FISH LANDING DATA IN 2006 AND 2007 IN PREY NOP II SIHANOUKVILLE, CAMBODIA
INTEGRATED COASTAL RESOURCES MANAGEMENT IN SIHANOUKVILLE (ICRM-SV)

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I. BACKGROUND

Prior to the start of the project on Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) in November 2005, socio-economic and fishing surveys were conducted in March 2005 to profoundly as well as precisely understand the surrounding situation of the project target area. Through these exercises, it was observed that there was no reliable fish landing data available in the project area. Fish landing data and information are fundamental tools in monitoring not only the marine biological changes but also for the improvement of the socio-economic conditions along with the project implementation. However, the project site is far from the fishery government office and due to limited budget, fish landing data collection every month was not possible. Therefore, the middleman logbook was introduced as the simple and cheap way to monitor the landing trend.

A fish landing data collection system in the fishing community in (Sangkat) Teuk Thla, which had been developed by the cooperative work among the FiA/Cambodia and SEAFDEC/TD staff and middlemen in the project site and used starting February 2006, was aimed at monitoring the fishery resources in the fishing ground of the Teuk Thla fishermen.

According to the Preliminary Socio-Economic Survey in Commune Teuk Thla, Sihanoukville (SEAFDEC/TD, 2005), 12 different types of fishing gears prevail in the project area. These are: crab trap (39.1%), hand push net (31.2%), hand shellfish collection (9.4%), fish gill net (7.2%), crab gill net (2.9%), mullet gill net (2.9 %), mackerel gill net (2.2%), hand crab fishing (1.4%), hook and line fishing (1.4%), shrimp gill net (0.7%), set bag-net/

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Fig. 1. Map showing the Integrated Coastal Resources Management in Sihanoukville (ICRM-SV) project site (by Siriporn Pangsorn)

Table 1. Main fishing gears used in project site, expressed in %

Village	Crab trap	Fish gill net (all type)	Hand fishing shellfish	Hand push net	Others
Prek pros	57.5	0.0	0.0	42.5	0.0
Prek sangke	32.6	25.6	16.3	20.9	4.7
Prek Tal	25.9	14.8	11.1	37.0	11.1
Kampong Chin	35.7	7.1	10.7	25.0	21.4

Source: SEAFDEC/TD, 2005
Note: Fish gill net includes all types of fish gill net, i.e. mullet gill net, mackerel gill net, etc.

stow net (0.7%), and cast net (0.7%). The most common fishing gears used in each village is shown in **Table 1**.

Results of the interview of the middlemen during the field survey for the setting up of the fish landing data collection system for the project site in February 2006 (Laongmanee and Boros, 2006) indicated that there are 23 middlemen in the project site (**Table 2**).

Table 2. Middlemen in each village and the number of customers (fishermen) including the main types of fishing gears used

Name of Middlemen	No. of fishermen	Main fishing gears
Prek Sangke village		
1.Seng Ly	~ 10	Vary
2.San Laok	~ 11	Crab trap
3.Chhoun Bouv	~ 8	Mix fishing gear
4.Ry Math	~13	Mix fishing gear
5.Vy Doc	~ 8	Mix fishing gear
Prek Pros village		
1.Meng Long	~ 4	Mix fishing gear
2.Pou Kokt	~ 7	Mix fishing gear
3.On Bo	~ 19	Crab trap
4.Pou Ren	~ 7	Mix fishing gear
5.Bon Son	~ 8	Mix fishing gear
6.Khon Nom	4-10	Hand push net
7.San Liv	10-12	Hand push net
8.Touch Nong	~ 6	Mix fishing gear
9.Yang Khom	~ 8	Mix fishing gear
10.Yang Khinna	~ 10	Mix fishing gear
Prek Tal village		
1.Meat Kvok	~ 10	By hand
2.Mat Dol	~ 5	By hand
3.Doel Kvol	~ 5	By hand
4.Yob Tina	~ 10	By hand
Kampong Chin village		
1.Chhon Polo	20-30	Mix fishing gear
2.Chhin Chin	4-5	Crab trap
3.Chom Yong (Mrs. Sang Khoun)	~ 7	Crab trap
4.Houn Lab	2-3	Crab trap

Note: Names in shaded cells are the volunteer middlemen to record data in the logbook

II. MATERIALS AND METHODS

The fish landing data for this project were based on the records of middlemen in four villages within Commune Teuk Thla, namely: Prek Sangke, Prek Pros, Prek Tal and Kampong Chin. Results of the Preliminary Socio-Economic Survey in Commune Teuk Thla, Sihanoukville (SEAFDEC/TD, 2005) indicated that the main fishing gear used in the project site are crab trap, fish gill net and hand shellfish collection. Therefore two types of simple logbooks, the crab trap logbook and catch logbook (for other types of fishing gear), were introduced to the middlemen.

The crab trap logbook is designed for recording the buying date, number of traps and the weight of catch while the catch logbook is for compiling data on buying date, types of fishing gear, main species composition and the catch weight (specifically of the swimming crab, mud crab and other species).

One middleman from each village served as volunteer for recording the data in the logbook (**Table 2**). Results showed that the number of fishermen from which the middleman buys the catch from vary each day. Volunteer middlemen Seng Ly from Prek Sangke, On Bo from Prek Pros (who served only during the beginning of the project was changed with another in March 2006), Yob Tina from Prek Tal, and Chom Yong from Kampong Chin, reported that they have customers of about 10, 19 10 and 7 fishermen, respectively (**Table 2**). They received advice from Mr. Yi Boros on how to fill up the logbooks (**Fig. 2**).

The volunteer middleman in Prek Sangke (Seng Ly) bought the catch from fishermen who use various types of fishing gears (i.e., crab trap, fish gill net, hook and line, push net, cast net, and clam collected by hand) while the middlemen from Prek Pros, Prek Tal and Kampong Chin bought only the catch from crab trap, clam collected by hand, and mud crab from crab trap, respectively.

The data from logbook were used to calculate the catch per unit effort (CPUE) based on monthly basis, the most basic indicator for stock assessment. The average, maximum and minimum CPUE of each fishing gear serve as indicators for monitoring the abundance of the marine resources in the fishing ground of the fishermen in the project site.

Fig. 2. Training of enumerators conducted by Mr. Yi Boros, Fishery Officer from Sihanoukville

Note: The participants in the training of enumerators were:

1. Seng Ly at Prek Samke village
2. A Cousin of On Bo at Prek Pros village
3. Yob Tina at Prek Tal village
4. Sang Khoun at Kampong Chin village

III. Results and Discussions

3.1 Swimming Crab Trap

The landing data for crab trap came from Prek Sangke and Prek Pros. Although the data from Prek Pros during 25 February - 8 March 2006 were available, the CPUE could not be calculated because the number of traps was not recorded. The average fishing hour of the crab trap fishermen in the area was about 10 hours with only 1 operation per day (SEAFDEC/TD, 2006, TD/RES/96). Based on the interview of the fishermen on 6 - 10 February 2006 (Laongmanee, 2006: Survey Report), the number of traps of each fisherman vary between 200 - 700 traps. The fishermen having boats without engine own about 200-250 crab traps while those having boat with

engine usually own 250 - 700 traps. The number of traps recorded by the middlemen however, indicated a different view as the fishermen reported that their traps vary from 20 to 700 units.

Since some fisherman in the project site used fishing boats with engine, while some of use fishing boats without engine and the others may not have used boats, information on the different types of fishing boats in the fishing ground is quite limited. The fishing ground of fisherman that uses no engine boat is more generally the near shore area while the fishing ground used by boats with engine is beyond. Due to the different fishing ground, the CPUE of crab trap for swimming crab was analyzed using three categories: CPUE of fisherman having less than 100 traps, 100 - 250 traps, and more than 250 traps.

The composition of catch from this type of fishing gear as shown in the logbook included the swimming crab, mud crab and others such as shark, ray, etc. However, only 3% of data have record of other catch because the fishermen usually keep the other catch for household consumption. Therefore, the CPUE of crab trap in this report was based on weight of crab per 100 traps.

The data on the swimming crab trap were collected from Prek Sanke and Prek Pros. There were no crab trap data from Prek Sanke during March 2006 to August 2006 as the volunteer middleman noted that the crab trap fishermen changed to other fishing gear during that period.

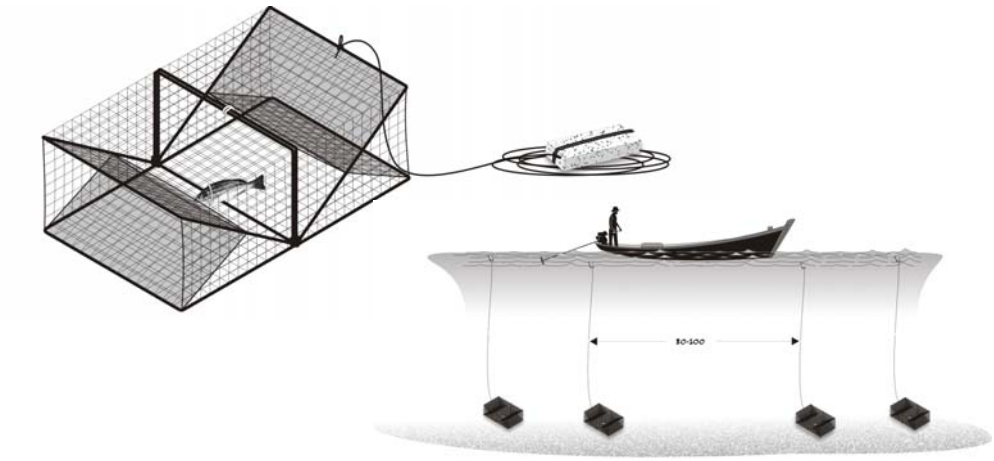

Fig. 3. Illustration of the crab trap used in the coastal area (Drawn by Narong Ruangsivakul, SEAFDEC/TD)

Number of traps: less than 100 traps

Table 3. CPUE (kg/100 traps) of crab traps used by fishermen, less than 100 traps/trip

Month	CPUE (kg/100 traps) of crab trap (Calculate only crab weight)			
	Maximum	**Minimum**	**Average**	**Number of data**
Feb06	9.7	1.2	3.0	22
Mar06	21.3	1.5	9.0	5
Apr06				
May06				
Jun06				
Jul06				
Aug06				
Sep06	26.3	5.9	11.9	16
Oct06	21.3	3.3	9.1	22
Nov06	19.2	2.5	6.7	31
Dec06	20.6	1.3	9.1	28
Jan07	8.0	3.0	6.2	5
Mar07	21.3	9.6	13.7	3
Apr07				
May07				
Jun07	26.3	9.3	16.1	3
Jul07	29.5	10.9	16.0	4
Aug07	12.0	10.9	11.4	2
Sep07	16.3	12.5	14.4	2

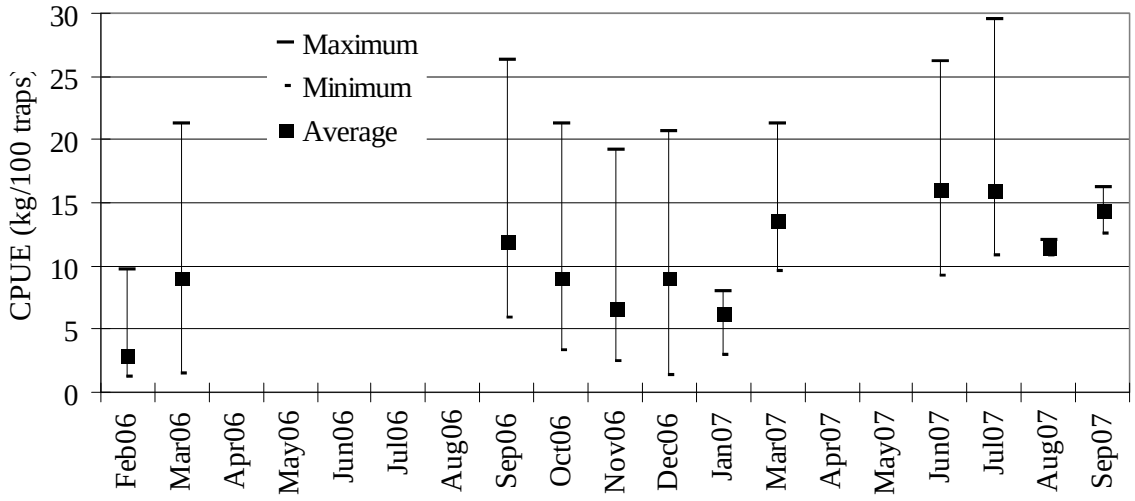

Fig. 4. Maximum, minimum and average CPUE (kg/100 traps) of crab traps, less than 100 traps

The average CPUE of the less than 100 traps category was between 3 - 16.1 kg/100 traps. High CPUE (more than 20 kg/100 traps) was observed in March 2006 and 2007, September 2006, October 2006, December 2006, June 2007 and July 2007.

Fig 4 and **Table 3** show that the average CPUE in 2007 was higher than in 2006. This could be a good signal on the status of the fishing ground of fishermen having less than 100 traps because they caught more crabs in 2007 than in 2006.

Number of traps: 100-250 traps

Table 4. CPUE (kg/100 traps) of crab traps, 100-250 traps/trip

Month	CPUE (kg/100 traps) of crab trap (Calculate only crab weight)			
	Maximum	Minimum	Average	Number of data
Feb06	12.5	1.0	2.7	66
Mar06	8.3	0.6	3.1	84
Apr06	6.3	0.6	2.6	50
May06	7.2	1.3	1.9	41
Jun06	5.4	0.6	2.1	153
Jul06	3.6	0.5	2.1	76
Aug06	4.1	0.5	1.9	58
Sep06	2.9	0.7	1.7	52
Oct06	4.7	0.4	2.2	38
Nov06	7.1	0.6	2.4	109
Dec06	6.4	0.6	2.5	118
Jan07	5.2	1.0	2.3	58
Mar07	8.3	0.6	3.1	76
Apr07	6.3	0.6	3.3	12
May07	4.9	0.7	2.3	58
Jun07	5.1	0.8	1.7	77
Jul07	5.4	0.8	2.1	26
Aug07	3.7	0.8	2.0	28
Sep07	2.3	0.7	1.6	22

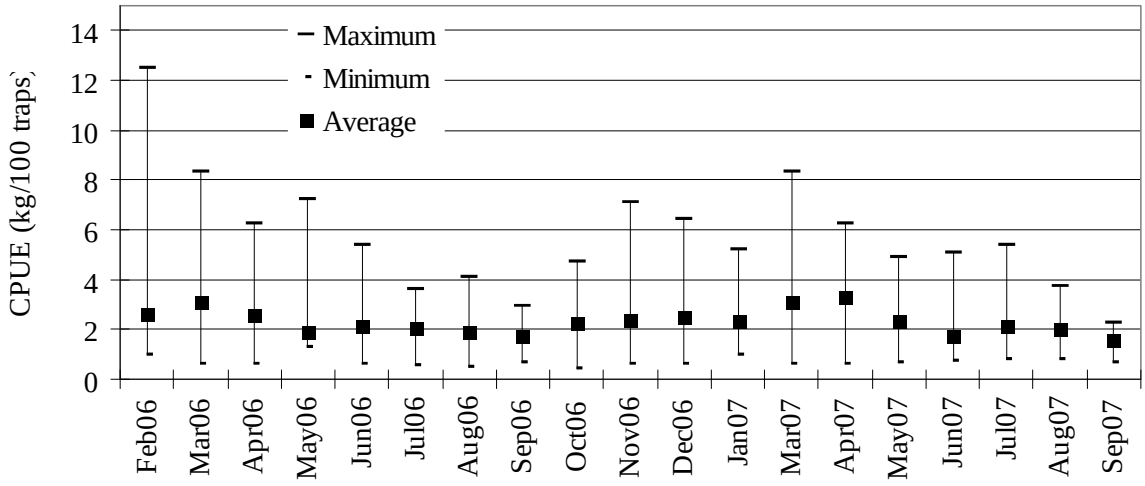

Fig. 5. Maximum, minimum and average CPUE (kg/100 traps) of crab traps, 100 - 250 traps/trip

For fisherman who use 100-250 crab traps/day, the average CPUE was 1.6–3.3 kg/100 traps. It was only in February 2006 that the maximum CPUE was higher than 10 kg/100 traps. High CPUE was observed during the summer season (March and April) both in 2006 and 2007 (**Fig. 5** and **Table 4**).

The average CPUE of this category was lower than the CPUE of crab trap when fishermen used less than 100 traps. In this category, there was no distinct difference between the CPUE in 2006 and 2007, which means that the resource situation in the fishing ground of fishermen using 100-250 traps was the same from 2006 until 2007.

Number of traps: more than 250 traps

Table 5. CPUE (kg/100 traps) of crab traps, more than 250 traps /trip

Month	CPUE (kg/100 traps) of crab trap (Calculate only crab weight)			
	Maximum	**Minimum**	**Average**	**Number of data**
Feb06	2.1	1.6	1.8	7
Mar06	3.5	0.2	1.4	97
Apr06	3.3	0.3	1.8	35
May06	2.7	1.3	1.9	41
Jun06	2.8	0.8	2.1	58
Jul06	3.1	0.5	2.1	32
Aug06	3.0	0.3	1.6	54
Sep06	2.5	0.8	1.5	45
Oct06	2.4	1.3	2.0	11
Nov06	3.1	0.5	1.1	17
Dec06	2.5	0.6	1.3	55
Jan07	2.4	0.5	1.4	25
Mar07	3.5	0.2	1.4	97
Apr07	3.3	0.3	1.7	21
May07	3.7	0.4	1.6	127
Jun07	4.3	0.7	1.6	134
Jul07	5.2	0.4	1.6	113
Aug07	5.9	0.4	1.5	108
Sep07	2.6	0.4	1.4	107

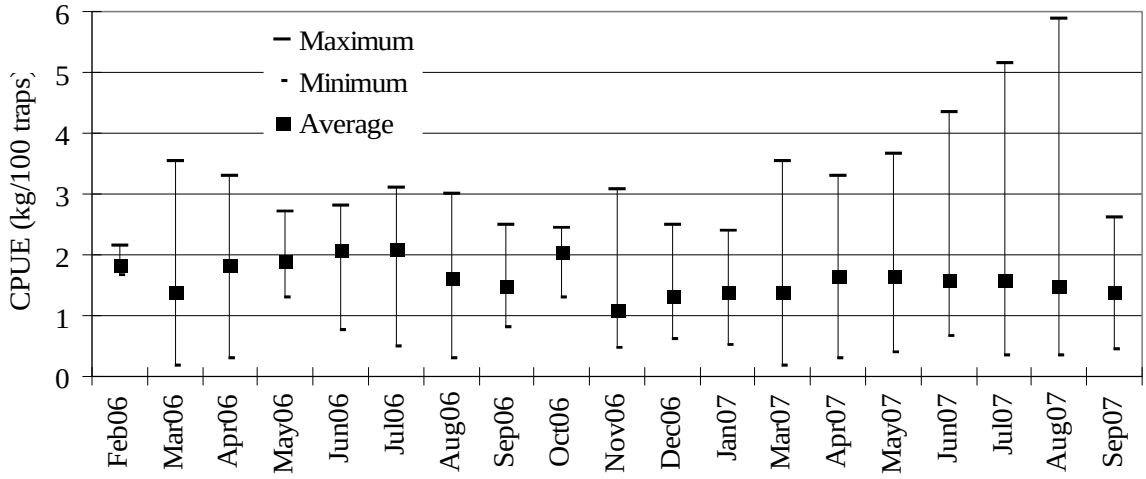

Fig. 6. Maximum, minimum and average CPUE (kg/100 traps) of crab traps, more than 250 traps/trip

The average CPUE of crab traps that the fishermen use more than 250 traps was 1.1–2.1 kg/100 traps. It was only in July and August 2007 that the maximum CPUE was higher than 5 kg/100 traps.

Fig 6 and **Table 5** show that the average CPUE in 2007 was slightly less than in 2006, indicating that the crab resources may be decreasing in this fishing ground.

SEAFDEC had conducted a project on Locally Based Coastal Fisheries Management in Pathew District (LBCFM-PD), Chumphon Province in Thailand, similar to that of the Integrated Coastal Resources Management in Sihanoukville (ICRM-SV). Some fishermen in (LBCFM-PD) were also involved in crab trap fishery. The Project staff also kept track of the CPUE of crab traps in the project site, where the fishermen own 35 to 250 traps. The average number of traps owned by the fisherman in Chumphon Province, Thailand was 200 traps. The CPUE for the crab trap was 5.4, 4.97 and 8.4 kg/100 traps in 2002, 2003 and 2004, respectively (Petchkamnerd et al. a and b, 2004).

A comparison of the CPUE of the crab traps in the project sites in Cambodia and Thailand indicated that crab trap CPUE of fisherman using less than 100 crab traps in Cambodia was higher than in Thailand. In the other categories, the data indicated that the CPUEs were about 94% less in Chumphon, Thailand than in Sihanoukville, Cambodia.

Fishing seasons

Although crab trap can be operated at the project site the whole year round, low landing weight was observed during some seasons (**Fig.7**). In April, the volunteer middlemen noted that the fishermen change their fishing gear, and also in July, August and September during the southeast monsoon season, when adverse weather condition is brought about by heavy rains and strong winds. Also in November, some fishermen stop fishing because they were engaged in rice harvesting. **Fig.7** shows that the peak season for swimming crab is in June, the month when the middleman bought the highest crab weight.

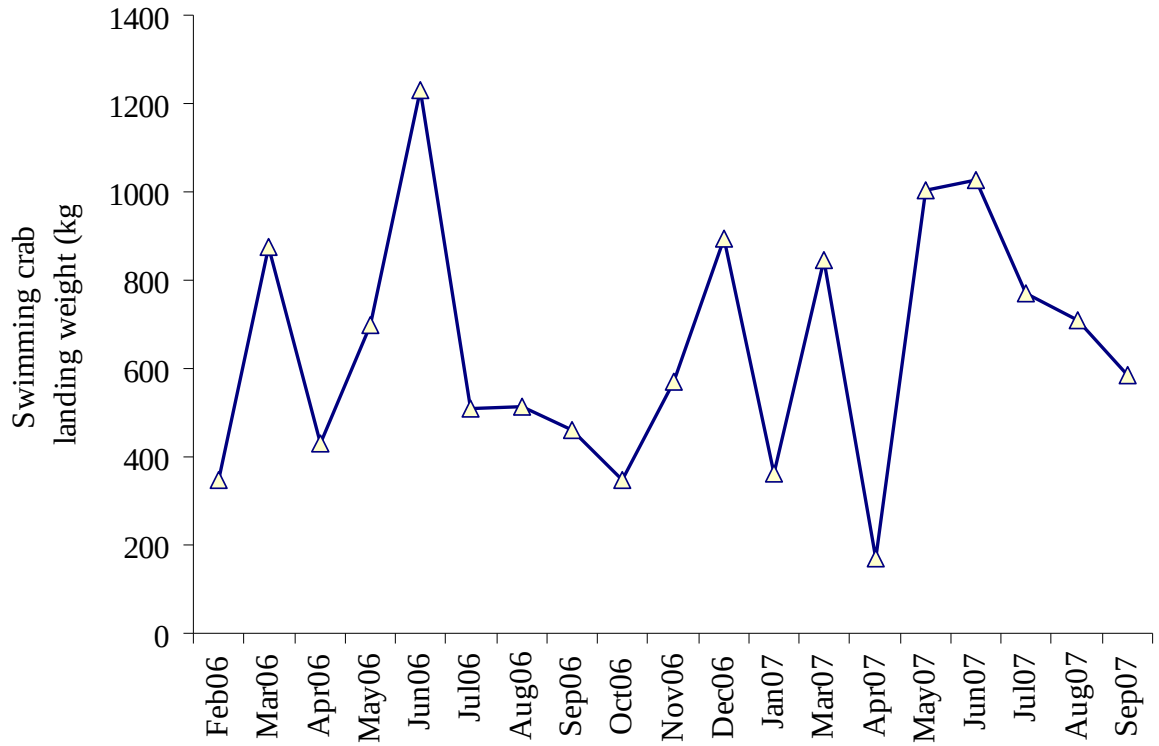

Fig. 7. Monthly swimming crab landing data collected by 2 middlemen

A strength pattern could be observed from the plotted data on the number of traps versus the crab weight in kg (**Fig. 8**). The figure indicated that a fisherman owning 700 traps can catch the same weight of crab compared with fishermen having less than 100 traps.

By simple logic, if a fisherman invests more they should gain more, otherwise they will have to change jobs. But since this data shows the opposite, the authors doubted the reliability of the data. However, even considering the data to be correct, the fishing ground used by fisherman owning more than 100 traps needs proper management otherwise the fishermen cannot survive with such low CPUE.

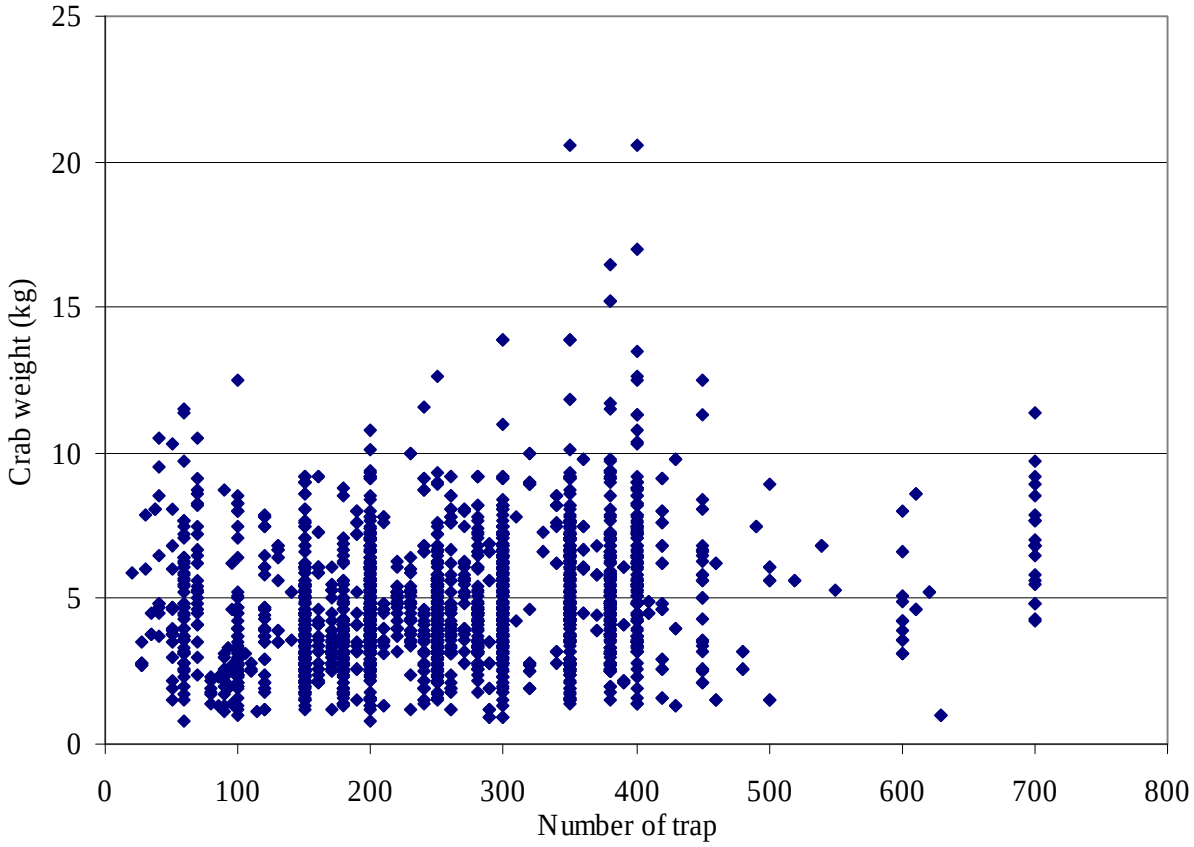

Fig. 8. Crab weight versus number of traps used in each fishing trip

3.2 Crab trap for mud crab

Most of the mud crab trap data came from Kampong Chin village, where the marketable size crabs are sold in markets near the village, namely: Tro Pang Ro Pov market and Nel Ren market while the small sizes are sold as seeds of culture (Laongmanee and Boros 2006). Usually, the fishermen set traps with bait in mangrove areas. The number used by fishermen in the project site is between 25-55 traps. For monitoring of the mud crab stock, the calculation of the CPUE for mud crab trap in this report was based on weight of the mud crab in kilograms per 50 traps.

The highest CPUE for crab trap was observed in January 2007 with an average CPUE of 10.5 kg/50 traps. In May and June 2006, the volunteer middleman noted that fishermen collected mud crab by hand therefore, those data are not including in **Fig. 10**, which considered only the CPUE of the crab trap. Moreover, the data on mud crab in July, August, September and October 2006 were not recorded due to unknown reasons.

Fig. 9. Catch of mud crab (*Scylla serrata*) using traps in Kampong Chin village

The average CPUE of crab trap for mud crab appeared to be greater in dry season (December to January) than during the rainy season (July - September, **Table 6** and **Fig. 10**). The variation of mud crab catch was influenced by the seasonal condition and its life cycle. Mud crab biology studies indicated that the zoea (larval) stage are sensitive to high temperatures and low salinities, and therefore could not exist in estuaries as they would survive only in marine conditions. In rainy season, due to large amount of run offs from rivers, the females migrate offshore to spawn (Grubert and Phelan, 2007). Unfortunately, there was no data in May to October 2006 and February 2007, so that computation of the CPUEs was not undertaken.

Table 6. CPUE (kg/50 traps) of crab trap for mud crab

Month	CPUE (kg/50 traps) of crab trap (Calculate only crab weight)			
	Maximum	Minimum	Average	Number of data
Feb06	11.5	0.4	3.9	35
Mar06	5.8	0.6	2.1	60
Apr06	2.4	0.7	1.3	13
May06				
Jun06				
Jul06				
Aug06				
Sep06				
Oct06				
Nov06	8.1	3.1	4.9	7
Dec06	12.5	1.3	5.8	32
Jan07	18.7	5.2	10.5	39
Mar07				
Apr07	9.3	2.5	5.3	28
May07	8.3	1.7	4.7	30
Jun07	7.5	2.5	4.9	29
Jul07	6.2	1.5	3.8	25
Aug07	11.9	0.3	2.6	61
Sep07	11.9	0.3	1.9	30

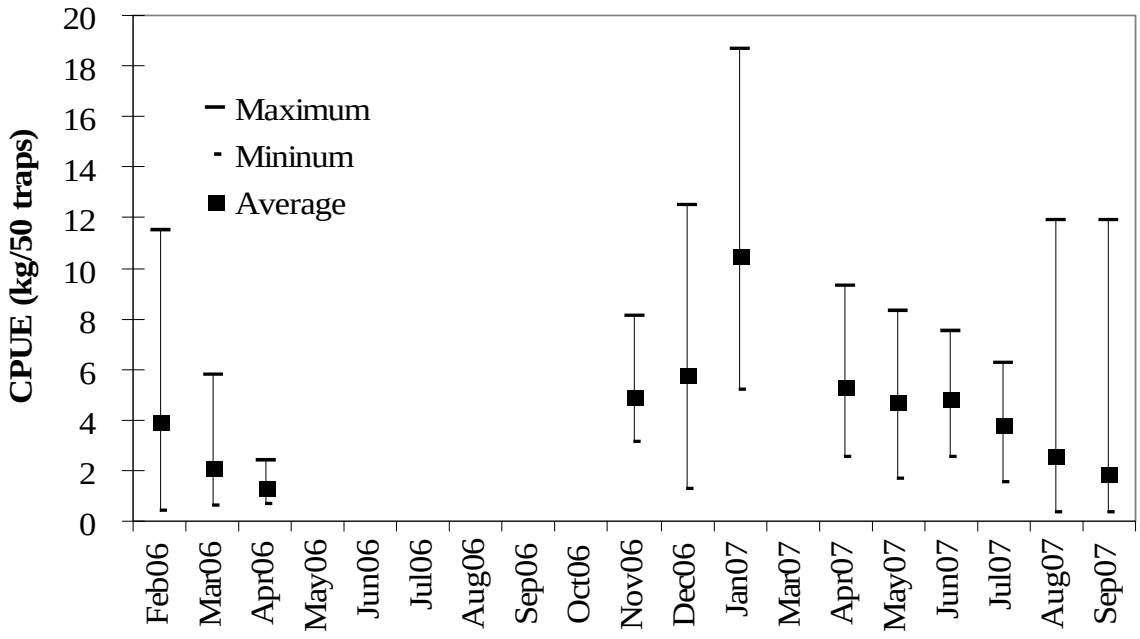

Fig. 10. Maximum, minimum and average mud crab trap in Kampong Chin village

3.3 Shellfish collection by hand

There are two groups of bivalves that the volunteer middlemen bought, namely: the marsh clams and blood cockles. Data on catch of marsh clams was recorded by the middlemen in Prel Tal and Prek Sanke. However, since April 2007, the volunteer middleman in Prek Sanke bought blood cockles instead of the marsh clams. Most of the bivalve collectors are women while sometimes, weekend and vocational children were also involved in bivalve collection.

The use of CPUE (kg/day) of clam collection to monitor the current situation and trend of clam resources in the project, considered the fact that the middlemen record only the date of buying and the catch. Effort information such as the number of collectors was not recorded. However, the average CPUE may indicate some relevant figures on the bivalve resource in its long-term monitoring.

Marsh clams

Marsh clam is abundant in muddy bottoms, in fresh and brackish waters of mangrove areas (FAO Species Identification Guide Vol. 1, 1998). They can be collected by hand during low tide when collectors can walk in the mangrove areas. The average CPUE of marsh clams collected by hand (kg/day) varies between 3-10.9 kg/day. **Table 7** and **Fig. 12** indicate that there are two high seasons for marsh clams in one year: March and September which show high in maximum, average and mode of data. During the northeast monsoon season (November and December), the middlemen observed that the tide was very high. The CPUE of marsh clams by hand was therefore influenced by tide and the time of the low tide. If the low tide is at night time, the fishermen could not collect the clams.

The average CPUE in 2007 (9.0 kg/day) was higher than that in 2006 (6.1 kg/day), which was probably due to the decreased number of collectors as observed from the data. However, the increasing trend of CPUE could indicate that marsh clams resource in the project site is still not yet over fished.

Fig. 11. Marsh clams (*Polymesoda* sp.) collected in the project site

Table 7. CPUE (kg/day) of collecting marsh clams by hand

Month	CPUE (kg/day)				Number of data
	Maximum	Minimum	Average	Mode	
Feb06	40.0	0.3	8.3	5	526
Mar06	34.0	0.3	8.0	10	429
Apr06	26.0	0.4	5.5	8	502
May06	18.0	0.2	4.4	4	574
Jun06	10.0	0.5	3.0	1.8	232
Jul06	12.0	0.5	4.6	4	168
Aug06	17.0	0.4	5.1	4	432
Sep06	31.0	1.1	7.1	5	413
Oct06	31.0	0.5	9.2	10	201
Nov06					
Dec06	13.0	2.0	5.7	4	182
Jan07	18.0	2.0	8.5	7	39
Mar07	34.0	1.0	10.9	10	230
Apr07	26.0	2.0	7.9	7	284
May07	17.0	2.0	6.7	5	141
Jun07	20.0	2.0	8.1	5	140
Jul07	19.0	2.0	8.9	4	43
Aug07	20.0	1.0	10.7	10	367
Sep07	20.0	1.0	10.8	10	245

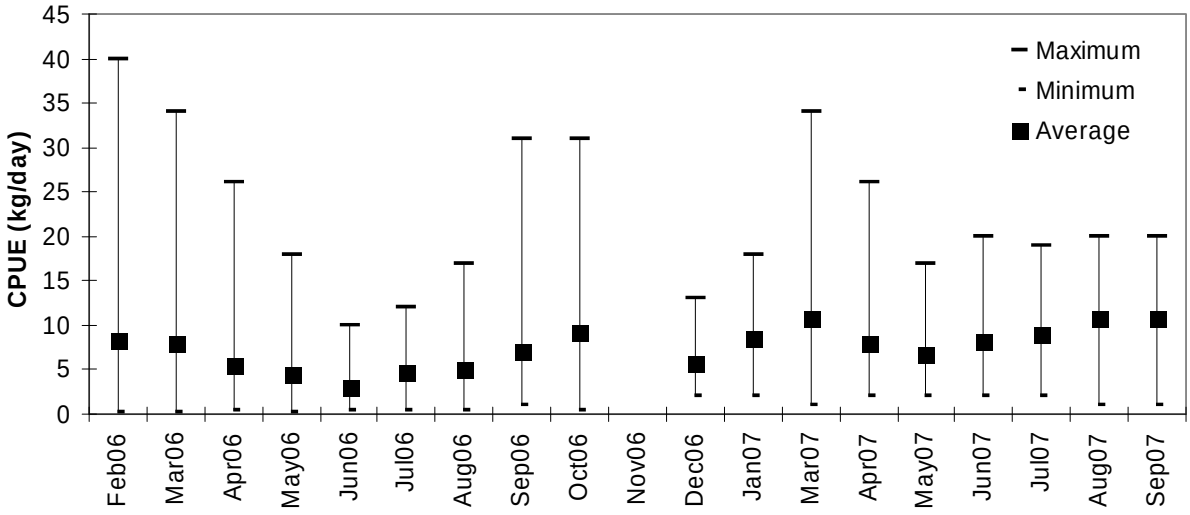

Fig. 12. Maximum, minimum and average CPUE (kg/day) of collecting marsh clams by hand

Blood cockle

Volunteer middleman from Prek Sanke started to record blood cockle catch from April 2007, when he bought blood cockles instead of marsh clams.

The blood cockle habitat is the muddy bottom in bays, estuaries or in mangrove areas. Fishermen can collect blood cockle by hand during low tide. However, there was no information on how the fishermen in the project site collected the blood cockle.

Since there was a large gap between the highest CPUE of blood cockle collecting compared with the average and lowest CPUEs therefore, the logarithm scale was applied (**Table 8** and **Fig.13**). The average CPUE of blood cockle collected by hand was between 1.6 to 4.9 kg/day, where the highest CPUE was observed in June 2007.

Since the available record on blood cockle collection was for the year 2007 only, a comparison could not be done. However, data should be recorded annually for future evaluation of the resources.

Table 8. CPUE (kg/day) of collecting blood cockle by hand

Month	CPUE (kg/day)				Mode
	Maximum	Minimum	Average	Number of data	
Apr07	51.0	0.4	3.3	207	1.5
May07	66.0	0.3	3.8	407	2.5
Jun07	57.0	0.4	4.9	284	4.2
Jul07	17.0	0.5	3.2	140	1.8
Aug07	28.0	0.5	2.6	128	2.5
Sep07	2.7	0.2	1.6	50	1.2

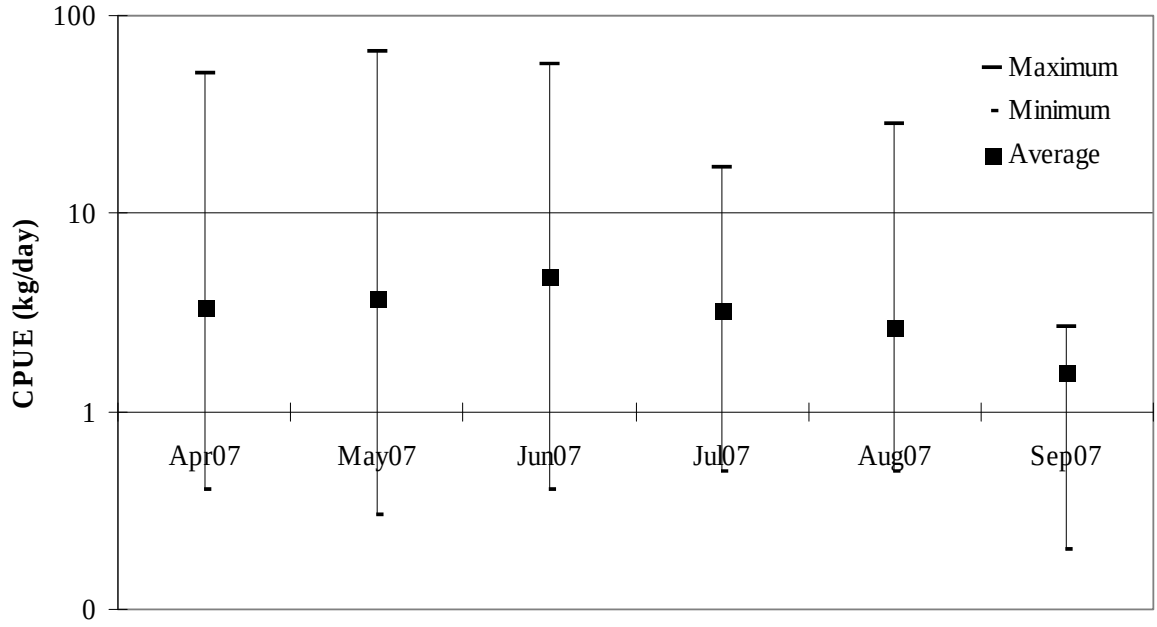

Fig. 13. Maximum, minimum and average CPUE (kg/day) of collecting blood cockle by hand

3.4 Push net

The push nets used in the project area are the hand push nets. The target species are the Sergestids shrimp (*Acetes* sp.) and small shrimps used for producing dried shrimp. The data on push nets came from the record of the Prek Sangke fishermen. Fishing hour of push net fishermen is about 5-6 hours/day (Laongmanee and Boros 2006). The CPUE of push net was calculated from the total shrimp catch (kg/day).

Fig. 14. The push net (left) and dried shrimp produced in the project site

Table 9. CPUE (kg/day) of hand push net

Month	CPUE (kg/day)			
	Maximum	Minimum	Average	Number of data
Feb06	4.4	1.4	2.6	12
Mar06	6.0	0.6	2.9	29
Apr06	8.5	1.0	3.6	35
May06	6.8	1.9	4.5	16
July06	18.9	1.7	6.8	51
Aug06	8.7	3.4	4.8	13
Apr07	2.7	1.2	2.1	3

The average CPUE of hand push net was between 2.1 to 6.8 kg/day. The highest CPUE (18.9 kg/day) was observed in July 2006, where the number of data recorded was also high (51 data) during this month. After August, there was no data recorded due to unknown reasons. For 2007, since only three data were recorded in April 2007, the number was not enough to be able to evaluate the resource.

IV. CONCLUSIONS

The objective of the activity was to make use of the middleman logbook in collecting fish landing data and information which are the fundamental tools in monitoring the marine biological changes and in the improvement of the socio-economic conditions along with the project implementation. It was found from the results of the activity that the swimming crab resources in different fishing grounds were in different situations. The fishing ground of

the fishermen using small number of crab traps showed a good sign that the swimming crab resource was still not depleted while the swimming crab resources in fishing grounds of fisherman having 100-250 traps and more than 250 traps, were consistent and decreasing, respectively. However, there was some cloud of doubt with the reliability of the data collected through the logbooks. For marsh clams, the CPUE of collecting the clams by hand showed a good sign. The difficulty of collecting the clams could lead to the conservation of the resource from over utilization.

The activity is still faced with the problem of continuity and reliability of data which led to some difficulty in monitoring some fishing gears such as mud crab, blood cockle collecting by hand and push net. For long-term monitoring of the resource, middlemen should be made to understand the importance of the data for management purposes. Close consultation with the project staff by the middlemen can improve the collection of the data by the middlemen using the logbook system.

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