Productivity of Purse Seine Fishing Gear at PPP Labuan, Pandeglang Regency

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ABSTRACT
This research intends to assess the productivity rate of the Purse Seine fishing method at the Coastal Fishing Port (PPP) Labuan in Pandeglang Regency and to develop sustainable management approaches. A quantitative descriptive approach was used to evaluate productivity through indicators like Catch Per Unit Effort (CPUE) and Maximum Sustainable Yield (MSY). Data were obtained through observations in the field, interviews with fishermen, and recording of catches in February 2024 by the marine and fisheries office in Labuan. The results showed a decrease in CPUE from 219.11 kg/trip. The CPUE results show that Purse Seine productivity in Labuan can be said to be good, but if it continues to be left unchecked it will result in a significant decrease in certain species such as tuna and squid obtained from data released from the Labuan marine and fisheries office. Therefore, there must be steps to prevent fluctuations in the Labuan fishing sector by applying an ecosystem-based approach (EAFM) to maintain the sustainability of the marine ecosystem in the Sunda Strait.

Keywords: CPUE, MSY, PPP Labuan, Productivity, Purse Seine

INTRODUCTION

Indonesia, as the largest archipelagic country in the world, has vast waters and enormous potential for fish resources. One of the fishing methods commonly used in pelagic fishing is Purse Seine, which is used to catch fish that are in groups on the surface of the water. At the Labuan Coastal Fishing Port (PPP) in Pandeglang District, Banten Province, this fishing gear is one of the mainstays of fishing activities. However, the increase in fishing intensity over the past few years has raised concerns about the sustainability of fish resources. The Catch Per Unit Effort (CPUE) indicator shows a decline, indicating reduced fishing efficiency and the potential for overfishing. This decline is believed to be caused by high fishing pressure, environmental changes, and the lack of ecosystem-based management.

This study aims to evaluate the productivity level of Purse Seine fishing gear at PPP Labuan in 2024, as well as to formulate management strategies based on a sustainability approach. The main focus is on CPUE analysis, catch composition, and its impact on stock availability and the economy of fishing communities. The Labuan Coastal Fishing Port (PPP) is located in the Labuan District, Pandeglang Regency, Banten Province. PPP Labuan, as one of the important fishing ports in the western part of Java Island, serves as a hub for small-scale and medium-scale fishing activities, catering to the fishing communities along the Sunda Strait coastline. PPP Labuan is designed to support various fishing activities, including the loading and unloading of catch, the provision of ice and fuel, and fish marketing facilities. The fishing gear used by fishermen at PPP Labuan is quite diverse, but this study focuses on the Purse Seine gear, which is one of the primary tools for catching small pelagic fish in this region (Ministry of Marine Affairs and Fisheries 2022; Nugraha *et al*. 2020).

However, increased fishing activity without adequate management has put pressure on fish resources. Studies show that some Indonesian waters have experienced a decline in fisheries productivity, as indicated by a decrease in Catch Per Unit Effort (CPUE) as an indicator of fishing gear efficiency (Wijayanto *et al*. 2020). In the context of small pelagic fisheries in the Java Sea, for example, fluctuations in Purse Seine catches have also been observed and require attention in management (Efendi *et al*. 2023).

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This decline in productivity can be influenced by several factors, such as environmental degradation, changes in seasons and sea temperatures, and dependence on a particular type of fish. Therefore, productivity studies and Maximum Sustainable Yield (MSY) analyses are essential to support sustainable and ecosystem-based resource management (Hidayat and Zainuddin, 2021).

MATERIAL AND METHOD

Time and Location of Research

This research was conducted at the Labuan Fishing Port, Pandeglang Regency, Banten Province. Data collection on purse seine catches will be carried out for one month in February 2024 and processed using CPUE and MSY.

Data Collection

This study uses a quantitative descriptive approach to analyse the productivity of purse seine fishing gear at the Labuan Coastal Fishing Port (PPP) in Pandeglang Regency. The main objective is to measure the Catch Per Unit Effort (CPUE) and Maximum Sustainable Yield (MSY) as key indicators of productivity and sustainability in small pelagic fishing activities.

Data collection was conducted during April 2025. The data used in this study was primary data obtained from direct observation in the field, interviews with fishermen, and records of Purse Seine vessel operational trips. Secondary data was obtained from port production records and reports from the fisheries department at PPP Labuan. The data collection techniques used included observing the operational processes of fishing gear and catch volumes, conducting structured interviews with fishermen and crew members to determine trips, operating hours, number of fishing gear, and dominant fish species, as well as documenting catch results and compiling annual production data.

Data Analysis

Data analysis will be conducted using the CPUE (Catch Per Unit Effort) method. CPUE analysis is used to measure the success rate of fishing by calculating the number of fish caught per unit of fishing effort. This is a commonly used indicator in fisheries science to assess the health of fish stocks and the efficiency of fishing efforts. Generally, changes in CPUE each year are caused by fluctuations in catch yields and the magnitude of production costs compared to the profits obtained (Sangaji et al. 2016).

$$CPUE = \frac{Catch\ (kg)}{Efforts\ (Trip)}$$

CPUE values were analysed to identify trends in fishing efficiency between years. Data analysis was also calculated using the MSY (Maximum Sustainable Yield) method, calculated using Schaefer's simplified method by Gulland.

$$MSY = 1x\frac{CPUE\ max\ x\ Effort\ max}{2}$$

RESULT AND DISCUSSION

Result

Data obtained from the Labuan Marine and Fisheries Service at TPI II Labuan, where Purse Seine catches are landed, shows that the most abundant catch is skipjack tuna (*Euthynnus affinis*). In addition, there are many other types of fish caught by Purse Seine fishermen.

Table 1. Total of catch

No	Fish Name	Total Catch (Kg)
1	Skipjack Tuna	7.560,3
2	Mackarel	142,6
3	Giant Trevally	194,16
4	Squid	3.574,3
5	Pomfret	1.184,1
6	Short Mackarel	152,4
7	Sardine	339
	Total	**13.146,86 Kg**

source: data analysis

CPUE (Catch Per Unit Effort)

CPUE calculations aim to determine the level of utilisation of a fishery resource by dividing the total catch by the fishing effort (Budiasih and Dewi, 2015; Muhammad et al. 2019). Changes in catch per unit effort (CPUE) are also used for monitoring and controlling the harvesting of fishery resources. The productivity of purse seine fishing gear at the Labuan Coastal Fishing Port (PPP) in February 2024 was measured using the Catch Per Unit Effort (CPUE) indicator.

$$CPUE = \frac{Catch\ (kg)}{Efforts\ (Trip)}$$

$$CPUE = \frac{13.146,86\ (kg)}{60\ (Trip)}$$

$$CPUE = 219,11\ kg/trip$$

Based on field data, the total catch obtained was 13,146.86 kg with a total of 60 trips in February 2024. The CPUE value was 219.11 kg/trip, indicating good productivity but potentially exceeding the limits for the sustainability of a species ecosystem if small pelagic fishing activities are allowed to continue unchecked. This CPUE value can serve as an initial indicator to assess the condition of fish stock resources in the waters of the Sunda Strait. A high CPUE value initially indicates abundant stock, but if uncontrolled, it can lead to a sharp decline due to overfishing.

MSY (Maximum Suistanaible Yield)

After calculating CPUE, data will then be calculated using MSY (Maximum Sustainable Yield), which will produce the total limit for fishing activities without reducing a species, using a formula popularised and simplified by Gulland (1983).

$$MSY = 1x \frac{\text{CPUE max } x \text{ Effort max}}{2}$$

$$MSY = 1x \frac{219,11 \ x \ 60}{2}$$
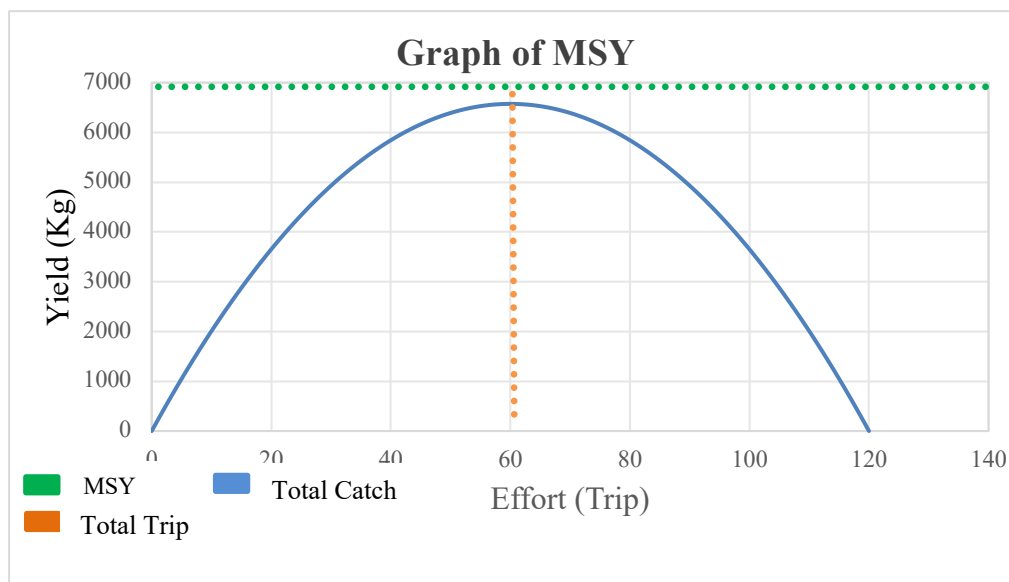
$$MSY = 6.573,3 \text{ kg/month}$$

Figure 1. Graph of MSY Purse Seine Values in Labuan

The total amount of fish that can be caught by 15 vessels in PPP Labuan is 6,573.3 kg to prevent overfishing, which would result in a drastic decline in fish stocks for fishing activities. The most dominant fish species in the catch in February 2024 was skipjack tuna (*Euthynnus affinis*), which accounted for more than 45% of the total catch volume. Other species recorded included short mackerel (*Rastrelliger sp*), sardines (*Sardinella sp*), and squid (*Loligo sp*). The dominance of a single species in the catch indicates a tendency among fishermen to target certain species that have higher market value and seasonal availability. The high dominance of one species increases the risk of overexploitation of certain stocks and, in the long term, can affect the structure of the fish community. Similarly, Boesono *et al*. (2016) reported that the composition of purse seine catches on the north coast of Java tends to be dominated by tongkol and kembung during the east monsoon season.

Discussion

Purse seine operations at PPP Labuan are conducted at night using two vessels, one of which carries lights to attract schools of fish. This activity is most frequently carried out during the east monsoon season (July-September), when sea conditions are relatively calm and sea surface temperatures are cooler, causing pelagic fish to aggregate at the surface. In addition, the season greatly affects catch yields. Based on interviews with fishermen, catch yields decrease significantly during the west monsoon season due to high waves and fish migration away from the main fishing grounds. Seasonal effects on distribution and catch yields were also observed in the study by Efendi *et al*. (2023) in the Java Sea, where the efficiency of purse seine operations decreased drastically during the west monsoon season.

Data from February 2024 indicates that fishing activities remain productive. However, the CPUE value of 219.11 kg/trip must be maintained

to prevent a decline due to uncontrolled increases in effort. Therefore, strengthening fishermen's institutions, diversifying catch species, and implementing data-based monitoring of catch results are crucial steps to maintain ecosystem balance and the sustainability of fishing operations. Reducing the total number of vessel trips per month is a key focus that will be prioritised to ensure the conservation of species and prevent significant declines in the coming years.

CONCLUSION

This study shows that the productivity of Purse Seine fishing gear at the Labuan Coastal Fishing Port (PPP) in 2024 remains at a relatively stable level, with a Catch Per Unit Effort (CPUE) value of 219.11 kg/trip. However, if left unchecked, this result will certainly lead to a significant decline and a high potential for fish stock depletion in the fishing area. The catch is dominated by the skipjack tuna species (Euthynnus affinis), reflecting a tendency towards dependence on a single primary commodity. The lack of diversity in catch composition and seasonal patterns that affect fishing effectiveness indicate that fisheries management in this region needs to be improved. Strengthening fishermen's institutions, diversifying catch species, and implementing an ecosystem-based approach (Ecosystem Approach to Fisheries Management, EAFM) are important steps to maintain the sustainability of fishing operations and the conservation of marine biological resources. Reducing the number of trips per month for each vessel is the most appropriate initial step to maintain the sustainability and fish stocks in the Labuan region. Thus, CPUE and MSY values can be used as preliminary indicators to support future catch quota determination and effort control policies in order to maintain a balance between economic productivity and ecological sustainability.

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