

## FRESHWATER STINGRAY FISHERMEN'S INCOME IN MUSI RIVER, PALEMBANG CITY, SOUTH SUMATRA

*Pendapatan Nelayan Pari Air Tawar di Sungai Musi, Kota Palembang, Sumatra Selatan*

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### ABSTRACT

Freshwater stingrays are one of the catches targeted by fishers in the Musi River of Palembang City. However, freshwater stingrays are listed as endangered species by the IUCN, and Indonesian government regulates their preservation. Prohibiting the capture of freshwater stingrays can have significant impact on the livelihoods of fishers around the river. This research was designed to analyze fishers' income and identify the contribution of freshwater stingray catches toward fishers' income. According to income analysis, the results show that the average fishers' income is around IDR 269,542.13 - 655,287.47 per trip per day with an R/C ratio to the total cost is 3.78 in the regular season and 2.14 in the low season. The share of freshwater stingray catches toward the total income ranges from 14.22% to 20.93%.

**Keywords:** elasmobranch, livelihood, profit sharing, sustainable fisheries

### ABSTRAK

Pari air tawar menjadi salah satu sumber tangkapan nelayan di Sungai Musi Kota Palembang. Pari air tawar termasuk dalam daftar spesies terancam punah yang dikeluarkan oleh IUCN dan keberadaannya dilindungi oleh peraturan perundang-undangan di Indonesia. Pelarangan penangkapan pari air tawar dapat berdampak pada hilangnya sumber penghidupan nelayan di Sungai Musi. Penelitian ini bertujuan untuk menganalisis pendapatan nelayan dan mengetahui kontribusi hasil tangkapan pari air tawar terhadap total pendapatan nelayan di Kota Palembang. Penelitian ini menggunakan metode analisis pendapatan. Hasil penelitian menunjukkan bahwa rata-rata pendapatan nelayan di Kota Palembang sekitar Rp269.542,13 - 655.287,47 per trip per hari dengan R/C *ratio* terhadap biaya total sebesar 3,78 pada musim normal dan 2,14 pada musim pakeklik. *Share* dari hasil tangkapan pari air tawar bernilai sangat rendah yaitu 14,22% - 20,93%.

**Kata kunci:** elasmobranch, penghidupan nelayan, perikanan berkelanjutan, bagi hasil.

### INTRODUCTION

One of the elasmobranch species found in Indonesian waters is the freshwater stingray.

Freshwater stingrays inhabit rivers, river mouths, and sometimes estuaries in Kalimantan, Sumatra, Jambi, and Papua (Iqbal

and Yustian 2016). South Sumatra is one of the regions that serves as a habitat for freshwater stingray species in Indonesia. There are fourteen species of freshwater stingrays in the waters of South Sumatra (Iqbal *et al.* 2018).

The Musi River is one of the habitats and a center for capturing freshwater stingrays in South Sumatra due to its high biodiversity (Iqbal *et al.* 2018). One of Indonesia's longest rivers, the Musi River, flows 750 kilometers across the provinces of South Sumatra, Jambi, Bengkulu, and Lampung (Andayani and Marlina 2022). It has a high potential for fisheries resources because of its numerous tributaries, which is why fishermen in South Sumatra rely on the Musi River as their livelihood source (Putri and Melki 2020).

The International Union for Conservation of Nature (IUCN) Red List lists freshwater stingrays originating from Indonesia as endangered species. Three out of the four species of freshwater stingrays can be found in the Musi River, namely the marbled whipray (*Fluviotrygon oxyrhynga*), the white-edge freshwater stingray (*Fluviotrygon signifer*), and the giant freshwater stingray (*Urogymnus polylepis*). The demand and high prices for stingray products create economic incentives for fishermen, leading to ongoing and even increasing catches of freshwater stingrays (Haryono *et al.* 2020). Freshwater stingrays are currently utilized as ornamental fish, leathercraft material, and for consumption (Fahmi *et al.* 2008).

Freshwater stingrays can still be legally caught by fishermen with the possession of a Permit for the Utilization of Fish Species (Surat Izin Pemanfaatan Jenis Ikan or SIPJI) issued by the Ministry of Marine Affairs and Fisheries (MMAF) of the Republic of Indonesia under Regulation Number 61 of 2018. Freshwater stingrays listed in CITES Appendix II are not endangered species but may become endangered if their international trade is not controlled.

Freshwater stingrays also play a role in the livelihoods of fishermen as a source of catch. They are one of the catches by fishermen in the Musi River (Isyhadu *et al.* 2021). However, data on freshwater stingray catches is not provided in MMAF data due to its low volume, often being categorized under 'other catches.' Consequently, conducting interviews with fishermen remains the sole method to gather information on freshwater stingray catches. The scarcity of freshwater stingray populations is an environmental and ecological issue and a social and economic

concern for freshwater stingray fishermen. The decline in freshwater stingray populations will decrease fishermen's income, prompting them to increase their costs to supplement their income. This could have negative consequences for the freshwater stingray population and the ecosystem in the Musi River if their capture is not sustainable (Daw *et al.* 2012).

Prohibiting the capture of freshwater stingrays can lead to the loss of livelihoods for fishermen in the Musi River. The capture of freshwater stingrays as one of the catches by fishermen in the Musi River needs to be identified to assess its contribution to fishermen's income and the sustainability of resources affecting the presence of freshwater stingrays. This research aims to analyze fishermen's income and determine the contribution of freshwater stingray catches to the total income of fishermen in Palembang City. The novelty of this research is that capturing the economic factors between the fishermen's livelihood and the protection of freshwater stingrays has not been previously addressed in an Indonesian publication. This research also provides an overview of the socio-economic conditions of the community and its impact on freshwater stingray conservation in Palembang City.

## METHODS

### *Data Collecting*

This research was conducted in Seberang Ulu II, Plaju, Kertapati, and Gandus districts in Palembang City, South Sumatra Province. Data collection took place from February to March 2023. The types of data used in this research are primary data and secondary data. Primary data were collected through a census of 38 fishermen.

The sampling method was determined using a census method. The census method involves collecting information from every individual in the population (Neuman 2014). The interviewed fishermen were those who had caught and sold freshwater stingrays in the last month. Information regarding the presence of fishermen who had caught and sold freshwater stingrays was obtained from fisheries extension officers in Palembang City, South Sumatra.

### *Data Analysis*

The data analysis used in this research is quantitative analysis. Quantitative analysis was carried out using income analysis. Income

analysis is derived from the total earnings of fishermen minus the total cost incurred by them. Fishermen's income can be calculated using a modified formula based on Debertin (2012):

$$\pi = TR - TC \dots\dots\dots(1)$$

The equation can be elaborated as follows:  $\pi$  represents income per trip, TR stands for Total Revenue, which is the total earnings of fishermen per trip, and TC represents Total Cost, which is the total cost per trip. The calculation of depreciation for the equipment owned by the fishermen is done using the straight-line method with the assumption of zero residual value. Depreciation cost with the straight-line method can be calculated using a modified formula based on Giudice *et al.* (2016):

$$D_g = \frac{(E-F)}{t} \dots\dots\dots(2)$$

The equation can be described as follows:  $D_g$  represents the depreciation cost in year  $g$  ( $g = 1, 2, \dots, n$ ),  $E$  is the purchase value of the fishermen's assets (in IDR),  $F$  is the residual value of the asset (in IDR), and  $t$  is the technical life of the asset (in years). Depreciation cost is calculated using the assumption of zero residual value.

The R/C ratio analysis is conducted to determine the ratio of income to cost incurred by fishermen. The formula for calculating the R/C ratio analysis is as follows (Suratiah 2015):

$$\frac{R}{C} \text{ ratio} = \frac{\text{Total income}}{\text{Total cost}} \dots\dots\dots(3)$$

The balance and R/C cost analysis indicates that every rupiah spent by the fishermen will generate an income equal to the resulting R/C. There are criteria used to assess the results of the R/C ratio analysis, namely, if the R/C ratio  $> 1$ , then the capture fisheries business is profitable to pursue because the income obtained is greater than the costs incurred. If the R/C ratio = 1, then the capture fisheries business is at the break-even point, meaning it neither makes a profit nor incurs a loss. If the R/C ratio  $< 1$ , then the capture fisheries business is not profitable to pursue because the income obtained is lower than the costs incurred by the fishermen.

The analysis of income share is used to determine the contribution of income from the capture of freshwater stingrays to the total income of fishermen. Determine the income share can be calculated using a formula modified from Leslie and Hardyastuti (2011):

$$Y = \frac{Pn}{Pt} \times 100\% \dots\dots\dots(4)$$

Equation (4) can be explained as follows:  $Y$  represents the percentage contribution of income from the capture of freshwater stingrays to the total income of fishermen (%),  $Pn$  represents the income of fishermen from the capture of freshwater stingrays (IDR), and  $Pt$  represents the total income of fishermen (IDR). The percentage share of income from the capture of freshwater stingrays to the total income of fishermen can be interpreted as follows (Leslie and Hardyastuti 2011):

If the income contribution is  $< 25\%$ , then the contribution of income from the capture of freshwater stingrays to the total income of fishermen is categorized as very low.

If the income contribution is  $25\% - 49\%$ , then the contribution of income from the capture of freshwater stingrays to the total income of fishermen is categorized as low.

If the income contribution is  $49\% - 75\%$ , then the contribution of income from the capture of freshwater stingrays to the total income of fishermen is categorized as high.

If the income contribution is  $> 75\%$ , then the contribution of income from the capture of freshwater stingrays to fishermen's total income is categorized as very high.

**RESULTS**

Fishermen are daily fishermen who go to sea, taking into account the tides and fishing seasons. The tides from the sea still influence the Musi River, so fishermen typically go to sea when the tide is high, around 03:00-14:00 WIB (Western Indonesia Time).

**Palembang City Artisanal Fisheries Overview**

**a) Fishing Boats Characteristics**

A fishing boat is a boat or floating structures that used for fishing operation, support fishing operations, transport, training, and research/exploration (Mudzakir *et al.* 2023). Most fishermen own boats ranging in size from 1.2 to 3 GT (Gross Tonnage), which are privately owned (see Figure 1). There are three engine sizes commonly used by fishermen, namely 6.5 HP (Horsepower), 9 HP, and 13 HP (*Paard Kracht*).

Fishermen use boat engines powered by gasoline, LPG gas, or a combination of both (Figure 2). Most engine types used by fishermen in Palembang City are LPG gas-

powered engines because they receive assistance from the local fisheries department.

**b) Fishing Gears**

Fishing gear is equipment or other objects used to catch fish (Mudzakir *et al.* 2023). There are four types of fishing gear used by fishermen: nets, seines, fishing lines, and traps. Fishermen typically carry and use various fishing gear when they go to sea. The majority of fishermen use nets (52.63%) and seines (26.32%) as their main fishing gear (Figure 3). Fishing gear used to catch freshwater stingrays are nets, seines, and fishing lines.

The income from the fishing business is the difference between the revenue and the actual fishing costs incurred by the fishermen during the fishing season, both per trip and per year (Rahim 2011). Fishermen's income is one of the indicators in measuring the welfare of fishermen. Fishermen's income generally varies between the normal season and the lean season. The normal season in Palembang City occurs from March to October, while the lean season occurs from November to February. During the lean season, fish catch production decreases, causing fish prices to rise due to relatively constant or increased demand or consumption (Fauzi 2010).

**Freshwater Stingray Fishermen's Income**

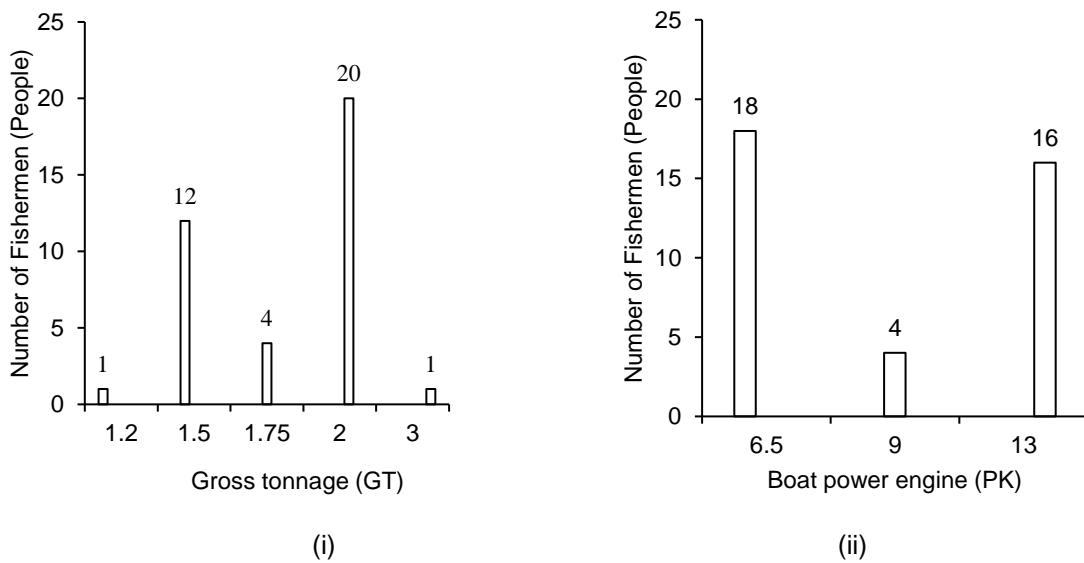


Figure 1 The number of fishers based on Gross Tonnage (GT) (i); The number of fishers based on boat power engine (PK) (ii)

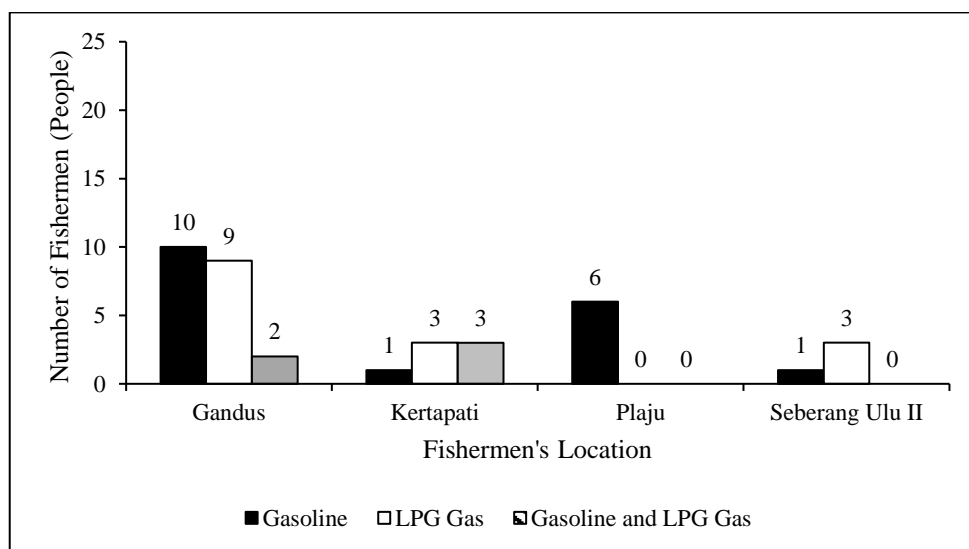


Figure 2 Number of fishers who use gasoline, LPG gas or gasoline and LPG gas engines in the study area

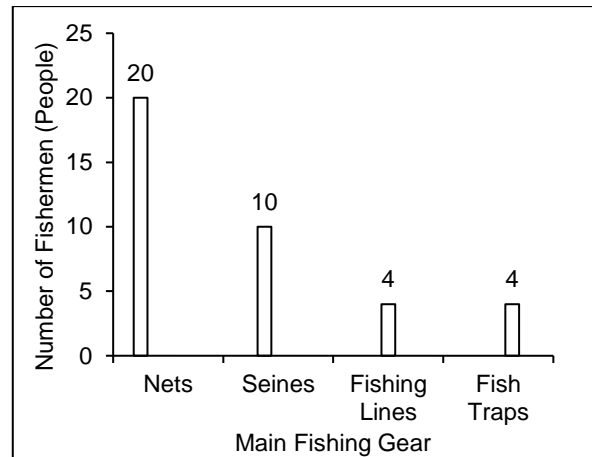


Figure 3 Number of fishermen who use nets, seines, fishing lines, or fish traps

### a) Investment Costs

Investment costs are costs incurred once in the production process to obtain benefits multiple times until it is no longer economically profitable (Firdaus and Triyanti 2017). Investment costs include the fishing fleet, boat engines, and fishing gear owned by the fishermen. The average total investment value for fishermen in Palembang City is IDR 13,233,678.64 (Table 1).

### b) Fishermen's Income

On average, fishermen obtain freshwater stingrays weighing around 0.5-1 kg each, including species like the white-edged freshwater stingray (*Fluvitrygon signifer*) for ornamental or consumption purposes, the marbled whipray (*Fluvitrygon oxyrhyncha*) for ornamental purposes, and the giant freshwater stingray (*Urogyrnus polylepis*).

During the normal season, the average income for fishermen is IDR891,038.65 (Table 2). The average catch for fishermen in Palembang City mainly includes fish species

like lais (*Kryptopterus palembangensis*), prawn (*Macrobrachium rosenbergii*), tirusan (*Johnius trachycephalus*), catfish (*Pangasius micronemus*), lemajang (*Cyclocheilichthys enoplos*), saluang (*Rasbora argyrotaenia*), baung (*Mystus nemurus*), and juaro (*Pangasius polyuranodon*).

During the lean season, the average income for fishermen is IDR 505,293.31 per day (Table 3). In addition to changes in the quantity of catches and a reduced variety of fish species during the lean season, there are also changes in fish prices due to shifts in demand and fish stocks.

The average fishermen's daily income in Palembang City during both the normal and lean seasons is IDR 698,165.98. The average monthly income, assuming 24 trips during both seasons, can reach IDR 16,755,983.52. It is assumed there are 24 trips per month because, on average, fishermen go to sea six times per week. The decrease in catches during the lean season leads to a lower average income during both seasons.

Table 1 The average fishermen's investment value in Palembang City

No	Detail	Technical Age (Year)	Volume (Unit)	Unit Price (IDR)	Investment Value (IDR)	%
1.	Boat	5	1	4,963,157.89	4,963,157.89	37.50
2.	Boat's engine	5	1	2,919,736.84	2,919,736.84	22.06
3.	Fishing equipment:					
	a. Net	1	3	553,194.44	1,582,750.77	11.96
	b. Seine	6	2	1,160,454.55	1,846,177.69	13.95
	c. Fish trap	1	27	52,280.00	1,411,560.00	10.67
	d. Fishing line	5	2	217,272.73	434,545.45	3.28
4.	Supporting equipment:					
	Coolbox	5	1	75,750.00	75,750.00	0.57
<b>Total</b>					<b>13,233,678.64</b>	<b>100.00</b>

Table 2 Average income of fishermen per trip per day during the normal season

No.	Type of Fish	Catch (Kg/Trip)	Average Fish Price (IDR/Kg)	Value (IDR)
1.	Live freshwater stingray (ornamental)	1.71	45,714.29	78,367.35
2.	Whole dead freshwater stingray	1.58	12,526.32	19,778.39
3.	Cut-up dead freshwater stingray	1.90	15,000.00	28,571.43
4.	Lais	0.50	60,000.00	30,000.00
5.	Prawn	1.35	105,294.12	142,456.75
6.	Tirusan	2.81	25,142.86	70,639.46
7.	Catfish	2.45	73,870.97	181,103.02
8.	Lemajang	2.74	28,236.84	77,279.78
9.	Saluang	3.59	32,647.06	117,145.33
10.	Baung	1.71	60,000.00	102,857.14
11.	Juaro	2.04	21,000.00	42,840.00
<b>Total</b>				<b>891,038.65</b>

Table 3 Average daily income for fishermen during the lean season

No.	Type of Fish	Catch (Kg/Trip)	Average Fish Price (IDR/Kg)	Value (IDR)
1.	Live freshwater stingray (ornamental)	1.71	45,714.29	78,367.35
2.	Whole dead freshwater stingray	1.00	12,394.74	12,394.74
3.	Cut-up dead freshwater stingray	1.00	15,000.00	15,000.00
4.	Lais	0.25	60,000.00	15,000.00
5.	Prawn	0.53	102,647.06	54,342.56
6.	Tirusan	1.33	30,714.29	40,952.38
7.	Catfish	1.13	75,806.45	85,587.93
8.	Lemajang	1.26	30,000.00	37,697.37
9.	Saluang	1.50	34,411.76	51,617.65
10.	Baung	1.19	70,000.00	83,333.33
11.	Juaro	1.24	25,000.00	31,000.00
<b>Total</b>				<b>505,293.31</b>

### c) Fishermen's Costs

Fishermen's costs consist of cash costs and non-cash costs (depreciation costs). Cash costs include fuel, oil changes, fan replacement, boat and engine servicing, gear servicing, fish ice, and consumption. Non-cash costs include boat depreciation, engine depreciation, gear depreciation, coolbox depreciation, and labor costs.

Depreciation costs represent benefits reserved until the end of the equipment's technical lifespan (Suharyanto *et al.* 2020). The residual value in depreciation calculations is assumed to be zero. The fishermen bear labor costs in catching fish. The fishermen themselves bear labor costs in catching fish since they do not have crew members (ABK). Non-cash information labor costs are assumed

to be IDR60,000 because, according to the fishermen's information, if they go to sea on a boat with crew members (> 5 GT), they are paid IDR 60,000 per day.

The average cash costs incurred by fishermen in Palembang City are IDR 158,655.72, and the non-cash costs are IDR77,095.46 per trip per day (Table 4) or IDR5,658,028.32 per month, assuming 24 trips per month. The average total cost for fishermen during both the normal and lean seasons is assumed to be the same.

### d) Fishermen's Income Analysis

Components of the fisherman's income include cash costs and income from total costs. The average income fishermen is the average revenue minus the average costs. The average income from cash costs obtained by fishermen

during normal seasons is IDR732,382.93 per trip per day and IDR346,637.59 during the lean season (Table 5). The average income from cash costs per trip per day is IDR 539,510.26 during normal and lean seasons, or IDR12,948,246.24 per month.

The capture fisheries business in Palembang City is profitable when looking at the R/C ratio value. If the R/C ratio value > 1, then the business is profitable to run; if the R/C ratio < 1, then the business is not profitable to run; and if the R/C ratio = 1, then the business is at a break-even point (Juliani *et al.* 2019).

The R/C ratio value over total cost during normal seasons is 3.78, which means that every Rupiah spent will return with a higher value of IDR3.78. The R/C ratio value over total

cost during the lean season is 2.14, which means that every Rupiah spent will return with a higher value of IDR2.14. The fishing business in Palembang is profitable because the revenue is greater than the costs.

#### e) Share of Fishermen's Income from Freshwater Stingray Catches

Share analysis is assumed using the calculation of income from freshwater stingray catches as a percentage of total daily income for fishermen. The share of income from freshwater stingray catches during normal seasons is 14.22% of total fishermen's income. The share of income from freshwater stingray catches during the lean season is 20.93% of total fishermen's income.

Table 4 Average fishermen's daily costs

Type of Cost	Unit	Quantity	Price (IDR/unit)	Value (IDR)	%
<b>Cash Cost</b>					
1. Fuel cost:					
a. Gasoline	Litre	3.04	12,565.22	38,241.97	16.22
b. LPG	Cylinder	2.23	24,650.00	54,846.25	23.26
2. Maintenance cost:					
a. Oil change	-	1	1,168.63	1,168.63	0.50
b. Fan replacement	-	1	950.00	950.00	0.40
c. Boat and engine service	-	1	3,258.22	3,258.22	1.38
d. Net service	-	1	5,675.93	5,675.93	2.41
e. Seine service	-	1	1,090.91	1,090.91	0.46
Fish ice	Pack	11	1,333.33	15,000.00	6.36
Cigarette	Pack	1	18,233.33	18,233.33	7.73
Consumption	Pack	1	20,190.48	20,190.48	8.56
Total cash costs				15,655.72	
<b>Non-cash Cost</b>					
1. Depreciation cost:					
a. Boat depreciation	-	-	-	3,446.64	1.46
b. Engine depreciation	-	-	-	2,027.60	0.86
c. Net depreciation	-	-	-	4,710.57	2.00
d. Seine depreciation	-	-	-	1,110.45	0.47
e. Fish trap depreciation	-	-	-	5,445.83	2.31
f. Fishing line depreciation	-	-	-	301.77	0.13
g. Coolbox depreciation	-	-	-	52.60	0.02
Labor cost (working hour per day)	HOK	1	60,000.00	60,000.00	25.45
Non-cash costs				<b>77,095.46</b>	
<b>Total Costs</b>				<b>235,751.18</b>	<b>100.00</b>

Table 5 Average fisherman's income per trip per day

No.	Component	Value in Normal Season (IDR)	Value in Lean Season (IDR)
1.	Revenue (IDR)	891,038.65	505,293.31
2.	Cash costs (IDR)	158,655.72	158,655.72
3.	Non-cash costs (IDR)	77,095.46	77,095.46
4.	Total cost (IDR)	235,751.18	235,751.18
5.	Income over cash costs (IDR)	732,382.93	346,637.59
6.	Income over total cost (IDR)	655,287.47	269,542.13
7.	R/C ratio over cash costs	5.62	3.18
8.	R/C ratio over total cost	3.78	2.14

The contribution of income from freshwater stingray catches to fishermen's total income is categorized as very low because the percentage is < 25%. The lower quantity and price of freshwater stingray catches compared to catches of other fish species are the reasons for the low share of income from freshwater stingray catches. One of the types of freshwater stingrays caught by fishermen is the marbled whipray, which is sold to retail traders and distributors to be used as ornamental fish. Marbled whiprays and white-edge freshwater stingrays are also sold by distributors on online marketplaces (Figure 4).

The giant freshwater stingray is generally found once every one to two weeks. One individual of the giant freshwater stingray can weigh between 40-60 kg (Figure 5). Giant freshwater stingrays are sold in pieces and marketed in the Musi II Market.

Based on the fishermen's description, white-edge freshwater stingrays are found almost daily but are small, weighing around 0.5-1 kg each. White-edge freshwater stingrays are sometimes sold as ornamental fish and are marketed through online marketplaces by distributors (Figure 6).

The share of fishermen's income from the sale of freshwater stingrays is higher during the lean season than the normal season because the catch of freshwater stingrays tends to remain stable or only decrease slightly during the lean season. The catch of other types of fish tends to decrease significantly during the lean season. According to the fishermen's descriptions, the catch of freshwater stingrays does not experience significant changes in quantity between seasons.

Based on the analysis of the share of fishermen's income from the sale of freshwater stingrays, it can be concluded that the contribution of freshwater stingrays to the total income of fishermen is mostly meager, i.e., less than 25%. The selling price of freshwater stingrays for consumption is meager, with an average selling price ranging from IDR10,000 to IDR 15,000 per kg. The selling price of freshwater stingrays for ornamental fish is relatively high compared to those for consumption, with an average selling price of around IDR45,000 per fish.



(Source: Personal documentation 2023)

Figure 4 The marbled whip rays are utilized as an ornamental fish





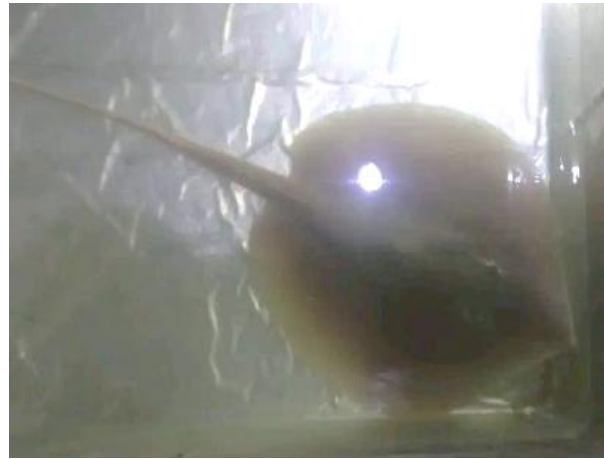
(i)



(ii)

(Source: Personal documentation 2023)

Figure 5 Giant freshwater stingrays caught by fishermen (i); Giant freshwater stingrays that have already been cut (ii)



(Source: Personal documentation 2023)

Figure 6 White-edged freshwater stingray

The analysis of the share of fishermen's income from the sale of freshwater stingrays shows meager results, and it does not have a significant impact if the sale and trade of freshwater stingrays are banned. Even though freshwater stingrays contribute very little to fishermen's income, fishermen are reluctant to release captured freshwater stingrays. They believe freshwater stingrays can increase their income and have a good selling price. According to one of the fishermen:

"Freshwater stingrays are a blessing for us that day. So it's a waste if we want to release them back." (Key-SO).

## DISCUSSION

Fishermen's income tends to be unpredictable because fishing activities are influenced by uncertainty and are speculative and fluctuating (Rahim 2011). The size of the engine, the duration of fishing trips, fuel prices, the fishermen's age, capital, and family

responsibilities significantly impact changes in fishermen's income (Vibriyanti 2019). The small-scale fishermen's economy is considered inefficient because it is weak in various aspects, including the low quality of boat engines, the limited owner boat of fishing gear, and the limited mastery of fishing techniques (Johnson 2006). The socio-economic conditions of small-scale fishermen correlate with the quality of the ecosystem due to the level of usage of fishing gear and boat engines (Kadfak 2019). Due to fishers' low utilization and technological expertise, poor socioeconomic conditions would degrade the ecosystem's quality.

The higher the income of fishermen, the higher their level of welfare. Small-scale fishermen generally struggle to save and tend to spend their income on daily costs or for fishing capital (Andari 2022). Fishermen in Palembang City belong to the category of small-scale fishermen who use traditional fishing methods. Hence, their income tends to

be small, and most of it is allocated to fishing capital. In line with the opinion expressed by Kusnadi (2002) in Triyanti and Firdaus (2016), the poverty of fishermen stems from two factors: natural factors related to fluctuations in fishing seasons and economic resources and non-natural factors related to the limitations of fishing technology and the weakness of marketing networks.

However, when viewed in terms of income over cash costs compared to the Regional Minimum Wage (UMR) of Palembang City, fishermen's income is still higher. Fishermen in Palembang City have a relatively abundant catch with a fairly high selling price, especially during the normal season. Fishermen's income is still higher than the UMR of Palembang City, valued at IDR3,565,409 per month.

## CONCLUSION

The fishing industry in Palembang City is profitable based on the R/C ratio during normal and lean seasons. Most fishermen's costs are used for operational and investment costs. The main catches of the fishermen include freshwater stingrays, catfish, juaro, baung, saluang, lemajang, and prawn. The average income of fishermen over the total cost during normal and lean seasons ranges from IDR 269,542.13 to IDR655,287.47 per trip per day. The catch of freshwater stingrays is not significantly affected by the season, making the number of catches relatively stable. The share of daily income from the catch of freshwater stingrays is low, ranging from 14.22% to 20.93%. Despite the low contribution of freshwater stingrays to the fishermen's total income, most of them are unwilling to release caught freshwater stingrays.

## SUGGESTION

There needs to be appropriate policy measures to address the potential decrease in income that fishermen might experience if the capture or sale of freshwater stingrays is restricted. More intensive education and awareness efforts among fishermen regarding the consequences of the extinction of freshwater stingrays and the importance of their preservation are required. The fishermen's low income and welfare levels are leading them to focus on profit maximization. The Palembang City Fisheries Department needs to create alternative income sources that fishermen can turn to during the lean

season, such as the construction of floating net cages and the processing of catches into economically valuable products with the guidance of fisheries extension officers. Fishermen's families can also be empowered to generate additional income to improve household welfare.

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