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Capture Fisheries Business Analysis of Boat Seine “Payang” Fishing Fleet at Palabuhanratu Nusantara Fishing Port, Indonesia

Faqih Baihaqi ^{1*} and Shafira Bilqis Annida ²

¹ Department of Fisheries, Faculty of Fisheries and Marine Sciences, Universitas Padjadjaran, Indonesia

² Marine Tourism Study Program, Vocational of Studies, Universitas Padjadjaran, Indonesia

*Corresponding Author: faqih.baihaqi@unpad.ac.id

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ABSTRACT

The boat seine fishing fleet, or payang, is a fishing business unit found in many Indonesian fishing ports, including Palabuhanratu Nusantara Fisheries Port in Sukabumi. Payang is a small-scale fishing fleet with a shipload dimension of no more than five gross tons (GT). As one of the largest fishing fleets, the payang fleet's capture fisheries business unit has a direct impact on the local economy and the sustainability of natural resources. Over the last 10 years, the dynamics of the payang fisheries business have been increasingly unstable, as indicated by a 21.4% decline in the number of active payang fleets. This decline is suspected to result from the financial failure of the payang fleet capture fisheries business to respond to the revenue dynamics of each fishing season. This study analyzed the dynamics of the payang fleet capture fisheries business in 2024, covering all fishing seasons that year, including the peak, medium, and lean seasons. The amount of gross revenue is calculated from the productivity of the catch and the selling value of each catch commodity obtained in each fishing season. The total cost of the payang fleet business is calculated based on the fixed cost component for purchasing investment goods and their maintenance, as well as operational costs for sea supplies. The analysis results show that the average monthly profit income of the payang fleet is IDR 3,677,115/month in the lean season to IDR 16,178,954/month in the peak season for the ship owner; IDR 2,298,197/month in the lean season to IDR 10,111,846/month in the peak season for the ship captain; and IDR 1,608,738/month in the lean season to IDR 7,078,292/month in the peak season for the ship crew. The analysis results show that the average monthly net income for each capture fisheries business actor varies by season. During the lean season, financial pressure can be felt as relatively high, with low income values, especially for the captain and crew. Therefore, financial managerial capabilities for each payang fleet business actor are essential to avoid losses or financial pressure during the lean fishing season.

INTRODUCTION

The capture fisheries industry is a crucial sector supporting Indonesia's fisheries economy (Kusdiantoro *et al.*, 2019). One type of capture fisheries industry that is developing in Indonesia is the use of seine boats, known locally as "payang." Seine boats

operate at various fishing ports in Indonesia (**Hapsari & Fitri, 2016; Annida et al., 2024**). The Palabuhanratu Nusantara Fisheries Port in Sukabumi offers significant potential for the capture fisheries industry, particularly for its seine boat fleet (**Imron et al., 2022; Annida et al., 2024**). Payang boats, as a type of fishing vessel that uses drag nets, are unique in their fishing process and operational cost structure (**Annida et al., 2024**).

Over the past few years, the dynamics of the payang fishing fleet at the Palabuhanratu Nusantara Fisheries Port have undergone significant changes, both in terms of revenue and operational costs. The dynamic nature of the payang fishing fleet has led several business actors to close their operations, as reflected in a 21.4% decline in the number of active payang fishing fleets at the Palabuhanratu Nusantara Fisheries Port over the past decade (**CSA, 2024**). Factors such as fishing seasons, fish market conditions, and operational costs influence the stability and sustainability of this business (**Imron et al., 2022**). In this context, a more in-depth analysis of the gross and net revenues of the payang fishing fleet is crucial, as it will provide a clearer picture of the business's future sustainability.

This study aimed to analyze the business conditions of the payang fishing vessel business unit at the Palabuhanratu Nusantara Fisheries Port, focusing on its gross and net revenues. This research is highly urgent, considering that the payang fishing vessel business at the Palabuhanratu Nusantara Fisheries Port is a sector that directly impacts the local economy and the sustainability of natural resources (**Annida et al., 2024; Zulkarnain et al., 2024**). Revenue fluctuations influenced by fishing seasons make a deeper understanding of the business's gross and net revenues crucial.

This research can fill a data gap regarding the economic dynamics of the capture fisheries business, which has not been widely studied to date. Furthermore, the results are expected to provide insights for business actors in planning more efficient business strategies and for the government in formulating policies that better support the capture fisheries sector. By analyzing factors influencing revenue, this research can also provide a stronger foundation for sustainable fisheries management, as well as for efforts to empower the local economy and increase the competitiveness of the fisheries industry at the national level.

The outcomes of this research can contribute to the sustainable development goals (SDGs). Several SDGs related to this research include SDG 1 on poverty eradication, SDG 8 on decent work and economic growth, SDG 12 on responsible consumption and production, SDG 14 on marine ecosystems and fisheries, and SDG 17 on partnerships for the Goals.

MATERIALS AND METHODS

The research object was identified as the payang fleet registered at the Palabuhanratu Nusantara Fisheries Port, Sukabumi, Indonesia. The research focused on analyzing the dynamics of the payang fleet capture fisheries business over one full year,

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2024, during the peak, medium, and lean seasons. The gross revenue value of the payang fleet capture fisheries business unit was analyzed using data on the number of catches and fishing trips in each month of 2024. Data on the number of catches and fishing trips were obtained from the logbook data of the payang fleet fishermen's group, which the vessel owners own. The data were also revalidated based on data from the Palabuhanratu Central Agency for Capture Fisheries Statistics in 2024. The gross revenue value of the payang fleet capture fisheries business unit was obtained by multiplying the number of catches (in kilograms) by the selling price (in IDR/kg) for each catch commodity (**Primyastanto & Wati, 2018; Annida & Baihaqi, 2025**).

$$\left[TR = \sum P_i \times Q_i \right] \dots\dots\dots(1)$$

Where, TR: total revenue (IDR); P_i: selling price of a particular species (IDR/Kg); Q_i: catch production of certain species (Kg).

Furthermore, the total costs incurred in running a payang fleet fishing business are classified into fixed costs and variable costs. Fixed costs refer to the costs associated with initial investment capital or the purchase of basic goods required to run a business. Furthermore, fixed costs also include the cost of maintenance or repairs to maintain the performance of these investment assets. Variable costs refer to the cost components routinely incurred during each business cycle. In this case, variable costs refer to the costs incurred on each payang fleet fishing trip (**Baihaqi & Annida, 2024**). Overall, a breakdown of the fixed and variable cost components calculated for the payang fleet fishing business unit is presented in Table (1).

Table 1. Fixed and variable costs components of the payang fishing fleet

No.	Fixed Cost Details*	Variable Cost Details
1	Fishing vessel	Dissel fuel
2	Fishing vessel engine	Machine oil
3	Fishing equipment	Ice block
4	Safety equipment	Food supply
5	Fish storage facilities	Mooring Permit Fee

* Each fixed-cost item consists of depreciation costs and asset maintenance costs

Each investment item is subject to depreciation based on its purchase price and valuable life. The depreciation charge is the amount to be set aside each month to cover the cost of purchasing the investment item (**Güngör, 2017**).

$$\left[DC = \frac{Y_i}{T_i} \right] \dots\dots\dots(2)$$

Where DC : depreciation costs (IDR/month); Y_i : investment capital of an asset (IDR) and T_i : the technical age of an asset (month).

Furthermore, the total cost incurred in the payang fleet fishing business is calculated each month by adding fixed costs (depreciation and maintenance or repair) and variable costs (**Annida & Baihaqi, 2025**).

$$[TC = TFC + TVC] \dots\dots\dots(3)$$

$$[TC = (DC + MC) + TVC] \dots\dots\dots(4)$$

Where, TC: total cost (IDR/month); TFC: total fixed cost (IDR/month); TVC: total variable cost (IDR/month); and MC: maintenance cost (IDR/month).

After obtaining the gross revenue and total costs, the net income of the payang fleet fishing business unit can be determined. The net income (NP) is the difference between gross revenue and total costs (**Tanamal, 2019; Tuli et al., 2024**).

$$[NP = TR - TC] \dots\dots\dots(5)$$

The net revenue is then distributed among the various fishing business actors: the vessel owner, the captain, and two crew members. Under the profit-sharing agreement for each fishing fleet operator at the Palabuhanratu Nusantara Fisheries Port, the vessel owner receives 40% of the net revenue, the captain receives 25%, and the remaining 35% is shared between the two crew members (**Annida et al., 2024**).

RESULTS AND DISCUSSION

Description of the payang fleet at the Palabuhanratu Nusantara Fisheries Port

The fleet of payang boats operating at the Palabuhanratu Islands Fishing Port generally has a capacity of 5 gross tons (GT) (**Soeboer et al., 2018**). These boats are constructed using wood from the Chengal or Shorea tree (**Dalton, 1926**). As power sources, the payang boats are equipped with outboard motors that run on diesel. The engines on these boats typically have a power output of 25-40 horsepower (HP) (**Soeboer et al., 2018**).

One of the distinctive features of a payang boat is the presence of an observation pole, known as a *kakapa* among local fishermen. This pole, made of bamboo, is used by the captain to observe the splashing water caused by schools of fish visible on the sea surface (**Purwangka et al., 2013**). Unlike most other fishing vessels, payang boats are not equipped with a storage space (hold) for the catch. Instead, the fish caught are stored directly in drums on board, making it easier for fishermen to unload at the port (**Novita et**

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al., 2014). Furthermore, payang boats generally lack a deckhouse, which aims to maximize the deck area for fishing activities (Soeboer *et al.*, 2018).

The main structure of the payang fishing gear consists of a seine net, two risers, a warp line, a weight at the bottom, and a float at the top of the net (Fig. 1). Payang nets are made of polyamide (PA) with double filaments. Payang fishermen at the Palabuhanratu Nusantara Fisheries Port generally use nets ranging in length from 180 to 250 meters. This net consists of three main parts: a 160-meter-long net wing, a 44-meter-long net body, and a 20-meter-long net bag. The mesh sizes vary across sections: 25-30 cm for the wing, 10-15 cm for the body, and 1-5 cm for the cod end (Annida *et al.*, 2024).

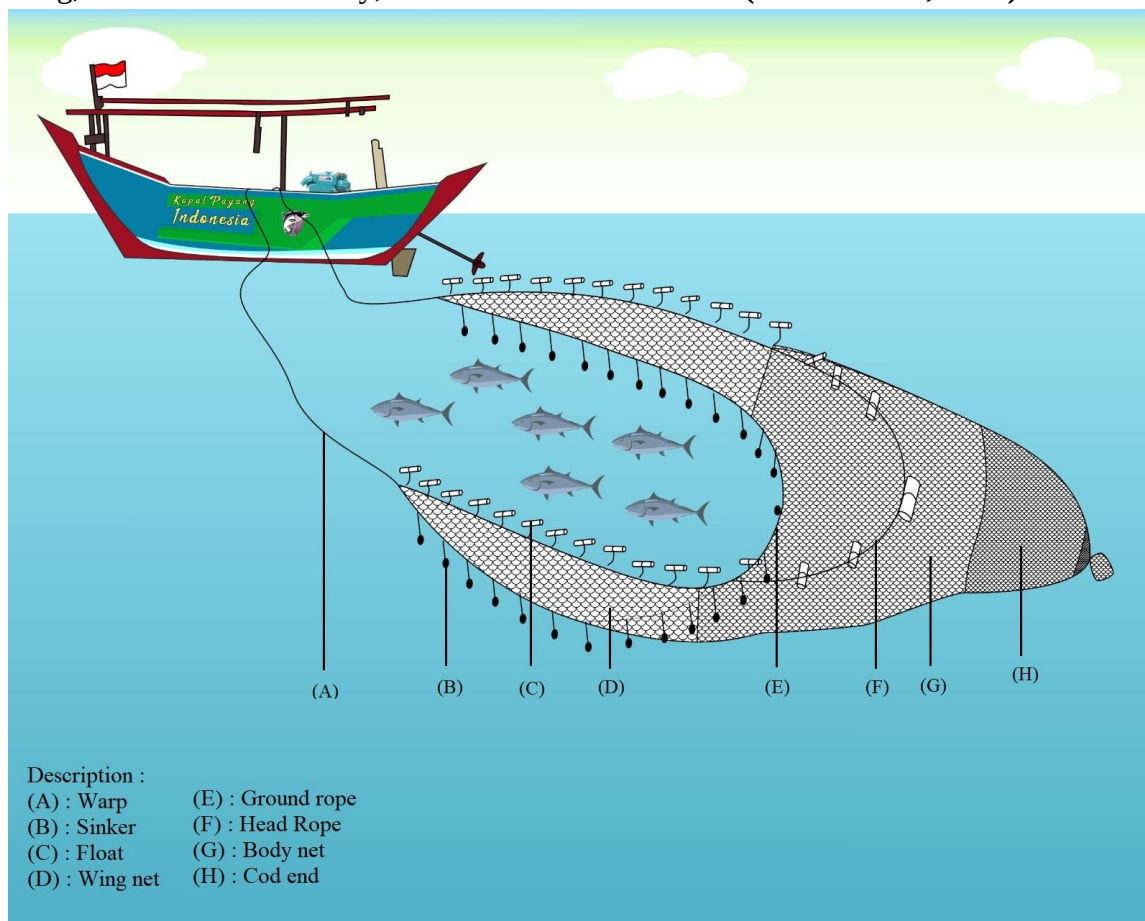


Fig. 1. Construction of vessels and fishing gear of the payang fleet

In the payang fishing gear, the riser line consists of two parts: the upper and lower riser lines, with diameters of approximately 3-4 mm and 5-6 mm, respectively. The upper ris line is approximately 190 meters long, while the lower ris line is approximately 170 meters. The upper ris line is longer to allow the upper lip of the net to protrude further inward, while the lower part protrudes forward during the fishing process. This aims to prevent fish from escaping to the bottom. The riser line also stretches the net and provides a place to attach floats and weights. In addition, a warp line ties the left and right

wing tips of the net and connects it to the fishing vessel. The warp line is used to pull the fishing gear during towing and also covers the most significant water area likely to be occupied by pelagic fish groups. The warp line is approximately 295 meters long. The payang fishing gear uses approximately 95% polyamide nets in its manufacture. **(Prasetyo & Iskandar, 2010; Annida *et al.*, 2024).**

Payang fishermen use buoys made from various materials, such as bamboo strips, Styrofoam, and plastic drums. However, the most common buoy used by the payang fleet at the Palabuhanratu Nusantara Fishing Port is 28 pieces of bamboo arranged along the top rope. Meanwhile, 20 lead weights are attached along the bottom rope to help open the net mouth downward during fishing **(Annida *et al.*, 2024).**

The payang fleet operates on a one-day fishing system, with active fishing time limited to no more than 24 hours. Preparations and departures begin in the morning, around 5:00-6:00 a.m., to head to the fishing location. Fishing and return to port typically occur between 4 and 6 p.m. Fishing areas are identified by observing water splashes or the number of birds flying over the water's surface. Both signs indicate the presence of pelagic fish on the sea surface. Fishing gear is deployed around the net to target pelagic fish. Once the fish gather in the net, the net is immediately pulled aboard **(Purwangka *et al.*, 2013; Annida *et al.*, 2024).**

As a small fishing fleet, payang has a limited fishing range. Their operational fishing areas are generally located around the coast of Palabuhanratu Bay, approximately 3-5 miles from the Palabuhanratu Nusantara Fisheries Port. **Imron *et al.* (2022)** explained that the payang fleet's fishing areas are spread throughout Palabuhanratu Bay, particularly in the eastern part of the bay, including the Batu Belah, Ciletuh, Lawang Jampang, and Cikepuh areas.

Catch commodities and gross income of payang fleet

A total of 21 species were caught during one year of fishing activity by the payang fleet in 2024. Most of the catch was pelagic fish, which are the primary target of the payang fleet **(Hapsari & Fitri, 2016; Susanto *et al.*, 2023).** All of these commodities have economic value for sale, some of which are quite high, such as tuna, skipjack tuna, and pomfret **(Annida *et al.*, 2024).**

Table 2. Monthly income based on sales of the payang fleet catches in each fishing season

No.	Catch Commodities	Average of Catch Production (kg/month)*			Selling Value (IDR/kg)	Average Selling Value of Catch per Month (IDR/month)		
		Lean Season (Nov. to Feb.)	Moderate Season (Mar. to Jun.)	Peak Season (Jul. to Oct.)		Lean Season (Nov. to Feb.)	Moderate Season (Mar. to Jun.)	Peak Season (Jul. to Oct.)
1	<i>Acetes</i> sp.	8.81	1.08	0.13	10,000	88,125	10,750	1,313
2	<i>Arius thalassinus</i>	-	0.84	0.36	15,000	-	12,563	5,344
3	<i>Auxis rochei</i>	83.63	52.04	956.34	18,000	1,505,250	936,675	17,214,075
4	<i>Auxis thazard</i>	18.94	12.43	372.60	18,000	340,875	223,650	6,706,800
5	<i>Decapterus macrosoma</i>	1.31	2.55	3.16	25,000	32,813	63,750	78,906
6	<i>Elagatis bipinnulata</i>	362.19	4.46	138.81	17,000	6,157,188	75,863	2,359,813
7	<i>Euthynnus affinis</i>	18.50	20.04	82.85	18,000	333,000	360,675	1,491,300
8	<i>Gymnura poecilura</i>	-	2.58	0.31	18,000	-	46,350	5,625
9	<i>Katsuwonus pelamis</i>	257.81	1,160.51	814.09	30,000	7,734,375	34,815,375	24,422,625
10	<i>Leiognathus equula</i>	36.56	20.66	272.34	10,000	365,625	206,625	2,723,375
11	<i>Megalaspis cordyla</i>	27.13	0.51	1.53	15,000	406,875	7,688	22,875
12	<i>Mene maculata</i>	185.25	68.16	849.80	10,000	1,852,500	681,625	8,498,000
13	<i>Pampus argenteus</i>	36.19	-	3.55	32,000	1,158,000	-	113,600
14	<i>Priacanthus tayenus</i>	-	6.63	4.34	25,000	-	165,625	108,438
15	<i>Rastrelliger brachysoma</i>	1.88	3.49	5.89	28,000	52,500	97,650	165,025
16	<i>Sardinella fimbriata</i>	14.00	5.36	-	12,000	168,000	64,350	-
17	<i>Scomberomorus commerson</i>	13.13	3.48	3.28	30,000	393,750	104,250	98,438
18	<i>Selaroides leptolepis</i>	-	5.28	1.58	12,000	-	63,300	18,975
19	<i>Thunnus albacares</i>	8.13	16.93	1.36	35,000	284,375	592,375	47,469
20	<i>Thunnus tonggol</i>	11.92	41.98	22.24	20,000	238,333	839,500	444,875
21	<i>Trichiurus lepturus</i>	-	21.16	15.64	30,000	-	634,875	469,313
Total of Production (kg/month)		1,085.35	1,450.14	3,550.19	Gross Income (IDR/month)	21,111,583	40,003,513	64,996,181

Based on the catch productivity value (kg/month), the payang fleet fishing season is divided into three seasons: a lean season from November to February, a moderate season from March to June, and a peak fishing season from July to October (**Annida et al., 2024**). The results of the calculation of the average gross income from the payang fleet fishing business unit based on catch productivity and the selling value of each catch commodity are IDR 21,111,583/month in the lean season, IDR 40,003,513/month in the moderate season, and IDR 64,996,181/month in the peak fishing season (Table 2).

In general, the dynamics of the fishing season directly impact the gross income of the Payang fleet's capture fisheries business unit. During the lean season, catch productivity is lower, resulting in lower profits. Meanwhile, during the peak fishing season, the Payang fleet is in optimal condition, achieving the highest catch productivity and generating higher gross income. In the capture fisheries industry, seasonal dynamics pose a significant challenge for business owners and fishermen. Fishermen need sound has a knowledge in managing finances, the number of fishing trips, and other financial strategies to survive the lean season and optimize their business during the peak fishing season (**Baihaqi & Annida, 2024; Annida & Baihaqi, 2025**).

Fixed and variable costs of payang fishing business

As a business, a fishing fleet has two capital components that require expenditure: fixed capital and variable capital. Fixed capital for a fishing fleet consists of the purchase of primary investment items, which can be calculated using depreciation costs or the costs that need to be set aside over time to cover the investment. Fixed costs remain constant and are unaffected by the fishing season (**Güngör, 2017; Irnawati et al., 2021**). The analysis of the fishing fleet business shows that the depreciation cost of the fixed costs required is IDR 3,498,796 per month (Table 3).

Table 3. Fixed costs of the payang fishing business

No.	Fixed Cost Details	Investment Costs (IDR)	Technical Age (month)	Depreciation Costs (IDR/month)	Maintenance Costs (IDR/month)	Total (IDR/month)
1	Fishing vessel	170,000,000	108	1,574,074	833,333	2,407,407
2	Fishing engine	20,000,000	96	208,333	208,333	416,667
3	Fishing equipment	7,000,000	12	583,333	41,667	625,000
4	Safety equipment	500,000	60	8,333	12,500	20,833
5	Fish storage facilities	1,000,000	72	13,889	15,000	28,889
Total of Fixed Cost (IDR/month)						3,498,796

The variable costs of the payang fleet's capture fisheries business unit vary across the three fishing seasons. The differences in variable costs incurred in each fishing season are driven by the different number of fishing trips undertaken during each season. On average, the payang fleet generally conducts 10 fishing trips per month during the lean

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season, 20 trips per month during the moderate season, and 25 trips per month during the peak fishing season (Annida *et al.*, 2024). The calculation results for the detailed variable costs incurred in each fishing season are IDR 8,420,000/month for the packelik season, IDR 16,840,000/month during the moderate season, and IDR 21,050,000/month during the peak fishing season (Table 4).

Table 4. Variable costs of the payang fishing business

No.	Variable Cost Details	Cost per Trip (IDR/trips)	Total of Variable Cost Per Month (IDR/Month)*		
			Lean Season (Dec.-Feb.)	Moderate Fishing Season (Mar.-Aug.)	Peak Season (Sep.-Nov.)
1	Dissel fuel	408,000	4,080,000	8,160,000	10,200,000
2	Machine oil	25,000	250,000	500,000	625,000
3	Ice block	99,000	990,000	1,980,000	2,475,000
4	Food supply	300,000	3,000,000	6,000,000	7,500,000
5	Mooring Permit Fee	10,000	100,000	200,000	250,000
Total of Variable Cost (IDR/Month)			8,420,000	16,840,000	21,050,000

* Lean Season: 10 Trip/Month; Moderate fishing season: 20 Trip/Month; Peak Season: 25 Trip/Month.

Net income and profit sharing

The net income of the payang fleet's fishing business unit was also analyzed based on the three fishing seasons. This net income is obtained by dividing gross income by total costs (fixed and variable) (Baihaqi & Annida, 2024; Shaumi *et al.*, 2022). The business analysis results show that the payang fleet's net income is IDR 9,192,787/month during the lean season, IDR 19,664,716/month during the moderate season, and IDR 40,447,385/month during the peak fishing season (Table 5).

Table 5. Net income of the payang fleet in each fishing season

Fishing Season	Fixed Cost (IDR/Month)	Variable Cost (IDR/Month)	Total Cost (IDR/Month)	Gross Income (IDR/month)	Net Profit (IDR/Month)
Lean Season	3,498,796	8,420,000	11,918,796	21,111,583	9,192,787
Moderate Season	3,498,796	16,840,000	20,338,796	40,003,513	19,664,716
Peak Season	3,498,796	21,050,000	24,548,796	64,996,181	40,447,385

The total net income obtained is then distributed among the various actors in the payang fleet fishing business, comprising the vessel owner, the vessel captain, and two crew members. Based on the agreement between the payang fleet fishing business actors, the vessel owner receives 40% of the total net income; the vessel captain receives 25% of the net income; and the remaining 35% is shared among the two crew members. The average monthly income of the payang fleet is IDR 9,240,652 for the vessel owner, IDR 5,775,407 for the vessel captain, and IDR 4,042,785 for each crew member (Table 6).

Table 6. Profit sharing of the payang fleet business actors

Fishing Season	Ship Owner (IDR/Month) 40% of Net Profit	Ship Captain (IDR/Month) 25% of Net Profit	Crew* (IDR/Month) 35% of Net Profit
Lean Season	3,677,115	2,298,197	1,608,738
Moderate Season	7,865,886	4,916,179	3,441,325
Peak Season	16,178,954	10,111,846	7,078,292
Average of Net Income	9,240,652	5,775,407	4,042,785

* The income has been divided between two crew members.

Compared with other studies, the payang fleet at the Asemdayong Coastal Fisheries Port, Pemalang Regency, has a net income of IDR 48,702,103/year or IDR 4,058,508/month for the ship owner and IDR 73,053,154/year or IDR 6,087,762/month to be distributed among 10-15 crew members (**Ningsih et al., 2013**). According to another source, the payang fleet at the Pasir Biru Fish Landing Base, Padang Pariaman Regency, generates a profit of IDR 33,686,333/year, or IDR 2,800,719 per month, to be distributed among all business actors (**Yernawilis et al., 2021**). Meanwhile, the payang fleet in Gili Ketapang, Purbolinggo Regency, East Java, has a net income of IDR 185,562,000 per year/year or IDR 15,463,500/month, which is distributed to all business actors (**Rachman et al., 2013**). These comparisons indicate that the financial condition of the payang fleet business at the Palabuhanratu Nusantara Fisheries Port remains at a better level.

Devita et al. (2023) stated that the average monthly income of active fishermen in Sukabumi Regency is IDR 3,480,000/month. The average minimum income for Sukabumi Regency, as regulated by the local government, is IDR 3,125,444/month (**Baihaqi & Annida, 2024b**). Comparing these two values indicates that the average monthly income of boat owners and captains of small-scale handline fishing fleets remains above the average income of fishermen and the minimum income in Sukabumi Regency. However, if we look at the dynamics of the net income of each payang fleet capture fishery business actor throughout the existing fishing seasons, the boat captain and crew have a monthly income below the regional average income of Sukabumi Regency, especially during the lean season. Therefore, financial management skills are essential for each payang fleet business actor to avoid losses or financial pressure during the lean fishing season.

CONCLUSION

The financial condition of the payang fleet's capture fisheries business in the Palabuhanratu Nusantara Fishing Port has closely been tied to the fishing season. In general, profit sharing on the payang fleet's net income still provides an average profit for each business owner. However, during the lean season, the net income for the ship's captain and crew is relatively small, or below the average income of fishermen in Sukabumi Regency and the regional minimum wage. Therefore, financial management

skills are essential for every payang fleet capture fisheries business owner to avoid financial pressure during the lean season.

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