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Original research article:

Analysis of the Potential and Management Strategies of Mud Crab (*Scylla spp.*) Resources in the Bangka Belitung Islands Province, Indonesia

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ABSTRACT

This study aims to analyze the potential of mud crab resources and formulate sustainable management strategies in the Bangka Belitung Islands Province. The research was conducted from April to May 2025 using a descriptive quantitative approach based on secondary data obtained from fisheries statistics, scientific publications, and relevant literature. Data analyzed included mud crab production, fishing gear utilization, and environmental conditions supporting mud crab habitats. The results showed that mud crab production in Bangka Belitung increased from 1,813.66 tons in 2020 to 3,854.27 tons in 2024, despite fluctuations in the number of trap nets (bubu) used by fishermen. Regression analysis indicated a moderate relationship between the number of trap nets and mud crab production, suggesting that production is influenced not only by fishing effort but also by environmental conditions, bait quality, and fishing techniques. Sustainable management strategies should focus on mangrove habitat conservation, regulation of minimum catch size, prohibition of harvesting berried female crabs, environmentally friendly fishing practices, development of mud crab aquaculture, and strengthening community participation. These strategies are expected to support the sustainability of mud crab resources and improve the welfare of coastal communities in IFMA 711.

Introduction

The Bangka Belitung Islands Province is a strategically important coastal region situated within the Fisheries Management

Area of the Republic of Indonesia (IFMA) 711. The area possesses substantial fisheries resources, supported by highly productive aquatic environments and the presence of coastal

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ecosystems such as mangrove forests, seagrass beds, and estuarine habitats. These ecosystems provide essential nursery, feeding, and breeding grounds for various crustacean species, particularly mud crabs (*Scylla* spp.). Owing to their high economic value, mud crabs have become a significant fishery commodity that contributes to the livelihoods of local fishermen and supports the coastal economy of Bangka Belitung. Nevertheless, increasing exploitation pressure accompanied by inadequate management practices poses a serious threat to the sustainability of mud crab populations and their habitats within IFMA 711. According to (Hermanto *et al.*, 2019), mud crab resources in the region have reached a concerning level of exploitation due to habitat degradation and overfishing. This condition is reflected in the relatively small average carapace width of harvested crabs, which ranges from 6.9 to 9.8 cm. (Adibrata *et al.*, 2025).

The use of mud crab resources in the Bangka Belitung Islands Province has been steadily increasing along with the rising demand from both domestic and export markets. Mud crabs have high economic value, making them a primary target for both traditional and commercial fishermen. Mud crab fishing is a vital livelihood for local fishermen, the sustainability of this resource is closely linked to the health of the mangrove ecosystem (Adibrata *et al.*, 2024). This situation puts significant exploitation pressure, especially on smaller crabs and egg-bearing female crabs. In addition, offshore tin mining, water pollution, and the conversion of mangrove areas pose serious threats to the sustainability of mud crab habitats. The decline in habitat quality can affect the growth, reproduction, and distribution of mangrove crab populations in the Bangka Belitung coastal areas. Therefore, ecosystem-based management is needed to maintain a balance between economic

use and the sustainability of aquatic resources (Tambunan *et al.*, 2023).

According to (Hermanto *et al.*, 2019) IFMA 711 is known as one of the national strategic fisheries areas with high fishing activity and vulnerability to overexploitation practices. Various studies show that fisheries management in IFMA 711 needs to be carried out through a sustainability approach, controlling fishing efforts, and strengthening resource monitoring. Proper management strategies require information about resource potential, stock conditions, utilization levels, and environmental factors affecting the distribution of mud crabs. Analyzing mangrove crab resource potential is an important basis for determining management policies such as catch size limits, protection of spawning habitats, regulation of fishing seasons, and the development of coastal conservation areas.

Considering these circumstances, an in-depth assessment of mud crab resource potential and appropriate management strategies in the Bangka Belitung Islands Province within the Fisheries Management Area of the Republic of Indonesia (IFMA) 711 is essential. Evaluating the resource potential is important for determining the current level of utilization and identifying opportunities for sustainable development. At the same time, the formulation of effective management strategies is necessary to maintain resource sustainability by integrating ecological, economic, social, and institutional considerations. Therefore, this study seeks to assess the potential of mud crab resources and develop sustainable management strategies for their long-term utilization in the Bangka Belitung Islands Province, IFMA 711.

Research Method

Time and Place

This study was carried out

between April and May 2025 within the Fisheries Management Area of the Republic of Indonesia (IFMA) 711. The research encompassed all administrative regions of the Bangka Belitung Islands Province, including Bangka Regency, West Bangka Regency, Central Bangka Regency, South Bangka Regency, Belitung Regency, East Belitung Regency, and Pangkalpinang City. The investigation was concentrated in coastal zones and mangrove ecosystems, which represent the primary habitats of mud crabs (*Scylla* spp.) throughout the province.

Research Tools and Materials

The materials and data used in this study are in the form of secondary data, including data on the production of mangrove crab (*Scylla* spp.) catch, potential fisheries resources, the level of fish resource utilization, coastal water conditions, as well as various scientific literature relevant to the management of mangrove crab (*Scylla* spp.) resources in IFMA 711 (Aprilia *et al.*, 2022). The data were obtained from publications of the Ministry of Marine Affairs and Fisheries (MMAF, 2025), scientific journals, and previous research reports. Data processing was carried out using Microsoft Excel and other supporting software (Kusumastanto *et al.*, 2024). Research data were obtained from fisheries statistical reports, government publications, and various scientific literature related to crab resources. The data obtained were then organized and tabulated using Microsoft Excel to facilitate the analysis process. Subsequently, a quantitative descriptive analysis was conducted to determine the potential and utilization level of crab resources, which was then used as a basis for developing strategies for sustainable crab resource management in the IFMA 711 area (Aprilia *et al.*, 2022).

Data Analysis

Data analysis was carried out in a quantitative descriptive manner through tabulation of mud crab (*Scylla* spp.) production data and the utilization rate of fishery resources in IFMA 711. The analysis was conducted by comparing catch data in each regency/city to determine the potential condition of mud crab (*Scylla* spp.) resources in the Bangka Belitung Islands Province (Tambunan *et al.*, 2023). In addition, a management strategy analysis was carried out based on ecological, economic, and social sustainability aspects to produce recommendations for the sustainable management of mud crab (*Scylla* spp.) resources in the IFMA 711 area (Kusumastanto *et al.*, 2024).

Results And Discussion

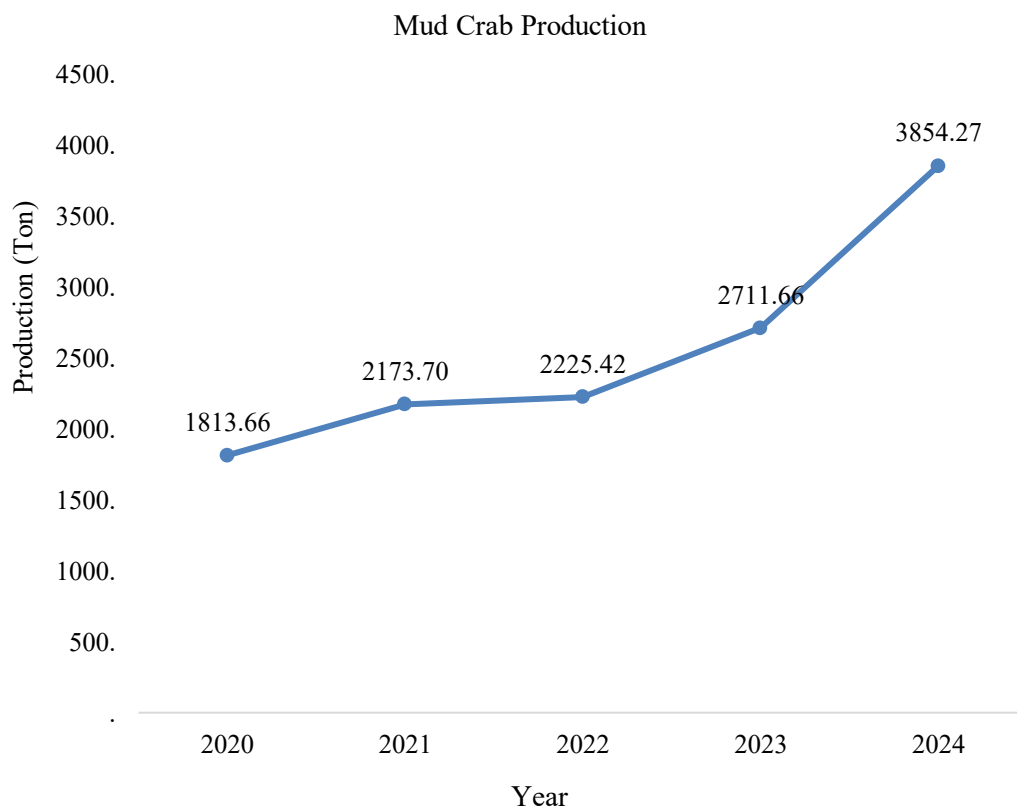
Overview of IFMA 711

IFMA 711 encompasses the Karimata Strait, the Natuna Sea, and the North Natuna Sea, all of which are characterized by highly productive aquatic environments supported by extensive mangrove forests, seagrass meadows, and estuarine ecosystems. These coastal ecosystems provide essential habitats for a wide range of crustacean species, particularly mud crabs (*Scylla* spp.). The Bangka Belitung Islands Province, situated within the IFMA 711 region, possesses substantial mangrove coverage that plays a critical role in sustaining mud crab populations. As a high-value fishery commodity, mud crabs contribute significantly to the livelihoods and economic well-being of coastal communities. In addition to supporting aquatic biodiversity, mangrove ecosystems function as important nursery, feeding, and refuge areas for marine organisms while also contributing to coastal protection, ecological balance, and the maintenance of fisheries productivity (Rudianto *et al.*, 2022) emphasized that integrated coastal ecosystem management through mangrove conservation and restoration is

essential for maintaining ecosystem resilience and ensuring the sustainable utilization of coastal resources. In addition, (Su *et al.*, 2021) reported that mangrove restoration generates significant ecological and economic benefits by enhancing biodiversity, strengthening coastal protection, and restoring ecosystem services that support fisheries production. Therefore, increasing fishing pressure, mangrove conversion, and coastal mining activities may threaten the sustainability of mud crab resources and associated ecosystem services, highlighting the importance of ecosystem-based management approaches in IFMA 711.

Mud Crab Production

Mud crab (*Scylla* spp.) is one of the economically important fisheries commodities in the Bangka Belitung Islands Province. The extensive mangrove ecosystems distributed throughout the coastal areas of the province provide suitable habitats that support the growth, survival, and productivity of mud crab populations. Therefore, an analysis of mud crab production trends is important to evaluate the utilization and sustainability of this valuable fishery resource in IFMA 711.



Source: Fisheries Statistics Data of the Ministry of Marine Affairs and Fisheries (MMAF, 2025)

Figure 1. Mud Crab Production

The production data used in this study refer specifically to mud crab

(*Scylla* spp.) production, one of the most economically valuable fishery

commodities in the Bangka Belitung Islands Province. Based on Figure 1, mud crab production showed an increasing trend during 2020–2024, rising from 1,813.66 tons in 2020 to 3,854.27 tons in 2024. This increase indicates that mud crab resources are still capable of supporting capture fisheries activities in the region. Besides fishing gear utilization, production growth is also associated with favorable mangrove habitat conditions, effective bait usage, suitable fishing seasons, and fishermen's ability to identify productive fishing grounds. Nevertheless, increasing production should be accompanied by sustainable management measures to prevent overexploitation of mud crab populations (Sari *et al.*, 2021).

According to (Pati *et al.*, 2023), habitat quality, including salinity, temperature, dissolved oxygen, and other physicochemical characteristics, plays an important role in supporting the growth, reproduction, and productivity of (*Scylla* spp.) populations. Healthy mangrove ecosystems provide suitable environmental conditions that contribute to the sustainability of mud crab fisheries. The availability of healthy mangrove areas contributes significantly to the abundance and sustainability of mud crab resources in coastal waters. In addition, (Tambunan *et al.*, 2023) reported that the abundance and growth patterns of mud crabs in the Bangka Belitung Islands are strongly influenced by habitat quality and environmental conditions. Therefore, the increasing trend in mud crab production observed during the period of 2020–2024 may indicate that environmental conditions in several coastal areas of Bangka Belitung are still capable of supporting mud crab populations and fisheries activities. Furthermore, the high economic value of mud crabs has encouraged fishermen to continue utilizing this resource to meet increasing market demand. However, continuous increases in production should be

carefully monitored because excessive exploitation may lead to a decline in natural stocks and threaten the long-term sustainability of mud crab resources.

Trap Net (Bubu) Fishing Gear

Among the various fishing methods employed in mud crab (*Scylla* spp.) fisheries, trap nets (*bubu*) remain one of the most frequently utilized gears in mangrove and estuarine ecosystems. Their widespread use is attributed to their operational simplicity, affordability, and suitability for shallow coastal environments with extensive mangrove coverage. In the Bangka Belitung Islands Province, trap nets are extensively used by local fishers and contribute significantly to mud crab harvesting activities within the Fisheries Management Area of the Republic of Indonesia (IFMA) 711. Therefore, examining temporal trends in the number of trap nets is important for evaluating the intensity of fishing effort and its possible effects on mud crab production and resource sustainability.

Based on Figure 2, the number of trap nets used in the Bangka Belitung Islands Province fluctuated during the period of 2020–2024, with an overall declining trend. The number of trap nets decreased substantially from 3,878 units in 2020 to 659 units in 2024. This pattern indicates a reduction in fishing effort directed toward mud crab (*Scylla* spp.) resources during the study period. However, despite the declining number of trap nets, mud crab production continued to increase. This finding suggests that variations in production were not solely determined by the quantity of fishing gear used. (Zeller *et al.*, 2021) reported that catch production may be influenced by multiple factors, including fishing efficiency, resource availability, and environmental conditions, in addition to fishing effort. Therefore, further analysis is required to evaluate the relationship between the number of trap nets and mud

crab production in the Bangka Belitung Islands Province.

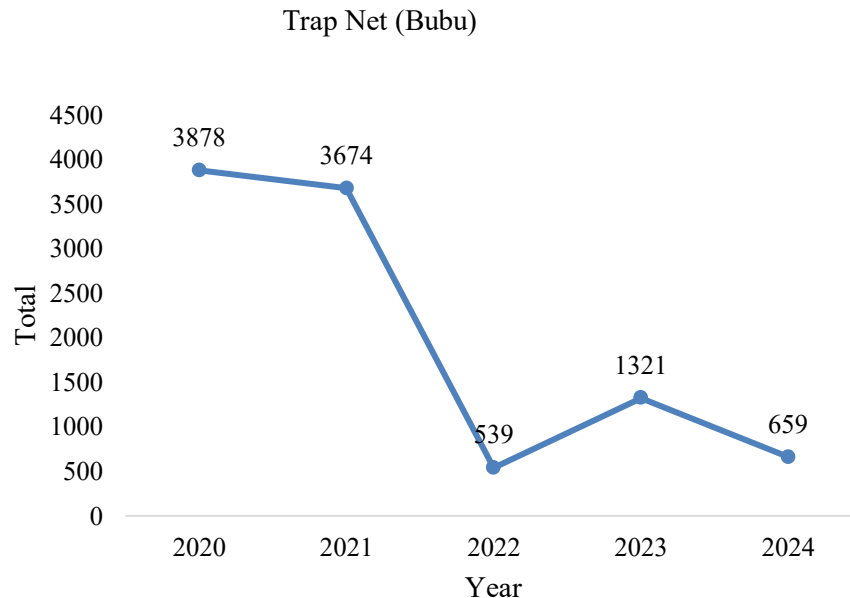


Figure 2. Trap Net (Bubu) Fishing Gear

Relationship Between the Number of Trap Nets and Mud Crab Production

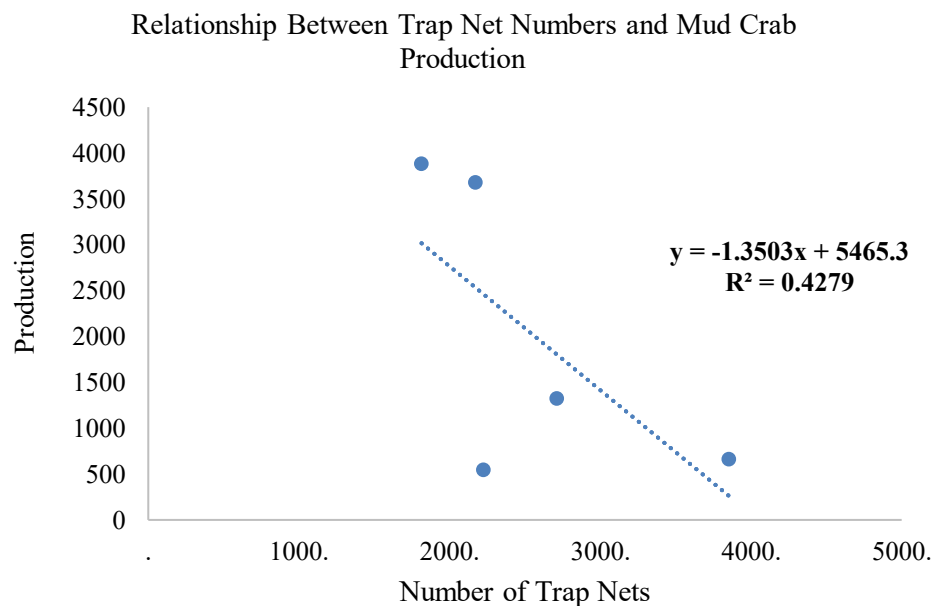
The relationship between fishing effort and catch production is an important indicator in evaluating fisheries resource utilization. According to (Hermanto *et al.*, 2019), fisheries management in IFMA 711 should be carried out by considering resource sustainability and environmental carrying capacity to prevent overexploitation. (Dewiyanti *et al.*, 2024) reported that changes in habitat characteristics and anthropogenic pressures may contribute to the decline of mud crab populations, indicating that environmental quality strongly influences the abundance and sustainability of mud crab resources. Based on Figure 3, the regression analysis shows a negative relationship between the number of trap nets and mud crab production, indicating that an increase in

fishing gear does not necessarily result in higher production. The coefficient of determination ($R^2 = 0.4279$) indicates that approximately 42.79% of the variation in mud crab production can be explained by the number of trap nets, while the remaining variation is influenced by other factors such as environmental conditions, habitat availability, fishing seasons, and fishermen's ability to identify productive fishing grounds.

These findings suggest that mud crab production in the Bangka Belitung Islands Province is influenced not only by fishing effort but also by ecological factors that support the sustainability of mud crab resources. Therefore, sustainable management should focus on both regulating fishing activities and maintaining environmental conditions that support mud crab populations. Environmental conditions may explain a

substantial proportion of variation in mud crab production. (Alexandre *et al.*, 2021) found that the distribution of *Scylla serrata* burrows was strongly associated with habitat characteristics, including substrate conditions, intertidal position,

and vegetation structure. This finding supports the present study, where mud crab production was not solely determined by the number of trap nets but was also influenced by habitat quality and environmental factors.



Source: Fisheries Statistics Data of the Ministry of Marine Affairs and Fisheries (MMAF, 2025)

Figure 3. Relationship Between the Number of Trap Nets and Mud Crab Production

Mud Crab Management Strategies

The sustainable management of mud crab (*Scylla* spp.) resources in the Bangka Belitung Islands Province, located within the Fisheries Management Area of the Republic of Indonesia (IFMA) 711, should adopt an ecosystem-based management framework that integrates resource utilization with conservation objectives. According to (Hermanto *et al.*, 2019) stated that fisheries management in IFMA 711 should be carried out by considering environmental carrying capacity and resource sustainability to prevent overexploitation. Therefore, mangrove protection and rehabilitation should become a management priority because

these ecosystems provide essential habitats for mud crab populations. In addition, the implementation of minimum catch size regulations, protection of berried female crabs, and the use of environmentally friendly fishing gears are necessary to maintain resource sustainability. Sustainable mud crab management requires integrated approaches that combine habitat conservation, stock protection, improved governance, and sustainable production practices to ensure long-term resource sustainability. Therefore, strengthening fisheries monitoring, improving resource data collection, developing mud crab aquaculture, and increasing community participation are important steps to support the long-term sustainability of

mud crab resources in IFMA 711. The development of sustainable mud crab aquaculture can also reduce fishing pressure on wild stocks. (Apine *et al.*, 2023) emphasized that well-managed mud crab aquaculture can generate substantial economic benefits while simultaneously contributing to the conservation and sustainable utilization of natural resources when supported by appropriate environmental and management practices

Conclusion

This study aimed to analyze the potential of mud crab (*Scylla* spp.) resources and formulate sustainable management strategies in the Bangka Belitung Islands Province within the Fisheries Management Area of the Republic of Indonesia (IFMA) 711. The results showed that mud crab production increased from 1,813.66 tons in 2020 to 3,854.27 tons in 2024, indicating that mud crab resources in the region still have considerable fisheries potential. The relationship analysis between the number of trap nets and mud crab production showed that catch production is influenced not only by fishing effort but also by environmental conditions, habitat quality, and fishing efficiency. Based on these findings, sustainable management strategies should focus on mangrove conservation and rehabilitation, the implementation of minimum catch size regulations, protection of berried female crabs, the use of environmentally friendly fishing gears, the development of mud crab aquaculture, and the strengthening of fisheries monitoring and community participation. These strategies are expected to support the sustainable utilization of mud crab resources while improving the welfare of coastal communities in IFMA 711.

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