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Size Distribution of Mangrove Crabs (*Scylla* spp.) Caught By Fishermen in the Bagek Kembar Exclusive Ecosystem Area (KEE), Sekotong, West Lombok

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Abstract: Mangrove crab (*Scylla* spp.) is one of the fishery commodities of high economic value that depends on the existence of mangrove ecosystems. The Bagek Kembar Exclusive Ecosystem Area (KEE) in Sekotong, West Lombok, is one of the important habitats for mangrove crabs and serves as the primary location for fishing activities by local fishermen. This study aims to determine the distribution of mangrove crab size caught by fishermen based on morphometric parameters, which include carapace length, carapace width, abdomen width, propodus length, propodus width, merus length, dactylus length, and plepod diameter. This type of research uses a descriptive research design with a quantitative approach. Sampling was conducted using purposive sampling, where mangrove crabs caught by fishermen at the research site were considered a representative sample of the population. Data analysis was conducted using descriptive statistics, which included calculating mean values, median, mode, and standard deviation, as well as analysing the frequency distribution of mangrove crab sizes. The determination of the number of classes and the interval of the frequency distribution class was carried out using Sturges' rule formula to describe the population structure of mangrove crabs. The study's results showed that most of the mangrove crabs caught were small to medium in size. The majority (65%) of crabs have a carapace length (PK) between 4–6 cm and are dominated by the juvenile or premature gonadal phase. The rarity of large individuals (>10 cm) suggests that crabs are significantly exploited before reaching their maximum adult size. This pattern also shows the role of KEE Bagek Kembar as a nursery ground dominated by juvenile individuals. Based on these findings, management efforts such as determining minimum catch sizes, protecting nursery habitats, increasing fishing gear selectivity, and long-term population monitoring are recommended to support the sustainability of mangrove crab stocks in this region.

Keywords: KEE Bagek Kembar; Mangrove Crab; Morphometric; *Scylla* spp.; Size Distribution.

Introduction

Indonesia has a vast and strategic marine potential that can be developed to improve people's welfare. The area of Indonesian waters reaches around 5.8 million km² or about 75% of the total national area, consisting of 2.8 million km² of archipelago waters, 0.3 million km² of territorial sea waters, and 2.7 million km² of Exclusive Economic Zone (EEZ) area [1].

One of the coastal ecosystems that plays a crucial ecological role is the mangrove forest. The ecosystem is located in a land–sea transition zone that is influenced by tides, with substrates ranging from sand to mud. Mangroves act as natural protectors from abrasion, large waves, and coastal flooding. In addition to their physical functions, mangroves are also important in climate change mitigation because they have the ability to store carbon at a rate four times greater than tropical rainforests [2].

Mangrove vegetation provides habitat for a variety of organisms, including mangrove crab (*Scylla spp.).* Conservation efforts in coastal areas, such as mangrove planting, aim to maintain the ecosystem's sustainability and improve the survival of the biota that depend on the area. Mangroves, as dicot plants that thrive in brackish waters near the sea, have significant economic value because they can be utilised for various purposes, including cosmetics, pharmaceuticals, and textiles [3]. In addition, this ecosystem also supports the economic activities of coastal communities, especially those who depend on commodities such as mangrove crabs [4].

Bagek Kembar Mangrove Forest, Cendi Manik Village, Sekotong, West Lombok, has been designated as a Mangrove Essential Ecosystem Area (KEE) based on the Decree of the Regent of West Lombok Number 637/10/DLH/2018. This area provides important benefits in ecological, educational, and economic aspects. The mangrove crab is one of the commodities with high economic value for the surrounding community, due to its nutritional content and high market demand [5].

Mangrove crabs (*Scylla* spp.) belong to the Portunidae family and live in coastal waters overgrown with mangroves, estuaries, and muddy beaches [6]. The regulations stipulate the minimum size of the catch, which is 15 cm carapace wide and 300 g in weight. Capture of mature gonad broodstock has an impact on inhibiting population regeneration [7]. Fishing in nature is mostly carried out using bubu, a passive fishing gear that is considered effective [8].

Mangrove crabs play a crucial ecological role in carbon cycling, influencing the structure of mangrove vegetation and the decomposition of organic matter [9]. However, in various coastal areas of Indonesia, high fishing pressure has led to a decline in crab stocks [10]. In the KEE

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Bagek Kembar area, fishing activities have not yet fully adhered to the principles of sustainable management. Fishermen still catch crabs without paying attention to the minimum catch size, thus potentially threatening the sustainability of the population [11] [12].

To support the sustainable use of resources, a minimum catch size has been set through the Minister of Agriculture Regulation No. 17/2021. Data on the distribution of crab sizes caught is important to assess the sustainability and effectiveness of these regulations. Therefore, research on mangrove crab sizes is necessary to determine the suitability of fishing practices in accordance with the rules and maintain the sustainability of the ecosystem.

Research Methods

This research was carried out in the Bagek Kembar Exclusive Ecosystem Area (KEE), Sekotong District, West Lombok Regency. Sampling was conducted over a three-month period, from March to May 2025. This study uses a descriptive research design with a quantitative approach [13].

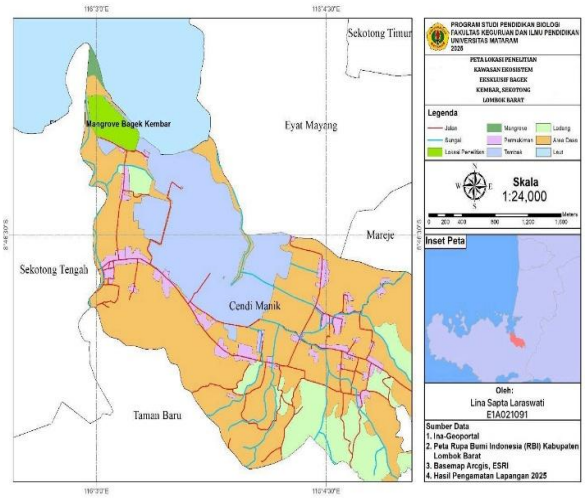

Figure 1. Map of the Research Location

The study population included all mangrove crabs (*Scylla* spp.) caught by fishermen in the Bagek Kembar Exclusive Ecosystem Area (KEE), Sekotong, West Lombok. The research sample consisted of mangrove crabs obtained directly from fishermen's catches at the location, including *Scylla* spp. criteria. species, intact, and randomly selected using purposive sampling techniques to avoid bias [14]. Sampling was conducted once a month during the study period, with a minimum of 30 crabs in each sampling period.

The variable observed in this study is the morphometric parameters of the mangrove crab (*Scylla* spp.), which encompass various body parts. The measurements of the main dimensions of the carapace include carapace width (CW) and carapace length (CL) (A). In addition, abdominal width (AW) (C) was measured. Measurements of the right cheliped structure include propodus length (PL), propodus width (PW), merus length (ML), dactylus length (DL), and propodus depth (PD) (B and D), as referred to in previous studies [15].

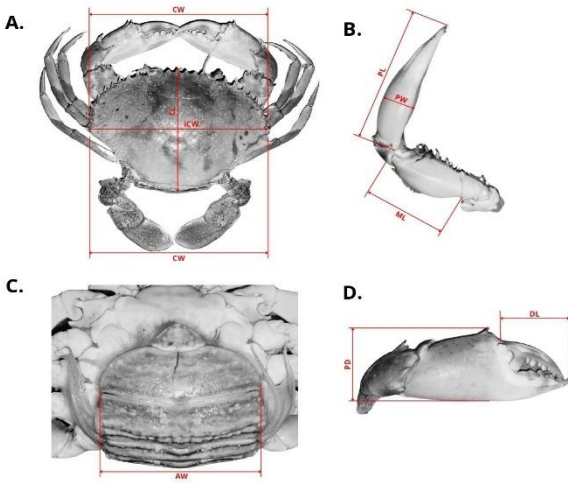

Figure 2. Mangrove Crab Parameter Section

In the implementation of this research, various tools and materials were used to support the process of measuring and analyzing data. The tools used include vernier callipers, digital or analytical scales, dissecting kits, cameras, stationery, spices, and buckets. The material used in this study is a sample of mangrove crab (*Scylla* spp.) caught by fishermen, which is the main object of the research.

The data analysis method used in this study is descriptive statistical analysis, which includes the calculation of mean values, median, mode, and standard deviation, as well as the analysis of the frequency distribution of mangrove crab size. The determination of the number of classes and frequency distribution class intervals is carried out using the Sturges' rule formula to describe the population structure of mangrove crabs, as stated by and shown in Equation 1 [16].

$$K = 1 + 3.3 \log n$$

Description:
K : Number of Classes
n : Amount of Data

Once the number of classes is obtained, the next step is to determine the appropriate class interval based on the formula developed by Walpole, as shown in Equation 2.

$$\text{Class I Interval} = \frac{\text{Xmax} - \text{Xmin}}{\text{k}}$$

Description :
i : class interval
r : the result of the maximum data value minus the minimum data
k : number of classes

Results and Discussion

Carapace Length of Mangrove Crab (*Scylla* spp.)

The proportion of mangrove crab carapace length is based on its size group. Based on this image, information was obtained that crabs caught by fishermen in Bagek Kembar, West Lombok, were predominantly (65%) 4-6 cm in size. As many as 18% of crabs are in the size group of 2–4 cm, while the size range of 6–8 cm is only 12%. Very small

individuals (1-2 cm) were found in only 4%, and the largest size, 8-10 cm, was recorded at the lowest frequency, which was 1%. This finding aligns with previous studies that reported the dominance of juvenile individuals in mangrove crab populations within mangrove ecosystems [17]. Specifically, mangrove crabs in Youtefa Bay, Jayapura, exhibit an average length range of 94.5 mm and are predominantly at low gonad maturity levels. The condition of the mangrove crab population in the Bagek Kembar KEE, which is dominated by small individuals (65% at 4–6 cm carapace length), confirms the existence of high overexploitation pressure on juvenile stocks. These conditions indicate that intensive fishing pressure led to a low number of large crabs at the research site. In addition to the pressure of capture, the variation in crab size is also influenced by environmental and seasonal factors. The juvenile abundance of *Scylla* spp. Tends to increase in certain phases of the moon, such as the new moon phase, and is also influenced by environmental dynamics, including rainfall and temperature, which collectively shape the pattern of size distribution and abundance of mangrove crabs in tropical waters [18] [19].

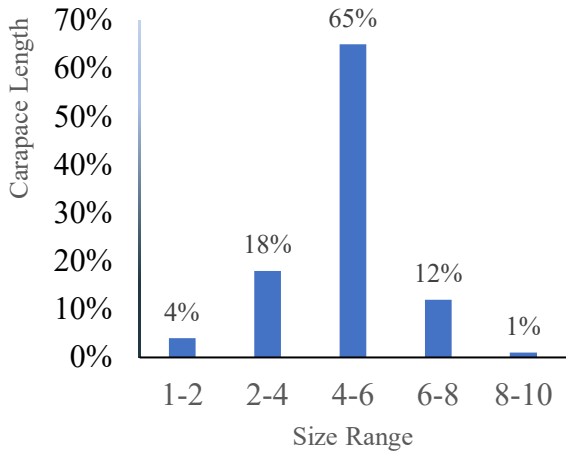

Figure 3. Length of Mangrove Crab Carapace at KEE Bagek Kembar, West Lombok, March-May 2025

Carapace width of Mangrove Crab (*Scylla* spp.)

The results of the analysis showed that the 6–8 cm size class was the most dominant, accounting for 54% of the total. The 8–10 cm size class accounted for 28%, while the 10–12 cm size class accounted for only 10%. Meanwhile, the smallest size class (1–2 cm) comprised 8% of the total. This pattern aligns with previous findings indicating that the low frequency of large individuals is a sign of overexploitation in mangrove crab populations [20]. Compared with other regions that recorded carapace widths of up to 165.5 mm, the crabs caught in Bagek Kembar were relatively smaller, indicating that the catch was made before the crabs reached their optimal size [21]. Based on comparative studies, the scarcity of large individuals (>10 cm) in Bagek Kembar strongly indicates that the catch occurs before the crabs reach adult size, in contrast to areas such as East Sinjai and Bintuni Bay, which still record a size range of up to 15–17 cm in carapace.

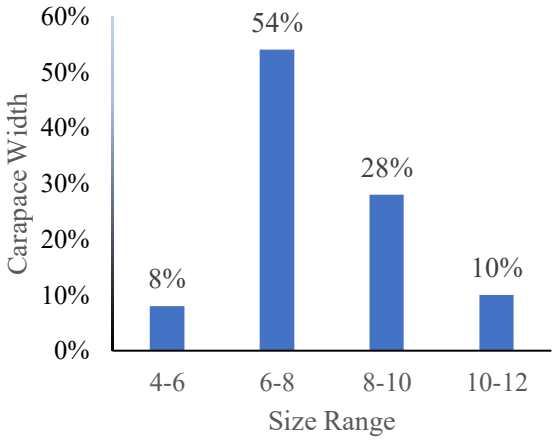

Figure 4. Mangrove Crab Carapace Width at KEE Bagek Kembar, West Lombok, March-May 2025

Abdomen Width of Mangrove Crab (*Scylla* spp.)

The abdominal width of the mangrove crab indicates that 70% of individuals are at a size of 1–2 cm. The 2–4 cm size class accounts for 24%, and only a small percentage (6%) have an abdominal width of 4 cm or greater. This indicates that the research site functions as a nursery ground, where the mangrove-mud transition area serves as a natural breeding habitat for mangrove crab juveniles [22]. This emphasizes that in Bagek Kembar, capture has the potential to reduce broodstock and reduce the spawning potential ratio. Furthermore, these findings reinforce that the mangrove forest in Bagek Kembar serves as a natural nursery ground, where juvenile mangrove crabs are predominantly found in the transition zone between mangroves and mud flats. Therefore, the high abundance of small individuals observed is in line with the ecological function of the care area.

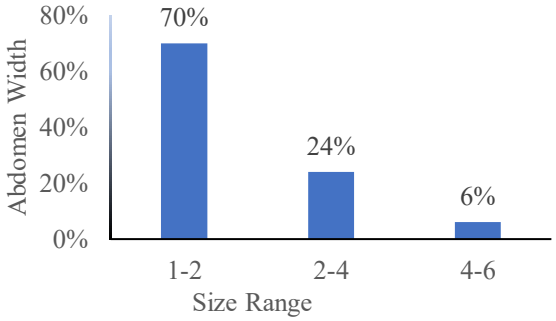

Figure 5. Abdomen Width of Mangrove Crabs in KEE Bagek Kembar, West Lombok, March-May 2025

Length of Mangrove Crab Propodus (*Scylla* spp.)

The dominant propodus size is in the range of 4–6 cm, accounting for 65% of the proportion. The 2–4 cm size class has a frequency of 18%, while the 6–8 cm size class is recorded at 12%. Very small individuals, i.e., 1–2 cm, were found at a frequency of up to 4%, and the largest size class, 8–10 cm, had the lowest frequency, at only 1%. The dominance of this small size reflects a negative allometric growth pattern, in which the increase in body length is not followed by a proportional increase in body mass, as

reported in the mangrove crab population in Bintuni Bay [23], where the growth in length is not followed by a proportional increase in body mass. This corroborates that young crabs are more in the growth phase of the extremities and carapace.

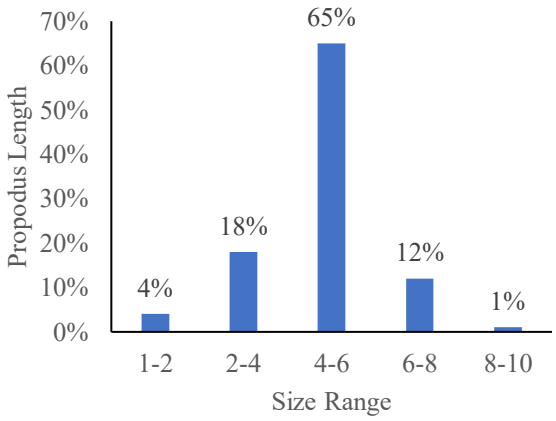

Figure 6. Length of Mangrove Crab Propodus at KEE Bagek Kembar, West Lombok March-May 2025

Width of the Mangrove Crab Propodus (*Scylla* spp.)

The results showed that the measured individuals were dominated by the 1–2 cm size class, with a frequency of up to 91%, making this size category the most common. The 2–4 cm size class accounted for only 8%, while the largest size class, 4–6 cm, was recorded at the lowest frequency, at 1%. This distribution pattern suggests that most individuals have relatively small propodus widths, while larger sizes are rarely found in the study samples.

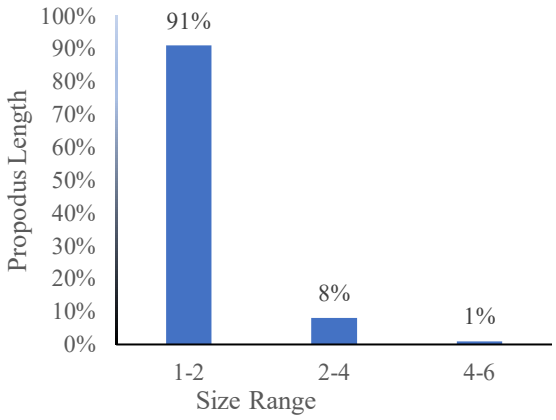

Figure 7. Mangrove Crab Propods in KEE Bagek Kembar, West Lombok, March-May 2025

Long Merus Mangrove Crab (*Scylla* spp.)

The results showed that the 2–4 cm class was the most dominant category, accounting for 66% of the total. The 1–2 cm size class was recorded at 32%, while the 4–6 cm size class had the lowest frequency, at only 2%, indicating that this size was relatively rare. Overall, this distribution pattern indicates that most individuals have a merus length in the mid-range, with far fewer individuals exhibiting extreme sizes. These results align with the pattern of limb development in crabs from Semarang waters, where juvenile individuals exhibit more pronounced merus development than other body proportions [24]. The rarity of merus sizes greater than 4 cm in this study again indicates the lack of adult crabs in the population.

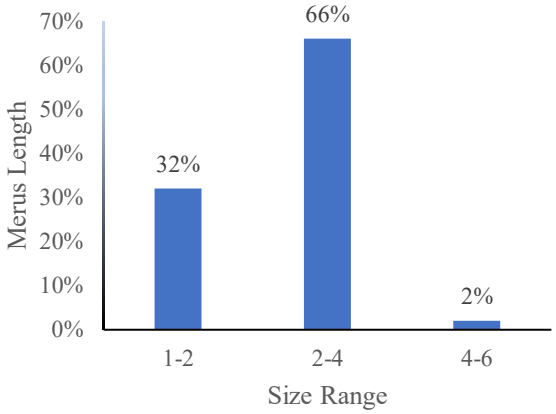

Figure 8. Length of Mangrove Crab at KEE Bagek Kembar, West Lombok, March-May 2025

Length of Mangrove Crab Dactylus (*Scylla* spp.)

The 2–4 cm category emerged as the dominant group, with a proportion of 56%, indicating that most individuals fell within this length range. Lengths of 1–2 cm rank next with a frequency of 43%, so small sizes remain common in samples. The 4–6 cm size class accounts for only 1%, indicating that this size is very rare. These findings are similar to those in other biomorphometry studies, which have noted that the distal portion of the walkway leg grows rapidly during the juvenile phase. The small size group of >4 cm indicates the absence of adult crabs, which usually have longer dactylus.

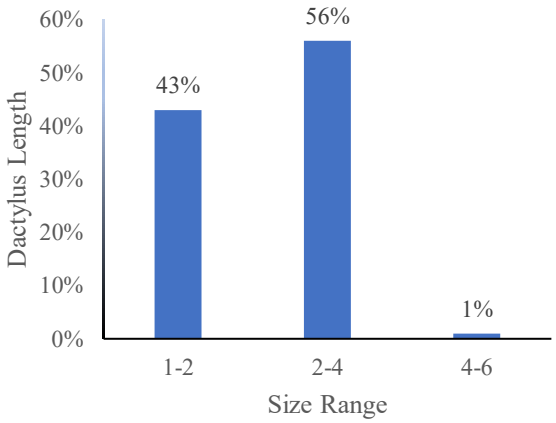

Figure 9. Length of Mangrove Crab Dactylus at KEE Bagek Kembar, West Lombok, March-May 2025

Pleopod Diameter Mangrove Crab (*Scylla* spp.)

The 2–4 cm size class appears to dominate, with a percentage of up to 55%, making it the most common size in the sample. Diameters of 1–2 cm are next with a proportion of 27%, indicating that small sizes are still quite common. Meanwhile, the 4–6 cm category has a frequency of 18%, and the largest size, 8–10 cm, is recorded at only 1%, making

it the least common. With the dominance of small size, the mangrove crab population in Bagek Kembar can be categorized as a pre-mature population of gonads.

In general, the population at these locations exhibits capture pressure, as reflected in the absence of large individuals. To maintain sustainability, recommended management strategies include establishing a minimum catch size based on M50 (±9–11 cm LK), protecting nursery zones in mangroves, increasing the selectivity of fishing gear, implementing a closing season, and developing small-scale crab aquaculture. These integrated efforts are crucial for maintaining stock sustainability while supporting the economic well-being of coastal communities in KEE Bagek Kembar.

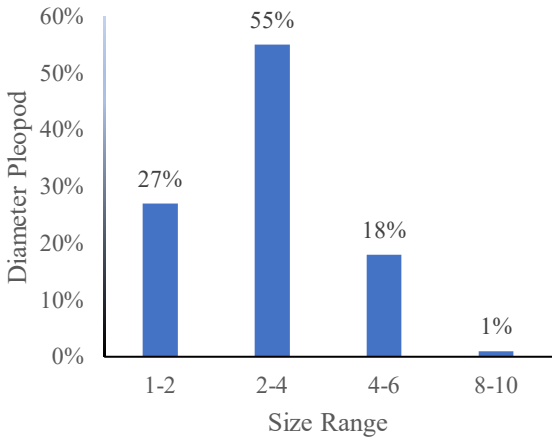

Figure 10 Diameter of Mangrove Crab Pleopods at KEE Bagek Kembar, West Lombok, March-May 2025

Conclusion

Based on the results of research on the distribution of mangrove crabs (Scylla spp.) caught by fishermen in the Bagek Kembar Exclusive Ecosystem Area (KEE), Sekotong, West Lombok, it can be concluded that the crabs caught are dominated by small to medium-sized individuals. Most individuals (65%) of crabs were in the 4–6 cm carapace length group, suggesting that the majority of samples were still in the juvenile phase or had not yet reached adult size, while the large individuals (>10 cm) were very few. This condition indicates high fishing pressure which has an impact on the reduction of adult crabs as broodstock, while strengthening the suspicion that the area functions as a nursery ground. To maintain stock sustainability, management is needed in the form of determining minimum catch sizes, protecting nursery areas, increasing fishing gear selectivity, and long-term research on population dynamics.

Author's Contributions

L. S. Laraswati: contributes to the conceptualization and design of research, data collection, data analysis, and article writing. A. Syukur, Karnan, and H. Mahrus: played a key role in supervising the entire research process, providing theoretical insights, and reviewing and approving the final manuscript version. All authors have read and approved the final manuscript for publication.

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References

[1] I. Hadi, "Struktur komunitas gastropoda sebagai bioindikator pencemaran air Sungai Gorong Kabupaten Lombok Tengah," *Biocaster: Jurnal Kajian Biologi*, vol. 3, no. 2, pp. 85–99, 2023, doi: 10.36312/biocaster.v3i2.175.

[2] E. R. Amini, G. Hadiprayitno, and I. W. Suana, "Identification of potential and suitability of Bagek Kembar mangrove forest as a tourist attraction," *Jurnal Biologi Tropis*, vol. 24, no. 2, pp. 333–341, 2024, doi: 10.29303/jbt.v24i2.6835.

[3] B. Gunawan *et al*., "Aksi restorasi penanaman mangrove dalam memitigasi bencana," *Asthadarma: Jurnal Pengabdian kepada Masyarakat*, vol. 3, no. 2, pp. 1–10, 2022, doi: 10.55173/asthadarmajurnalpengabdiankepadamasyarakat.v3i2.1.

[4] H. V. Santiti and A. Herison, "Pemanfaatan hutan mangrove untuk budidaya kepiting bakau," 2018.

[5] M. Hilmi, K. Karnan, and M. L. Ilhamdi, "Population structure of mud crab (*Scylla serrata*) in mangrove forest of Bagek Kembar," *Jurnal Biologi Tropis*, vol. 24, no. 1, pp. 699–707, 2024, doi: 10.29303/jbt.v24i1.6683.

[6] R. S. D. Gita, "Keanekaragaman jenis kepiting bakau (*Scylla* spp.)," *Jurnal Biologi dan Pembelajaran Biologi*, vol. 1, no. 2, pp. 148–161, 2016.

[7] R. Silaban *et al*., "Sebaran ukuran dan pola pertumbuhan kepiting bakau," *Jurnal Kelautan*, vol. 16, no. 3, pp. 231–242, 2023, doi: 10.21107/jk.v16i3.22536.

[8] K. Dananjaya, G. Prayitno, and D. A. Nafurbenan, "Distribusi ukuran kepiting bakau," *Jurnal Sumberdaya Akuatik Indopasifik*, vol. 6, no. 3, pp. 247–258, 2022, doi: 10.46252/jsai-fpik-unipa.2022.vol.6.no.3.228.

[9] D. Santoso and A. Syukur, "Community structure and carbon content of mangrove forest," *Jurnal Biologi Tropis*, 2024.

[10] D. Jaya *et al*., "Dampak aktivitas perikanan terhadap sumber daya pesisir," 2025.

[11] E. Tiurlan, A. Djunaedi, and E. Supriyantini, "Aspek reproduksi kepiting bakau," *Journal of Tropical Marine Science*, vol. 2, no. 1, pp. 29–36, 2019, doi: 10.33019/jour.trop.mar.sci.v2i1.911.

[12] M. M. Beku, K. G. Sine, and A. A. Ayubi, "Ukuran layak tangkap kepiting bakau," *Jurnal Bahari Papadak*, vol. 2, no. 2, pp. 42–48, 2021.

[13] M. Ramdhan, *Metode Penelitian*. Bandung, Indonesia: Cipta Media Nusantara, 2021.

[14] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*, 19th ed. Bandung, Indonesia: Alfabeta, 2013.

[15] H. Fazhan *et al*., "Sexual dimorphism in mud crabs,"

PeerJ, vol. 9, 2021, doi: 10.7717/peerj.10936.
[16] R. E. Walpole, *Pengantar Statistika*. Jakarta, Indonesia: Gramedia, 1995.
[17] I. S. B. Ramandey, S. Mulyani, and N. A. Umar, "Sebaran ukuran kepiting bakau," *Journal of Aquaculture and Environment*, vol. 6, no. 1, pp. 1–6, 2023, doi: 10.35965/jae.v6i1.3880.
[18] S. K. Patnaik, P. Panda, and P. K. Sahoo, "Juvenile abundance and post-larval incursion of mud crabs (*Scylla* spp.) in Chilika Lagoon: Influence of lunar phases," *International Journal of Marine Sciences*, vol. 40, no. 6, pp. 834–840, 2011.
[19] M. Fazhan, A. M. Kamaruddin, and A. Arshad, "Sympatric occurrence and population dynamics of *Scylla* spp. in equatorial climate: Effects of rainfall, temperature, and lunar phase," *Estuarine, Coastal and Shelf Science*, vol. 198, pp. 299–310, 2017, doi: 10.1016/j.ecss.2017.09.022.
[20] M. Khalil, Zulfikar, and Saifullah, "Eksploitasi kepiting bakau," *Acta Aquatica*, vol. 8, pp. 98–102, 2021, doi: 10.29103/aa.v11i3.13571.
[21] S. F. Safitri, S. Sunaryo, and A. Djunaedi, "Biomorfometri kepiting bakau," *Journal of Marine Research*, vol. 9, no. 1, pp. 55–64, 2020, doi: 10.14710/jmr.v9i1.25794.
[22] M. E. Walton *et al*., "Mangrove–mudflat boundaries as nursery grounds," *Marine Biology*, vol. 149, no. 5, pp. 1199–1207, 2006, doi: 10.1007/s00227-006-0267-7.
[23] W. Kantun, S. Wulandari, and H. Anggreni, "Ukuran pertama matang gonad kepiting bakau," *Bawal Widya Riset Perikanan Tangkap*, vol. 14, no. 2, pp. 57–67, 2022, doi: 10.15578/bawal.14.2.2022.57-67.
[24] A. S. Hardiyanti *et al*., "Biomorfometrik kepiting bakau," *Buletin Oseanografi Marina*, vol. 7, no. 2, 2018, doi: 10.14710/buloma.v7i2.20686.