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A Study on Mud Crab Species in the Mangrove Ecosystem of Batu Ampar, West Kalimantan

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Abstract: This study aimed to identify mud crab species inhabiting the mangrove ecosystem of Batu Ampar, Kubu Raya Regency, West Kalimantan. Sampling was conducted from 26 October – 2 November 2024 during low tide using manual hand-catching, traditional traps (*bubu*), and fishermen's catches obtained through interviews. A total of 20 crab individuals were collected and identified based on external morphological characteristics, referring to identification keys from WWF-Indonesia and the World Register of Marine Species (WoRMS). The results identified two dominant species, *Scylla serrata* and *Scylla paramamosain*. The main morphological differences included carapace coloration, claw size and shape, and the number and form of frontal spines. Among the total samples, *S. serrata* was more dominant compared to *S. paramamosain*. Interviews with fishers also revealed a body size classification commonly used in trade, namely Size A (≥ 600 g) and Size B (± 200 g), which directly influenced market prices. These findings confirm that the Batu Ampar mangrove ecosystem supports more than one economically valuable mud crab species. The study provides baseline information that can serve as an initial reference for sustainable management and conservation of mud crabs in coastal West Kalimantan.

Keywords: Batu ampar; Morphology; Mud crab; *Scylla paramamosain*; *Scylla serrata*

Introduction

Batu Ampar Village in Kubu Raya Regency, West Kalimantan, is a coastal area with extensive mangrove ecosystem potential (Maryam et al., 2024). The mangrove area in the Batu Ampar area is 49.255,05 ha, with a breakdown of sparse mangroves covering 304,43 ha, moderate mangroves covering 2,337.65 ha, and dense mangroves covering 46.612,97 ha (Jabbar et al., 2021). Mangrove ecosystems play a crucial role in maintaining the balance of the coastal environment, both physically as protection from abrasion and waves, and ecologically as habitats for various biota (Friess et al., 2023; Safika, 2022; Nuraya & Agawaman, 2025). Furthermore, mangroves serve as protective habitats for various economically valuable fish and crab species (Pratiwi et al., 2023; Utomo et al., 2024). One of the biological resources dependent on this ecosystem is the mangrove crab, which is also the primary livelihood for some coastal communities. Mangrove crabs (*Scylla* spp.) play both ecological and economic roles. In addition to being bioindicators of coastal environmental quality, mangrove crabs are also a high-value fishery commodity that supports the livelihoods of coastal communities.

The mangrove crab (*Scylla* spp) is an important species commonly found in mangrove and estuarine waters (Haruna et al., 2022). Mangrove crabs are keystone species and play a vital role in the mangrove ecosystem (Setyawan & Dharmawan, 2020). Morphologically, mangrove crabs are a group of crabs

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that can swim, characterized by a pair of flat hind legs (Ohoiulun & Hanoatubun, 2020). Mangrove crabs are also one of the leading fishery commodities in Indonesia, and they have high economic value (Safitri & Sofiana, 2024). Mangrove crabs are a commodity with great potential in export trade (Ihsan et al., 2024). The high interest in crab consumption makes it one of the commodities with great potential in the global market.

Mangrove crabs also play a role in maintaining ecosystem balance through bioturbation, which aids nutrient circulation and the decomposition of organic matter (Zilius et al., 2023). Mangrove crabs are a primary source of livelihood for small-scale fishermen due to high domestic and international market demand (Hidayat et al., 2023). However, pressure on mangrove habitats, such as illegal logging for charcoal production, can negatively impact mangrove crab populations and the economic sustainability of communities that depend on their catch for their livelihoods.

Several studies have shown that mangrove ecosystems are crucial in supporting the survival and growth of mangrove crabs (*Scylla serrata*), particularly as shelter, breeding grounds, and food sources (Prayoga et al., 2025). The water pH in mangroves is considered optimal for supporting the growth of mangrove crabs, particularly the *Scylla serrata* species (Riska et al., 2023). Furthermore, the *Scylla serrata* species is known to have a positive association with the mangrove ecosystem, according to research by Riska et al. (2023).

However, research on mangrove crabs in Batu Ampar is still limited in production and utilization. Information on dominant species, distinguishing morphological characteristics, and microhabitat distribution remains minimal. However, a clear understanding of species identification is crucial to supporting sustainable fisheries management. Each Scylla species can have different habitat preferences, growth rates, and economic value.

Therefore, the novelty of this research lies in providing data on the identification of mangrove crab species in the Batu Ampar mangrove ecosystem, which has not been documented in detail. By revealing the dominant species and their distinguishing morphological characteristics, this study fills the knowledge gap regarding mangrove crab diversity in the area. The results serve as an initial reference for further ecological research and the formulation of scientifically based coastal resource management strategies. Therefore, this study aims to identify mangrove crab species found in the Batu Ampar mangrove ecosystem, Kubu Raya Regency, West Kalimantan, to support conservation efforts and sustainable management of mangrove crab resources in the region.

Method

Research Time and Location

The research was conducted on 26 October – 2 November 2024 in of Sungai Limau Hamlet, Batu Ampar District, Kubu Raya Regency. The sampling location was determined purposively based on the following criteria: (1) dense mangrove vegetation cover, (2) the presence of traces of crab activity such as burrows or shell remains, and (3) accessibility at low tide. The coordinates of the central research location were 0°46'43"S 109°35'46"E. The research location can be seen in Figure 1.

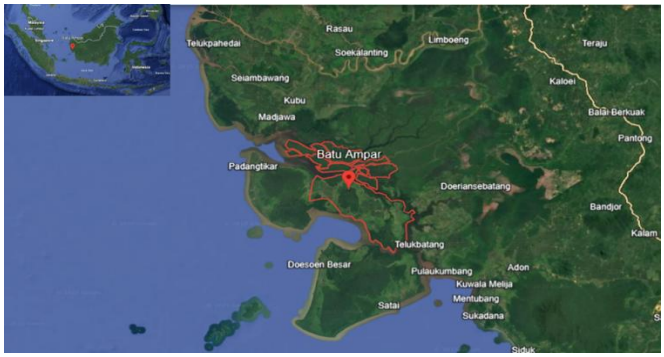

Figure 1. Research location

Sampling Method

Sampling was conducted through an exploratory survey for seven days, from 26 October – 2 November 2024, during low tide in the Batu Ampar mangrove area. Several techniques were used to obtain mud crabs (*Scylla* spp.): (1) Hand-catching: crabs were collected manually when observed around mangrove roots or active burrows (Mirera, 2011). (2) Traditional traps (*bubu*): traps were deployed in water channels and dense mangrove areas for approximately 24 hours and then retrieved to record the catch (Arief et al., 2019). (3) Fishermen's catches: additional specimens were obtained through interviews with local fishermen, which also provided supporting information on dominant fishing sites (see Figure 2).

Figure 2. Interview process with local fishers to obtain supplementary information on crab size and market price (Image source: personal documentation)

In total, 20 individuals were collected, consisting of specimens from hand-catching, traps, and fishermen's catches. These samples were subsequently identified in the field and laboratory.

Species Identification

Caught crabs were observed and identified based on morphological characteristics, such as carapace and claw color, the shape and number of spines on the carapace, patterns on the chelipeds and legs, and differences in male and female morphology on the ventral abdomen (Sitorus et al., 2023; khwanuddin et al., 2011). Identification was conducted using the identification key from WWF-Indonesia (2023) and the World Register of Marine Species (WoRMS) website.

Data Analysis

The collected data were compiled and analyzed descriptively. Species identification results were presented in tables, photographs, and descriptive narratives of morphological differences. In addition, a simple quantitative analysis was performed by calculating the percentage dominance of each species based on the number of individuals identified (Pratiwi et al., 2022). Information on habitat characteristics, such as substrate type and vegetation density, was also documented to support ecological interpretation.

Research Flow Diagram

The overall research process is illustrated in the flow diagram (Figure 3), starting from site selection, sample collection, species identification, data compilation, data analysis, and reporting of findings.

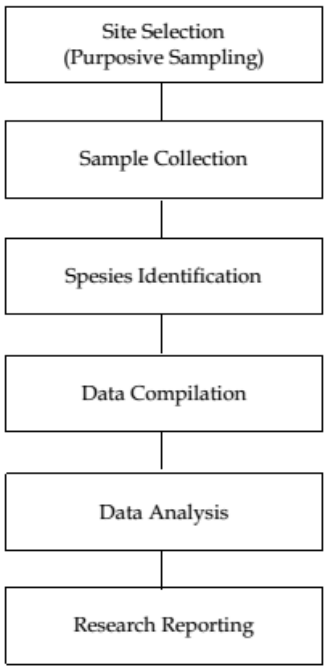

Figure 3. Research flow diagram

Result and Discussion

Types of Crabs Found

Identification results showed two species of Sungai Limau Hamlet, Batu Ampar District, Kubu Raya Regency, namely *Scylla serrata* and *Scylla paramamosain*. Of the 20 individuals successfully collected, 12 individuals (60%) were identified as *Scylla serrata*, while 8 (40%) were identified as *Scylla paramamosain*. The dominance of *Scylla serrata* indicates that this species is more adaptive to mud substrate conditions with dense mangrove cover. At the same time, *Scylla paramamosain* is often found in sandy mud substrates and open water channels.

Figure 4 shows the morphological appearance of an individual *Scylla serrata* from the ventral (A) and dorsal (B) sides. The ventral view (Figure 4A) shows the arrangement of walking legs and abdomen, which are narrow and elongated in males. The large, powerful claws characteristic of this species are also visible. Meanwhile, the dorsal view (Figure 4B) clearly shows the dark bluish-green carapace color, rough surface pattern, and lateral spines on the sides of the carapace. These spines function as a defense tool and are one of the distinguishing characteristics between species.

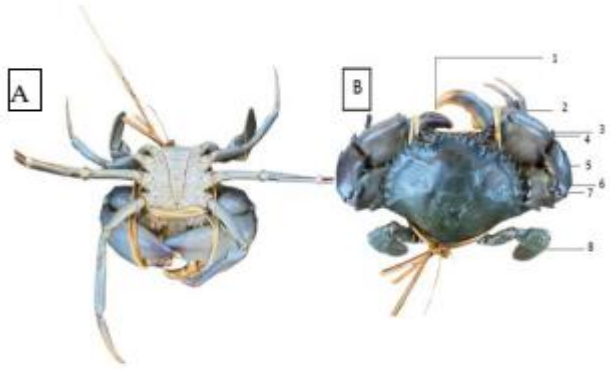

Figure 4. *Syclla serrata* from the mangroves area of Sungai Limau Hamlet, Batu Ampar Sub-district: (A) Ventral view, (B) Dorsal view, (1) Eye, (2) Walking leg II, (3) Chela, (4) Walking leg I, (5) Walking leg III, (6) Swimming leg, (7) Carapace, (8) Lateral Spine (Image source: personal documentation)

The giant mud crab (*Scylla serrata*) is locally known as the red mangrove crab. Fishermen often find this species in the waters of Batu Ampar. According to Forsskal (1775), the classification of the *Scylla serrata* species is as follows:

Kingdom : Animalia
Phylum : Arthropoda
Class : Malacostraca
Family : Portunidae
Genus : Scylla
Species : *Scylla serrata*

Scylla serrata is generally larger, with a carapace length reaching 20 cm. The carapace color of *Scylla serrata* varies from blackish green to dark brown, with a rough surface and a clear polygonal pattern. On the cheliped, *Scylla serrata* has large and strong claws with an orange-red color on the underside. In addition, the frontal spines of *Scylla serrata* are taller and sharper, with edges that tend to be rounded. *Scylla serrata* has two sharp spines on the propodus and carpus spines, and one pair of sharp spines on the carpus. According to Masitoh et al. (2024), *Scylla serrata* is included in the "Mamosain" group, which lives in burrows in mangrove forest areas. *Scylla serrata* plays an important role in the mangrove ecosystem, mainly because of its ecological and economic significance (Berliani et al., 2023; Dewiyanti et al., 2024).

Figure 5 shows the appearance of *Scylla paramamosain*. Figure 5A shows the ventral view of a female individual, characterized by its broad and rounded abdomen. Figure 5B shows the dorsal view, which shows a smooth carapace surface, prominent lateral spines, and a greenish-brown coloration on the body and claws.

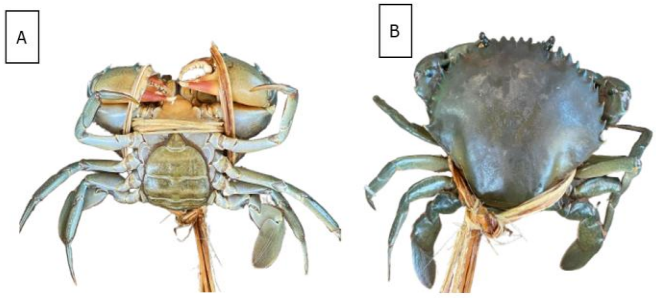

Figure 5. *Scylla paramamosain* from the mangrove area of Sungai Limau village, Batu Ampar sub-district (A) ventral view (B) (Image source: personal documentation)

Scylla paramamosain, locally known as the green crab, has slimmer claws ranging from green to yellow-brown, and lower, less sharp frontal spines. The most apparent difference between *Scylla serrata* and *Scylla paramamosain* is seen in the spines on the propodus and carpus. *Scylla serrata* has two sharp spines on the propodus and one pair of sharp spines on the carpus, while *Scylla paramamosain* has smaller spines on both sides. Based on the classification of the *Scylla paramamosain* species (Estampador, 1994):

Kingdom : Animalia
Phylum : Arthropoda
Class : Malacostraca
Order : Decapoda
Family : Portunidae
Genus : Scylla
Species : *Scylla paramamosain*

Habitat Distribution

Based on the identification results in Sungai Limau Hamlet, Batu Ampar District, Kubu Raya Regency, two species of mangrove crab were found, namely *Scylla serrata* and *Scylla paramamosain*. These two species were found in different microhabitats, even in the same mangrove ecosystem. *Scylla serrata* tends to be found in thick, muddy zones with dense mangrove vegetation cover, while *Scylla paramamosain* is more commonly found in areas with mud-sand substrates and open water channels. These conditions indicate that the two species have different habitat preferences, in line with the findings of Sinaga et al. (2024), who stated that mangrove crabs tend to choose waters with clay-sand substrates.

In addition, this finding is consistent with previous studies by Vay (2001) and Keenan et al. (1998), which stated that *Scylla paramamosain* tends to live in estuary habitats with smoother and more open substrates and has a higher tolerance to salinity fluctuations. Meanwhile, *Scylla serrata* prefers stable, thick, muddy areas and dense mangrove vegetation as shelter and spawning grounds (Trivedi & Vachhrajani, 2013; Setiawan & Triyanto, 2012). The agreement between field data and these references supports the validity of the results of identifying and distributing species at the research site.

Local environmental characteristics, such as substrate type, light penetration, and mangrove root density, can influence these spatial distributions. These affect the crabs' comfort in carrying out biological activities such as burrowing and moulting. Furthermore, the relatively pristine water conditions around Batu Ampar are an important supporting factor for the existence of these two species. Research by Pati et al. (2023) shows that environmental parameters such as substrate, salinity, and mangrove density significantly determine the presence of Scylla spp. in a location.

With their role as keystone species, the presence of *Scylla serrata* and *Scylla paramamosain* reflects habitat conditions and serves as an ecological indicator of the sustainability of the mangrove ecosystem. Flint et al. (2021) stated that mangrove crabs can be bioindicators in monitoring coastal environmental quality. Therefore, the results of this study indicate that the Batu Ampar mangrove area has environmental quality that supports the lives of two main mangrove crab species, but still needs to be protected from human activities that could potentially disrupt the ecosystem's balance.

Morphological differences between crab species

Morphological differences between *Scylla serrata* and *Scylla paramamosain* found in the Batu Ampar mangrove area were directly observed based on external visual characteristics. To support clear identification and

analysis, Table 1 compares the main morphological characteristics of the two species based on field observations and literature references.

To strengthen the identification, morphometric measurements were also conducted, including carapace length (Carapace Length/CL) and carapace width (Carapace Width/CW), using a caliper. The measurement procedure is illustrated in Figure 6 and 7, which show the positions for CL and CW measurements on mud crab specimens. These morphometric parameters are widely recognized as standard criteria in mud crab taxonomy and provide valuable baseline information for future studies on growth patterns and population structure.

Table 1. Morphological Differences of Mangrove Crabs

Morphological Characteristics	*Scylla serrata*	*Scylla paramamosain*
Carapace color	dark green to blackish (trivedi & vachhrajani, 2013)	brownies green (wwf-indonesia, 2023)
claw color	orange-red (safitri et al., 2024)	olive green or brownish green (vay, 2001)
claw shape	large, robust, thick (wwf-indonesia, 2023)	symmetrical, slimmer than *Scylla serrata* (wwf-indonesia, 2023)
carapace texture	rough polygonal (trivedi & vachhrajani, 2013)	smoother, faint pattern (safitri et al., 2024)
frontal carapace spines	sharp, high and prominent (safitri et al., 2024)	sharp, but shorter (wwf-indonesia, 2023)
lateral carapace spines	sharp and striking (trivedi & vachhrajani, 2013)	sharp but relatively smaller (wwf-indonesia, 2023)
walking leg pattern	distinct polygonal (trivedi & vachhrajani, 2013)	less distint pattern (safitri et al., 2024)
female abodamen shape	broadly rounded (wwf-indonesia, 2023)	broadly rounded (wwf-indonesia, 2023)
habitat substrate preference	dense muddy mangrove vegetation (safitri et al., 2024)	soft muddy estuary (vay, 2001)
body size	larger (trivedi & vachhrajani, 2013)	medium, smaller than *Scylla serrata* (wwf-indonesia, 2023)

Figure 6. Measurement carapace width in mud crabs (Image source: personal documentation)

Figure 7. Measurement carapace length in mud crabs (Image source: personal documentation)

Body size, market classification, and economic value

In addition to morphological identification, supplementary information was obtained through interviews with local fishers (Figure 2). Fishers commonly classify mud crabs into two size categories known as Size A and Size B. Size A crabs typically weigh ≥ 600 gram with a wider carapace, while Size B crabs weigh around 200 gram with relatively smaller body size. This distinction is illustrated in Figure 8, which shows a visual comparison between Size A and Size B mud crabs.

This size classification is mainly applied by fishers and traders for commercial purposes, as body size directly influences the selling price. Interview results revealed that Size A crabs are generally sold at higher prices, ranging from IDR 80,000 to 100,000 per kilogram, whereas Size B crabs are usually sold at lower prices, around IDR 60,000–80,000 per kilogram. Similar findings have been reported in previous studies, where variations in body size strongly affected both growth potential and market value of mud crabs (*Scylla* spp.) (Susilo et al., 2017; Musfira et al., 2023; Dananjaya et al., 2022; Supriyadi et al., 2020).

For instance, Musfira et al. (2023) observed that male *Scylla serrata* in Takalar had a carapace width ranging from 59.1 to 149.3 mm with weights of 30–560 g,

while females ranged from 64.0 to 172 mm and 40–790 g. Similarly, Susilo et al. (2017) reported that *Scylla serrata* from Sambas mangrove areas had an average carapace width of ~205 mm, significantly larger than *Scylla paramamosain* (~95 mm). These studies confirm that differences in carapace width and body weight not only serve as taxonomic and ecological indicators but also directly influence their economic classification in local fisheries.

Such price variation reflects greater market demand for larger-sized crabs, which are considered to have higher consumption value. This finding is consistent with previous studies indicating that body size is an important factor determining the economic value of mud crabs (Keenan et al., 1998; Vay, 2001). Nevertheless, the price information presented here is used only as supplementary data. The primary focus of this study remains on species identification of mud crabs, while the market classification and economic value are included to provide an initial overview of the relationship between body size variation and market value at the fisher level.

Although the present study primarily focuses on species identification, the information on body size and market classification provides valuable supplementary insights. It demonstrates the strong linkage between morphological variation, fishers' categorization, and the economic value of mud crabs in Batu Ampar.

Figure 8. (A) Size A crab and (B) Size B crab (Image source: personal documentation)

Microhabitat and Conservation Implications

Field observations indicated that the two mud crab species tend to exhibit different habitat preferences. *Scylla serrata* was more frequently found in areas with dense mangrove vegetation and muddy substrates, whereas *Scylla paramamosain* was generally associated with sandy-mud substrates and less dense mangrove stands. These findings are consistent with previous studies, which reported that mud crab species display different ecological tolerances to coastal environmental conditions (Vay, 2001; Keenan et al., 1998).

This highlights the strong linkage between mud crab occurrence and mangrove ecosystem quality. Management and conservation efforts in the Batu Ampar area should therefore not only focus on regulating harvest, but also on maintaining the integrity of their natural habitats. The baseline information on species identification and habitat preferences provided by this study can serve as an initial reference for sustainable management strategies of mud crab resources in coastal West Kalimantan.

Conclusion

This study successfully identified two mud crab species in the Batu Ampar mangrove ecosystem, with *Scylla serrata* being more dominant than *Scylla paramamosain*, distinguished primarily by carapace coloration, claw shape, and frontal spine characteristics. Interviews with local fishers indicated a practical size classification (Size A and Size B) linked to market value, although this information was considered supplementary. These findings highlight that the Batu Ampar mangrove ecosystem supports multiple economically valuable mud crab species and provide essential baseline data for conservation and sustainable management efforts.

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Author Contributions

Conceptualization, T. N.; methodology, L.P.I.A.; software, T.N.; validation, L.P.I.A.; formal analysis, T. N.; investigation, L. P. I. A.; resources, T.N.; writing-original draft preparation, T.N.; writing—review and editing, L. P. I. A.; visualization, L. P. I. A.; supervision, L. P. I. A.; project administration, L. P. I. A.; funding acquisition, T.N. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The author confirms the absence of any conflicts of interest or personal connections that could affect the content of this article.

References

Arief, M., Hartati, R., & Endrawati, H. (2019). The abundance and distribution of mud crab (Scylla serrata) in mangrove ecosystem of Segara Anakan. *Jurnal Kelautan Tropis*, *22*(1), 33–41. https://doi.org/10.14710/jkt.v22i1.4741

Berliani, S., Bidayani, E., & Kurniawan, A. (2023).

Morphology and Truss Morphometrics of Scylla serrata and Scylla tranquebarica from Bangka Island. *Journal of Aquatropica Asia*, *9*(1). https://doi.org/10.33019/joaa.v9i1.5429

Dananjaya, K., Prayitno, G., & Nafurbenan, D. A. (2022). Size distribution and growth pattern of mud crab, Scylla serrata (Forskal, 1775) captured with bubu and gill nets in the waters of the Babo District, Bintuni Bay, West Papua. *Jurnal Sumberdaya Akuatik Indopasifik*, *6*(3), 247–258. https://doi.org/10.46252/jsai-fpik-unipa.2022.vol6.no3.228

Dewiyanti, I., Yunita, Deviana, T., Nurfadillah, Octavina, C., & Valentino, R. A. (2024). Some Biological Aspects of Mud Crabs (Scylla serrata) in Mangrove Ecosystem, Banda Aceh and Aceh Besar. *BIO Web of Conferences*, *92*, 01015. https://doi.org/10.1051/bioconf/20249201015

Estampador, E. P. (1949). Studies on Scylla (Crustacea: Portunidae) I.Revision of the genus. *The Phillipine Journal of Science*, *78*(1), 95–109. Retrieved from https://crabs-japan.linnaeus.naturalis.nl/linnaeus_ng/app/views/literature2/reference.php?id=21199&epi=32

Flint, N., Anastasi, A., De Valck, J., Chua, E. M., Rose, A. K., & Jackson, E. L. (2021). Using mud crabs (Scylla serrata) as environmental indicators in a harbour health report card. *Australasian Journal of Environmental Management*, *28*(2), 188–212. https://doi.org/10.1080/14486563.2021.1923579

Forsskål, P., & Niebuhr, C. (1775). *Descriptiones animalium, avium, amphibiorum, piscium, insectorum, vermium*. Hauniæ, ex officina Mölleri. https://doi.org/10.5962/bhl.title.2154

Friess, D. A., Chen, L., Cormier, N., Krauss, K. W., Lovelock, C. E., Raw, J. L., Rogers, K., Saintilan, N., & Sidik, F. (2023). Mangrove Forests and Climate Change. In *Climate Change and Estuaries* (pp. 381–400). CRC Press. https://doi.org/10.1201/9781003126096

Haruna, M. F., Karim, W. A., Rajulani, R., & Lige, F. N. (2022). Struktur Komunitas Kepiting Bakau Di Kawasan Konservasi Mangrove Desa Polo Kecamatan Bunta Kabupaten Banggai. *Bio-Lectura : Jurnal Pendidikan Biologi*, *9*(2), 150–159. https://doi.org/10.31849/bl.v9i2.10659

Hidayat, N., Amiluddin, A., & Baso, A. (2023). Mangrove Crab (Scylla spp.) Catching Units as a Community Side Business in Tarakan Tengah Sub-District , City of Tarakan. *PONGGAWA: Journal of Fisheries Socio-Economic*, 65–78. https://doi.org/10.35911/ponggawa.v2i2.18318

Ihsan, G. A., Widodo, M. S., Faqih, A. R., & Paricahya, A. F. (2024). Utilization Ecdysterone Hormone of Krokot (Portulaca oleracea) Extract on Molting Activity in Mud Crabs (Scylla serrate). *Jurnal Penelitian Pendidikan IPA*, *10*(10), 7823–7831. https://doi.org/10.29303/jppipa.v10i10.8074

Ikhwanuddin, M., Azmie, G., Juariah, H. M., Zakaria, M. Z., & Ambak, M. A. (2011). Biological information and population features of mud crab, genus Scylla from mangrove areas of Sarawak, Malaysia. *Fisheries Research*, *108*(2–3), 299–306. https://doi.org/10.1016/j.fishres.2011.01.001

Jabbar, A., Nusantara, R. W., & Akbar, A. A. (2021). Valuasi Ekonomi Ekosistem Mangrove Berbasis Ekowisata pada Hutan Desa di Kecamatan Batu Ampar Kalimantan Barat. *Jurnal Ilmu Lingkungan*, *19*(1), 140–152. https://doi.org/10.14710/jil.19.1.140-152

Keenan, C. P., Davie, P. J. F., & Mann, D. L. (1998). A revision of the genus Scylla de Haan, 1833 (Crustacea: Decapoda: Brachyura: Portunidae). *Raffles Bulletin of Zoology*, *46*(1), 217–245. Retrieved from https://era.dpi.qld.gov.au/id/eprint/8476/1/KeenanDavieMann1998_Scyllarevision_lowres.pdf

Le Vay, L. (2001). Ecology and Management of Mud Crab Scylla spp. *Asian Fisheries Science*, *14*(2), 101–111. https://doi.org/10.33997/j.afs.2001.14.2.001

Lisnawati, L., Karnan, K., & Syukur, A. (2024). Reproductive Aspects of Blue Swimming Crab (Portunus pelagicus) Landed on the South End Coast of East Lombok. *Jurnal Penelitian Pendidikan IPA*, *10*(10), 7775–7783. https://doi.org/10.29303/jppipa.v10i10.9097

Maryam, S., Daningsih, E., & Mardiyyaningsih, A. N. (2024). Identifikasi Tumbuhan Mangrove di Hutan Lindung Padu Empat-Lebak Kerawang Desa Batu Ampar Kabupaten Kubu Raya. *Bioscientist : Jurnal Ilmiah Biologi*, *12*(1), 1382. https://doi.org/10.33394/bioscientist.v12i1.11285

Masitoh, L. K., Latuconsina, H., & Zayadi, H. (2024). Kelimpahan dan Struktur Ukuran Kepiting Bakau (Scylla Serrata) Pada Habitat Mangrove Di Desa Banyuurip Kecamatan Ujung Pangkah Kabupaten Gresik. *Jurnal Ilmiah Biosaintropis (Bioscience-Tropic)*, *10*(1), 8–19. https://doi.org/10.33474/ejbst.v10i1.413

Musfira, M., Kantun, W., Kabangnga, A., & Ardianza, R. (2024). Size distribution and growth pattern of mangrove crab Scylla serrata in Takalar District. *Acta Aquatica: Aquatic Sciences Journal*, *11*(3), 198–203. https://doi.org/10.29103/aa.v11i3.13571

Nuraya, T., & Agawaman, L. P. I. (2025). Effect of River Organic Carbon Input in Mangrove Sediment. *Jurnal Penelitian Pendidikan IPA*, *11*(2), 1043–1052. https://doi.org/10.29303/jppipa.v11i2.10158

Ohoiulun, D., & Hanoatubun, M. I. H. (2020). Analisis Morfometrik Kepiting Bakau (Scylla serrata) Hasil

Tangkapan Dari Perairan Desa Warwut Kabupaten Maluku Tenggara. *Jambura Fish Processing Journal*, *2*(1), 28–35. https://doi.org/10.37905/jfpj.v2i1.5188

Panatar, J. S., Djunaedi, A., & Redjeki, S. (2020). Studi Morfometrik Kepiting Bakau (Scylla serrate) Forsskål, 1775 (Malacostraca : Portunidae) di Kecamatan Wedung, Demak, Jawa Tengah. *Journal of Marine Research*, *9*(4), 495–500. https://doi.org/10.14710/jmr.v9i4.25960

Pati, S. G., Paital, B., Panda, F., Jena, S., & Sahoo, D. K. (2023). Impacts of Habitat Quality on the Physiology, Ecology, and Economical Value of Mud Crab Scylla sp.: A Comprehensive Review. *Water*, *15*(11), 2029. https://doi.org/10.3390/w15112029

Pratiwi, I., & Dimenta, R. H. (2023). Population of mud crab (Scylla serrata) in the Barumun River estuary waters, Labuhanbatu Regency, reviewed from growth patterns and condition factors. *Bioscientist: Jurnal Ilmiah Biologi*, *11*(2), 191–200. https://doi.org/10.33394/bioscientist.v11i2.3749

Pratiwi, R., Ardi, I., & Susilowati, R. (2022). An ecological study and its fishery potential of the mud crab Scylla serrata (Forskål, 1775) in Segara Anakan mangrove waters, Cilacap, Indonesia. *Jurnal Pengelolaan Sumberdaya Alam Dan Lingkungan*, *12*(2), 245–256. https://doi.org/10.29244/jpsl.12.2.245-256

Prayoga, B., Bengen, D. G., Nurjaya, I. W., & Natih, N. M. N. (2025). The Effects of Mangrove Ecosystem on Mud Crabs (Scylla serrata) in East Lombok, Indonesia. *Jurnal Penelitian Pendidikan IPA*, *11*(4), 516–526. https://doi.org/10.29303/jppipa.v11i4.10709

Raj, V. M., Sangeetha, R., & George, S. (2025). A Comprehensive Overview on the Biology and Culture Practices of Mud Crab (Scylla Sp.) in India. *Asian Journal of Fisheries and Aquatic Research*, *27*(1), 103–108. https://doi.org/10.9734/ajfar/2025/v27i1868

Riska, J. A. T., Syukur, A., & Zulkifli, L. (2023). Association between Mangrove Types and Some Mangrove Crab Species in West Lombok Sheet Mangrove Ecosystem. *Jurnal Penelitian Pendidikan IPA*, *9*(7), 5610–5619. https://doi.org/10.29303/jppipa.v9i7.4781

Riyanto, M., Wisudo, S. H., Rufiati, I., Fachri, F. R., Septiani, W. D., Inayah, Rukim, M., Ilyas, G. N., de la Rosa, E., & Saputra, R. (2025). Length-based stock assessment of Scylla serrata (Forskål, 1775) in Indragiri Hilir, Riau Province, Indonesia. *Egyptian Journal of Aquatic Research*, *51*(2), 217–224. https://doi.org/10.1016/j.ejar.2025.02.004

Safika, A. (2022). Strategi Pemasaran Kacang pukul di Bagan Siapiapi Kecamatan Bangko Kabupaten Rokan Hilir (Studi Kasus Kacang Pukul Pada Toko H.H). *Agricore: Jurnal Agribisnis Dan Sosial Ekonomi Pertanian Unpad*, *7*(1), 12–21 10 24198 7 1 38238. https://doi.org/10.24198/agricore.v7i1.38238

Safitri, I., & Sofiana, M. S. J. (2024). Kepiting Bakau Di Kawasan Mangrove Pering Kabupaten Natuna Kepulauan Riau. *Jurnal Perikanan Unram*, *14*(1), 103–110. https://doi.org/10.29303/jp.v14i1.752

Setiawan, F., & Tri, T. (2012). Studi Kesesuaian Lahan Untuk Pengembangan Silvofishery Kepiting Bakau (Scylla Serrata) Di Kabupaten Berau, Kalimantan. *Limnotek*, *19*(February), 158 – 165. Retrieved from https://www.researchgate.net/publication/294873126

Sinaga, S., Widodo, M. S., & Maimunah, Y. (2024). Analysis of Substrate, Gastric Content and Nutrient Content of Varuna litterata. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 9886–9895. https://doi.org/10.29303/jppipa.v10i11.7691

Sitorus, M. A., Pratiwi, F. D., & Utami, E. (2023). Morphometric and meristic characters of mangrove crabs (Scylla paramamosain) in the mangrove ecosystem of Kurau Barat Village, Central Bangka District. *Aquatic Science*, *5*(1), 1–10. https://doi.org/10.33019/aquatic.v5i1.5350

Supriyadi, A., Pratiwi, F. D., & Indrayani, E. (2020). Growth rate analysis of mangrove crab (Scylla serrata) in Selindung River fishermen's catch apartment. *Akuatik: Jurnal Sumberdaya Perairan*, *14*(1), 9–17. https://doi.org/10.33019/akuatik.v14i1.5517

Susilo, A., Setyawati, T. R., & Yanti, A. H. (2017). Morphometric characteristics of mangrove crab (Scylla spp.) in mangrove forests of Mutusan River Estuary. *Sambas District. Protobiont*, *6*(1), 53–58. https://doi.org/10.26418/protobiont.v6i1.20139

Trivedi, J. N., & Vachhrajani, K. D. (2013). Taxonomic account of genus Scylla (de Haan, 1833) from Gujarat State, India with two new records of species. *Arthropods*, *2*(4), 159–171. https://core.ac.uk/download/pdf/27162732.pdf

Utomo, A. P., Haerani, J. O., Ferdian, R. N., Paradise, R., & Radianto, D. O. (2024). Pemaksimalan Fungsi Penanaman Mangrove di Daerah Rawan Abrasi Jakarta. *Jurnal Ilmiah Nusantara*, *1*(3), 12–22. https://doi.org/10.61722/jinu.v1i3.1502

Yang, C.-M., Li, J.-J., & Chiang, H.-C. (2011). Stakeholders' perspective on the sustainable utilization of marine protected areas in Green Island, Taiwan. *Ocean & Coastal Management*, *54*(10), 771–780. https://doi.org/10.1016/j.ocecoaman.2011.08.006

Zilius, M., Bartoli, M., Bonaglia, S., Cardini, U., Chiozzini, V. G., Marzocchi, U., Moraes, P. C., Zaiko, A., & Braga, E. S. (2023). Role of crab holobionts in benthic N cycling in mangroves with different trophic status. *Marine Ecology Progress Series*, *712*, 87–99. https://doi.org/10.3354/meps14327