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ANNOTATED IDENTIFICATION GUIDE TO ECONOMICALLY IMPORTANT MARINE PRAWN SPECIES IN SARAWAK WATERS

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ABSTRACT

Due to their economic value, the prawns are susceptible to overfishing of their natural resources. Therefore, it is imperative to develop an effective management plan to sustain the prawn fishery in Sarawak and Malaysia. In order to ensure sustainable management and conservation of the species, the identification of the prawn species is a necessary first step. This study aims to provide a comprehensive reference for the identification of economically important marine prawn species found in Sarawak waters. Between 2021 and 2023, samples were collected from Tanjung Bako LKIM Jetty, Union Ice Jetty, Kampung Goebilt Jetty, Kampung Meludam Jetty (in Kuching Division), Pasar Mukah Jetty, Hock Ming Jetty (Sibu division) and Hock Hai Khim Jetty, Kuala Baram Jetty, Kuala Bakam Jetty (Miri Division). All the samples collected by trawl nets, trammel nets and bag nets. Annotated descriptions were documented, high-quality images were captured, taxonomic keys and illustrations of the most helpful morphological traits for identification were highlighted to facilitate accurate species identification. Overall, 20 species belonging to 8 genera within the Superfamily Penaeoidea were identified. Among these, the genus *Penaeus* exhibits the highest diversity with 6 species, followed by *Metapenaeus* (5 species), *Mierspenaeopsis* (2 species), *Metapenaeopsis* (2 species), and one species each from the genus *Parapenaeopsis*, *Alcockpenaeopsis*, *Solenocera*, *Kishinouyepenaeopsis* and *Trachysalambria* respectively. The ability to accurately identify prawn species can prevent the overfishing of certain species, ensuring that more vulnerable species are protected while supporting sustainable harvesting of more abundant ones. This leads to more balanced extraction quotas, allowing fishery managers to establish limits that ensure the long-term viability of prawn populations. The correct identification of penaeid prawns until species level are crucial for government agencies to formulate decisive conservation strategies based on biology, ecology, habitat preferences of penaeid prawns.

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ABSTRACT

Due to their economic value, the prawns are susceptible to overfishing of their natural resources. Therefore, it is imperative to develop an effective management plan to sustain the prawn fishery in Sarawak and Malaysia. In order to ensure sustainable management and conservation of the species, the identification of the prawn species is a necessary first step. This study aims to provide a comprehensive reference for the identification of economically important marine prawn species found in Sarawak waters. Between 2021 and 2023, samples were collected from Tanjung Bako LKIM Jetty, Union Ice Jetty, Kampung Goebilt Jetty, Kampung Meludam Jetty (in Kuching Division), Pasar Mukah Jetty, Hock Ming Jetty (Sibu division) and Hock Hai Khim Jetty, Kuala Baram Jetty, Kuala Bakam Jetty (Miri Division). All the samples collected by trawl nets, trammel nets and bag nets. Annotated descriptions were documented, high-quality images were captured, taxonomic keys and illustrations of the most helpful morphological traits for identification were highlighted to facilitate accurate species identification. Overall, 20 species belonging to 8 genera within the Superfamily Penaeoidea were identified. Among these, the genus *Penaeus* exhibits the highest diversity with 6 species, followed by *Metapenaeus* (5 species), *Mierspenaeopsis* (2 species), *Metapenaeopsis* (2 species), and one species each from the genus *Parapenaeopsis*, *Alcockpenaeopsis*, *Solenocera*, *Kishinouyepenaeopsis* and *Trachysalambria* respectively. The ability to accurately identify prawn species can prevent the overfishing of certain species, ensuring that more vulnerable species are protected while supporting sustainable harvesting of more abundant ones. This leads to more balanced extraction quotas, allowing fishery managers to establish limits that ensure the long-term viability of prawn populations. The correct identification of penaeid prawns until species level are crucial for government agencies to formulate decisive conservation strategies based on biology, ecology, habitat preferences of penaeid prawns.

Keywords: Prawn, taxonomy, economically important species, fisheries management, Sarawak

INTRODUCTION

Sarawak boasts a long coastline stretching over 1,000 kilometres along the South China Sea. This coastline is divided from extensive mangrove forests that play crucial role as nursery and breeding ground for aquatic species, the large river system such as Batang Rajang, Batang Lassa and Kuala Baram which connect the fresh water and marine ecosystem (Mustafa *et al.*, 2021; Shabdin, 2010). All these habitats interact with each other to produce a complex ecosystem with high biodiversity including variety of prawn species. Prawn fishery is an important industry in Sarawak due to the state's rich coastal and marine resources (Hadil & Haris, 2001; Hadil, 1995; Hadil, 1994).

The annual report of Department of Fisheries (2022) stated that total landing of marine prawn in Sarawak waters was 6884 metric tonnes which constitute 6.63 % of total fish landing in Sarawak. Although landings of marine prawn are relatively small, nonetheless, they constitute as the main exports that generated RM662,119,665 of export economic value (Annual Fisheries Statistic, 2022).

In Sarawak's wet markets and landing sites, marine prawns are commonly differentiated by colour, size, and quality, and are locally classified into categories such as *Udang*, *Siar*, *Payak*, and *Bubok*. However, these local classifications often vary by district and are not based on scientific taxonomy. Accurate identification of marine prawn species is crucial for biological studies and sustainable fisheries management, yet taxonomic studies on marine prawns in Sarawak waters remain scarce.

Published work of penaeid prawns occurring in Malaysia dates from the earliest exploration by Hall (1962). Hall (1962) identified 53 species of penaeid prawns occurred in Malaysian waters excluding Sarawak whereas Lee (1972) identified 28 species. A recent study on prawn identification focused solely on Peninsular Malaysia, also leaving out Sarawak, which is concerning for several reasons (Hurzaid *et al.*, 2023). Sarawak, located in East Malaysia on Borneo Island, has a vastly different ecosystem, biodiversity, and environmental conditions compared to Peninsular Malaysia. This geographical distinction means that the species diversity, particularly for aquatic life like prawns, is likely to be significantly different between the two regions.

The most comprehensive early taxonomic studies on marine prawns in Sarawak waters was documented by Tamaei (1979). It provided a foundational understanding of species diversity in the region, documenting species presence and creating the first significant taxonomic record for Sarawak. However, due to rapid changes in marine environments and the study is now over four decades old, there is a need for updated research finding on prawn taxonomy in Sarawak waters.

Thus, to address the need for accurate species identification, this study aims to provide an annotated identification guide to economically important marine prawn species in Sarawak waters.

METHODOLOGY

Sample Collection

The prawn samples were collected between 2021 and 2023 from Tanjung Bako LKIM Jetty, Union Ice Jetty, Kampung Goebilt Jetty, Kampung Meludam Jetty (in Kuching Division), Mukah Market Jetty, Hock Ming Jetty (Sibu division) and Hock Hai Khim Jetty, Kuala Baram Jetty, Kuala Bakam Market Jetty (Miri Division) (Table 1) (Figure 1).

Table 1: Showing coordinates of landing/sampling sites in Kuching, Sibu and Miri Division.

No.	Location	Latitude	Longitude
1.	LKIM Tanjung Bako Jetty	1° 34.666513' N	110° 26.119992' E
2.	Union Ice Jetty	1° 33.496867' N	110° 21.389742' E
3.	Kampung Goebilt Jetty	1° 37.938440' N	110° 27.608052' E
4.	Kampung Maludam Jetty	1° 39.519869' N	111° 2.219172' E
5.	Mukah Market Jetty	2° 53.836207' N	112° 5.766654' E
6.	Hock Ming Jetty	2° 18.439461' N	111° 49.144902' E
7.	Hock Hai Khim Jetty	4° 24.649479' N	114° 1.343238' E
8.	Kuala Baram Jetty	4° 34.682268' N	113° 59.276790' E
9.	Kuala Bakam Market Jetty	4° 15.123334' N	113° 55.694040' E

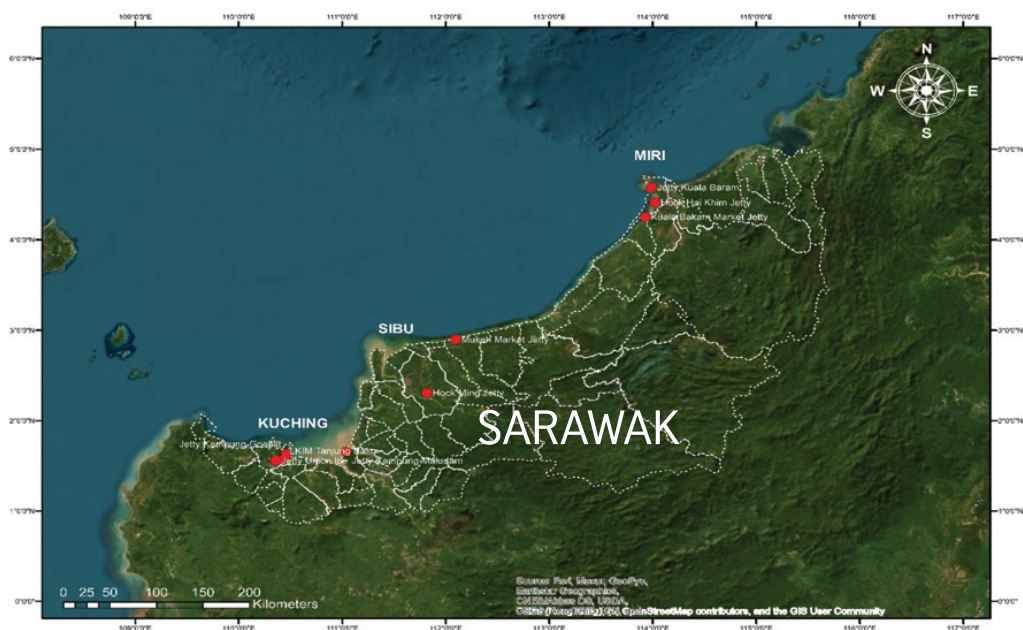


Figure 1: Map of Sarawak showing three main area of study (Kuching, Sibu and Miri). (Generated from ArcGIS Software)

All samples were landed by fishers that operate trawl nets, trammel nets and bag nets and samples were collected at the landing sites. Figure 2, 3, 4 and 5 shows the basic morphological characteristic for identification for penaeid prawns. The body are divided into head, thorax and abdomen. The head and thorax are enclosed by a carapace with a rostrum, which is called cephalothorax, whereas the abdomen is made up of six articulating segments and telson. The identification of samples using the most helpful morphological traits such as coloured pattern, rostrum character with presence of dorsal teeth, ventral teeth, numbers of teeth, shape and length of rostrum (i.e. long and straight, curved upwards, curved downwards, short). Number of abdominal carina on abdominal segments, presence of lateral spines on telson, carapace with spines, carinae and grooves, the presence of longitudinal and transverse sutures, the presence of pterygosmian and carina spine, third maxilliped (shape of dactylus), fifth pereopods (the shape of spine on merus) are also prominent character for identification (Nurridan, 2018; Piratheepa *et al.*, 2016; Desmukh, 2013, Jose, 2013; Chan, 1998; Dall, 1990, Tamaei, 1979). The female's thelycum is located between the fifth pair of pereopods, whereas the male's petasma is made up of modified endopods from the first pair of pleopods. The thelycum and petasma are copulatory organs with specific to the species variations (Nurridan *et al.*, 2023,; Annie *et al.*, 2018; Nurridan, 2018; Chan, 1998; Tamaei, 1979). The feature of the dactylus of the 3rd maxilliped in male specimen (Figure 8A&B, Figure 10A&B) is useful identification feature for genus *Penaeus* (Chong *et al.*, 1982, Pendrey *et al.*, 1999). The antennular peduncle and antennular flagella are also used for identification relative to the length of carapace and rostrum.

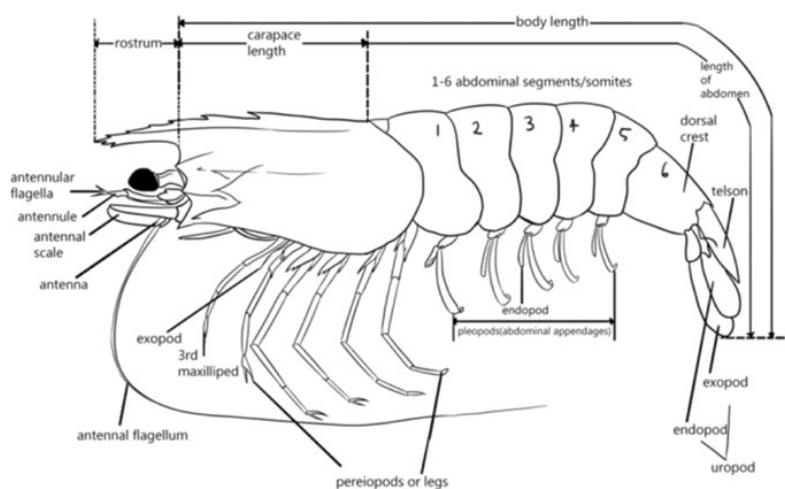


Figure 2: Illustration of the schematic parts of penaeid prawn. (Adapted from Chan, 1998)