



**Establishment and Operation of a Regional System of
Fisheries *Refugia* in the South China Sea and Gulf of Thailand**

REPORT

THE STUDY OF JUVENILE TIGERPRAWN (*Penaeus monodon*) DISTRIBUTION, DENSITY AND BIOMASS IN PASU, LUTONG AND SIBUTI RIVERS IN MIRI, SARAWAK

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Introduction

Globally, the penaeids constituting 225 species from 26 genera (Food and Agriculture Organization of the United Nations, FAO, 2008). It has been reported that 300 species of prawns had economic value, and out of that only 100 species are recorded in landings of statistics worldwide (Chan, 1998) reflecting their value as commercial species. The tiger prawn, *Penaeus monodon* Fabricius falls under the Family Penaeidae and was identified as one of the largest and the most commercial commodity. *Penaeus monodon*, with body length reaches 270 mm can be considered as one of the largest prawns under Family Penaeidae. Due to marine fisheries in the world are in the trend of declining and resources depletion (FAO, 2018), hence, management mitigation measures were introduced to curb these problems including refugia.

The refugia concept is defined as “Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use” (UNEP, 2005).

Based on observation and research done in 1998 (Hadil and Faazaz, 1998) location for tiger prawn spawners were located in water depth (> 30 m) in Tg. Batu, Miri to Kuala Baram, Miri. Local trawlers have been operating since 1997 to collect spawners. The data was verified by resource survey that have been conducted in 1999 (Hadil and Albert, 2001) & 2012 (Hadil 2014). In order to get the complete information of the life cycle, it is necessary that research on juvenile tiger prawn conducted, therefore, this report will focus on juvenile tiger prawn.

Materials and Method

The juvenile tiger prawn surveys were carried out at 3 major rivers inhabited by juvenile tiger prawn namely Pasu, Lutong and Sibuti rivers respectively (Figure 1) from March to November 2019 with the help from local fishermen. Sampling was execute using random sampling method technique where sampling were done at selected stations either at a point closer to the river mouth, middle of the river or further upstream. A total of 20 stations were completed.

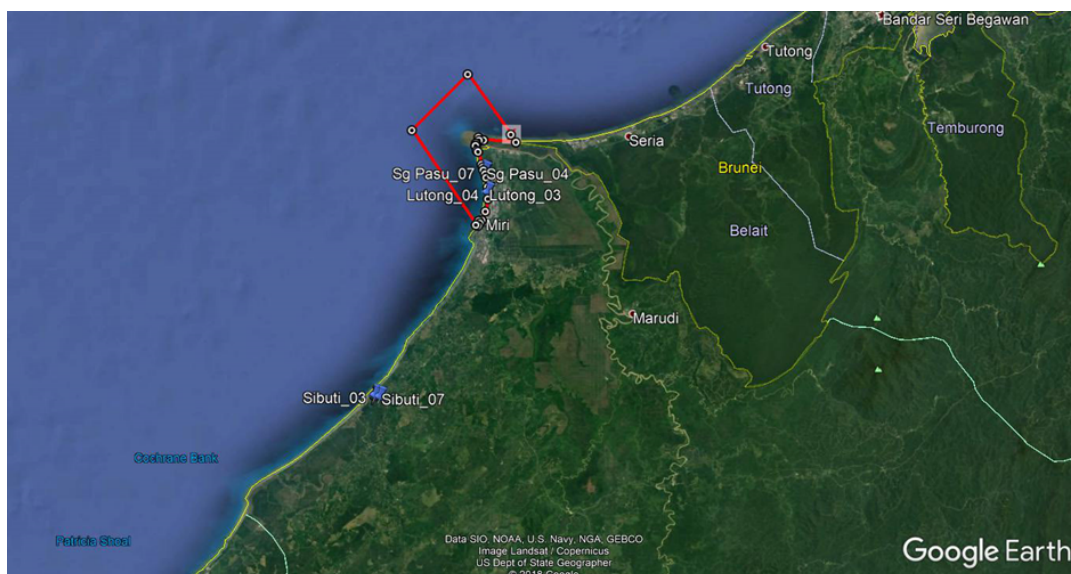


Figure 1. Three major rivers, Pasu, Lutong and Sibuti rivers as nursery ground for juvenile tiger prawn (juvenile sampling stations).

Fishing was carried out during low and high tide. A cast net with 1.8 metre in length and 2.1 metres in diameter made of polyethylene net with mesh size of 19 mm (0.75 inch) was casted at each station to catch prawn. The sampling methodology adopted was the total removals methods (Welcomme 1983) where the catches usually consist of both prawns and fish. The cast net was thrown at the station then pulled and hauled

up. All specimens collected were identified (Annie Lim *et al.*,) counted and weighed. The juvenile tiger prawn were sexed (male or female) based on presence or absence of the male genitalia (petasma) and female genitalia (thelycum), total length (TL; mm), carapace length (CL; mm) and weight (g) were measured.

To estimate the current biomass, the catch of prawns harvested from the 1.8 m cast net was then equated to the total length of the river. The total area of the cast net was calculated using

$$A = \pi r^2.$$

The simple equation for estimating the current biomass, where, A=area, r^2 = radius

In the estimation of prawn biomass, it was assumed that the distribution of the prawn catch per 1.8 m cast net from different rivers is normal (Mordkoff 2016). In order to normalize all the 1.8 m cast net catches, log transformation (Mc Donald 2014; Hadil *et al.*, 2016; Hadil *et al.*, 2017, FRI 2017) was carried out.

Results

A total of 375 casting activities using cast net were carried out between March and November 2019. The catches of the cast net at the surveyed location were listed in Table 1. There were 25 species including *Penaeus monodon* caught in all the 3 rivers sampled. Beside *P. monodon*, *Fenneropenaeus merguensis*, *F. indicus*, *Metapenaeus lysianassa* (prawn from the Family Penaeidae), *Macrobrachium rosenbergii* (prawn from Family Paleomonidae) the other 20 species caught were fin-fish.

In terms of catch composition (Table 1), *P. monodon* constituted 39.0 % of the total catch followed by Banana prawn, *F. merguensis* – 18.4 %, Longarm Mullet, *Moolgarda cunnesius* -7.1 %, Indo-Pacific Tarpon, *Megalops cyprinoides* – 5.6 %, Tade grey Mullet, *Chelon planiceps* – 5.5 %, Indian white prawn, *F. indicus* – 4.9 %, Tiger-toothed croaker, *Otolithes ruber* – 3.1 %, Spotted scad, *Scatophagus argus* – 2.2 % and the remainder 17 species each contributed < 1 %.

Table 1. Percentage catch composition and total catch in terms of weight, wt. (g) and numbers, no. tails over 375 casting operations at Pasu, Lutong and Sibuti rivers, Miri surveys in March and April 2019

No.	Species	Weight (g)	No. tails	Percentage(%)
1.	<i>Penaeus monodon</i>	2415.2	70	39.02
2.	<i>Fenneropenaeus merguensis</i>	1140.0	93	18.40
3.	<i>Moolgarda cunnesius</i>	439.4	11	7.1
4.	<i>Megalops cyprinoides</i>	345.0	2	5.6
5.	<i>Chelon planiceps</i>	339.4	11	5.5
6.	<i>F. indicus</i>	302.4	47	4.9
7.	<i>Toxotes chatareus</i>	194.2	6	3.13
8.	<i>Otolithes ruber</i>	189.6	10	3.06
9.	<i>Scatophagus argus</i>	138.2	55	2.20
10.	<i>Lutjanus johni</i>	127.0	2	2.05
11.	<i>Oxyeleotris sp.</i>	116.1	4	1.8
12.	<i>Coilia boernensis</i>	44.5	2	0.71
13.	<i>Eubleekeria splendens</i>	54.0	10	0.87
14.	<i>Thryssa setirostris</i>	4.2	1	0.06
15.	<i>Encrasicholina punctifer</i>	31.8	4	0.51

16.	<i>Macrobrachium rosenbergii</i>	20.8	8	0.33
17.	<i>Raonda russeliana</i>	51.6	3	0.83
18.	<i>Plectorhinchus chaetodonoides</i>	6.2	1	0.10
19.	<i>Pomadasys kaakan</i>	29.6	3	0.47
20.	<i>Gerres erythrourus</i>	34.6	5	0.56
21.	<i>Sillago sihama</i>	116.4	1	1.88
22.	<i>Carangoides malabaricus</i>	33.2	1	0.53
23.	<i>Amblygaster sirm</i>	10.6	1	0.17
24.	<i>Scomberoides tala</i>	9.4	1	0.15
25.	<i>Metapenaeus lysianassa</i>	4.33	3	0.07
	Total	6197.73	355	100.0

Prawn biomass was estimated based on adjusted mean catch, AMC obtained from cast net sampling. Biomass estimates of tiger prawns from the 3 rivers sampled calculated were summarized in Table 2. With an AMC of 10.61 kg of tiger prawns per 1.2 metres radius of cast net, Pasu river is the most productive, followed by Sibuti river and Lutong river respectively. Whereas, the biomass (kg) estimated was 11.73, 20.77 and 15.22 for Pasu, Lutong and Sibuti rivers respectively.

Table 2. Estimated biomass of juvenile tiger prawn in Pasu, Lutong and Sibuti rivers

No	River	Length (km)	AMC (kg)	Variance of AMC	Biomass (kg)
1.	Pasu river	1.0	10.61	9.67	11.73
2.	Lutong river	1.2	3.34	5.94	20.77
3.	Sibuti river	3.0	5.85	82.21	15.22

Discussion

The results of these survey indicated that the value of *P.monodon* (in terms of numbers and percentage) are significant compare to total species caught in the survey. Among the three rivers, Pasu river was the nearest nursery grounds, adjacent to Kuala Baram, where adjusted mean catch (AMC) calculated as the highest. In terms of biomass, Lutong river showed the highest biomass, 20.77 kg, followed by Sibuti and Pasu river respectively.

Conclusion

A total of 375 casts were recorded from 5 survey trips. The total number of juvenile *P.monodon* caught during the survey was 70 tails (37 tails male and 33 tails female). This indicated that these three rivers namely Pasu, Lutong and Sibuti is the nursery grounds for the juvenile *P. monodon*. It is important to preserve and conserve these nursery grounds to ensure the life cycle of *P. monodon* withstand.



Figure 2. Species composition caught during one of the trips / surveys in Pasu River.



Figure 3. A cast net with 1.8 metre in length and 2.1 metres in diameter made of polyethylene net with mesh size of 19 mm (0.75 inch) used to catch the juvenile *P.monodon*.



Figure 4. Ground for Mangrove in Pasu river, nursery juvenile *P.monodon*



Figure 5. Catches from Lutong river