



Species Diversity and Morphological Identification of Freshwater Shrimps in Lentic and Lotic Ecosystems of Ogan Ilir Regency

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Abstract: Freshwater shrimps are important components of inland aquatic ecosystems and contribute to biodiversity, nutrient cycling, and ecosystem stability. Despite their ecological importance, information regarding freshwater shrimp diversity in lentic and lotic ecosystems of Ogan Ilir Regency, South Sumatra, remains limited. This study aimed to identify freshwater shrimp species and describe their diagnostic morphological characteristics in contrasting freshwater habitats. Field sampling was conducted from November 2025 to January 2026 at six sampling stations representing three lentic and three lotic ecosystems. Specimens were collected using baited traps (*bubu*) and identified using standard taxonomic keys based on external morphological characteristics, including body shape, rostrum, cephalothorax, abdomen, telson, antennae, pereopods, pleopods, and body coloration. Three freshwater shrimp species belonging to the family Palaemonidae were identified, namely *Macrobrachium lanchesteri*, *Macrobrachium rosenbergii*, and *Macrobrachium nipponense*. Each species exhibited distinctive morphological characteristics that enabled reliable identification. Differences in species occurrence between lentic and lotic ecosystems indicate habitat-related variation in freshwater shrimp assemblages. This study provides baseline information on freshwater shrimp diversity in Ogan Ilir Regency and contributes to biodiversity inventories, taxonomic studies, and freshwater ecosystem conservation in South Sumatra.

Keywords: Freshwater shrimp; Lentic ecosystems; Lotic ecosystems; *Macrobrachium lanchesteri*; *Macrobrachium nipponense*; *Macrobrachium rosenbergii*; Morphological identification; Species diversity

Introduction

Freshwater ecosystems are among the most biologically diverse environments on Earth and provide essential ecological functions, including nutrient cycling, food-web maintenance, and habitat for numerous aquatic organisms. Crustaceans, particularly freshwater shrimps belonging to the family Palaemonidae, play important ecological roles in detritus processing and energy transfer within aquatic food webs (Grave et al., 2008; Wowor et al., 2009; Grave, 2020; García-Dávila et al., 2021).

Indonesia is recognized as one of the world's megabiodiversity countries, supporting a rich diversity of freshwater crustaceans distributed across rivers, lakes, swamps, reservoirs, and floodplain wetlands (Grave et al., 2008; Grave & Fransen, 2011; Wowor et al., 2009). Among these crustaceans, species of the genus *Macrobrachium* are widely distributed and occupy a broad range of freshwater habitats. Their occurrence is influenced by various environmental factors, including hydrological conditions, substrate characteristics, aquatic vegetation, and water quality. Consequently, documenting freshwater shrimp diversity is essential for

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understanding species distribution patterns and supporting freshwater biodiversity conservation (Shalehati et al., 2023; Bond-Buckup & Buckup, 1994).

South Sumatra Province contains extensive freshwater ecosystems with diverse ecological characteristics. Ogan Ilir Regency, in particular, comprises interconnected rivers, floodplain swamps, ponds, oxbow lakes, and other freshwater habitats representing both lentic (standing water) and lotic (flowing water) ecosystems. These contrasting habitat types provide suitable environments for freshwater shrimp communities and may influence species occurrence through differences in water flow, habitat complexity, and substrate composition (Shalehati et al., 2023).

Previous studies have documented freshwater shrimp diversity in several regions of Indonesia; however, most investigations have focused on single habitat types or individual river systems. Information concerning freshwater shrimp diversity in Ogan Ilir Regency remains limited, particularly studies comparing species occurring in both lentic and lotic ecosystems (Simanjuntak & Eprilurahman, 2018). Furthermore, published information describing the diagnostic morphological characteristics of freshwater shrimp species in this region is still scarce, despite morphology remaining the principal basis for species identification in ecological surveys and biodiversity inventories (Holthuis, 1952).

Accurate species identification is fundamental for biodiversity assessment, ecological monitoring, and conservation planning. External morphological characteristics, including body shape, rostrum morphology, cephalothorax, abdomen, telson, antennae, pereopods, pleopods, and body coloration, are widely recognized as reliable diagnostic characters for identifying freshwater shrimps within the family Palaemonidae (Wowor et al., 2009). Comprehensive documentation of these characters therefore provides important baseline information for future taxonomic and ecological studies (Mantelatto et al., 2018).

This study provides updated information on freshwater shrimp diversity in Ogan Ilir Regency by documenting species occurring in both lentic and lotic freshwater ecosystems and describing their diagnostic morphological characteristics using standard taxonomic identification keys (Ng et al., 2008). The findings are expected to strengthen biodiversity databases for freshwater crustaceans in South Sumatra and provide scientific information to support future ecological research and freshwater ecosystem conservation (Johnson, 1960).

Therefore, this study aimed to identify freshwater shrimp species and describe their morphological

characteristics in lentic and lotic ecosystems of Ogan Ilir Regency, South Sumatra.

Methods

Study Area

The study was conducted in freshwater ecosystems of Ogan Ilir Regency, South Sumatra, Indonesia, from November 2025 to January 2026. Sampling was carried out at six observation stations representing two freshwater ecosystem types, consisting of three lentic (standing water) and three lotic (flowing water) habitats. The selected stations were located within the Kelekar, Ogan, and Komering watershed systems, representing contrasting hydrological conditions commonly found in the region. Morphological identification of shrimp specimens was performed at the Biology Laboratory, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya.

Shrimp Sampling

Freshwater shrimp specimens were collected using traditional baited bamboo traps (*bubu*), which are commonly used for sampling freshwater decapods. Two sampling replicates were conducted at each observation station. Traps were deployed at approximately 17:30 WIB and retrieved the following morning at approximately 07:00 WIB, corresponding to the nocturnal activity period of freshwater shrimps.

Captured specimens were carefully removed from the traps, cleaned with freshwater to remove attached debris, and preserved in 70% ethanol prior to laboratory examination. Each specimen was labeled according to its sampling location to maintain traceability throughout the identification process.

Morphological Identification

Species identification was conducted using standard taxonomic identification keys for freshwater shrimps following (Wowor et al., 2009; Grave & Fransen, 2011; Pratiwi et al., 2025) and supported by relevant taxonomic literature for the family Palaemonidae. Identification was based on external morphological characteristics without morphometric measurements (Annawaty & Wowor, 2015).

The diagnostic characters examined included body shape, body coloration, rostrum morphology, cephalothorax, abdomen, telson, antennae, antennules, pereopods, pleopods, and uropods. Each specimen was examined visually, and the observed characters were compared with published taxonomic descriptions to determine species identity (Mota et al., 2025).

Habitat Observation

Habitat observations were conducted simultaneously during shrimp sampling to characterize the freshwater environments in which the specimens were collected. Habitat type was classified as lentic or lotic according to water movement characteristics. General environmental observations, including water conditions and surrounding habitat characteristics, were recorded to support the interpretation of species occurrence. The surrounding aquatic vegetation, substrate type, and general environmental conditions were also recorded during each sampling event to support habitat characterization. Habitat heterogeneity has been recognized as one of the principal factors influencing freshwater decapod diversity (Grave et al., 2008; Dudgeon et al., 2006; García-Dávila et al., 2021).

Data Analysis

The collected data were analyzed using a descriptive qualitative approach. Species were identified based on diagnostic morphological characteristics, and the occurrence of each species was summarized according to habitat type. Morphological descriptions were compared with published taxonomic references to confirm species identification (Bauer, 2004). The results were then presented descriptively using photographs and narrative descriptions of diagnostic morphological characters (Man, 1892).

Result and Discussion

Results

A total of three freshwater shrimp species belonging to the family Palaemonidae were identified from lentic and lotic freshwater ecosystems in Ogan Ilir Regency, South Sumatra. The identified species were *Macrobrachium lanchesteri*, *Macrobrachium rosenbergii*, and *Macrobrachium nipponense*. Species occurrence varied among sampling stations, indicating differences in freshwater shrimp assemblages between lentic and lotic ecosystems (Chace & Bruce, 1993; Annawaty et al., 2022).

Table 1. Species occurrence varied among sampling stations

Species	Habitat	Diagnostic morphological characteristics
<i>Macrobrachium lanchesteri</i>	Lentic/Lotic	Small body, transparent coloration, slender rostrum
<i>Macrobrachium rosenbergii</i>	Lentic/Lotic	Large body, enlarged second pereopods, long rostrum
<i>Macrobrachium nipponense</i>	Lentic/Lotic	Medium body size, bluish-yellow coloration, elongated rostrum

The presence of these three species demonstrates that freshwater ecosystems in Ogan Ilir provide suitable habitats for members of the family Palaemonidae (Cai & Ng, 2002; Magalhães et al., 2005). Variations in water flow, substrate composition, vegetation cover, and habitat characteristics may contribute to differences in species occurrence among sampling sites.

Macrobrachium lanchesteri



Figure 1. External morphology of *Macrobrachium lanchesteri* collected from Ogan Ilir Regency, South Sumatra

Macrobrachium lanchesteri exhibited a relatively small and slender body with transparent to light brown coloration (Figure 1). The cephalothorax was narrow, while the abdomen appeared elongated. The rostrum was relatively long and slender with distinct dorsal and ventral teeth. The second pereopods were comparatively small and symmetrical, distinguishing this species from the larger congeners observed in the present study.

The combination of body size, body coloration, and rostrum morphology allowed reliable identification of this species based on the taxonomic characters described by Wowor et al. (2009).

Macrobrachium rosenbergii



Figure 2. External morphology of *Macrobrachium rosenbergii* collected from Ogan Ilir Regency, South Sumatra

Macrobrachium rosenbergii exhibited the largest body size among the collected specimens. Individuals

possessed a robust cephalothorax, elongated abdomen, and well-developed second pereopods. Body coloration ranged from bluish-green to brownish depending on individual size. The long rostrum and large chelipeds represent important diagnostic characters distinguishing this species from other members of the genus *Macrobrachium* (Pratiwi et al., 2025; Mariappan & Balasundaram, 2004).

Macrobrachium nipponense



Figure 3. External morphology of *Macrobrachium nipponense* collected from Ogan Ilir Regency, South Sumatra

Macrobrachium nipponense displayed an elongated body with bluish-yellow coloration. Compared with *M. rosenbergii*, this species exhibited a smaller body size and more slender pereopods. The rostrum was elongated with distinct dorsal teeth, while the abdomen was relatively narrow (Annisa et al., 2025).

The observed morphological characteristics were consistent with published taxonomic descriptions of *M. nipponense*, allowing differentiation from the other two species identified in this study (Pratiwi et al., 2025).

Discussion

Freshwater shrimp diversity recorded in the present study indicates that lentic and lotic freshwater ecosystems of Ogan Ilir Regency support multiple species belonging to the family Palaemonidae (Holthuis, 1950; Nogueira et al., 2023). The occurrence of *Macrobrachium lanchesteri*, *M. rosenbergii*, and *M. nipponense* expands available information regarding freshwater shrimp diversity in South Sumatra, where comprehensive inventories remain relatively limited. Similar species have previously been reported from other freshwater ecosystems in Indonesia, demonstrating their wide distribution in tropical inland waters (Pratiwi et al., 2025; Jalihal et al., 1993).

Species identification relied on external morphological characters, which remain the principal diagnostic criteria in freshwater shrimp taxonomy

(Grave & Fransen, 2011). Characters including body shape, rostrum morphology, cephalothorax, abdomen, pereopods, pleopods, telson, and body coloration have long been recognized as reliable taxonomic features for distinguishing species within the family Palaemonidae (Wowor et al., 2009). Consequently, morphological examination remains an effective approach for biodiversity surveys and ecological inventories where molecular identification is unavailable (Nguyen et al., 2021).

Among the three identified species, *Macrobrachium lanchesteri* exhibited the smallest body size and a relatively transparent body. These characteristics are consistent with previous descriptions of this species and facilitate its recognition among sympatric freshwater shrimps (Wowor et al., 2004; Wowor & Ng, 2007; Wowor & Short, 2007). In contrast, *Macrobrachium rosenbergii* possessed a considerably larger body and strongly developed second pereopods, which represent the principal diagnostic features of the species. Meanwhile, *Macrobrachium nipponense* exhibited intermediate body size with distinctive body coloration and elongated rostrum. Similar morphological variation among these species has been documented in previous taxonomic studies conducted in Indonesia and other Southeast Asian countries (Faulinda et al., 2023; Aprila et al., 2020).

The rostrum represented one of the most informative diagnostic characters observed in this study. Differences in rostrum length, curvature, and dentition enabled clear discrimination among the three species. Previous taxonomic studies have emphasized that rostral morphology, together with the cephalothorax and pereopods, provides stable diagnostic characters for freshwater shrimp identification (Wowor et al., 2009). Therefore, detailed examination of rostral morphology remains essential in species identification within the genus *Macrobrachium* (Wowor & Ng, 2010).

Differences in species occurrence between lentic and lotic ecosystems may reflect habitat preferences associated with environmental characteristics such as water flow, substrate composition, aquatic vegetation, and food availability. However, because the present study focused on species identification and morphological description, these habitat associations should be interpreted cautiously. Further ecological investigations involving quantitative environmental analyses are required to determine the environmental factors influencing freshwater shrimp distribution in Ogan Ilir Regency.

The present study provides baseline information on freshwater shrimp diversity in Ogan Ilir Regency and contributes to regional biodiversity documentation. The morphological descriptions presented here can facilitate future species identification, biodiversity assessments, and ecological monitoring programs while supporting

freshwater conservation and sustainable management of aquatic biological resources (Chong & Khoo, 1988).

The occurrence of three species belonging to the same genus indicates that freshwater ecosystems in Ogan Ilir still maintain habitat heterogeneity capable of supporting multiple *Macrobrachium* species. Such habitat heterogeneity has been recognized as an important factor influencing freshwater decapod diversity in tropical ecosystems (Grave et al., 2008; Cai & Shokita, 2006; Arifqa et al., 2025).

The findings of this study provide baseline information for freshwater shrimp biodiversity inventories in South Sumatra. The documented diagnostic morphological characters may facilitate future taxonomic studies, ecological monitoring, and conservation planning for freshwater shrimp communities inhabiting lentic and lotic ecosystems (Nabil & Eprilurahman, 2018).

Similar morphological variation among *Macrobrachium* species has been documented in Indonesia, Malaysia, Thailand, and China (Aprila et al., 2020; Faulinda et al., 2023; Murphy & Austin, 2005; Short, 2004).

Conclusion

Three freshwater shrimp species belonging to the family Palaemonidae, namely *Macrobrachium lanchesteri*, *Macrobrachium rosenbergii*, and *Macrobrachium nipponense*, were identified from lentic and lotic freshwater ecosystems in Ogan Ilir Regency, South Sumatra. The three species exhibited distinct external morphological characteristics, particularly in body size, body coloration, rostrum morphology, and pereopod structure, enabling reliable species identification using standard taxonomic keys. The occurrence of different species in contrasting freshwater habitats enriches the current knowledge of freshwater shrimp diversity in South Sumatra and provides baseline information for future biodiversity inventories, ecological studies, and freshwater conservation programs.

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Author Contributions

Conceptualization, writing – review & editing, supervision, A.S. and K.M.; methodology, species identification, S.T.G.W. and A.S.; field investigation, data analysis: writing – original draft, S.T.G.W.

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Conflicts of Interest

The authors declare that there are no financial or non-financial conflicts of interest regarding the publication of this study.

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