board

According to the Communities define their own fisheries management measures of Nam Oon Dam, the Community's sign board which contain the map of Nam Oon Dam, close season period, the allowed date for fishing, prohibited fishing gear and conservation zone, were set up at 16 Communities around Nam Oon Dam by community themselves after the community meeting to announce and make understand on the fisheries management measures. The sample of sign board show as below:

Figure 1. *The Sign board of Fisheries management measures in Nam Oon Dam*

Data collection on catch data by fishing logbook

In order to monitor the change of fisheries resources before and after close season, the fishermen volunteered from 16 communities asking to record fish catch on the logbook providing by SEAFDEC. Moreover, the catch data also record from middlemen at landing site to know the quantity of selling catch. The result of catch data can calculate the total catch and catch value of Nam Oon Dam.

Monitoring catch data and satisfaction on fisheries management measures

After close season period, the fishermen continue to record catch data into the logbook until 31 December 2015. The results of catch data will be indicated the current situation of fisheries resources in Nam Oon Dam which will show to the 16 fisheries communities before the next closed season in April 2016. Furthermore, SEAFDEC conducted the attitude survey from fishermen on the appropriate close season period, fishing gear prohibited, conservation zone, fisheries resources after close season period and other opinion to follow up the fisheries management measures declare to the fisheries community by the sign board.

IV. Conclusion

The Fisheries Co-management of Nam Oon Dam, Sakon Nakhon Province was promoted to 16 Fisheries Community around Nam Oon Dam. The fishermen have learned the fisheries management by themselves and encourage awareness rising on conservation of the fisheries resources through the activities of fisheries management providing by SEAFDEC and DOF Thailand. Moreover, the problem on decline of fisheries resources in the Community Fisheries will be solved and the fishermen will preserve the fisheries resources with the sustainable fisheries management.

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