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Illegal Fishing and Fishermen Income in Lemito Village Pohuwato Regency, Indonesia

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ABSTRACT

This research aimed to provide an overview of illegal fishing practices in Lemito Village, including fish resources conditions, illegal fishing type, and fishermen's income category in the practice. This study was conducted in Lemito Village, Pohuwato Regency, Gorontalo Province, Indonesia from May to June 2022. Data collection techniques involved observation, interviews, and documentation. Descriptive and income analyses were applied to the data. Even though more than half of the respondents (51–59%) admitted to being aware of the practice of illegal fishing and its negative impact on fish resources in their area, the current condition of fish resources according to most of them (67%) is still in good condition. Illegal fishing types occurring in this area are fishing using prohibited tools. The average income of fishing communities in Lemito Village was categorized as moderate.

INTRODUCTION

Indonesia is one of the world's largest archipelagic countries **(Soemarmi *et al.*, 2019)**, with abundant potential for marine and fishery resources. Therefore, sustainable management is needed to ensure that future generations can continue to enjoy it. Based on article 2 in Law Number 45 of 2009 Indoensia Republic, amendments to Law Number 31 of 2004 concerning fisheries, concerning fisheries management is carried out based on the principles of benefit, justice, togetherness, partnership, independence, equity, integration, openness, efficiency, sustainability, and sustainable development. Illegal fishing has harmed the country financially **(Muhamad, 2016)**. All existing stakeholders should optimally employ this management principle; nevertheless, some individuals who are not responsible for managing fisheries violate the law. For traditional fishermen, illegal fishing is very detrimental to any country **(Damastuti *et al.*, 2018)**. Based on data from the Food and Agriculture Organization (FAO), Indonesia has a loss of 30 trillion per year due to illegal fishing. These data illustrate that illegal fishing is a problem that must be seriously taken since it can reduce fish resource stocks and harm both the waters and the economy of fishermen **(Sari, 2019)**.

The Tomini Bay area in Pohuwato Regency is an area that has significant economic, social and ecological values for the survival of the surrounding community **(Prasetyo, 2016)**. Generally, fishermen rely on aquatic products through cultivation and direct capture **(Wijayanti, 2013)**. One area in Indonesia that is suspected of still being rife with illegal fishing practices is the waters of Lemito Village, Lemito District, Pohuwato Regency, Gorontalo Province **(Mohi, 2017)**. The practices in this area tend to be destructive to fishing using explosive fish or bombs. This causes ecological losses, which are associated with decreasing the productivity of coral reef ecosystems **(Somun, 2014)**. Increased exploitation has a trend of decreasing catches and fish size in some areas **(Zamroni *et al.*, 2016)**. In addition to explosives, using trawls is also a form of illegal fishing practice; trawling is a fishing tool that is not environmentally friendly and damages the bottom of the waters (**Jarwanto *et al.*, 2014**). It is suspected that this practice of illegal arrests has been going on for a long time and that the perpetrators do not only come from Lemito Village. This research aimed to provide an overview of illegal fishing practices in Lemito Village, including fish resource conditions, illegal fishing types, and fishermen's income categories.

MATERIALS AND METHODS

This research was conducted from May to June 2022 in Lemito Village, Lemito District, Pohuwato Regency, Gorontalo, Republic of Indonesia (Fig. 1). This location was considered a research area since it was rumored to experience intense illegal fishing practices. However, scientific reports on this matter have never been reported.

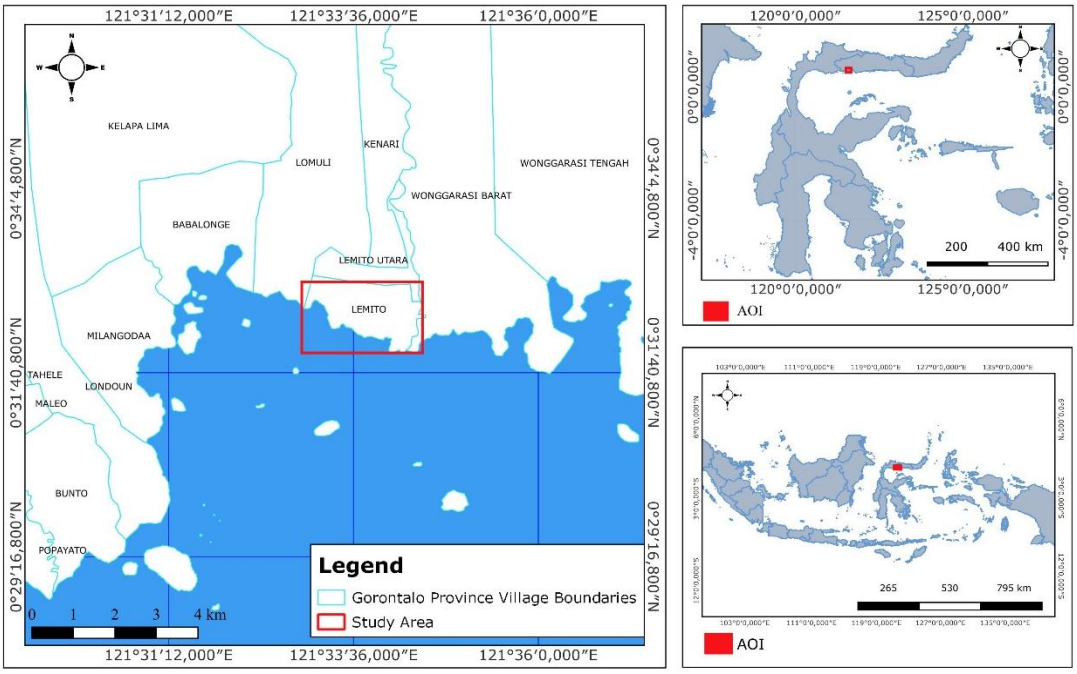

Fig. 1. Location of research data collection

1. Respondents determination

The population component includes all the objects or subjects to be measured and the parts to be studied **(Sugiyono, 2019)**. The population is the whole or totality of psychological objects limited by certain criteria **(Hidayat & Junianto, 2017)**. Sample is part of the number and characteristics possessed by the population. In this study, population comprised all fishermen engaged in fishing activities in the waters of Lemito Village, totaling 297 fishermen. The sample was taken using the simple random sampling method, where samples were randomly taken from the population and no longer looked at the level of the population **(Sugiyono, 2019)**. The Slovin equation was used to determine the number of samples in this study following the method of **Simanjuntak (2016)**, as follows:

$$n = \frac{N}{1 + Ne^2} = \frac{297}{1 + (297)(0.1)^2} = 74.81 = 75$$

Note:
n = Number of samples required
N = Total population
Ne = Error rate (10%)

2. Data collection

2.1 Observation

Observation is a systematic observation of human activities and physical settings **(Hasanah, 2017)**. In this study, data were collected by observing and seeing directly community behavior, illegal fishing activities, and fishing gear used by fishermen in Lemito Village.

2.2 Interview

According to **Hasan (2017)**, interviews involve researchers and informants. The responses given by the informants then became the raw data to be analyzed by the researchers. In social sciences, interviews are still widely accepted to collect qualitative data **(Rachmawati, 2017)**. The interviews in this study were conducted in a structured manner using a validated questionnaire instrument. Data were collected in the form of questions and answers from fishermen who were fishing in the waters of Lemito Village as respondents. The answers to the questions posed came purely from the perspective of the respondents, which broadly included aspects of the condition of fish resources, their understanding of illegal fishing practices, identification of types of illegal fishing, as well as an analysis of fishermen's income categories based on indicators from the Central Agency of Statistics of Indonesia. The interview results' components are described in detail in the next section.

2.3 Documentation study

Mohi (2017) stated that documentation includes records writing, drawings, and someone's monumental works. Documentation result in an accumulation of invaluable information correctly and completely **(Sudarsono, 2012)**. This research documentation

study was obtained from previous studies which can be sourced from relevant references to the illegal fishing.

2.4 Data analysis

This study applied descriptive analysis to describe the fisheries resources conditions and types of illegal fishing in Lemito Village, Pohuwato Regency, Gorontalo. The income analysis, as referred to by **Wahda (2021)**, is as follows:

a. Production cost analysis

TC = FC+VC

Where, TC = Total cost, FC = Fixed cost, VC = Variable cost

b. Revenue analysis

TR = PxQ

Where, TR= Total revenue; P= Price; Q = Quantity of production

c. Profit analysis

π = TR-TC

Where, π = Profit; TR = Total revenue; TC = Total cost

Table 1. Population income category by the Central Agency of Statistics of Indonesia

Class	Income per month (IDR)	Category
I	> 3,500,000	very high
II	2,500,000 –3,500,000	high
III	1,500,000 –2,500,000	moderate
IV	> 1,500,000	low

RESULTS

1. Fish resources condition

The illegal fishing is a situation where there is fishing behavior that violates legal provisions, which has an adverse impact on the condition of fisheries and marine resources. For the most part, 67% of the fishing community views the condition of fish resources as being in good condition. In contrast, 33% of respondents considered the condition of aquatic resources in the waters of Lemito Village to be in bad condition. This may indicate illegal fishing practices in the form of destructive fishing disrupting the condition of the resources.

2. Fishermen insight to illegal fishing

The level of knowledge and sensitivity of fishermen responding to the problem of illegal fishing is a substantial thing to describe the conditions in Lemito Village. This information is displayed in Table (2).

Table 2. Lemito fishermen insight into illegal fishing

Fishermen response		Answer (%)		
		Yes	No	Total
Question	Definition of illegal fishing and its bad impact on the aquatic environment	51	49	100
	Knowledge of fishermen about the existence of illegal fishing in Lemito Village	59	41	100
Total respondents	75			

Based on the description above, fishermen in Lemito Village are dominant in knowing the meaning of illegal fishing and its impact on the aquatic environment. Furthermore, most fishermen in Lemito Village are aware of illegal fishing practices in Lemito Village waters.

3. Type of illegal fishing

Illegal fishing is divided into four categories: fishing without a permit, fishing using fake permits, fishing with types or species that are not in accordance with the permit, and fishing using prohibited and destructive fishing gear, according to the guidelines outlined by **FAO (2004)**. Based on the interview, the illegal fishing category occurring in Lemito Village is fishing using destructive gear. Fishermen argued for using bombs for fishing in the waters of Lemito Village. The perpetrators informed that they made bombs using basic materials that were easy to find at low prices. Fishermen admitted that the profits obtained in fishing activities using bombs are substantial, given that the capital spent is relatively small, and the basic materials are easy to obtain. The materials and prices for making fish bombs used by fishermen engaged in illegal fishing are presented in Table (3).

Table 3. Types of basic ingredients for making fish bombs

Material type	Number	Price (IDR)	Total (IDR)
Matches	20 pieces	40,000	800,000
Fertilizer	5 bottles	55,000	275,000
Fuel	15 liter	10,000	150,000
Spritus	4 liter	26,000	104,000
Glass bottle	20 bottles	5,000	100,000
	Total (IDR)		1,429,000

4. Fishermen income

Total cost

Total cost is the costs incurred by Lemito fishermen in supporting their activities in the fishing process. The readiness of fishing gear and fishing aids needed by fishermen while at sea is a determinant of smooth fishing. The production costs incurred by fishermen consist of fixed and variable costs.

Fixed cost

Fixed costs are costs incurred by fishermen in supporting their fishing activities. The average costs incurred by fishermen in Lemito Village are displayed in Table (4). The total fixed costs incurred by fishermen in Lemito Village are obtained by adding up

the total costs incurred by fishermen for a month. Therefore, the total fixed costs incurred by fishermen in Lemito Village per month are an average of IDR 191,693.52.

Table 4. Average fixed costs incurred by fishermen in Lemito Village

No	Item	Number	Price (IDR)	Cost per month (IDR)	
				Purchase	Maintenance
1	Boat	1	6,733,333	6,733,333	58,533
2	Machine	1	4,640,000	4,640,000	64,800
3	Box	3	25,000	73,000	-
4	Flash	1	60,000	76,800	-

Variable cost

Variable costs are costs incurred by fishermen that are tentative in nature. Costs are adjusted to the duration at sea and the catchment area's distance from fishermen when out fishing. The details of the variable costs incurred by fishermen in Lemito Village are displayed in Table (5). The total variable costs were obtained by adding up all the variable costs, starting from buying food and drinks, cigarettes, ice cubes, batteries, and fuel for each trip. The total cost of each trip is multiplied by a week or month. Hence, based on this sum, the total variable costs incurred by fishermen in Lemito Village are an average of IDR 2,393,440.00 per month.

Tabel 5. Details of fishermen's variable costs in Lemito Village

Item	Cost (Rp)		
	Average	Maximum	Minimum
Food and Drink	18,662	55,000	0
Cigarette	27,160	105,000	0
Ice	2,186	12,000	0
Battery	48,000	48,000	48,000
BBM	57,386	350,000	10,000

Total cost

Total cost comes from the sum of the fixed costs and variable costs incurred by fishermen. The size of the total production costs is aligned with the needs of fishermen when fishing, especially variable costs, which are tentative in nature. The average total cost of production for fishermen in Lemito Village is IDR 2,585,133.52 per month.

Total revenue

Total revenue or income is obtained from the number of catches of fishermen multiplied by the selling price. The detail total revenue of fishermen in Lemito Village is exhibited in Table (6). The fish catch obtained by fishermen determines the income of fishermen per trip.

Table 6. Details of the total income of fishermen in Lemito Village

Component	Quantity
Number of trips per week	4 times
Catch	12.74kg
Price per kilogram	IDR 26,240
Revenue per trip	IDR 276,588.93
Monthly income	IDR 4,271,532.27

Profit

Profit is what will be achieved from an effort in fishing carried out by fishermen. The thing that affects profits is the total costs incurred by fishermen. Therefore, fishermen's fishing efforts are maximized to get as much profit as possible. The profit of fishermen in Lemito Village in Table (7) averages IDR 1,686,398.75 per month. This value is obtained from the total income of fishermen per month minus the total monthly costs.

Table 7. Profits of the fishermen of Lemito Village

Description	Profit per month (IDR)
Total revenue (TR)	4,271,532.27
Total cost (TC)	2,585,133.52
Profit	1,686,398.75

Based on the classification of population income according to Table (1), the income of Lemito Village fishermen is in category III or moderate, which ranges from IDR 1,500,000– Rp 2,500,000 per month. However, compared with the regional minimum wage for Gorontalo Province in 2024 of IDR 3,025,100, the income is still relatively low.

DISCUSSION

Illegal fishing practices occur not only in Indonesia but also in the world. According to **Desai and Shambaugh (2021)**, illegal fishing can also harm the small-scale fishing economy. The problem of illegal fishing in Lemito Village has become a public scourge that fishermen are generally aware of. **Nahuelhual *et al* (2023)** reported that illegal fishing aligns with the characteristics of a wicked policy issue. It defies clear definition and generalization, presenting diverse representations and uncertainties regarding its nature, scale, and consequences. By framing illegal fishing as a wicked problem, stakeholders can acknowledge the absence of perfect solutions, prompting the consideration of a combination of imperfect governance approaches. Education about the threat to the sustainability of fisheries resources in the future needs to be emphasized on local fishermen as the main actors in fishing activities. Therefore, the education process regarding the negative impacts of illegal fishing must be carried out intensively. Improving education needs special attention from the government since fishermen in Lemito Village generally have only graduated from elementary school or not even

attended school. Special attention must be paid to formal and informal education for fishing families, and as a result fishermen's insight into fish resource management will be easily accepted and applied. Apart from that, strict supervision by law enforcement officials must continue to be carried out to provide a deterrent effect on individuals who carry out fishing activities that violate fishing regulations. These efforts will likely be able to minimize and even eliminate illegal fishing behavior.

Combatting illegal fishing practices in an area is complex since it involves many aspects and multi-sectors. The findings from the study conducted by **Kuemlangan *et al* (2023)** regarding approaches to eradicating illegal fishing are: illegal fishing cannot be solely addressed through better fisheries management practices and strengthened legislation, both administrative and criminal sanctions can be adopted to tackle illegal fishing, national fisheries legislation generally permits administrative and criminal enforcement approaches against illegal fishing, and to address illegal fishing, multipronged legal solutions are needed like criminalizing serious fisheries violations. A study by **Virdin *et al.* (2022)** revealed that efforts to combat illegal fishing have led to an expansion of seafood supply chain transparency initiatives; however, there is still limited understanding of their impact on fishing behavior and trade. The literature has mixed consensus that comparable transparency initiatives adopted in apparel, extractives, and timber supply chains have met their sustainability goals or significantly affected costs and revenues. This research is limited to the Lemito area, and further in-depth studies on technical investigations related to illegal fishing practices can be developed. Similar to previous research, involving broad aspects and components can enrich understanding and figure out solutions to eradicate illegal fishing practices on a local and national scale.

CONCLUSION

This work revealed that 67% of respondents assessed the condition of fish resources in Lemito Village waters as good, while the remaining 33% valued it as bad. Fishermen's knowledge of the existence of illegal fishing practices and the dangers of these practices in Lemito Village was acknowledged by 51- 59% of respondents. Meanwhile, 41- 49% admitted that they were unaware of the practice and its harm. Illegal fishing type occurring in this area is fishing using prohibited tools. Additionally, the average income of fishing communities in Lemito Village was categorized as moderate.

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