

CATCH INFORMATION OF BLUE SWIMMING CRAB (*Portunus pelagicus*) FROM SARAWAK COASTAL WATER OF SOUTH CHINA SEA

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Abstract: The status of Blue Swimming Crab in Sarawak coastal water was investigated. The Catch per Unit Effort (CPUE) from the study site peaked in three months- May, July and October. The percentages of the male crabs were greater than those of the female crabs in all months except August. The study suggested that the shore marine embayment with less sandy seabed is not suitable for the larger crabs. The gill net mainly targets the larger crabs which caused the lower CPUE. The abundant sea grass beds contributed to the high percentage of the berried female. The abundant sand bank has also contributed to high percentage of male crabs found at the study site.

KEYWORDS: Catch information, Blue swimming crab, *Portunus pelagicus*

Introduction

The *Portunus* species is one of the most important families of the Brachyura, in the marine embayment and estuaries throughout the Indo-West Pacific (Stephenson, 1962; Kailola et al., 1993). Studies shows that *Portunus pelagicus* are often represented by resident populations in protected marine embayment (Sumpton et al., 1994; Sukumaran & Neelakantan, 1997). However, Potter et al. (1983) also described that *P. pelagicus* frequently enter estuaries early in life and remains there for several months where the crab undergoes considerable growth.

P. pelagicus is an important component of the crab industry in Sarawak. A total of 9,314.81 metric tonnes of crabs were harvested from 1996 to 2004 or average 1,034.98 metric tones per year (Director of Marine Fisheries Sarawak, 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003; 2004). *P. pelagicus* fishery in Sarawak is predominantly an open access fishery with no restriction for the capture of this species. The commercial catch has been increasing substantially, principally due to the use of gill nets. Increasing market prices and new market opportunities have also led to higher harvesting volume with the volume of *P. pelagicus* crabs landing in Sarawak increased from 168.48 metric tones in 1996 to 2,527.08 metric tones in 2004 (Director of Marine Fisheries Sarawak, 1996; 2004).

The major concern for most fisheries managers is the decline in fish and crustacean stocks including crabs that may occur due to commercial exploitation. However, crustacean and fish stocks have increased in population when the productivity in their environment increases or the numbers of their predators decline (Bailey, 1982; Steckis et al., 1995; Merrick, 1997; Stevens et al., 2000). Study by Pollock (1995) also shows that increases in the crustaceans and fish population have been accompanied by a reduced growth rate and the attainment of maturity at a smaller size. Despite the high potential of *P. pelagicus* in Sarawak, there is no up to date information on its catch. This study analysed the fishery catch information including some population characteristics of *P. pelagicus* in near-shore marine embayment.

Materials and Methods

The study site is along the coastal waters of the Sematan Fishing District, Sarawak. The Sematan Fishing District is located at the most western part of Sarawak, stretching from Tanjung Dato to Sampadi (Figure 1). The *P. pelagicus* commercial fishing grounds within this Sematan Fishing District is located around the two coral reef islands of Talang-talang Kecil Island at 1°53'N, 109°46'E and Talang-talang Besar Island at 1°55'N, 109°46'E'. This Talang-talang Island is about 10.5 km from the Sematan estuary.

Samples for the study were obtained during sampling trips covering 24 stations within the shallow water biotopes of the study site (Table 1). The study site is also the commercial fishing ground for *P. pelagicus*. Crabs were caught by means of gill nets of 16.5 cm mesh size, 2.1 m (height) x 24.5 m (length) net dimension size (Table 2 and Figure 2). During every sampling trip only one gill net set were used with seven pieces of net per set of the gill net. The nets are of the same type used by the local crab fishermen in Sematan. The crabs were sampled for 10 months (March to December 2004) with 10 sampling trips per month at 10 different sampling stations within the 24 sampling stations. During every sampling trip, the number of crabs caught were recorded which included number of male and female crabs, and number of ovigerous females. The gill net was laid for 24 hours. Data are presented as mean $\pm$ standard deviation.

Results

The recorded monthly Catch per Unit Effort (CPUE) of *P. pelagicus* using the gill nets is presented in Table 3. The CPUE from the study site has three peak periods: May with mean CPUE of 39.50 ± 27.52 (range, 93.0 – 15.0 crabs per set of nets; n = 10 sampling trips), July with mean CPUE of 29.60 ± 8.55 (range, 50.0 – 20.0 crabs per set of nets; n = 10 sampling trips) and October with mean CPUE of 28.40 ± 23.04 (range, 77.0 – 6.0 crabs per set of nets; n = 10 sampling trips) (Table 3). The lowest CPUE was recorded in December with mean CPUE of 1.70 ± 2.16 (range, 6.0 – 0.0 crabs per set of nets; n = 10 sampling trips) (Table 3). The mean CPUE which were sampled in 2004 were 18.60 ± 19.20 (range, 0.00 - 93.00 crabs per set of nets; n = 100 sampling trips) (Table 4). Due to heavy rain and rough sea condition during the monsoon season, no sampling trips were made in January and February 2004. From the mean monthly CPUE of the study site, it is expected that the mean monthly CPUE for January and February 2004 also has low CPUE similar to the CPUE for March and December, 2004.

Table 5 shows the monthly *P. pelagicus* sex's composition in gill net catches from the study site in 2004. The results indicate higher number of male crabs except in August 2004 (14.17% male and 86% female).

Table 6 shows the monthly total and percentage of *P. pelagicus* berried female composition in gill net catches. The results indicate that the monthly percentage of the berried female from the total female crabs catch has two peaks (March 2004 (79.13%) and in December 2004 (71.43%)) (Table 6). The results indicate high produce of berried female during March, 2004 (78.13%), April, 2004 (58.73%), November, 2004 (69.57%) and December 2004 (71.43%).

Discussion

The mesh size of gill net used in this study is designed to target the mature and larger crabs. So the juvenile crabs are not so well represented in this present study crab samples. Joel and Raj

(1987) reported that the small *P. pelagicus* prefers shallow water while the larger crabs migrate to deeper water. The coastal habitat of the near-shore marine embayment may not be suitable for the larger crabs. The nature of the gill net which mainly target the larger crabs cause the lower CPUE for the shallow water of the study site compared to the deeper water of Sarawak coastal water.

The result of this study revealed seasonality in the CPUE of *P. pelagicus*, similar to the trends reported by Sumpton (2001) in Queensland, Australia, and Chande and Mgaya (2003) in Dar es Salaam, Tanzania. The result of the present study suggests that peak CPUE occurred in May, July and October, the off-monsoon season. Heasman (1980) suggested that in tropical estuaries the period of peak spawning for *S. serrata* generally coincides with periods of high nutrient input associated with monsoon rainfall. This high nutrient input after the monsoon season has been suggested by Heasman (1980) may contribute to high abundance of food to support the early development of *P. pelagicus* larvae and juvenile in the present study. The result from the present study shows that CPUE increased from March and peak in May, July and October. It is suggested that adult crabs could have migrated to offshore marine embayment from the shallow water after the peak CPUE in May which results in low CPUE in December for the shallow water. Seasonal fluctuations in *P. pelagicus* densities influenced by an offshore migration were also reported by Edgar (1990) in Western Australia and Chande and Mgaya (2003) in Dar es Salaam, Tanzania.

The low CPUE were recorded in December could also be influenced by the nature of the habitat. Studies by Arnold (1984) and Lin (1991) reported that swimming crab, *Callinectes* spp. is widely distributed in the neotropics and subtropics with sandy and sandy-mud (sandy-loam) bottoms. These make the shallow water with less sandy seabed not so suitable for the larger crab for burrowing and recorded lower crab density and CPUE. Chande and Mgaya (2003) also suggested that swimming ability of the larger crabs which can tolerate strong waves in the deeper water make the deeper water more suitable for the larger crab than the smaller ones.

Goldstein et al. (1996) pointed that sea grass beds has enhances growth of juvenile crabs of *Callinectes sapidus*. Studies by de Lestang et al. (2003a; 2003b) in west coast of Australia showed that the juvenile of *P. pelagicus* become recruited into the shallow water of the near-shore. Other studies show that rapid growth of juvenile crabs occurred at the shallower inshore areas (Joel & Raj, 1987; Sumpton et al., 1994; Chande & Mgaya, 2003). This may also be attributed to the presence of food and refuge functions of the sea grass beds which lead to smaller crab preference to the shallow water. However the lower CPUE in December is certainly related to the offshore migration of the smaller crab from the shallow water of the study site.

Studies reported that *P. pelagicus* undergo breeding migration, whereby berried female migrate to a more oceanic environment in the deeper water (Batooy et al., 1980; Potter & de Lestang, 2002; de Lestang et al., 2003a; de Lestang et al., 2003b). The present study also stated that the monthly percentages of the berried female from the total female crabs catch for berried females sampled from the shallow water is high (which two peaks in March, 2004 at 79.13% and in December, 2004 at 71.43%). The possible reason for this high percentage of berried female may be attributed to the presence of sea grass beds abundant in the shallow water of the study site. As mentioned earlier the presence of sea grass may provide food and perform a refuge function.

The result of the present study show that the monthly *P. pelagicus* sex's composition in gill net catches from the study sites has more monthly percentages of the male crabs than the female crabs except in August 2004. Study by Campbell (1984) shows that female's *P. pelagicus* require a sandy substrate for successful egg extrusion and attachment to the pleopods. Study in Moreton Bay, Queensland, Australia shows that the migration of mature females on to sand banks for egg extrusion may be partly responsible for the variation of sex ratios in just prior to the spawning season (Sumpton et al. 1994). Males prefer deeper gutter and lower slopes of sand banks (Kangas, 2000). Personal observation during the SCUBA diving shows that there were a lot of sand banks with low slopes in the study site. This could be the reason why the monthly percentages of the male crabs are more than the female crabs for the study site. It is also predicted that the high percentage of female crab will dominated the estuary and the flat sand bank areas near to the coastline where it is out of the sampling sites of the present study.

The results from the present study concluded that the shallow water biotopes of the study site is been dominated by the male crabs.

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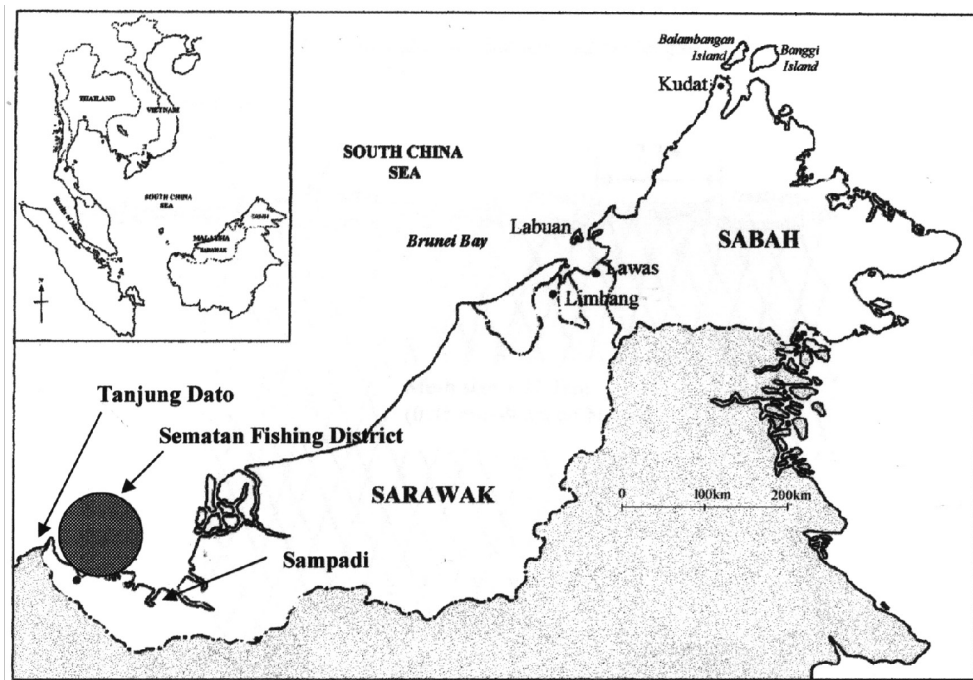


Figure 1. Location of the study site at Sematan Fishing District, Sarawak coastal water of South China Sea.

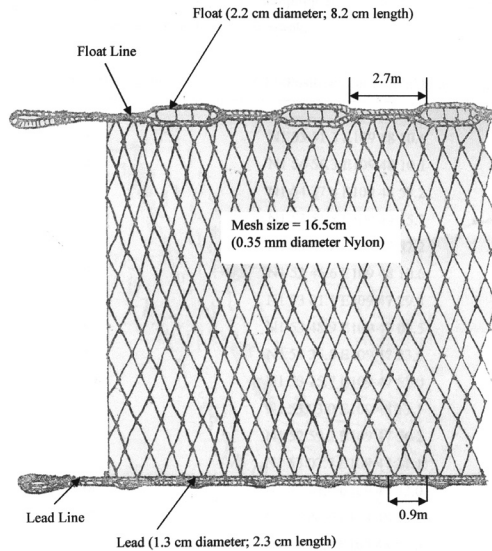


Figure 2. Gill nets specification used in the present study.

Table 1. GPS positions for the 24 sampling stations within the shallow water biotopes of the Sematan Fishing District, Sarawak.

Sampling station no.	GPS Position (Lat/Lon hddd°mm's.ss'")
1	N1 53 51.3 E109 48 10.6
2	N1 54 56.3 E109 48 10.1
3	N1 54 37.4 E109 48 57.2
4	N1 53 51.8 E109 49 15.7
5	N1 53 07.2 E109 48 57.2
6	N1 52 46.6 E109 48 10.6
7	N1 53 01.1 E109 47 29.3
8	N1 53 48.9 E109 47 07.5
9	N1 54 35.5 E109 47 23.5
10	N1 53 25.7 E109 47 52.0
11	N1 53 03.0 E109 48 13.1
12	N1 52 59.2 E109 47 56.2
13	N1 53 07.7 E109 47 31.1
14	N1 53 44.7 E109 47 43.0
15	N1 53 26.0 E109 48 35.2
16	N1 54 19.0 E109 48 52.0
17	N1 54 44.0 E109 48 24.2
18	N1 54 19.4 E109 47 20.8
19	N1 54 30.0 E109 48 02.5
20	N1 54 00.0 E109 48 47.5
21	N1 53 42.2 E109 48 53.0
22	N1 54 17.1 E109 47 45.4
23	N1 53 34.7 E109 47 16.9
24	N1 54 27.1 E109 48 26.8

Table 2. Gill nets specification used in the present study.

Items	Specification
1. Net	
i. Materials	i. Nylon; 0.35 mm (diameter)
ii. Mesh size	ii. 16.5 cm
iii. Net dimension size	iii. 2.1 m (height) x 24.5 m (length)
2. Main / anchor rope	
i. Materials	i. Polyethylene (PE)
ii. Rope size	ii. 7 mm diameter
iii. Rope length	iii. 50.9 m
3. Float / lead rope	
i. Materials	i. Polyethylene (PE)
ii. Rope size	ii. 3 mm diameter
iii. Rope length	iii. 318.5 m @ 7 pieces of nets per gill net set
4. Float	
i. Size	i. 8.2 cm (length) x 2.2 cm (diameter)
ii. Distance between float	ii. 2.7 m
iii. No. of float per net	iii. 16 pieces per net @ 112 pieces per 7 nets
5. Lead	
i. Size	i. 2.3 cm (length) x 1.3 cm (diameter)
ii. Distance between lead	ii. 0.9 m
iii. No. of lead per net	iii. 49 pieces per net @ 343 pieces per 7 nets
6. Gill net set	
i. No. of nets per set	i. 7 pieces of nets per set of the gill net

Table 3. Monthly Catch per Unit Effort (crabs / set of the gill net*1) of *P. pelagicus* from coastal waters of the Sematan Fishing District, Sarawak in 2004.

Month	Mean	Max	Min	Sd	n* ²
Mar.	6.70	16.00	2.00	5.42	10.00
Apr.	16.40	34.00	5.00	8.03	10.00
May	39.50	93.00	15.00	27.52	10.00
Jun.	24.50	53.00	6.00	17.35	10.00
Jul.	29.60	50.00	20.00	8.55	10.00
Aug.	12.70	20.00	9.00	3.89	10.00
Sep.	20.70	93.00	1.00	28.04	10.00
Oct.	28.40	77.00	6.00	23.04	10.00
Nov.	5.80	15.00	0.00	4.57	10.00
Dec.	1.70	6.00	0.00	2.16	10.00

Crabs / set of the gill net*1 = Number of crabs per set of the gill net with seven (7) nets of 2.1m (height) x 24.5m (length) net dimension size per set of the gill net.

n*2 = Number of sampling trips per month with every sampling trip used only one (1) set of the gill net

Table 4. Mean, maximum, minimum, standard deviation and number of sampling trips (n) of CPUE of *P. pelagicus* from coastal waters of the Sematan Fishing District, Sarawak in 2004.

	CPUE
Mean	18.60
Max	93.00
Min	0.00
Sd	19.20
N	100.00

Table 5. Monthly total and percentage of *P. pelagicus* sex composition from coastal waters of the Sematan Fishing District, Sarawak with 10 sampling trips per month of 2004.

Month	Total catch			Catch percentage		
	Male	Female	Total catch	Male (%)	Female (%)	Total (%)
March	35.00	32.00	67.00	52.24	47.76	100.00
April	101.00	63.00	164.00	61.59	38.41	100.00
May	309.00	86.00	395.00	78.23	21.77	100.00
June	170.00	75.00	245.00	69.39	30.61	100.00
July	161.00	135.00	296.00	54.39	45.61	100.00
August	18.00	109.00	127.00	14.17	85.83	100.00
September	137.00	70.00	207.00	66.18	33.82	100.00
October	212.00	72.00	284.00	74.65	25.35	100.00
November	35.00	23.00	58.00	60.34	39.66	100.00
December	10.00	7.00	17.00	58.82	41.18	100.00
Total	1,188.00	672.00	1,860.00	590.00	410.00	1,000.00

Table 6. Monthly total and percentage of *P. pelagicus* berried female from coastal waters of the Sematan Fishing District, Sarawak with 10 sampling trips per month of 2004.

Month	Total berried female	Total female	Berried female percentage
March	25	32	78.13
April	37	63	58.73
May	26	86	30.23
June	25	75	33.33
July	32	135	23.70
August	39	109	35.78
September	8	70	11.43
October	24	72	33.33
November	16	23	69.57
December	5	7	71.43

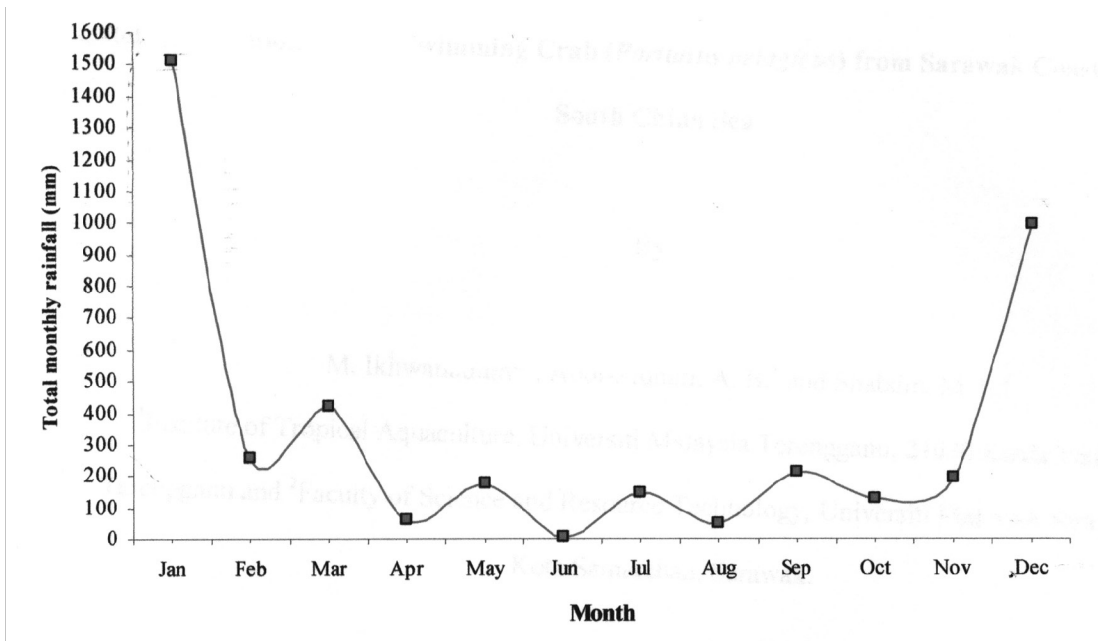


Figure 3. The total monthly rainfall for the study site, recorded at Sematan Hydrology Station, Sarawak Drainage and Irrigation Department for 2004 show that the monsoon season started in October and ended in February.