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ANALYSIS OF THE ENVIRONMENTAL FRIENDLINESS OF PURSE SEINE FISHING AT KENDARI OCEAN FISHING PORT, SOUTHEAST SULAWESI, INDONESIA

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ABSTRACT

Purse seine is a type of fishing gear used in commercial fishing. This fishing gear consists of a circular net equipped with rings and a drawstring. It is operated by pulling the net at the bottom by pulling the drawstring, and is operated by one or two boats. Based on the research results, the main catch was obtained in the form of *Decapterus spp* by 55% (16,648 kg), *Selarodies leptolepis* by 15% (4,500 kg) and Bycatch like as *Katsuwonus pelamis* by 12% (3,750 kg), *Euthynnus affinis* by 12% (3,550 kg), *Thunnus albacares* by 3% (768 kg), and *Elagatis bipinnulata* obtained by 3% (975 kg) (less during the fishing operation during six trips with a total catch of 30,191 kg of the total catch, the main catch was 70.0% (21,148 kg) and bycatch 30.0% (9,043). The initial damage to environmental resources and aquatic biota was caused by fishing activities and competition between fishing gears, causing fishermen to use various fishing methods, including those that were not environmentally friendly. Evaluation of the impact of fishing gear operations must be able to address several key issues, such as the impact on the environment, on resource abundance, the use of fishing gear, and the impact on target fish resources. Through the total number of each indicator, a comprehensive assessment can be compiled so that the resulting picture is not only based on one criterion, but includes all values. The results of the calculation of the level of environmental friendliness obtained a score of 30.1 and a total score of 1507. This value indicates that the purse seine is included in the very environmentally friendly category (28-36) for operation by fishermen in the PPS Kendari area.

Keywords: Purse Seine, Fishing Vessels, Environmental Friendliness, *Decapterus* spp

1 INTRODUCTION

Indonesia is a country dominated by vast expanses of water. Therefore, coastal area management is crucial and complex, given the vastness of the area to be managed and the diverse challenges faced. Participation from various stakeholders and stakeholdersis very necessary to ensure the sustainability of coastal ecosystems and the welfare of the people living around them [1].

The Banda Sea is a basin-shaped body of water that separates the Sunda Shelf in the west and the Sahul Shelf in the east.[2]. He explained that these waters are one of Indonesia's waters with significant potential for pelagic fisheries resources. The Banda Sea has the potential to be a habitat for pelagic fish such as *Thunnus* sp., *Decapterus* sp., *Katsuwonus pelamis*, *Euthynnus affinis*, and *Thunnus albacares*. Most of the fish caught in the Banda Sea are landed at the Kendari Oceanic Fisheries Port (PPS).[3] Salam et al 2026.The fishing gear that is widely operated at PPS Kendari is Purse seine, pole and line, and hand line.

Kendari Port has comprehensive port facilities for standard activities such as storage, processing, loading and unloading, and marketing or auctioning of catches. The types of fishing fleets operated there include: gillnet, pole and line, hand line, purse seine and so on [4]. Based on 2025 data, the recorded number of fishing vessel fleets was 581 units, dominated by purse seine vessels at 226 units, with a total fishery production landed at the PPS Kendari in 2025 of 16,912,670 kg. This reflects the increasing volume of capture fisheries production at the PPS Kendari, with a focus on sustainable management and improving the quality of fishery resources. The vessel fleet that is mostly found at the PPS Kendari is the purse seine. Generally, the use of Purse seine is much sought after by fishermen because it is considered to have potential and produces high catch productivity, indicating that capture fisheries Purse seine from an economic perspective, it is worth developing because it provides large profits [5].

Purse seine is an effective fishing tool used to catch pelagic fish that gather and live near the surface of the water, which consists of several ingredients and materials, its performance is determined by rational technical rules, including the use of the type of material, size and acceleration, including *Katsuwonus pelamis*, *Thunnus* sp., *Loligo* sp., *Decapterus* sp., *Rastleriger* sp., *Sardinella lemuru* [6].

To maintain the sustainability of fish resources in marine ecosystems, the government is implementing the concept Code of Conduct Responsible for Fisheries (FAO) Framework for Fisheries (CCRF) in 1995 is an international instrument containing rules and frameworks to promote sustainable and environmentally friendly fisheries development. The Indonesian government has implemented the CCRF as a guideline for responsible and sustainable fishing activities. These guidelines establish international principles and standards for responsible research to ensure the effectiveness of the conservation, management, and development of aquatic living resources, while preserving ecosystems and biodiversity is also a priority [7].

2 MATERIAL AND METHODS

2.1 Time and Place

The research will be conducted at the Kendari Ocean Fisheries Port (PPS) in Southeast Sulawesi, with the management area located at FMARI 714. The research will be conducted from January 26 to May 9, 2026.

2.2 Tools and materials

Table 1 Tools and materials used during the research include boats, fishing gear, stationeries, cameras/cell phones, calculators.

2.3 Method of collecting data

2.3.1 Data primer

Primary data was obtained through direct observation during purse seine operations. Interviews with fishermen were also conducted to gather data related to the analysis method.

2.3.2 Data seconds

Secondary data is obtained from related agencies or parties by means of data requests, the data is in the form of the number and type of fishing gear, number and size of vessels, catch production, etc.

2.3.3 Data Analysis Method

Analysis of the composition of purse seine catch results

The data analysis method used to calculate the catch composition in purse seine fishing is based on the composition of each trip per unit setting (kg) using the following formula:

$$pi = \frac{\text{ni}}{\text{N}}\ x\ 100\%$$

Information:

pi = Abundance of Catch Results (%)

is = Total Species Catch (kg)

N = Total Catch Amount (kg)

2.4 Analysis of the proportion of main and by-catch

According to [8], Fish caught from purse seines are classified into two types, namely target fishing and bycatch. Target fishing includes species targeted by fishing activities or operations. Meanwhile, bycatch is species outside the target fishing activities or operations. Data on the number and weight of fishing targets and bycatch from fishing operations are calculated as a percentage, then compared to determine which of the two has the greater proportion. The proportion of target fishing and bycatch. If the proportion of Target fishing obtained is ≥ 60%, the fishing gear can be considered environmentally friendly.[9] described in the following formula:

Target fishing = $\frac{Total\ main\ catch}{Total\ catch}$ x 100%

Bycatch = $\frac{Total\ bycatch}{Total\ catch}$ x 100%

2.5 Analysis of the number of respondent samples

According to [10], explains that a sample is a portion of the characteristics or traits possessed by a population which is a small part taken from the population members based on predetermined procedures so that it can be used to represent the population. Sampling uses the purposive sampling method, namely taking samples from the population based on predetermined criteria to determine the number of respondent samples can use the Slovin formula as follows;

$$\text{n} = \frac{N}{1 + Ne^2}$$

Information:

n: Sample size

N: Population size

e: Estimated error rate

1: Constant value

2.6 Analysis of the level of environmental friendliness of fishing gear

The data analysis method is carried out in accordance with the weighting criteria for environmentally friendly fishing gear based on nine criteria for environmentally friendly fishing gear in accordance with Code of Conduct for Responsible Fisheries (CCRF), 1995 [11].

- Fishing gear must have high selectivity;
- The fishing gear used does not damage the habitat, living and breeding places of fish and other organisms;
- Does not harm fishermen;
- Produce good quality fish;
- The product does not harm the health of consumers;

- Bycatch minimum;
- The fishing gear used must have a minimum impact on the diversity of biological resources (*biodiversity)*;
- Do not capture legally protected or endangered species;
- Socially accepted.

The environmental friendliness criteria score for fishing gear can be seen in table 1 below:

Table 1: Scores of criteria for the level of environmental friendliness of fishing gear.

No.	Criteria	Sub Criteria	Score	Choice
1.	Has high selectivity	The fishing gear more than 3 species with very different sizes.	1	
		The fishing gear 3 species with very different sizes.	2	
		The fishing gear less than 3 species of approximately the same size.	3	
		The tool catches only 1 species with approximately the same size.	4	
2.	The fishing gear used does not damage the habitat, reproduction of fish and other organisms.	Causes habitat destruction over large areas	1	
		Causes habitat destruction in a narrow area	2	
		Causes some habitats in narrow areas	3	
		Safe for habitat (does not damage habitat)	4	
3.	Does not endanger fishermen	Fishing gear and how it is used can result in death for fishermen	1	
		Fishing gear and its use can result in permanent disability for fishermen.	2	
		Fishing gear and its use can result in temporary health problems.	3	
		Safe fishing gear for fishermen	4	
4.	Producing good quality fish	Fishing gear produces dead and rotten fish	1	
		Fishing gear produces dead, fresh and physically defective fish	2	
		Fishing gear produces fresh dead fish	3	
		Fishing gear produces live fish	4	
5.	The product does not harm the health of consumers	In this criterion, the safety of the catch is determined by the method of operation of the fishing gear. If toxic materials or other hazardous substances are used during the fishing process, this will have an impact. at the level of consumer safety:		
		Has a high chance of causing death	1	
		Potential to cause health problems for consumers	2	
		Very small chance of harming consumer health	3	
		Safe for consumers	4	
6.	*by-catch* minimum	Bycatch consists of several species that are not sold in the market	1	
		Bycatch consists of several types and some are sold in the market	2	
		Bycatchless than three types and sold in	3	
		Bycatch less than three types and high priced in the market	4	
7.	The fishing gear used must have a minimum impact on biodiversity	Fishing gear and its operations cause the death of all living creatures and destroy habitats.	1	
		Fishing gear and its operations cause the death of several species and destroy habitats.	2	
		Fishing gear and its operations cause the death of some species but do not damage habitat.	3	

		Safe for the diversity of biological resources	4	
8.	Do not capture legally protected or endangered species	Fish protected by law are often caught by fishing gear.	1	
		Fish protected by law have been caught several times by fishing gear	2	
		Protected fish have been caught	3	
		Protected fish are never caught	4	
9.	Socially Accepted	Community acceptance of a fishing tool will depend greatly on the social, economic, and cultural conditions of a given location. A tool is socially accepted by a community if: 1. Low investment costs. 2. Economically profitable. 3. Does not conflict with local culture. 4. Not contrary to existing regulations. The weighting of the criteria is determined by assessing the reality in the field that:		
		Fishing gear meets one of the four points in the statement above	1	
		The fishing gear meets two of the four points in the statement above	2	
		The fishing gear meets three of the four points in the statement above	3	
		The fishing gear meets all the above statements	4	
Amount			36	

After collecting all the scores from the interviews, the next step is to calculate the average score. This is done by dividing the total score obtained by all respondents by the number of respondents. In this assessment, a score of 1 is interpreted as the lowest score, while a score of 4 is interpreted as the highest score. In other words, the higher the score selected by the respondent, the higher the score obtained for each criterion assessed. The calculation of the environmental friendliness score of fishing gear can be seen in the following formula:

$$X = \frac{\sum Xn}{N}$$

Where:

X = Total score of environmental friendliness level

∑Xn = Total number of score values;

N = Number of Respondents.

According to [12] Once the scores or values are obtained, a reference point is created to serve as a reference point for determining rankings. Here, the maximum score or value is 36 points, while the eco-friendly fishing gear category is divided into four categories with value ranges as shown in Table 2 below:

Table 2: Categories of environmental friendliness scores of fishing gear

No.	Category	Score
1	Very Unfriendly to the Environment	Indicators 1-9
2	Not Environmentally Friendly	Indicators 10-18
3	Environmentally friendly	Indicators 19-27
4	Very Environmentally Friendly	Indicators 28-36

Source: [13]

3 RESULTS AND DISCUSSION

3.1 Fishing Vessel

According to [14] a fishing vessel is a type of vessel used by fishermen for fishing activities. This vessel serves as the primary means of catching fish and also serves as a storage facility for the catch during processing at sea. After the operation is complete, the vessel also plays a role in storing the catch to ensure it remains safe and prevents damage. In addition to storing the catch, fishing vessels are equipped with facilities for cooling the catch, thus maintaining the quality of the fish until it reaches the port or is transported.

Figure 1: Purse seine vessel used during the research.

3.2 Fishing area

According [15] a fishing ground is a water area where target fish can be maximally caught using effective and economical fishing gear. The area must be large enough to allow for optimal fishing gear operation. Fishing activities are carried out at FMARI 714, where fish aggregating devices (FADs) are positioned at least 5 miles east of Ereke Island in North Buton, with a maximum distance of 12 miles, as described below.

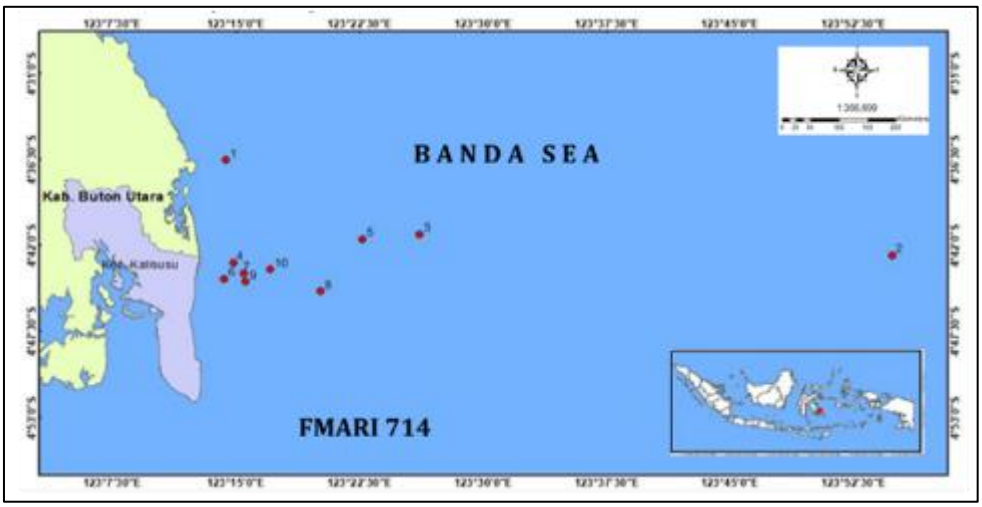

Figure 2: Fishing Area

3.3 Composition of Purse Seine Catch Results

According to [16] The catch in fisheries refers to fish, squid, crabs or other marine biota caught by fishing gear such as nets. Purse seine, the catch includes two categories, namely the main catch which is the target fishing and bycatch those caught. Thus, the definition of catch includes all organisms obtained from a fishing operation, both those that meet the target and those that are not. The catch consists of several species, as can be seen in table and figure 3.

Table 3: Composition of catch

No.	Species	Trip 1 (kg)	Trip 2 (kg)	Trip 3 (kg)	Trip 4 (kg)	Trip 5 (kg)	Trip 6 (kg)	Total (kg)
1	*Decapterus macrosoma*	2.147	2.725	1.200	2.044	6.732	1.800	16.648
2	*Selarodies leptolepis*	1.200	1.000	550	500	800	450	4.500
3	*Katsuwonus pelamis*	400	650	950	1.000	400	350	3.750
4	*Euthynnus afinnis*	3000	150	400				3.550
5	*Thunnus* sp.	300	168	50	150		100	768
6	*Elagatis bipinnulata*	240	400	160		100	75	975
	Amount	7.287	5.093	3.310	3.694	8.032	2.775	30.191

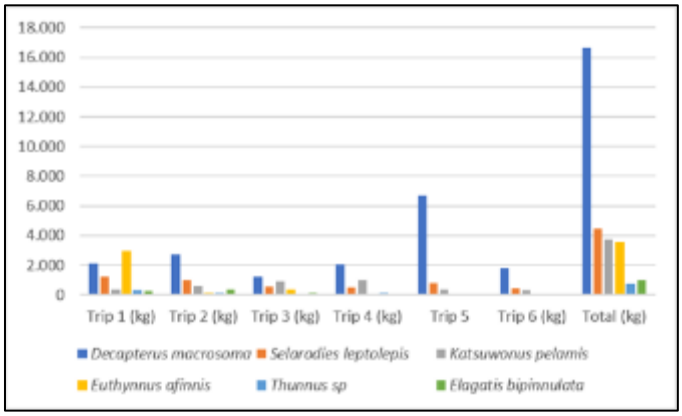

Figure 3: Graph of catch results per trip

The catch of large and small pelagic fish is divided into two catch groups. [17] Target species include species targeted by fishing operations. Meanwhile, bycatch are species not targeted by fishing activities or operations. Fishing operations during the six trips were dominated by primary target fish, such as *Decapterus macrosoma, Euthynnus affinis, Katsuwonus pelamis,* which has a high selling value. Meanwhile *Thunnus* sp, *Selarodies leptolepis*, and *Elagatis bipinnulata* is a bycatch fish which are usually used and resold by fishermen depending on the level of damage to the fish. The percentage composition of the catch during the six trips can be seen in the diagram below.

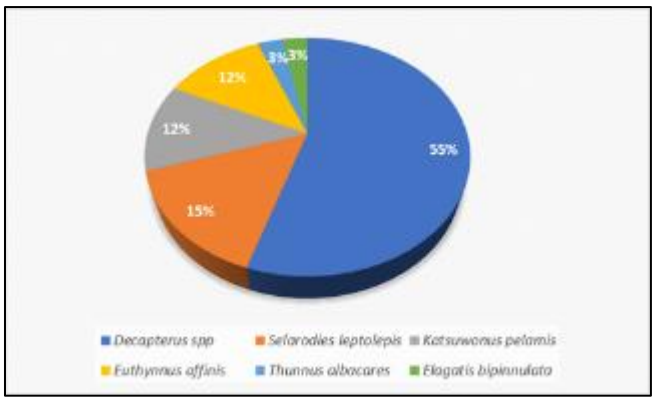

Figure 4: Diagram of catch composition

Based on the research results, the target fishing was obtained in the form of *Decapterus* spp. by 55% (16,648 kg), *Selarodies leptolepis* by 15% (4,500 kg). Bycatch results such as, *Katsuwonus pelamis* by 12% (3,750 kg), *Euthynnus affinis* by 12% (3,550 kg), *Thunnus albacares* by 3% (768 kg), and *Elagatis bipinnulata* obtained by 3% (975 kg) (less

during the fishing operation during six trips with a total catch of 30,191 kg. Based on the distribution of the catch composition, it can be concluded that the catch is dominated by *Decapterus* spp. and cannot be estimated due to several factors such as waves, currents, and torn nets which affect the percentage composition of the number of catches.

3.4 Proportion of Target Fishing and Bycatch Results

The percentage of target fishing in Figure 4 shows that the main catch is still dominated by *Euthynnus affinis*, *Thunnus sp.*, and *Katsuwonus pelamis*. Meanwhile, the bycatch is dominated by *Thunnus albacares*, and *Elagatis bipinnulata*, with this according to [18] The role of the catch proportion is used to calculate the percentage of each species obtained during the fishing process. With this calculation, the ratio of each organism included in the catch can be determined, so the catch proportion can help determine the large percentage of the target fishing, bycatch, and the amount ultimately discarded. This determination is important for assessing the effectiveness of fishing operations and understanding the impact on non-target species. Furthermore, the proportions can be used as a basis for more precise fishing gear management, thereby increasing target yields. The proportions of target fishing and bycatch are presented in Table 4 and the following figure:

Table 4: Proportion of target fishing and bycatch

No.	Catch	Weight (kg)	Percentage (%)
1	Target fishing	21.148	70,0
2	Bycatch	9.043	30,0
	Amount	30.191	100

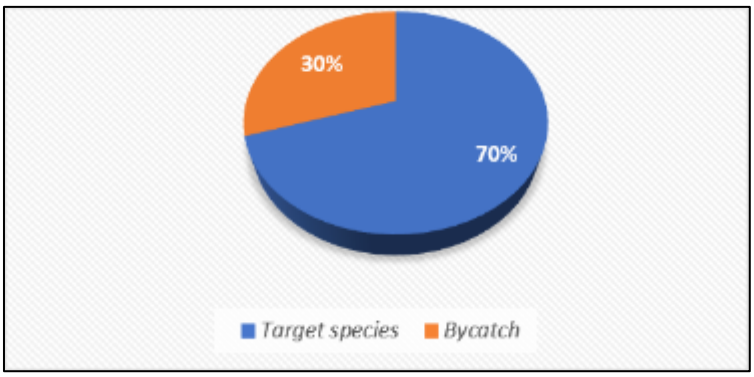

Figure 5: Diagram of the proportion of target fishing and by-catch results

Based on the graph above, the percentage of the proportion of catch between the target fishing and bycatch with a percentage of target fishing of 70.0% (21,148 kg) and bycatch 30.0% (9,043). This shows that the purse seine has a good level of selectivity and it can be said that the large value of the proportion of the target fishing in terms of quantity is more dominant because the target fishing is small pelagic fish that live in schooling in searching for the optimum habitat for its survival.

3.5 Analysis of the Number of Respondent Samples

Based on the observation results, the respondents needed during data collection that correspond to the level of fishing gear friendliness include all purse seine fishermen at PPS Kendari. The selection of respondents was carried out by purposive sampling, namely a method where respondents were deliberately selected to represent the research objectives, the data collection technique was carried out through a survey method, in the form of primary data and secondary data based on the Slovin formula, the results of the calculation of the number of respondents taken are as follows:

$$\mathrm{n} = \frac{N}{1 + Ne^2}$$

$$n = \frac{138}{1 + 138 \times 0.1^2}$$

$$n = \frac{138}{2,74}$$

$$n = \frac{138}{2,74}$$

$$n = 50$$

Based on the results of the calculation of the number of respondent samples, 50 respondents were generated, which was generated based on the number of fishermen who own boats, which was 138 people.

3.6 Environmental Friendliness Level of Fishing Gear

The main criteria for determining the level of environmental friendliness, based on the provisions [19] the criteria for environmentally friendly fishing gear meet nine criteria, each of which has four sub-criteria to be assessed. These four sub-criteria are weighted from lowest to highest. The weighting method for these four sub-criteria is to create a score from lowest to highest, followed by a final point based on the results selected by the respondents.

Data collection of respondents totaling 50 purse seine fishermen with a total of 28 people on small pelagic purse seine vessels and 22 people on large pelagic purse seine vessels with each having a score value on the criteria for environmentally friendly fishing gear, which resulted in a total of 1503 scores with an average age of respondents of 29 years. From the interview results, it was found that the last educational qualification of respondents by purse seine fishermen was elementary school education of 19 people, junior high school education of 16 people, and high school education of 14 people. This shows that the educational qualification of purse seine fishermen is dominated by elementary school level. The percentage of environmentally friendly fishing gear criteria is presented by calculating the scores chosen by respondents, which can be seen in the diagram below.

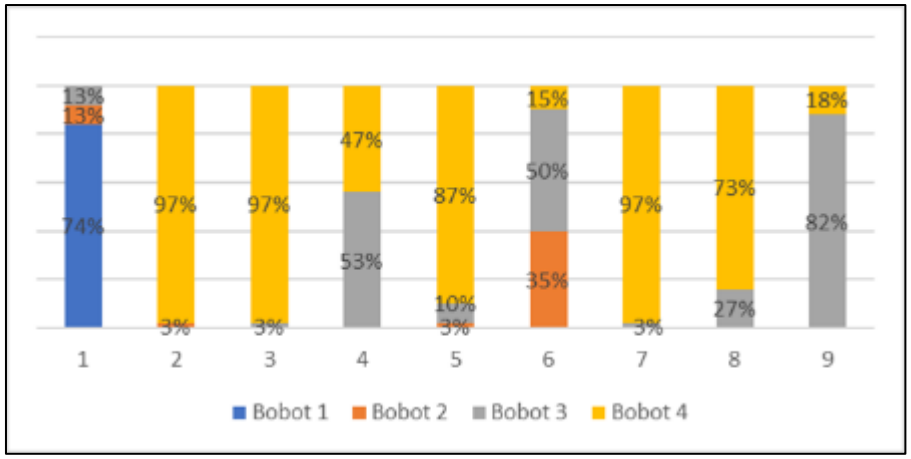

Figure 6L Percentage diagram of environmental friendliness level scores.

3.6.1 High level of selectivity

Based on the results of the purse seine fisherman questionnaire, out of 50 respondents, 74% (42 respondents) caught more than three species with very different sizes while 13% (4 respondents) caught three species with very different sizes and 4 respondents (13%) caught less than three species with approximately the same size. This shows that the average criterion 1 produces low selectivity or is not yet selective by using a 1 inch mesh size net on the bag and using fish aggregating devices (FADs) and light with a total score of 62.

Table 5: Criteria for high selectivity levels

Criteria	Sub Criteria	Weight	Respondent	Amount
High Selectivity	Fishing gear more than 3 species with very different sizes.	1	42	42
	Fishing gear 3 species with very different sizes.	2	4	8
	Fishing gear less than 3 species of approximately the same size.	3	4	12

	Fishing gear only 1 species with approximately the same size.	4	0	0
	Amount			62

This is in accordance with what was quoted from [20] in his research he said that the operating pattern Purse seine by wrapping it around a school of fish that becomes target fishing one way to find a way is to use fish aggregating devices (FADs) and lighting. These two devices function to gather fish for a specific period of time, allowing them to group together and allow for fishing gear operation. The light is used at night.

3.6.2 The level of damage to aquatic habitats

Maintaining fish habitat plays a crucial role in supporting the sustainability and conservation of fish resources. Good habitat conditions allow fish to function optimally, including providing shelter and the ability to grow and reproduce. In addition to providing habitat for target fish, a well-maintained habitat also benefits other organisms that contribute to the aquatic ecosystem. Therefore, questions about habitat impacts should focus on how fishing activities or gear can affect the environment in which fish and other biota live.

Table 6: Criteria for the level of damage to aquatic habitats

Criteria	Sub Criteria	Weight	Respondent	Amount
No Habitat Damage	Causes habitat destruction over large areas	1	0	0
	Causes habitat destruction in a narrow area	2	1	2
	Causes partial destruction of habitat in a narrow area	3	0	0
	Safe for habitat	4	49	196
	Amount			198

Based on the second criteria, the level of habitat damage received a weighted value with an average of 4, namely 97% (49 respondents) who indicated purse seine is safe for the habitat during operations because it is surface-based and does not reach the seabed, while on the other hand, 3% (1 respondent) said that fishing gear causes habitat damage in narrow areas because some vessels still do not comply with regulations during operations. The second criterion received a total score of 198.

Thus, as mentioned by [21], that the emergence of purse seines answers all the problems regarding safe fishing because in its operation it does not disturb the habitat or damage the ecosystem in the waters, this is because purse seines are an effective fishing tool for catching pelagic fish that are in groups and live near the surface of the water and do not reach the seabed.

3.6.3 The level of danger to the safety of fishermen

The criteria of not endangering fishermen received a weighted score of 97% with 49 respondents indicating that the use of purse seines is mostly safe for fishermen, although some of them can cause health problems of 3% (1 respondent) such as body aches and fever after operation. In this criterion, a total score of 199 was obtained and it is recommended that the captain and crew pay attention to safety during operation, one of which is by providing work equipment to reduce the level of work accidents.

Table 7: Criteria for the level of danger to fishermen's safety

Criteria	Sub Criteria	Weight	Respondent	Amount
No Harm to Fishermen	Its use can result in death for fishermen.	1	0	0
	Its use can result in permanent disability in fishermen.	2	0	0
	Its use may result in temporary health problems.	3	1	3
	Safe for fishermen	4	49	196
	Amount			199

3.6.4 High quality fish quality level

Based on the interview results, the fourth criterion, namely catch quality, resulted in a weighted score of 53% (28 respondents) who chose to produce fresh, dead fish without physical defects during operation. Meanwhile, 22 fishermen respondents stated that when hauling the fishing gear, the fish they caught tended to be fresh, live fish. The total score for the fourth criterion was 172.

Table 8: Criteria for high quality fish quality levels

Criteria	Sub Criteria	Weight	Respondent	Amount
Quality of the Catch	Produces dead and rotten fish	1	0	0
	Produces dead, fresh and physically defective fish	2	0	0
	Produce fresh dead fish	3	28	84
	Produce live fish	4	22	88
	Amount			172

This is in accordance with what was said [22] to maintain freshness and quality, caught fish are then moistened or doused with seawater before being loaded into the hold. This process prevents the fish from deteriorating quickly and maintains their cleanliness while on board. By periodically adding seawater, the fish can also be better prepared for storage in the hold, thus maintaining optimal quality.

3.6.5 Levels that do not harm consumer health

Based on the fifth criterion, namely that the product does not endanger the health of consumers, producing varied score data, there is a percentage of weighted values of 87% (45 respondents) that the catch is considered safe for buyers or consumers, because the fresh fish caught is poured into the hold accompanied by sea water and ice, so that the quality of the fish can be maintained.

Table 9: Criteria for levels that do not endanger consumer health

Criteria	Sub Criteria	Weight	Respondent	Amount
The product does not harm the health of consumers	Has a high chance of causing death	1	0	0
	Potential to cause health problems for consumers	2	1	2
	Very small chance of harming consumer health	3	4	12
	Safe for consumers	4	45	180
	Amount			194

Meanwhile, some fishermen believe that the catch has a very small chance of causing health problems, at 10% (4 respondents), and a small number (3% (1 respondent) said the catch has the potential to cause health problems for consumers if the handling process is not optimal, resulting in fish spoilage. The total score for the criterion "Product does not harm consumers" was 194.

3.6.6 Bycatch rate

According to [23] bycatch is a type of fish or other biota that is not the primary target of a fishing operation, but is caught by fishing gear. Although not the species planned for capture, this biota still has sufficient economic value to be sold. With the presence of bycatch, fishing activities not only produce target fishing but also provide additional income for fishermen.

Table 10: Bycatch level criteria

Criteria	Sub Criteria	Weight	Respondent	Amount
Bycatch minimum	Bycatch consists of several types (species) that are not sold on the market	1	0	0
	Bycatch consists of several types and some are sold in the market	2	20	40
	Bycatch less than three types and sold in the market	3	25	75
	Bycatch less than three types and high priced in the market	4	5	20
	Amount			135

In the sixth criteria, 50% (25 respondents) were of the opinion that by catch less than three types and sold well in the market and as many as 20 respondents (35%) chose a score of 2, bycatch consists of several types and is sold in the market. Some fishermen think that bycatch which produced less than three types and had high market value of 15% (5 respondents), this shows that the sixth criterion produced varying weight values with a total score of 135.

3.6.7 The level of non-damaging habitat (biodiversity low)

Table 11: Criteria for the level of non-damage to the habitat (low biodiversity)

Criteria	Sub Criteria	Weight	Respondent	Amount
Biodiversity	Fishing gear and its operations cause the death of all living creatures and destroy habitats.	1	0	0
	Fishing gear and its operations cause the death of several species and destroy habitats.	2	0	0
	Fishing gear and its operations cause the death of some species but do not damage habitat.	3	1	3
	Safe for the diversity of biological resources	4	49	196
	Amount			199

Criteria on impact to biodiversity received a value that was dominated by weight 4, namely 97% (49 respondents) who thought purse seine considered to have a safe and non-damaging impact biodiversity. Meanwhile, a small proportion of fishermen chose weight 3, amounting to 3% (1 respondent), which causes death in several species, but does not damage the habitat. In the indicator "Level of not damaging the habitat (biodiversity)" resulting in a total weighted value of 199.

3.6.8 The level does not harm protected fish.

Based on the results of data collection on the eighth criteria regarding "Level of danger to protected fish" of 73% (42 respondents) chose a value with a weight of 4, namely protected fish have never been caught, meanwhile, several fishermen think that some protected fish such as dolphins, baby sharks have been trapped during operations which were then released again in order to implement regulations in accordance with the Decree of the Minister of Maritime Affairs and Fisheries No. 66., (2025) which regulates the types of protected fish, namely 27% (8 respondents) with a total weight value of 192.

Table 12: Criteria for the level of danger to protected fish

Criteria	Sub Criteria	Weight	Respondent	Amount
Do not capture legally protected or endangered species	Legally protected fish are often caught	1	0	0
	Legally protected fish caught several times	2	0	0
	Protected fish have been caught	3	8	24
	Protected fish are never caught	4	42	168
	Amount			192

3.6.9 Socially acceptable level

The final criterion, which assesses whether the purse seine operation at the Kendari Fisheries Port (PPS) is "socially acceptable," is based on several aspects, including low investment costs, economically advantageous fishing gear, compliance with local culture, and compliance with applicable regulations. These four aspects are then used to determine whether the four statements above align with the fishermen's responses.

Table 13: Criteria for socially acceptable levels

Criteria	Sub Criteria	Weight	Respondent	Amount
Socially Accepted	Fishing gear meets one of the four points in the statement above	1	0	0
	The fishing gear meets two of the four points in the statement above	2	0	0
	The fishing gear meets three of the four points in the statement above	3	44	132
	The fishing gear meets all the above statements	4	6	24
	Amount			156

Based on observation and interview data, 44 respondents (82%) chose a weighting value of 3, namely that the fishing gear fulfills three of the four statements above. This shows that the average investment cost for purse seine fishing is In PPS Kendari, it is relatively expensive, ranging from IDR 500,000,000 – IDR 1,000,000,000 as initial investment capital and IDR 20,000,000 – IDR 25,000,000 as capital for each trip, then 18% (6 respondents) chose a weight value of 4, the fishing gear fulfills all the statements above, resulting in a total weight value of 156. The nine criteria for the level of environmental friendliness, the results obtained include the total number of indicators based on the Food and Agriculture Organization (FAO) guidelines. Code of Conduct for Responsible Fisheries (CCRF) in 1995 can be summarized in the following table 14:

Table 14: Summary of the total number of environmental friendliness questionnaire scores for purse seines

No.	Criteria for Environmentally Friendly Fishing Gear According to FAO (1995)	Total Scores
1	Has high selectivity	62
2	Does not damage the habitat	198
3	Does not endanger fishermen	199
4	Producing good quality fish	172
5	Production does not harm consumers	194
6	bycatch minimum	135
7	Providing minimum impact on biodiversity	199
8	Do not capture legally protected or endangered species	192
9	Socially accepted	156
Amount		1,507

Based on the total score in Table 19, it can be concluded that the highest score was obtained for criterion 3, "Does not endanger fishermen", with a total score of 199, which can be said to have achieved a perfect score. Meanwhile, the lowest score was for criterion 1, namely "Fishing gear has high selectivity," with a total score of 62. The process of calculating the total for each indicator is an important step in forming a more complete picture of the research results.

Through the total number of each indicator, the assessment can be compiled comprehensively so that the resulting picture is not only based on one criterion, but includes the entire value so that conclusions can be drawn from the research that has been done. By collecting and analyzing the values of the nine CCRF criteria, this study is able to produce a more detailed understanding of the level of environmental friendliness of the purse seine from each criterion presented in the form of a comprehensive calculation that can be seen through the results of the formula below:

$$X = \frac{\sum Xn}{N}$$

$$X = \frac{1.507}{50}$$

$$X = 30{,}1$$

According to [24] The main criteria for assessing environmentally friendly fishing gear refers to the opinion that fishing gear is said to be environmentally friendly if it meets 9 criteria. Based on the results of the calculation of the level of environmental friendliness, the value of X = 30.1 was obtained. This value indicates that the purse seine is included in the very environmentally friendly category for operation by fishermen in the Kendari PPS area.

4 CONCLUSION

Based on the research results on the level of friendliness of purse seine at PPS Kendari, the following conclusions can be drawn:

- The types of fish caught at PPS Kendari tend to consist of large pelagic fish species, however, it can be said that vessels with the same fishing gear also produce appropriate catches and the catches obtained during six trips are still dominated by small pelagic fish with a total production of 30,191 kg.
- The proportion of purse seine catches in the study showed that the main catch was dominated by *Decapterus* spp and *Selarodies leptolepis*, amounting to 21,148 kg (70%). Meanwhile, bycatch was dominated by large pelagic fish such as *Katsuwonus pelamis*, *Euthynnus affinis*, *Thunnus albacares*, and *Elagatis bipinnulata*, amounting to 9,043 kg (30%).
- Environmental friendliness level of purse seine resulting in a total score of 30.1 which means the average purse seine which is operated at PPS Kendari is classified as very environmentally friendly.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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No conflict of interest to be disclosed.

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