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PRODUCTIVITY AND CATCH COMPOSITION OF THE *PAYANG* FISHING FLEET IN THE PALABUHANRATU ARCHIPELAGO FISHING PORT, SUKABUMI, INDONESIA

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ABSTRACT

Payang is known as a traditional fishing gear from the trawl group which is operated in the water column and targets pelagic fish as its catch target. Payang fisheries can be found widely in Indonesia, one of which is at the Palabuhanratu Archipelago Fishing Port, Sukabumi. In this research we tried to assess the productivity and catch composition of the payang fleet that landed fish at the Palabuhanratu Archipelago Fishing Port. Catch productivity is approximated by the average number of catches landed in each fishing trip. Data on catches and the number of fishing trips were collected for the last ten years from 2013 to 2022. We found that the productivity value of the payang fleet has consistently increased over the previous ten years. The average increase in productivity is known to be 15.7% per year. The payang fleet is known to obtain more than 24 caught species that have economic value. The composition of the catches of the payang fleet shows bullet tuna (*Auxis rochei*), moonfish (*Mene maculata*), and common ponyfish (*Leiognathus equula*) as fisheries commodities that always dominate and are obtained every year.

Keywords**:** *Catch composition, fisheries management, Payang fishing fleet, productivity.*

Introduction

Palabuhanratu Archipelago Fishing Port is a capture fisheries center in Sukabumi Regency, West Java. Palabuhanratu Archipelago Fishing Port is strategically located and faces the Indian Ocean in the Indonesian Fisheries Management Area 573 [1]. The Palabuhanratu Archipelago Fishing Port contributes 61% of the total fish production in the southern coastal region of West Java Province [2]. The Indonesian Ministry of Maritime Affairs and Fisheries also recorded capture fisheries production figures at the Palabuhanratu Archipelago Fishing Port in 2023, reaching 4,179 tons with an economic valuation of IDR 75.73 billion. This production value increased by 4.48% from the previous year [3]. The increase in capture fisheries production at the Palabuhanratu Archipelago Fishing Port almost always occurs yearly. This is considered inseparable from the rise in the productivity of the catches of various fishing fleets. One type of capture fishery business often found at the Palabuhanratu Archipelago Fishing Port is the payang fleet [4].

Payang is a traditional Indonesian fishing gear from the Bag Seine group. Coastal communities throughout Indonesia widely use this fishing gear. Payang fishing equipment consists of a float made of bamboo, a net, and a sinker. Nets from payang fishing gear are generally made from multifilament Polyamide (PA) [5]. Payang fishing gear is usually operated in the water column to catch pelagic fish [6]. Payang fishermen found at the Palabuhanratu Archipelago Fishing Port carry out fishing operations on a one-day trip where the departure to the fishing ground starts in the morning and returns to the fishing base in the afternoon until evening with a fishing duration of around 10-13 hours [7].

Payang is a small-scale capture fisheries business unit that only relies on boats powered by outboard motors [2]. As a small-scale fishing fleet, payang is known as a capture fisheries business unit with relatively low costs and a fast business turnaround. This has made the payang fleet one of the capture fisheries businesses quite popular among fishermen groups in Indonesia [8]. This condition was also found at the Palabuhanratu Archipelago Fishing Port. The Central Archipelago Fisheries Port Statistics Agency of Palabuhanratu recorded that 482 people, or around 44% of the fishermen living around the port, were Payang fishermen [2].

In this study, we tried to examine the fluctuations in the productivity of the payang catch along with the catch composition over the last ten years from 2013 to 2022. The results of this research can describe the productivity pattern of the payang catch in the previous ten years along with the catch composition structure. The results of this research can be a source of scientific literacy in the direction of regulatory management of the payang fishery in Indonesia in general and at the Palabuhanratu Archipelago Fishing Port in particular.

Research Methods

This research was executed at the Palabuhanratu Archipelago Fishing Port, Sukabumi, Indonesia. The research object focuses on the payang fleet with outboard motorboat specifications, which is the group most often found landing fish at the Palabuhanratu Archipelago Fishing Port. Landed catch and fishing trip data from the Payang fleet were collected over the last ten years, from 2013 to 2022. Research data was obtained from the Central Fisheries Statistics Agency, Palabuhanratu Archipelago Fishing Port. The data was analyzed to obtain catch productivity values, which were approached through landing per unit effort (LPUE) calculations. LPUE is calculated for each year with a modified formulation from Metri and Perez as follows [9]:

$$LPUE\ (Kg/landing) = \frac{Landed\ fish\ biomass}{Number\ of\ fishing\ trip}$$

Apart from the LPUE value, the catch composition is also calculated based on data on the number of catches each year. The composition of the catch is calculated to obtain an idea of the proportion of each type of commodity caught from the payang fleet. The composition of the catch is obtained based on the formula referring to Odum as follows [10]:

$$Catch\ composition\ (\%) = \frac{Number\ of\ catch\ of\ certain\ comodities}{Total\ number\ of\ catches}$$

Result and Discussion

Description of the Payang Fishing Fleet

The payang fishing fleet that lands fish at the Palabuhanratu Archipelago Fishing Port generally has ship dimensions of 5 gross tonnage (GT) [11]. Payang ships are made from wood from Chengal or Shorea trees [12]. Payang ships have propulsion in the form of an outboard motor engine fueled by diesel fuel. The engines on payang boats generally have a power of 25 to 40 PK/HP [11].

A characteristic feature of constructing a payang ship is a viewing pole on the deck, usually called kakapa by local fishermen. Kakapa is composed of bamboo wood, which fishing masters use to observe water splashes from schools of fish visible on the water's surface [13]. Apart from that, the payang boat construction does not have a hold (a place to store the catch) like most other fishing vessels. As a substitute for holds, the fish caught are generally put directly into the drums on the ship. Storing caught fish directly in drums makes it easier for fishermen when unloading at the fishing port [14]. Apart from that, the payang fleet generally does not have a deck house. This condition is intended to maximize the ship's deck area for fishing operations [11].

The main construction of the payang fishing gear consists of a seine net, two ris ropes and a warp rope, a weight at the bottom, and a float at the top of the net (Figure 1). Trawl nets are made from multifilament Polyamide (PA). The length of the nets payang fishermen use at the Palabuhanratu Archipelago Fishing Port generally ranges between 180-250 meters. The net of this fishing gear consists of three parts: the wing section measuring 160 meters, the net body measuring 44 meters, and the pocket section measuring 20 meters. The mesh size of nets varies in each part, which 25-30 cm on the wings, 10-15 cm on the body, and 1-5 cm on the cod end.

The ris rope on the payang fishing gear consists of an upper ris rope and a lower ris rope with diameters of around 3-4 mm and 5-6 mm, respectively. The length of the top rope is around 190 meters and the bottom rope is around 170 meters. The upper ris rope is longer than the lower ris rope, intended to open the construction of the upper net lip to protrude more inward and the lower part to protrude more forward during fishing operations. This is intended to prevent fish from escaping to the bottom of the water. The risline stretches the net and is a place for attaching floats and weights. Apart from that, a warp rope ties the ends of the left and right wings of the net and is connected to the fishing vessel. The warp rope is a medium for pulling fishing gear during hauling. This rope also encircles the largest possible water area in schools of pelagic fish. Warp rope is approximately 295 meters long.

The buoys used by payang fishermen vary based on the basic materials they are made from. Some basic materials for making floats from payang fishing gear are pieces of bamboo, styrofoam, and plastic jerry cans. The primary buoy material most widely used by the payang fleet at the Palabuhanratu Archipelago Fishing Port is 28 bamboo pieces arranged along the top rope. Meanwhile, 20 sinkers made of tin are arranged along the bottom rope and function to open the mouth of the net to the bottom during the fishing process.

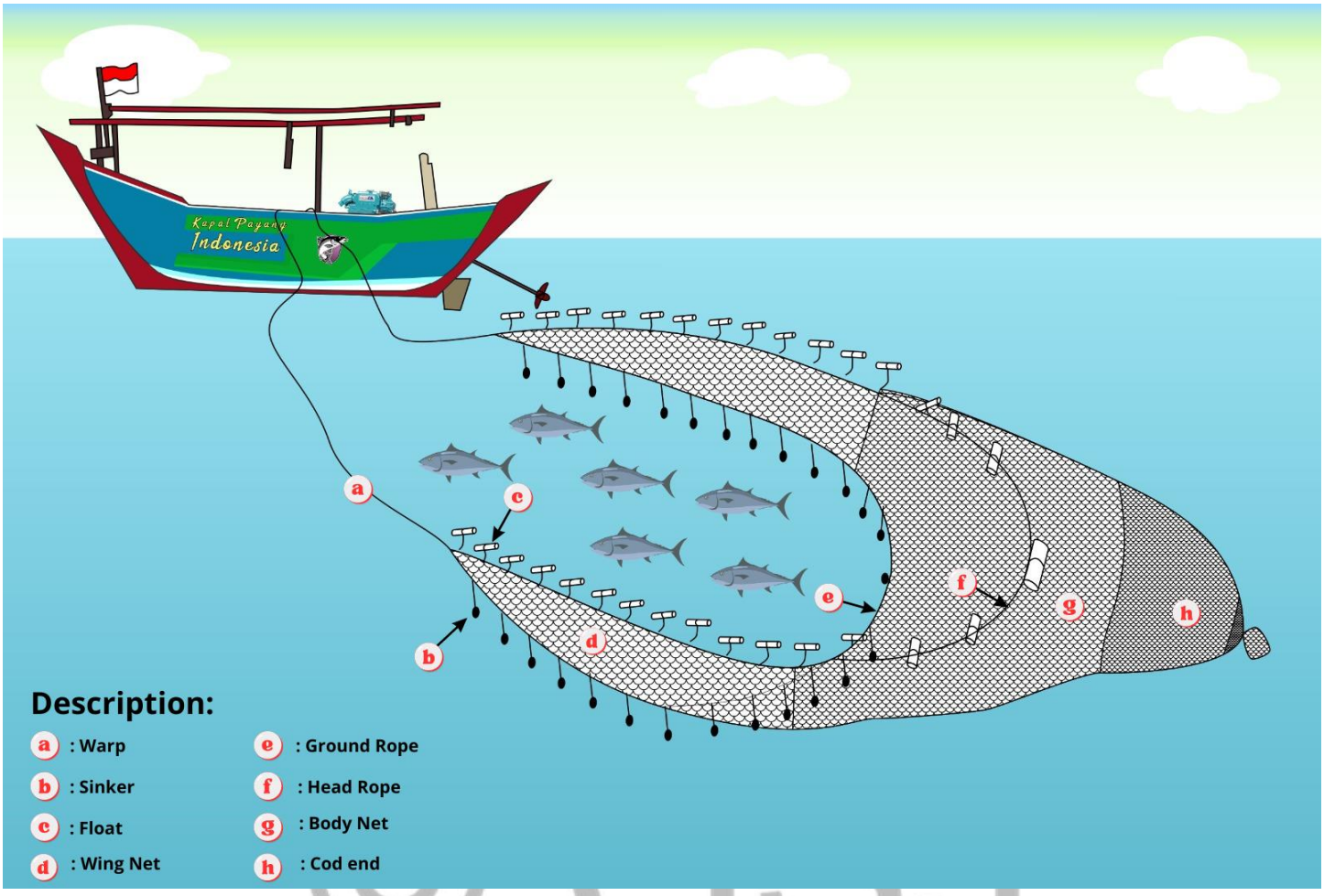

Figure 1. The main construction of the payang fishing gear

The payang fleet is operated on a one-day fishing basis, with less than 24 hours of active fishing time. Preparation and departure for fishing begin at dawn at 5-6 am at the fishing ground. The final time for catching and returning to the fishing base (port) is generally 4-6 pm. Searching for fishing areas is indicated by splashes on the water's surface or the number of birds flying above the water's surface. These two signs are signals of the presence of schools by the pelagic fish on the surface of the waters. The fishing gear is set by circling the net targeting pelagic fish. When the fish have gathered in the body of the net, the net will immediately be pulled onto the boat [13].

As a small-scale fishing fleet, payang has a fishing range that is not too far. The operational area for catching payang is still around the coast of Palabuhanratu Bay, which is around 3-5 miles from the Palabuhanratu Archipelago Fishing Port. Imron et al. details the fishing areas of the payang fleet spread around Palabuhanratu Bay, especially in the eastern part of the bay, as in the Batu Belah, Ciletuh, Lawang Jampang and Cikepuh areas [4].

Catch Productivity of The Payang Fishing Fleet

Catch productivity is a measuring value for evaluating the catch production capacity of a fishing fleet in a particular fishing effort unit [15]. In this case, catch productivity is often used as a business evaluation parameter for a fishing fleet [16]. In the scientific realm of fisheries resources, the productivity value of the catch is also often used as a parameter that can estimate the Maximum Sustainable Yield (MSY) value. MSY is an estimator value for the amount of catch allowed by considering a fish population's sustainability and recovery capacity [17].

The payang fleet's catch productivity has increased over the last ten years, from 2013 to 2022, with an average increase of 15.7% per year. In more detail, the payang fleet's catch productivity had the highest growth rate from 2017 to 2020, with an average gain of 28.5% per year. Furthermore, the average rate of increase in the productivity of the payang fleet's catch has decreased to 2.7% per year in the last two years (Figure 2).

Changes in the average increase in productivity per year can generally be caused by the availability of fisheries resources in nature [18]. FAO explains that increasing the number of catches closer to sustainable catch values will reduce the rate of increase in catches per year. Under certain conditions where the total catch has exceeded the sustainable catch value, a decline in the productivity of the catch may occur shortly [19].

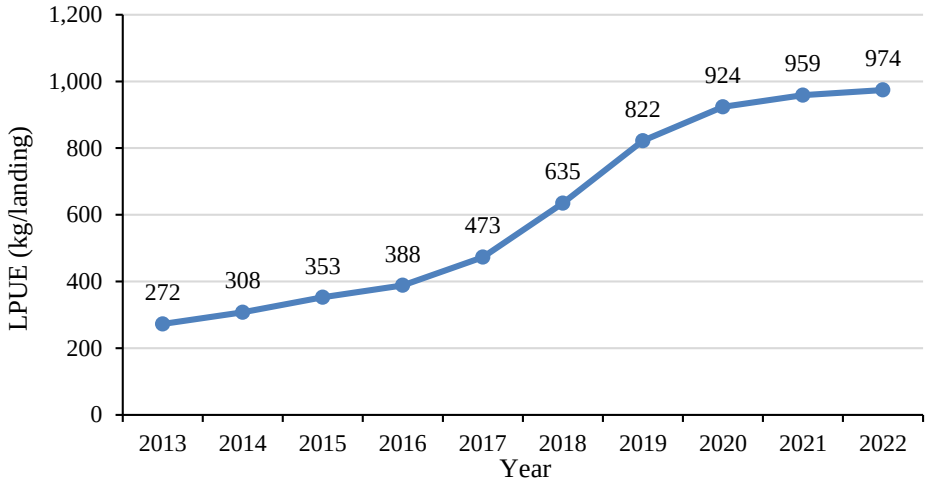

Figure 2. Total catch productivity of the payang fleet that landed fish at the Palabuhanratu Archipelago Fishing Port in 2013-2022.

It should be noted that the relationship between catch productivity and the availability of fisheries resources can be achieved by assuming that every catch by a fishing fleet is landed and reported in the fishing port register [20]. The existence of transshipment activities or the movement and sale of catches in marine waters without reporting is another factor that needs to be considered [15]. Problems related to transshipment and unreported fishing activities have always been an obstacle to evaluating resource availability estimates and the direction of fisheries regulations [20].

The total productivity of the catch of the payang fleet is known to be most influenced by the catch of the bullet tuna (*Auxis rochei*) and moonfish (*Mene maculata*) species, followed by the common ponyfish (*Leiognathus equula*) and skipjack tuna (*Katsuwonus pelamis*) species which have the highest catch productivity graph compared to with other caught species (Figure 3). In scientific studies regarding the sustainability of capture fisheries, it is essential to consider the productivity value of the catch of each existing species. This is because the resource stock availability condition may differ for each species caught [21]. FAO reiterates that in tropical waters with a high level of fish resource biodiversity, there is a phenomenon known as multigear and multispecies in capture fisheries operations. Multigear explains that one species of fish can be caught by more than one type of fishing gear. Multispecies describes the phenomenon where one fishing gear can catch more than one fish species [15].

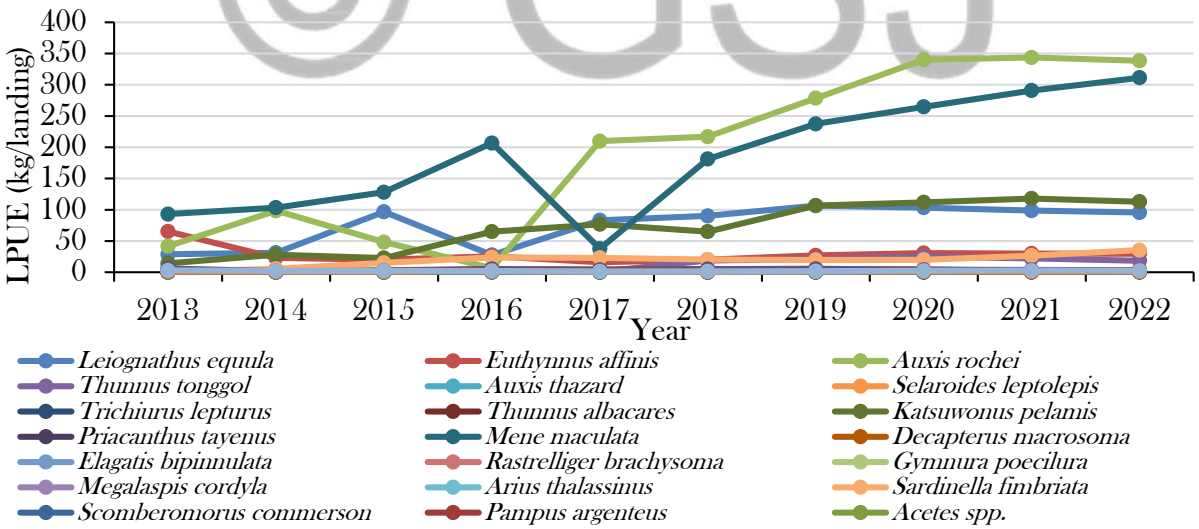

Figure 3. Catch Productivity of the payang fishing fleet that landed fish at the Palabuhanratu Archipelago Fishing Port in 2013-2022**.**

Catch Composition of The Payang Fishing Fleet

More than 24 species were identified as catches from the payang fishing fleet that landed fish at the Palabuhanratu Archipelago Fishing Port from 2013 to 2022. The composition of the catch highlights the common species ponyfish (*Leiognathus equula*), bullet tuna (*Auxis rochei*), and moonfish (*Mene maculata*) is known always to have the highest proportion of the total catch (Figure 4).

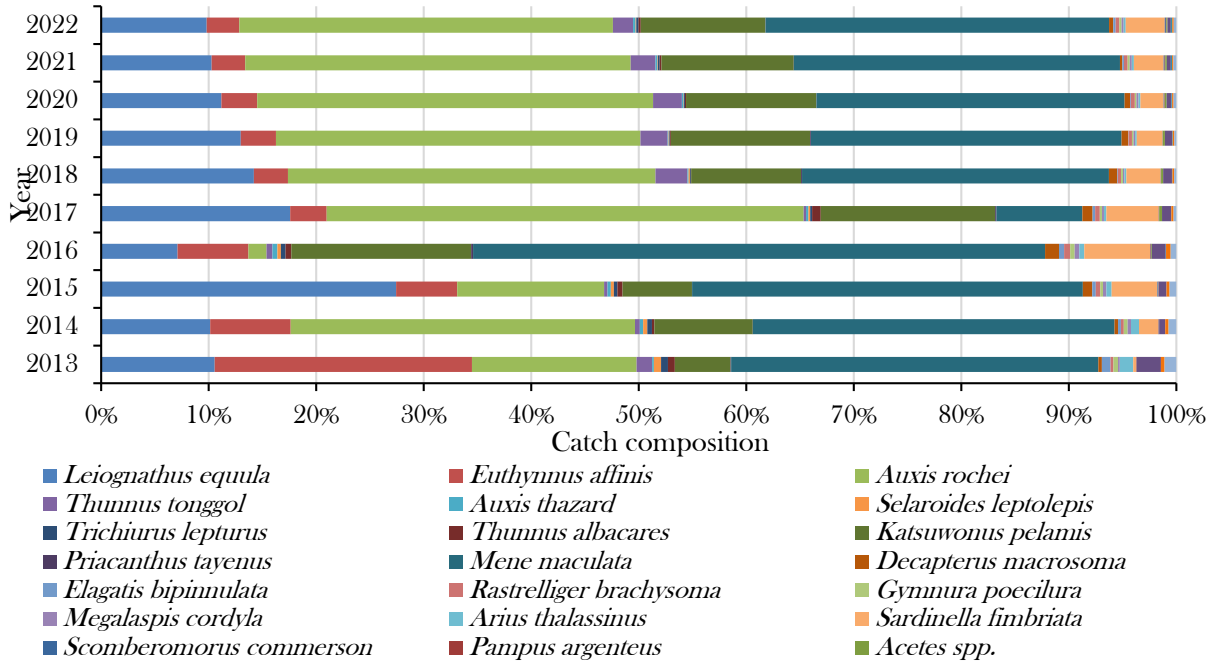

Figure 4. Catch composition of the payang fishing fleet that landed fish at the Palabuhanratu Archipelago Fishing Port in 2013-2022.

The pelagic fish group includes most of the species caught by the payang fishing fleet that lands fish at the Palabuhanratu Archipelago Fishing Port. Pure et al. stated that the target catch of the payang fishing fleet is a group of large and small pelagic fish with economic value [22]. In another study, Sambah et al. reported that the catch composition of the payang fleet in Pasuruan Regency, East Java, Indonesia mainly consisted of fish from the small pelagic group such as anchovies, short mackerels, and sardinella [23]. Apart from small pelagic fish, squid from the mollusk group also has a reasonably dominant proportion as a catch of the payang fleet in Pasuruan Regency. Almost similar results were expressed by Rahmawati et al. who found that small pelagic fish such as anchovies, Indian mackerel, and sardinella were the most dominant catches from the payang fleet that carried out fishing operations in the waters of Pemalang, East Java [24].

As one of the fishing gears grouped into the trawler type, the payang is known to have a small catch selectivity value, especially for its operation in tropical waters [25]. Silaban et al. also stated that the payang fleet has the lowest selectivity value compared to lift net boats, and fishing rods are also included in the small-scale capture fisheries business unit at the Palabuhanratu Archipelago Fishing Port. However, these three types of fishing gear are still standardized and have low selectivity values compared to fishing fleets [26]. The high species richness of capture fisheries in tropical regions such as Indonesia always results in low catch selectivity values for several types of conventional fishing gear [27].

Conclusion

The catch productivity of the payang fishing fleet that lands fish at the Palabuhanratu Archipelago Fishing Port has consistently increased over the last ten years from 2013 to 2022. The average growth in catch productivity is 15.7% per year. There are more than 24 species identified as caught by the payang fleet, with the species common ponyfish (*Leiognathus equula*), bullet tuna (*Auxis rochei*), and moonfish (*Mene maculata*) always known to have the highest proportion of the total catch.

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