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

REPORT

The Diversity of Shrimp in West Kalimantan

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT

The Diversity of Shrimp in West Kalimantan

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Introduction

The importance of shrimp to human beings lies in the value of food as an essential source of protein. Shrimp is a superior commodity of fisheries that contributes to Indonesia's economic growth. The West Kalimantan sea waters, which are part of the State Fisheries Management Area (FMA) of the Republic of Indonesia 711, are known to be potential shrimp-producing areas.

The sea area of West Kalimantan Province is 30,364.59 km2 with a total coastline of 1,398 km; besides that, West Kalimantan also has potential for coastal ecosystems such as mangroves 229,396.60 hectares and coral reefs 269,563.22 hectares. Marine waters and mangrove ecosystems in West Kalimantan Province are habitats for various fish and shrimp resources.

West Kalimantan is known to have a high diversity of shrimps, ranging from large commercial shrimp species to abundant small shrimp (Sumiono, 2012). The shrimp fishery sector is one of the leading producers in several districts along the coast of West Kalimantan. This condition is presumed supported by a large number of the estuary and the extent of mangrove forests along the coastal waters of West Kalimantan, which are shrimp habitats during their critical life cycles (Hedianto et al., 2014).

In the past five years, shrimp production in West Kalimantan has averaged 17,000 tons. Shrimp from West Kalimantan contributes 5-6% to national production. There are 17 species of shrimp in the West Kalimantan sea, and four are economically important species (export commodities) from the Penaeidae group, namely banana shrimp (*Penaeus merguiensis*), white shrimp (*P. indicus*), greasy back shrimp (*Metapenaeus ensis*), and tiger prawns (*Penaeus monodon*).

Biology of Shrimp

Penaeid shrimp are classified into 3 (three) types based on their activities, as presented in Table 1. Furthermore, there are morphological differences between freshwater shrimp and seawater shrimp, as well as female shrimp and male shrimp, shown in Figures 1

Table 1. Group of shrimps categorized based on its activities (Penn, 1984)

Group	Characterization	Species
I	Nocturnal, always buried during the day, inhabit clear water, no schooling	*Penaeus duorarum, P.latisulcatus P. plebejus, P.notialis, P.brasiliensis*
II	Generally nocturnal, inhabit turbid water and sandy mud bottom, no schooling,	*Penaeus aztecus, P.esculentus, P.monodon, P.japonicus*
III	Strongly diurnal, not buried, inhabit turbid water and sandy mud bottom, frequently schooling	*Penaeus setiferus, P.merguiensis, P.indicus, P.orientalis*

Then the difference between male and female shrimp (Figure 1) is in the genitals. Male shrimp have genitals (petasma) which are located between the first swimming legs (pleopods), while female shrimp have genitals (thelycum) which are located between the fifth walking legs (periopods) (Figure 1).

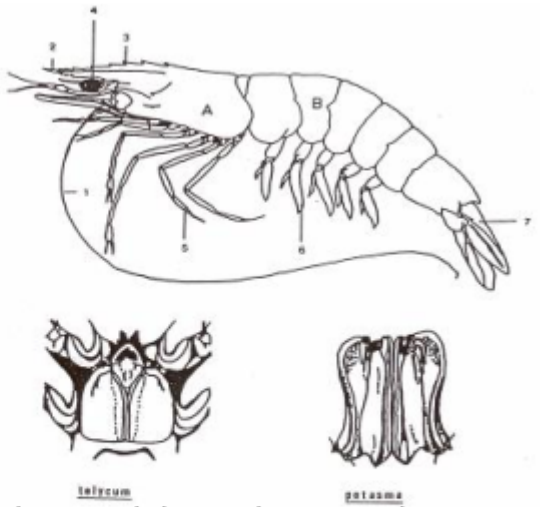

Figure 1 Penaeid shrimp's body parts and genital organs (Holthuis, 1980; King, 1995).

The gonadal maturity of Penaeid shrimp is classified into four-level (Motoh, 1981) :

Table 2. Gonadal maturity of Penaeid shrimp

Gonad maturity	Condition	Description
I	Immature	Thin ovaries, transparent, colorless
II	Early mature	Enlarged ovaries, the front and center part of the ovary developed
III	Advance mature	Light green ovary and can be seen through the exoskeleton, the front and center part fully developed
IV	Mature	Dark green ovary, ova bigger than the previous stage.
V	Spent	Soft and wrinkle ovaries. Ova has been spent. Usually, the shrimp body feels smooth, and the upper abdominal cavity is empty

Shrimp species in Indonesia

Occurring in all oceans, especially in tropical and subtropical regions, the Penaeidae family includes some of the most critical marine shrimp, comprising, up until 2020, 32 genera with 224 species (Hurzaid et al., 2020), some of which are considered the crustaceans of most significant economic importance in the world (Dall et al., 1990; FAO, 2018; De grave, 2011).

In Indonesia, 83 species belong to the Penaeidae family, but commercially they are divided into three groups of species :

1. **Banana Shrimp**

Species of banana shrimp are *Penaeus mergunesis*, *P. indicus*, and *P. orientalis.* This group has a yellowish-white smooth body surface or brownish yellow; the rostrum is straight and short with an enlarged base and is triangular (sigmoid); The rostrum is thinly serrated on the top and bottom with 7-8 teeth on the top and 4-6 on the bottom.

2. **Tiger Shrimp**

Species of tiger shrimp are *Penaeus monodon, P. semisulcatus, P. latisulcatus, P. esculentus, and P. japonicus*. They have smooth body surface characteristics; blackish red with large vertical stripes on the abdomen; Thin serrated rostrum which has 7-8 teeth on the top and 2-3 on the

bottom. P. *monodon* has a clear striped pattern (black tiger), while P. *semisulcatus* has a slightly brownish striped pattern.

3. Endeavor Shrimp

The group of endeavor shrimp consists of *Metapenaeus ensis*, *M. endeavori*, and *M. elegans.* This species has a brownish-white or reddish-green rough body surface; the rostrum is straight and slightly upward, thinly serrated; the number of serrations on the top 6-9 pieces and the bottom is not serrated

4. Other species (Mixed Shrimp)

In addition to the three groups of shrimp above, there are other groups of shrimp with significant enough stocks but low export value. The species that belong to the group are Parapenaeopsis sculptilis, *P. stylifera*, *Metapenaeopsis spp*., *Metapenaeus dobsoni*.

Shrimp species in West Kalimantan

There are 20 shrimp species identified in West Kalimantan (Tabel 3)

Table 3. Shrimp species from West Kalimantan

No.	Species	Family
1.	*Penaeus merguiensis*	Penaeidae
2.	*Penaeus indicus*	Penaeidae
3.	*Penaeus monodon*	Penaeidae
4.	*Penaeus semisulcatus*	Penaeidae
5.	*Metapenaeus affinis*	Penaeidae
6.	*Metapenaeus brevicornis*	Penaeidae
7.	*Metapenaeus elegans*	Penaeidae
8.	*Metapenaeus ensis*	Penaeidae
9.	*Metapenaeus lysianassa*	Penaeidae
10.	*Metapenaeus tenuipes*	Penaeidae
11.	*Metapenaeopsis stridulans*	Penaeidae
12.	*Metapenaeopsis barbata*	Penaeidae
13.	*Parapenaeopsis gracillima*	Penaeidae
14	*Parapenaeopsis hardwickii*	Penaeidae
15.	*Parapenaeopsis hungerfordi*	Penaeidae
16.	*Parapenaeopsis sculptilis*	Penaeidae
17.	*Parapenaeopsis stylifera coromandelica*	Penaeidae
18.	*Acetes sp.*	Sergestidae
19.	*Solenocera crassicornis*	Solenoceridae
	Oratosquilla sp	Squillidae

Penaeid is the dominant shrimp found throughout the region of West Kalimantan from the south to the north, Kubu Raya Regency, North Kayong Regency, Ketapang Regency, and Pemangkat. This indicates that penaeid shrimp are abundant along the coast of West Kalimantan. Most of the peneids have high economic value and become essential commodities of the fisheries sector that contribute to Indonesia's fisheries exports. Banana shrimp (*Penaeus merguiensis*) and white shrimp (*Penaeus indicus*) are high-value commercial shrimp in West Kalimantan. Both of those species can be found in the southern part to the northern part of West Kalimantan.

Morphologically, *Penaeus merguiensis* and *P.indicus* are similar to each other. The characteristics that are easy to distinguish between those species are as follows (Grey et al., 1983; Chan,1998)

1. Penaeus merguiensis

Female shrimp are usually larger than males; adult female shrimp can reach a rostrum length of 5 cm. The body is smooth-skinned brownish yellow, and there are brown spots, translucent (translucent). The rostrum is a sigmoid shape with a triangular shape at the base; the upper side of the rostrum has 6-9 teeth and the bottom side 3-5 teeth. The antennae are reddish-brown, as well as walking legs and swimming legs.

2. Penaeus indicus

Female shrimp are larger than males; adult female shrimp can reach a rostrum length of 3-4 cm—smooth-skinned body whitish-yellow, brown spots, translucent (translucent). The rostrum is longer than the eye, sigmoid in shape with a not-so-significant elevation at the base, the upper side of the rostrum has between 7-9 teeth and the lower side 3-6 teeth. The antennae (antennae) are yellowish-brown, like the walking and swimming legs.

Figure 2a. *Penaeus merguiensis*

Figure 2b. *Penaeus indicus*

The life cycle of Penaeid consists of two-phases, the marine phase and the estuarine phase (Figure 3). The female shrimp spawn in the sea at depth 20-30 m. After 24 hours of hatching, the eggs develop into *nauplii, protozoea*, *mysis* and *post-larvae*. All the stages aforementioned are planktonic and naturally follow the current move to the nursery area in the estuarine and mangrove area. The post-larvae develop become a juvenile stage, and it grows to be *sub adult phase* after 3-4 months, and then migrate to the sea to complete the life cycle for being adult, mating and spawn.

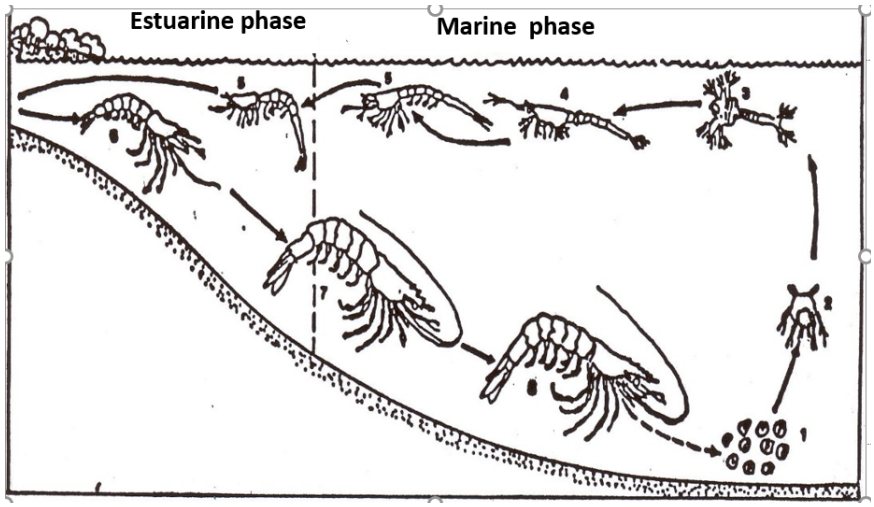

Figure 3. Life cycle of Penaeid

Mangroves are just one of the habitats found in estuaries and shallow coastal waters, although in many tropical areas they are the dominant estuarine habitat type (Blaber 2000). Mangrove has been empirically proven as critical habitat for many Crustaceans. The juveniles of some species, such as banana prawns (*Penaeus merguiensis* and *P. indicus*), are found almost exclusively in mangrove-lined creeks (Staples et al. 1985, Vance et al. 1998, Rönnbäck et al. 2002).

West Kalimantan has mangroves covering an area of 177,023,738 hectares spread across almost all coastal districts, of which the mangroves in Kubu Raya district are the most extensive, followed by North Kayong. The sea area of Kubu Raya and North Kayong Regencies is also known as the potential area of banana shrimp. This is indicated that the mangroves area in Kubu Raya and Kayong Utara has critical to the sustainable shrimp fisheries in West Kalimantan.

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