



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

REPORT

**DISTRIBUTION, DENSITY, AND BIOMASS OF
Penaeus monodon IN PASU, BAKAM AND LUTONG RIVERS
IN MIRI, SARAWAK FOR 2020**

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Distribution, density and biomass of juvenile *P. monodon* in Pasu, Bakam and Lutong rivers in Miri, Sarawak for 2020

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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 prawn under Family Penaeidae. Due to marine fisheries in the world are in the trend of declining and resources depletion (FAO, 2018), hence, management mitigation measure 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 focused on juvenile tiger prawn.

Materials and Method

The tiger prawn surveys in 2020 were continued at 3 major rivers inhabited by juvenile tiger prawn (like previous year, 2019) namely Pasu, Lutong and Sibuti rivers respectively (Figure 1) and another new river namely Sg. Bakam (Figure 2) in March 2020, June to November 2020 with the help from local fishermen. Sampling was executed 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 34 stations were completed.



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

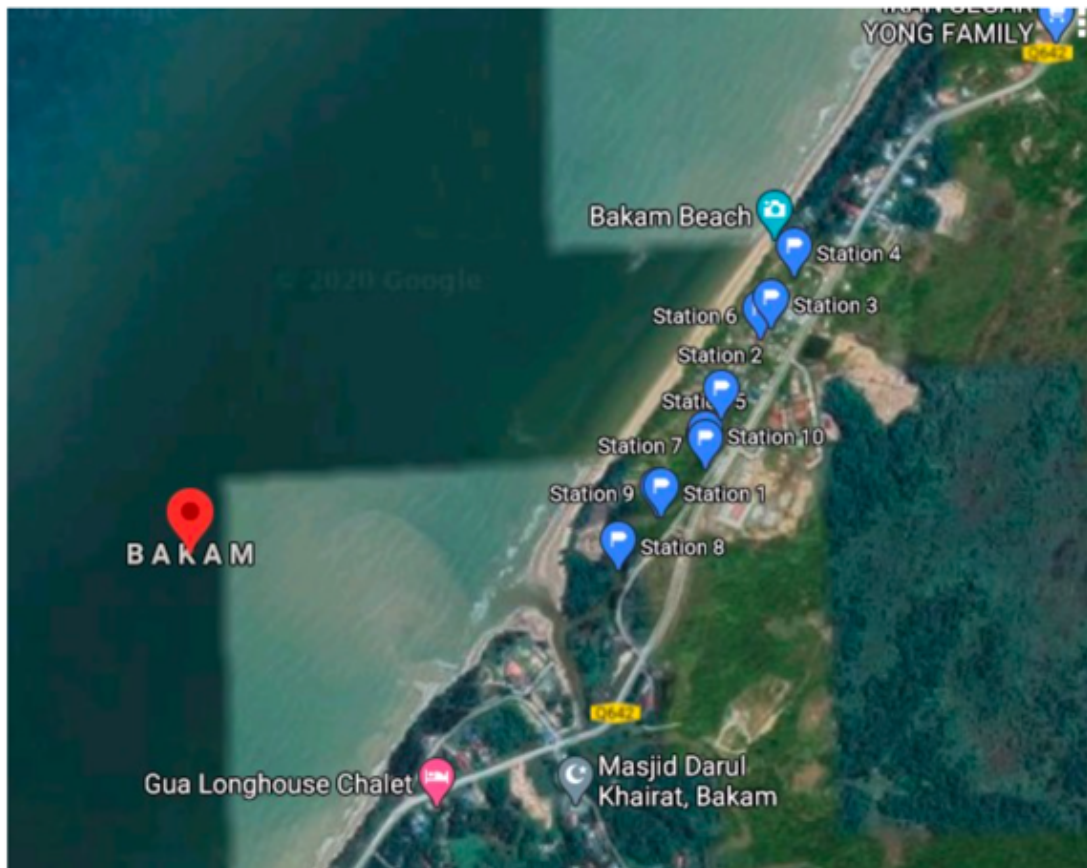


Figure 2 : Sg. Bakam, as a new nursery ground for juvenile tiger prawn (ten juvenile sampling stations).

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 threw 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 2380 casting activities using cast net were carried out between March, June until November 2020. The catches of the cast net at the surveyed location were presented into a pie chart as in Figure 3. The catch were classified into three category which are *P.monodon*, other prawns and other species. Other species of prawn caught in all the three rivers (Pasu, Lutong and Bakam) sampled includes *Fenneropenaeus merguensis*, *F. indicus*, *Metapenaeus lysianassa*, *Metapenaeus affinis*, *Metapenaeus ensis* (prawns from the Family Penaeidae), *Macrobrachium rosenbergii* (prawn from Family Paleomonidae) and the other species caught were fin-fish. Whereas, for Sibuti, juvenile *P. monodon* were not caught at this period.

In terms of catch composition (Figure 4), all three rivers shared the same trend where *P. monodon* constituted about 1-2 % of the total catch followed by other prawns (12-14%) and other fish that contributed the biggest portion to the catch which are around 85-86% respectively (in terms of number caught)

It was observed that, from March, June until November 2020, juvenile *P.monodon* was not caught in Sg. Sibuti, additionally, the juvenile tiger prawn were caught in March 2020, and from September 2020 onwards for Sg. Pasu, Sg. Lutong and Sg. Bakam.

Prawn biomass was estimated based on adjusted mean catch, AMC obtained from cast net sampling. Biomass estimates of tiger prawns from the 3 rivers (refer to Sg.Pasu, Sg. Lutong and Sg.Bakam) sampled calculated were summarized in Table 1. With an AMC of 1.62 kg of tiger prawns per 1.2 metres radius of cast net, Sg. Bakam is the most productive, followed by Sg.Pasu and Sg. Lutong respectively. Whereas, the biomass (kg) estimated was 31.94, 25.33 and 4.80 for Pasu, Bakam and Lutong rivers respectively. In terms of density (calculated as g/m²), Sg. Pasu preceded with 4.43 g/m², followed by Sg Bakam, with 1.20 g/m² and Sg. Lutong, 0.40 g/m².

Table 1 : Estimated biomass of juvenile tiger prawn (*P.monodon*) in Pasu, Bakam and Lutong rivers in 2020 (March, Jun until November 2020)

No	River	Length (km)	AMC (kg)	Density (g/sqm)	Biomass (kg)
1.	Pasu river	1.2	1.60	4.43	31.94
2.	Bakam river	3.0	1.62	1.20	25.33
3.	Lutong river	1.5	0.95	0.40	4.80

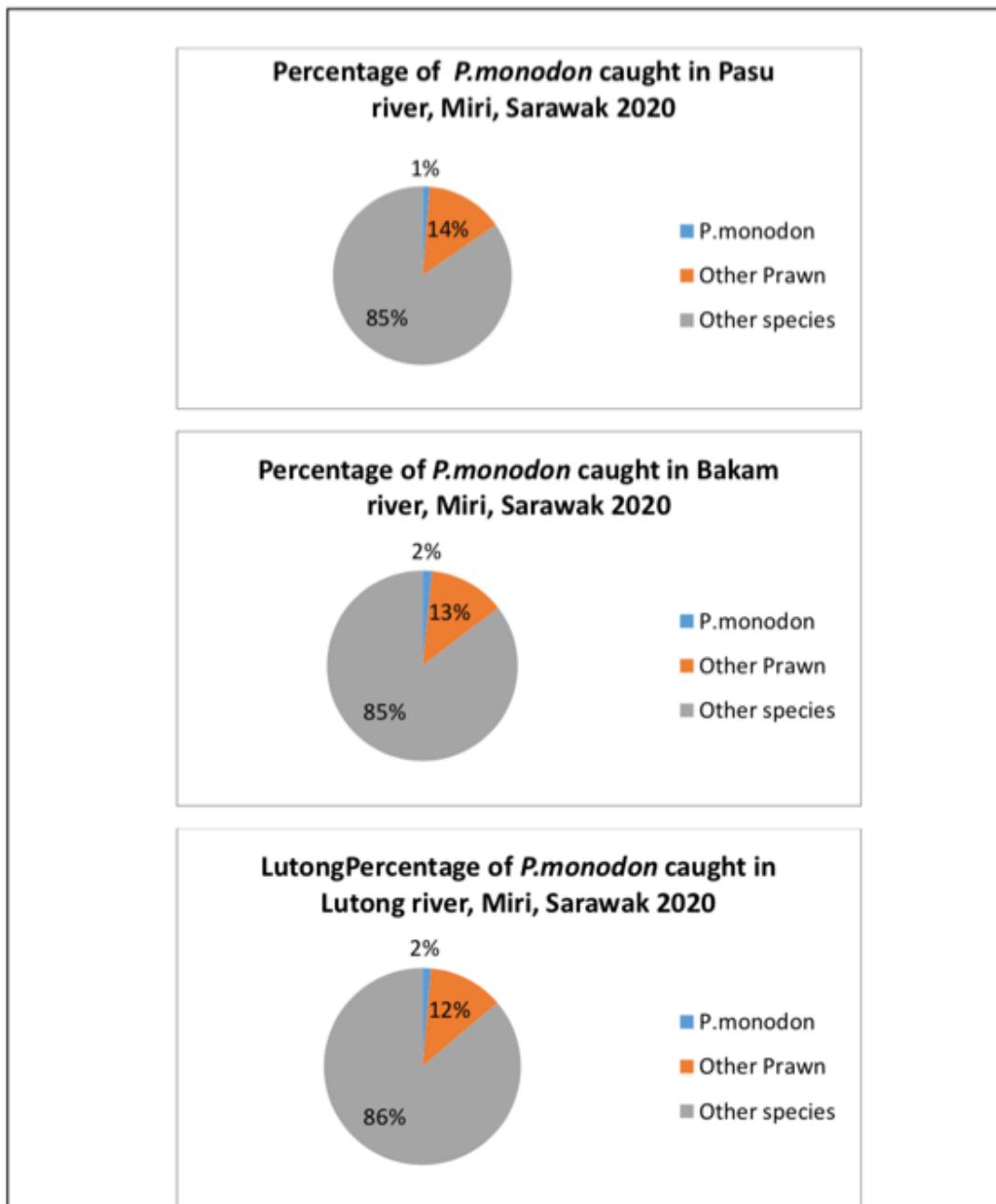


Figure 2 : Percentage of Tiger Prawn (*P.monodon*) caught in Pasu, Bakam and Lutong rivers, Miri, Sarawak 2020

Discussion

The results of these survey indicated that the value of *P.monodon* (in terms of numbers and percentage) are significant compared to total species caught in the survey. Among the three rivers, Pasu river was the nearest nursery grounds, adjacent to Kuala Baram, followed by Lutong and Bakam. In terms of biomass, Pasu river showed the highest biomass, 31.94 kg, followed by Bakam and Lutong river respectively.

Conclusion

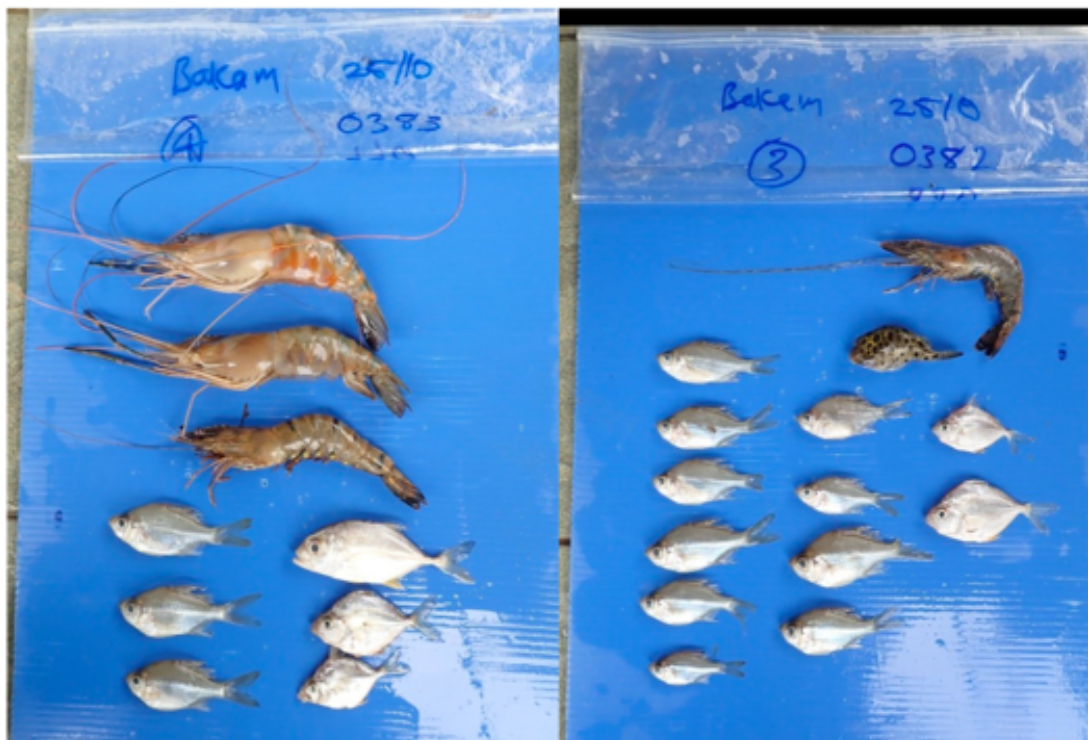
A total of 2,380 casts were recorded from 7 survey trips. The total number of juvenile *P.monodon* caught during the survey was 46 tails (27 tails male and 19 tails female). This indicated that these three rivers namely Pasu, Lutong and Bakam is the nursery grounds for the juvenile *P. monodon*. It is important to preserve and conserve these nursery grounds to ensure the life cycle of *P.monodon* withstand. Sungai Pasu, Sg. Lutong and Sg. Bakam was located adjacent to Kuala Baram, where K. Baram was earmarked as refugia site for tiger prawn, *P. monodon*, this refugia management plan serve as conservation tool to safeguard *P. monodon*.



Different size of juvenile *P. monodon* caught



View of Sg. Bakam (a new nursery ground for juvenile *P. monodon*)



Species composition in Sg. Bakam : *P. monodon*, *Arothron stellatus*, *Caranx sexfasciatus* (juvenile stage), *Macrobrachium rosenbergii* and *Kurtus indicus* (adult)



View of Sg, Lutong (one of the nursery ground for juvenile *P. monodon*, mangrove seen at the river edge)



Family Penaeidae consists of *P. monodon*, *Fenneropenaeus merguensis*, *Metapenaeus affinis*, *M. ensis*, *Parapenaeopsis hardwickii*