

The commercial coastal shrimp of the *Penaeidae* family from Tanjung Jabung Timur, Indonesia

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Abstract. Shrimp is a fishery commodity, especially in coastal or mangrove areas. One of the mangrove coastal areas with high fishing activity is in Kuala Simbur, Tanjung Jabung Timur, Indonesia. As a coastal area, it serves as a buffer zone for migratory animals such as shrimp. As an animal protein source, the shrimp species that are largely captured and consumed by people are from the *Penaeidae* family. The shrimp species from the *Penaeidae* family are generally large in size and have good taste, so they have great demand. This study was conducted from August to October 2017. The samples in this research (*Penaeidae* shrimp) were captured by local fisherman in Kuala Simbur coastal waters, Tanjung Jabung Timur, Jambi Province. The shrimp species of *Penaeidae* family from the Tanjung Jabung Timur regency consist of 4 genera and 10 species: *Penaeus monodon*, *P. indicus*, *P. cannaliculatus*, *Metapenaeus lysianassa*, *M. brevicornis*, *M. ensis*, *M. tenuipes*, *Parapenaeopsis sculptilis*, *P. hardwickii*, *Parapenaeus fissuroides*. *Penaeus* and *Metapenaeus* are known as the most important commercial shrimp genera in Tanjung Jabung Timur. Phylogenetic analysis based on morphological characters shows that a grouping of shrimp species according to their genus is present.

Key Words: mangrove, morphology, *Penaeidae*, shrimp.

Introduction. Tanjung Jabung Timur is a district in Jambi Province, Sumatra, Indonesia. Geographically, Tanjung Jabung Timur is located downstream of Batanghari River, being a coastal area. The interactions between fresh water and sea water leads to specific conditions and organisms in the area. As a coastal area, it acts as a buffer zone for migratory organisms. This area is a place for breeding and feeding of different organisms, especially fish and shrimp (Ridho 2008). Some of the sub-districts in Tanjung Jabung Timur are centers for collecting and trading fish caught by fishermen in Jambi Province. The fishery products from Tanjung Jabung Timur are often distributed to the surrounding areas.

Shrimps, especially from the *Penaeidae* family, are the main preference of fishermen in Tanjung Jabung Timur for catch and trade. The shrimp species from *Penaeidae* family are generally large in size and have good taste, being in great demand. The *Penaeidae* family is part of the *Penaeoidea* superfamily, most commonly used as food. According to Pratiwi (2008), shrimp from the *Penaeidae* family, such as the genus *Penaeus* and *Metapenaeus* are the main commodities of the Indonesian fisheries sector. A previous study showed the fishery resources in Sungsang waters from the coastal areas of Banyuasin District are dominated by the *Penaeidae* family, with species like the white shrimp (*Fenneropenaeus merguensis*), the giant tiger prawn (*Penaeus monodon*) and the brown shrimp (*Metapenaeus ensis*) (Djamali et al 2002; Fauziyah et al 2018).

As a fishery resource, the *Penaeidae* shrimp aquaculture and fishing must be developed and preserved, because it is a source of income for local people. Comprehensive data and information about the shrimp from Tanjung Jabung Timur has not been reported yet, to our knowledge. According to Fauziyah et al (2018), information about shrimp biodiversity in an area is vital, especially for the sustainable utilization of shrimp and conservation strategies. From an ecological side, shrimp is a particularly

vulnerable water biota, because it has an important role in the food chain, being valuable as the main food for many other organisms (Suyatna et al 2017).

Identification based on morphological characters is still often used and still considered relevant. Morphological characters can show the kinship of shrimp species, especially those within a family. The aim of this research was to screen and identify the commercially important shrimp species that can be found in Tanjung Jabung Timur waters of Jambi Indonesia, as new information that might be used in developing the aquaculture and conservation of the species.

Material and Method. This study was conducted from August to October 2017. The samples in this research (*Penaeidae* shrimp) were collected by local fishermen in Kuala Simbur coastal waters, Tanjung Jabung Timur, Jambi Province. The morphological identification of shrimp is difficult if the shrimp is not in the adult phase (Rajkumar et al 2015). The *Penaeidae* shrimp were grouped based on similarity of morphological characters, such as color of carapace, shape and size of rostrum, telson, uropod and carapace. In the laboratory, the identification was done based on the differences in morphological characters (Carpenter & Niem 1998; Wowor & Peter 2007; Eguia et al 2009; Wahyudewantoro 2011).

After identification, the characters were converted to binary data and the cladistic tree was constructed using R program 3.5.1. The cladistic tree reconstruction was based on morphological characters. Morphological characters of each species, as well as identification keys can be used as a tool for the reconstruction of phylogeny trees (Ardika 2015). The reconstruction of the phylogeny tree was carried out using Euclidean values as distance measurements, with 1000x replication and using the UPGMA method (Unweighted Pair Group Method with Arithmetic Mean). UPGMA (Unweighted Pair Group Method with Arithmetic Mean) is an algorithm method that can be used to reconstruct phylogenetic trees based on the sample distance (Sylvano et al 2006).

Results and Discussion. Members of the *Penaeidae* family can generally be found in estuarine waters (low salinity) to the sea area (high salinity). Pratiwi & Widyastuti (2017) found 11 shrimp species from the *Penaeidae* family in the waters of South Java. In the Coromandel coast, 12 *Penaeidae* species were found. The main characteristics that distinguish this family from other families (*Aristeidae*, *Sicyoniidae*, and *Selonoceridae*) are the location of the cervical groove, which is far from the dorsal carapace, and the absence of postorbital and post-antennal spines (Carpenter & Niem 1998). In this study, 10 species of shrimp were identified from 4 genera; *Penaeus monodon*, *P. indicus*, *P. canaliculatus*, *Metapenaeus lysianassa*, *M. brevicornis*, *M. ensis*, *M. tenuipes*, *Parapenaeopsis sculptilis*, *P. hardwickii*, *Parapenaeus fissuroides* (Figure 1).

Shrimp from this study are included into the important commercial shrimp genera. Carpenter & Niem (1998) stated that *Penaeus* and *Metapenaeus* shrimp are the most important commercial shrimp genera. Some of *Penaeus* members have great economic importance, like *P. monodon*. According to Wakida-Kusunoki et al (2013), the giant tiger shrimp *P. monodon* Fabricius, 1798 is one of the largest commercially exploited shrimp species in the world. The giant tiger shrimp are rusty brown in color with distinctive black and white banding across the back and on the tail. These can also be seen in the samples from this study (Figure 1). *P. monodon* and other species from the *Penaeus* genera (*P. canaliculatus* and *P. indicus*) can be found in the Tanjung Jabung Timur area in large quantities. Fuller et al (2014) stated that mature *Penaeus* can be found in these nearshore marine habitats. *Penaeus canaliculatus* was also identified in this study. This species is distributed throughout the Indo-West Pacific region. It prefers depths of 33 to 46 meters. The main character of *Penaeus canaliculatus* is the lack of movable spines along the telson (Dore & Frimodt 1987).

Metapenaeus is the other important genus besides *Penaeus* that was collected in this study. *Metapenaeus* has a good number of commercially important species in Indian waters (Chanda 2014). The main characters of the *Metapenaeus* genera is the exopod lacking on the fifth pereopod. Many species from this genus were considered to be from the *Penaeus* genus, and are easy to confuse. *Metapenaeus* was originally described as *P.*

affinis Milne Edwards, 1837, from Kerala coast, India. *M. ensis* was described by De Haan as *P. monoceros ensis* from the North Japan sea. *M. brevicornis* was originally described as *P. brevicornis* by Milne Edwards, from Ganjam, India (Chanda 2014). The species identified in this short study can be seen in Figure 1.

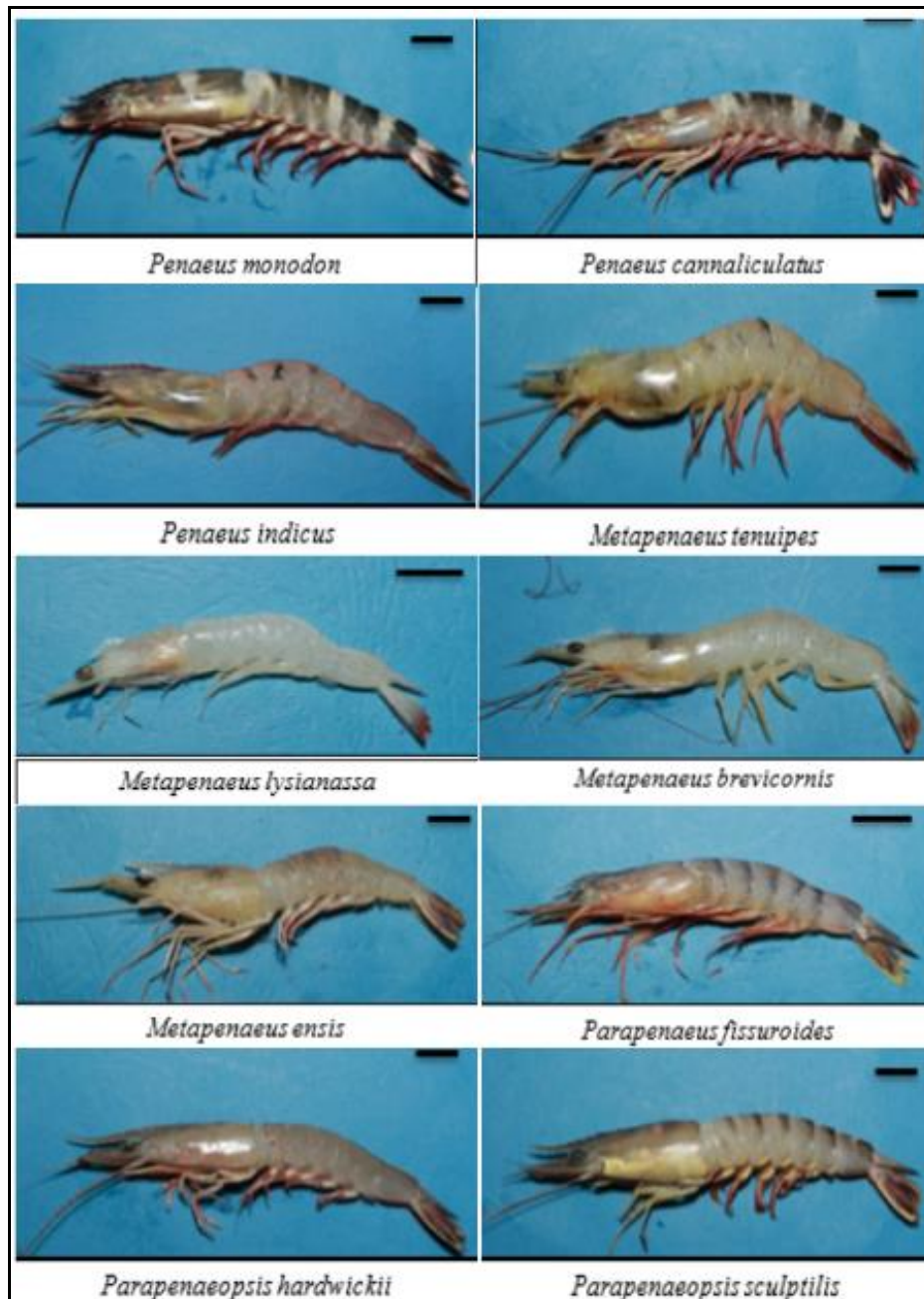


Figure 1. Shrimp of the *Penaidae* family from Tanjung Solok coastal area (scale bar represents 1 cm).

4 species from the *Metapenaeus* genera were found in this study. They are *Metapenaeus tanuipes*, *M. lysianassa*, *M. brevicornis* and *M. ensis*. *M. ensis* is also known as the Greasyback shrimp and grows to about 160 mm. This species is distributed in the Indo-West Pacific region. Some reports regard this shrimp as the species *M. monoceros* (Dore & Frimodt 1987).

Parapenaeus fissuroides is the only species from the *Parapenaeus* genera that was found in this study. The main characteristics of this species are the smooth rostrum, the vertical and longitudinal carapace sutures, 6 to 7 dorsal teeth and a lack of ventral teeth.

Branchiostegal spines are situated in the anterior edge of the carapace. The epigastric spine is distinctly observable behind the hepatic spine. This genera presents a telson with two fixed lateral spines (Dineshabu 2004).

The last genera found in this study is *Parapenaeopsis*, with *P. hardwickii* and *P. sculptilis* species. Tzeng (2007) observed that sword prawn (*P. hardwickii*) is distributed mainly in the Indo-West Pacific region, from Pakistan to Japan. *P. sculptilis* has a large body and small tail. The distinguishing feature from this species is the shell with pink and brown bands (Dore & Frimodt 1987).

The similarity values have been identified, and the shrimp relationships are presented in Figure 2.

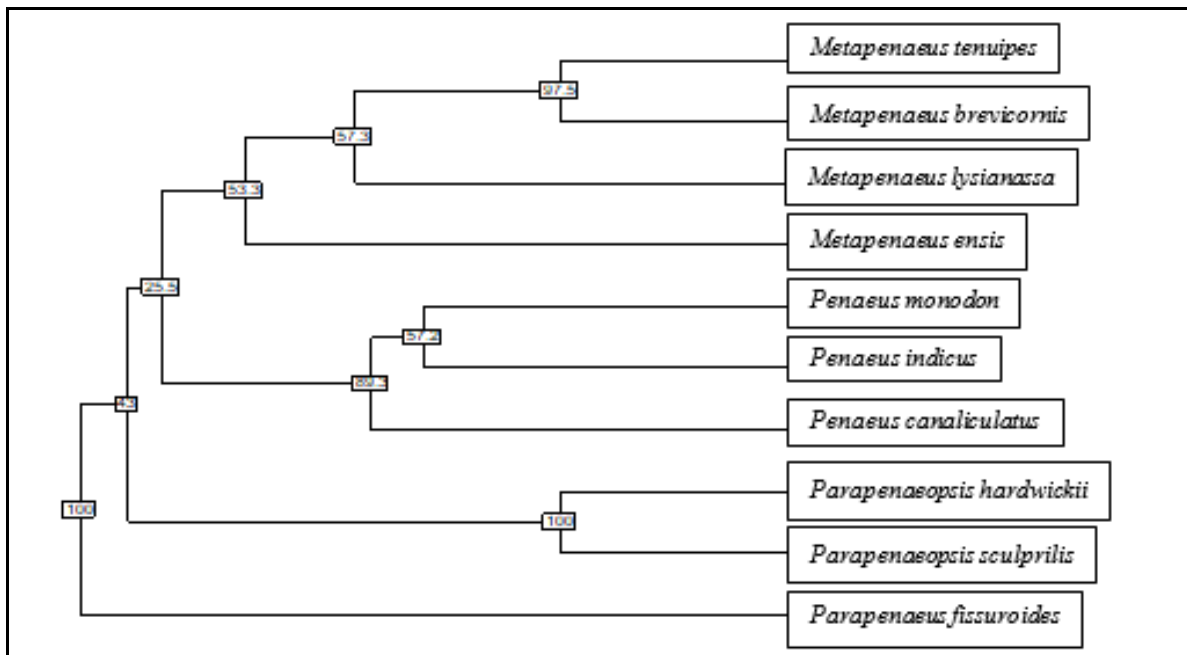


Figure 2. Phylogenetic tree of the *Penaeidae* shrimp based on morphological characteristics.

Parapenaeus fissuroides is completely different from other species that form clades, at a distance value of 100%. Other species of shrimp are in the subclade of the same genus. Each genus was separated in a distance of more than 50%. According to Wardiatno et al (2015), investigating specific characteristics at species level is needed in the identification of shrimps, because the species of the same genera are similar.

Reconstructed phylogeny trees could show the existence of groupings of shrimp from the *Penaeidae* family according to their species and genus. It could be said that the possessed characters by each species of shrimp could be grouped clearly. Phylogeny trees can be used to find out the evolutionary processes that occur in organisms, along with the evolutionary relationships between one organism and another (Sylvano et al 2006).

Conclusions. In this preliminary study, we had identified 10 shrimp species from 4 genera of the *Penaeidae* family, from Tanjung Jabung Timur coastal area. *Penaeus* and *Metapenaeus* shrimp are the most important commercial shrimp genera in Tanjung Jabung Timur. The kinship analysis based on morphological characters clearly determined the grouping (clade) of each genus of shrimp. Future focus will be on a detailed analysis of the morphological characters, since the species are sometimes identified incorrectly.

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