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Analysis of Production Trends of Mackerel Tuna (*Euthynnus affinis*) Landed at Nusantara Fishing Port of Brondong (NFP Brondong), Lamongan Regency, East Java, Indonesia

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ABSTRACT

This study aimed to analyze the production trends and production value of mackerel tuna landed at Nusantara Fishing Port of Brondong (NFP Brondong), Lamongan Regency, East Java, within Indonesian Fisheries Management Area (IFMA) 712. The research was conducted from April to May 2025 using a quantitative descriptive approach based on time-series data from 2020 to 2024 obtained from the Statistical Data Portal of the Ministry of Marine Affairs and Fisheries of Indonesia. The results showed that mackerel tuna production exhibited a fluctuating pattern throughout the study period. The highest production was recorded in 2024 at 53.18 tons, while the lowest production occurred in 2022 at 18.37 tons, with an average annual production of 35.29 tons. The production value also fluctuated, reaching its highest level in 2023 at IDR 1,098,435,000 and its lowest level in 2024 at IDR 464,758,000. Fluctuations in production volume were likely influenced by fishing seasons, weather conditions, fishing activities, and oceanographic factors in the Java Sea. Meanwhile, fluctuations in production value were associated with market prices, consumer demand, and fish quality. The findings indicate that mackerel tuna remains an important fishery commodity in IFMA 712. Therefore, sustainable fisheries management is necessary through continuous production monitoring and appropriate control of fishing efforts to ensure resource sustainability and support fishers' welfare.

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Introduction

Nusantara Fishing Port of Brondong (NFP Brondong), located in Lamongan Regency, East Java Province, is one of the major fishing ports along the northern coast of Java and plays an important role as a center for fish landing, distribution, and marketing activities. The port significantly contributes to the regional fisheries sector by supporting capture fisheries activities, providing employment opportunities, and supplying raw materials for fish processing industries. In addition to serving as a fish landing center, NFP Brondong plays a strategic role in ensuring the availability of raw materials for fish processing industries in Lamongan and surrounding areas. Previous studies have indicated that the demand for fish as raw material in processing industries around NFP Brondong continues to increase, highlighting the importance of sustainable fish supply from capture fisheries activities (Hidayah *et al.*, 2022).

One of the economically important fishery commodities landed at NFP Brondong is mackerel tuna. Mackerel tuna is a pelagic fish species with high economic value and is widely consumed by local communities. This species contributes significantly to food security and serves as an important source of income for fishers. The increasing market demand for mackerel tuna has led to intensified fishing activities over time. Consequently, sustainable management measures are required to ensure that the utilization of mackerel tuna resources does not exceed their natural recovery capacity and to maintain the long-term sustainability of fish stocks (Ardelia *et al.*, 2017).

The production of mackerel tuna landed at fishing ports generally fluctuates from year to year. These fluctuations may be influenced by various factors, including fishing seasons, oceanographic conditions, weather

variability, fishing fleet capacity, fishing gear effectiveness, and market dynamics. Changes in production volume directly affect the production value obtained by fishers and other stakeholders in the fisheries sector. Therefore, information regarding production trends and production value is essential for evaluating the utilization status of fishery resources and supporting the formulation of sustainable fisheries management policies (Wicaksono *et al.*, 2020).

Although several studies have examined the utilization of mackerel tuna resources, exploitation levels, and the availability of raw materials for fish processing industries at NFP Brondong, studies specifically focusing on the trends in production volume and production value of mackerel tuna in recent years remain limited. Such information is crucial for understanding the development of capture fisheries production and the economic performance of fisheries in Indonesian Fisheries Management Area (IFMA) 712. Furthermore, production trend analysis can serve as an initial indicator for evaluating the sustainability of fishery resource utilization and supporting fisheries management decision-making processes (Hidayah *et al.*, 2022). Based on the aforementioned background, this study aimed to analyze the trends in production volume and production value of mackerel tuna landed at Brondong Nusantara Fishing Port (NFP Brondong) during the period of 2020–2024 within the Indonesian Fisheries Management Area (IFMA) 712. The findings are expected to provide valuable information to support sustainable fisheries management in the Indonesian Fisheries Management Area (IFMA) 712.

Methods

Study Area and Research Period

This study was conducted from April to May 2025 at Nusantara Fishing

Port of Brondong (NFP Brondong), Lamongan Regency, East Java Province, Indonesia. The study area is located within the Indonesian Fisheries Management Area (IFMA) 712. Research

activities included data collection, processing, and analysis of mackerel tuna production landed at NFP Brondong during the period of 2020–2024.

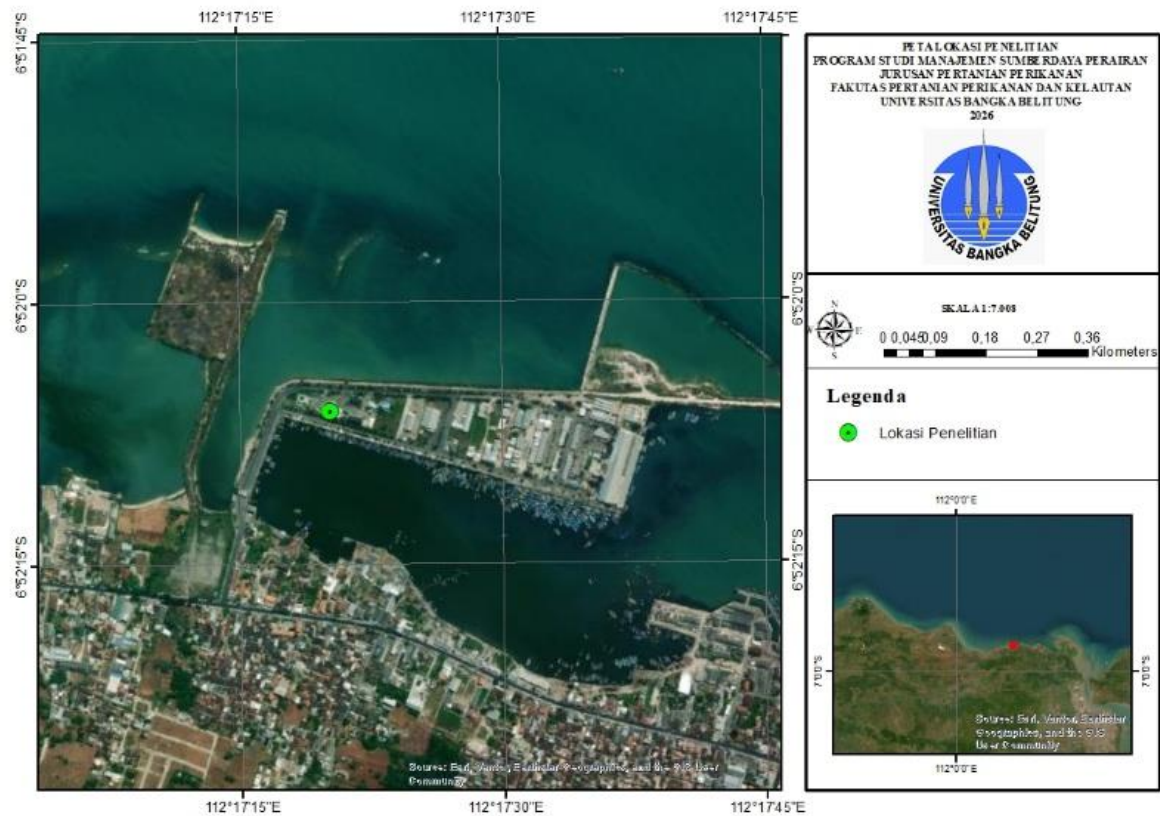


Figure 1. Study Area

Research Materials and Data Sources

The equipment used in this study consisted of a laptop computer and data-processing software, including Microsoft Excel and Microsoft Word. Secondary data were obtained from the Statistical Data Portal of the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia. The data included annual production volume (tons) and production value (IDR) of mackerel tuna landed at NFP Brondong from 2020 to 2024. Additional information was collected from scientific journals, government reports, and official documents related to fisheries management, fishery resources,

and the allowable catch in the Indonesian Fisheries Management Area (IFMA) 712.

Data Analysis

Data were analyzed using a quantitative descriptive approach based on time-series data from 2020 to 2024. This method was applied to describe the production characteristics of mackerel tuna using numerical data presented in tables and graphs, thereby facilitating the interpretation of production trends throughout the observation period. Trend analysis was performed by comparing annual changes in production volume and production value during the study period. Furthermore, the average annual

production was calculated to provide an overview of mackerel tuna production at NFP Brondong. The average production

was calculated using the following equation:

$$\bar{x} = \frac{\sum x}{n}$$

Where:

$\bar{x}$ = average production (tons)

$\sum x$ = total production during the observation period (tons)

n = number of observation years

Results and Discussion

Mackerel Tuna Production at Nusantara Fishing Port of Brondong, Lamongan Regency

Based on capture fisheries production data obtained from the Statistical Data Portal of the Ministry of Marine Affairs and Fisheries (MMAF), mackerel tuna (*Euthynnus affinis*) production landed at Nusantara Fishing Port of Brondong (NFP Brondong), Lamongan Regency, during the period of 2020–2024 exhibited a fluctuating pattern. These fluctuations indicate

variations in fish catches that may be influenced by fishing seasons, fishing fleet capacity, fishing gear utilization, and the condition of fishery resources within the Indonesian Fisheries Management Area (IFMA) 712. Mackerel tuna is one of the economically important pelagic fish species commonly harvested using purse seine fisheries in the Java Sea; therefore, changes in production are closely related to fishing activities and environmental conditions. The annual production volume and production value of mackerel tuna landed at NFP Brondong are presented in Table 1.

Table 1. Production Volume and Production Value of Mackerel Tuna at Nusantara Fishing Port of Brondong (NFP Brondong) During 2020–2024.

Year	Production (tons)	Production Value (IDR,000)
2020	24.00	477.000
2021	28.66	764.840
2022	18.37	485.039
2023	52.23	1.098.435
2024	53.18	464.758
Total		176,44
Average Production		35,29

Source: MMAF Statistical Data Portal (MMAF, 2025)

Based on Table 1 and Figure 2, mackerel tuna production experienced both increases and decreases throughout the study period. The highest production was recorded in 2024 at 53.18 tons, while the lowest production occurred in 2022 at 18.37 tons. Production increased in 2021 compared to the previous year but

declined again in 2022. Subsequently, production increased significantly in 2023 and remained relatively stable in 2024. These findings indicate that mackerel tuna production in the study area followed a fluctuating trend associated with fishing activities and environmental variability in the Java Sea.

Fluctuations in pelagic fish catches are generally related to seasonal changes, fish distribution patterns, and oceanographic

conditions such as sea surface temperature and food availability in marine waters

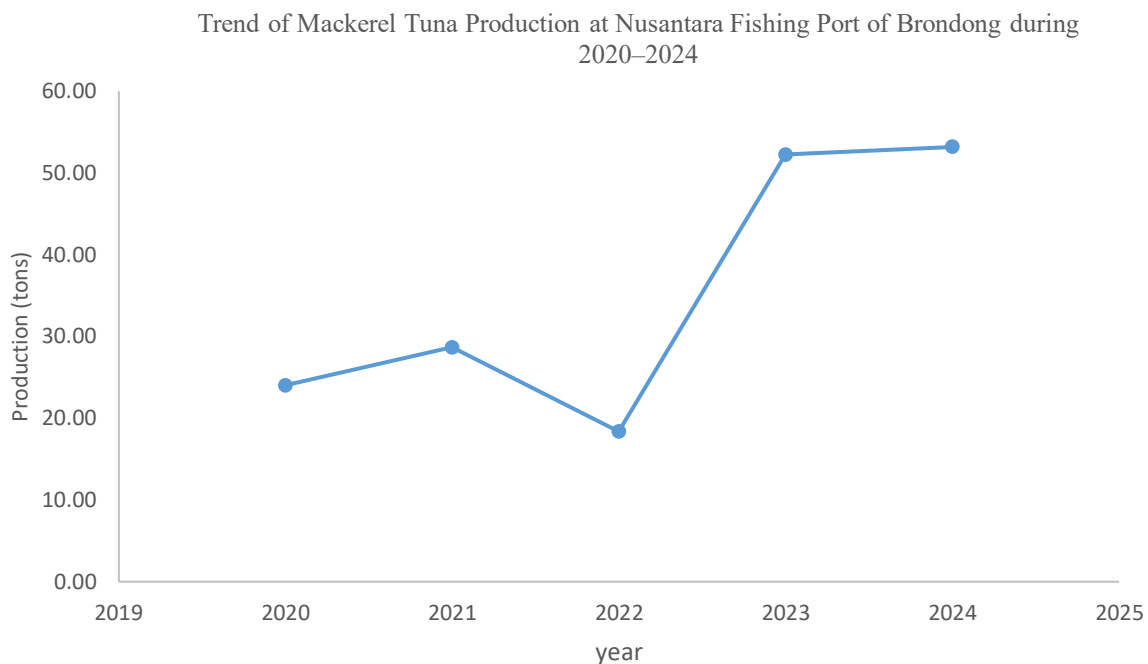


Figure 2. Trend of Mackerel Tuna Production at Nusantara Fishing Port of Brondong (NFP Brondong)

The decline in production observed in 2022 was likely associated with unfavorable weather conditions that limited fishing operations in the Java Sea. Rough sea conditions and high waves may reduce fishing effort and consequently decrease mackerel tuna catches. Furthermore, oceanographic factors such as ocean currents, sea surface temperature, and chlorophyll-a concentration may influence the spatial distribution of mackerel tuna in fishing grounds. As a pelagic species, mackerel tuna tends to migrate in response to environmental changes and the availability of food resources. Variations in these environmental parameters affect the productivity of fishing grounds and may influence the success of fishing operations. Previous studies have demonstrated that sea surface temperature and primary productivity are

closely associated with the abundance and distribution of mackerel tuna in Indonesian waters, indicating that favorable oceanographic conditions generally support higher fish availability and increase fishing success (Syamsuddin *et al.*, 2018)..

The substantial increase in production during 2023 and 2024 suggests a recovery in fishing activities following the decline observed in 2022. This increase was likely influenced by higher fishing intensity, the effective use of purse seine gear, and the experience of fishers in identifying productive fishing grounds. In addition to fishing activities, improvements in environmental conditions may also have contributed to the increased availability of mackerel tuna in the fishing area. Seasonal changes that support higher primary productivity can increase the abundance of pelagic fish

and improve catch performance. Similar findings have been reported in previous studies, which showed that purse seine fisheries operating in the Java Sea contribute significantly to pelagic fish production and play an important role in supporting fisheries production within the Indonesian Fisheries Management Area (IFMA) 712 (Maulana *et al.*, 2021). These results indicate that fluctuations in mackerel tuna production are influenced by the interaction between fishing activities and environmental conditions, highlighting the importance of continuous production monitoring to support sustainable fisheries management in the study area.

Production Value of Mackerel Tuna

Production value represents the

economic value generated from mackerel tuna catches landed at Brondong Nusantara Fishing Port (NFP Brondong) during the study period. Production value is influenced not only by catch volume but also by market prices, consumer demand, fish quality, and the efficiency of distribution systems. In general, higher production volumes tend to generate greater economic value when supported by stable market prices. As one of the major fishery commodities in Lamongan Regency, mackerel tuna contributes significantly to the income of local fishing communities and plays an important role in supporting the regional fisheries economy. The trend in production value of mackerel tuna landed at NFP Brondong during 2020–2024 is presented in Figure 3.

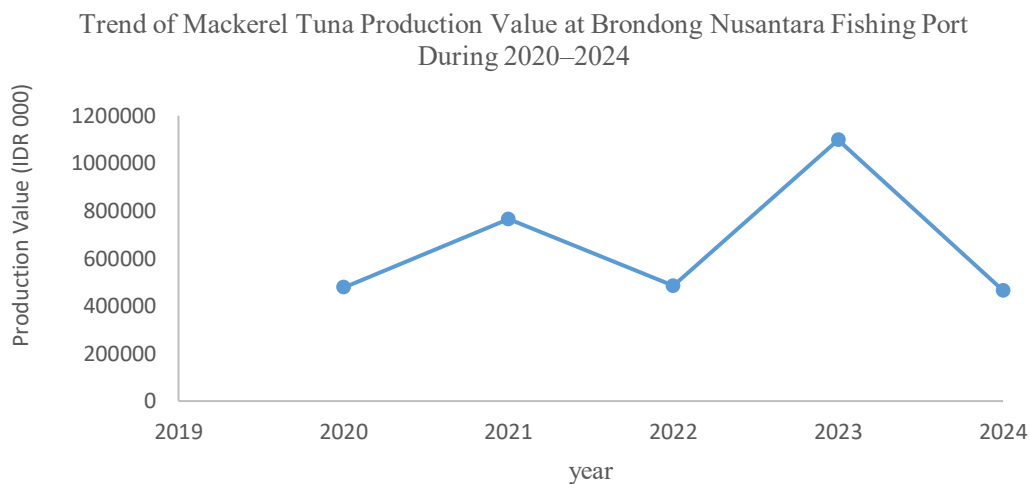


Figure 3. Trend of Mackerel Tuna Production Value at Nusantara Fishing Port of Brondong (NFP Brondong)

Based on Table 1 and Figure 3, the production value of mackerel tuna fluctuated throughout the study period. The highest production value was recorded in 2023 at IDR 1,098,435,000, whereas the lowest production value occurred in 2024 at IDR 464,758,000. The high production value observed in 2023 was likely associated with increased

catches and favorable market prices. Production value is not determined solely by catch volume but is also influenced by market conditions, consumer demand, fish quality, and distribution systems. Variations in fish prices may significantly affect fishers' income and the overall economic value of fisheries production. Similar findings were reported by

(Wicaksono *et al.*, 2020). who stated that changes in production value are closely related to fluctuations in production volume and market conditions.

Although production volume increased in 2024 compared to the previous year, its production value declined considerably. This condition suggests that market prices may have decreased or that changes in fish quality affected the selling price of the catch. In addition, market demand and the distribution system may also influence the final economic value received by fishers. When fish supply exceeds market demand, selling prices generally decline despite increasing production volume. Conversely, limited fish supply combined with high consumer demand may increase market prices and improve production value. Therefore, production value should be interpreted by considering both biological factors affecting fish availability and economic factors influencing market performance. These findings demonstrate that increases in production volume do not necessarily correspond to increases in production value (Hikmayani *et al.*, 2014).

Furthermore, fluctuations in production value indicate that improving fisheries performance cannot rely solely on increasing production volume. Efforts to improve fish handling practices, maintain product quality, strengthen cold-chain facilities, and expand market access are equally important to enhance the economic value of mackerel tuna. Better post-harvest management can reduce quality deterioration during transportation and distribution, thereby increasing the competitiveness and selling price of fish products. Consequently, fisheries management should integrate biological sustainability with economic development strategies to ensure that increased production is accompanied by improved economic benefits for fishing communities. This integrated approach is expected to support sustainable fisheries development in the Indonesian Fisheries Management Area (IFMA) 712 while maintaining the long-term welfare of coastal

communities (Hidayah *et al.*, 2022).

Average Production of Mackerel Tuna

The average production analysis was conducted to provide an overview of mackerel tuna production landed at Brondong Nusantara Fishing Port (NFP Brondong) during the period of 2020–2024. Based on the production data presented in Table 1, the average annual production of mackerel tuna was 35.29 tons. This result indicates that mackerel tuna remains one of the important pelagic fish commodities contributing to capture fisheries production at NFP Brondong. The relatively high average production reflects the important role of the Java Sea as one of the main fishing grounds for pelagic fish resources and demonstrates the continued dependence of local fishers on mackerel tuna fisheries as a source of income and regional fish production (Ardelia *et al.*, 2017).

Although the average annual production was relatively high, the fluctuations observed during the study period indicate that mackerel tuna resources are influenced by various factors affecting capture fisheries production. Annual changes in production may be associated with differences in fishing seasons, weather conditions, fishing intensity, and the availability of fish resources in the fishing grounds. These fluctuations should be considered in evaluating the sustainability of resource utilization because continuous increases or decreases in production may reflect changes in resource conditions or fishing activities. Therefore, production trend analysis provides important information for fisheries managers in assessing the utilization status of mackerel tuna resources and supporting sustainable fisheries management in the Indonesian Fisheries Management Area (IFMA) 712 (Wicaksono *et al.*, 2020).

Considering the economic importance of mackerel tuna for coastal

communities in northern East Java, sustainable fisheries management should be continuously strengthened to maintain the availability of fish resources while supporting fishers' livelihoods. Management efforts may include regulating fishing capacity, monitoring fishing gear utilization, controlling fishing intensity according to the resource potential of IFMA 712, and protecting fish before they reach sexual maturity and during spawning periods (Hidayat *et al.*, 2018). In addition, regular monitoring of fisheries production data is essential to evaluate changes in production patterns and provide scientific information for fisheries management decisions. Continuous monitoring can also support the implementation of adaptive management strategies that balance resource conservation with the long-term economic benefits of fishing communities. These efforts are expected to maintain the sustainability of mackerel tuna resources and ensure that capture fisheries continue to contribute to regional economic development and community welfare (Hidayah *et al.*, 2022).

Conclusion

The results of this study indicate that the production volume and production value of mackerel tuna (*Euthynnus affinis*) landed at Brondong Nusantara Fishing Port (NFP Brondong) during 2020–2024 exhibited a fluctuating trend. The average annual production reached 35.29 tons, indicating that mackerel tuna remains one of the important pelagic fish commodities contributing to capture fisheries production in the Indonesian Fisheries Management Area (IFMA) 712. Fluctuations in production volume were influenced by fishing seasons, weather conditions, fishing activities, and environmental conditions, while fluctuations in production value were associated with market prices, consumer

demand, fish quality, and distribution systems. These findings highlight that production performance should be evaluated from both biological and economic perspectives to provide a comprehensive understanding of fisheries conditions. Therefore, continuous production monitoring and sustainable fisheries management are essential to maintain the availability of mackerel tuna resources, support responsible resource utilization, and improve the long-term welfare of fishing communities in the study area.

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