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CATCH COMPOSITION AND ENVIRONMENTAL FRIENDLINESS LEVEL OF SONDONG FISHING GEAR LANDED AT THE FISHERY HARBOR OF RIAU PROVINCE

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ABSTRACT

Sondong fishing gear is one of the dominant fishing gear used by fishermen in the UPT Fisheries port of Riau Province Dumai City, which, when operated, can scrape to the bottom of the waters. The specifications of sondong fishing gear affect the catch. This study aimed to determine the composition of catches based on type, length, and weight and explain the level of environmental friendliness of sondong fishing gear that refers to the FAO 1995 CCRF criteria and Taeran 2014 subcriteria. The method used in this research is a survey method, which is conducted by conducting interviews and collecting data directly in the field, then analyzing it using descriptive statistics. The results showed that the composition of the main catch was white shrimp (*Penaeus merguiensis*), red prawn (*P.monodon*), and kelong shrimp (*P. indicus*). At the same time, the bycatch was white pomfret (*Pampus argenteus*), gulamah (*Pseudocienna amovensis*), gangetic anchovy (*Thryssa mystax*), malung (*Muraenesox cinereus*), stingray (*Dasyatis* sp), and crab (*Portunus pelagicus*). The environmentally friendly level of sondong fishing gear, with a value of 16.43 from the interviews with 23 respondents using 8 criteria, states that sondong fishing gear is a category of fishing gear that is not environmentally friendly.

Keywords: Sondong fishing gear, Catch composition, Environmentally friendly

1. INTRODUCTION

Dumai City is one of the cities in Riau Province with a significant role in the marine fisheries sector. The marine waters of Dumai City are sand and mud bottom waters. The amount of mud and suspended solids in these waters is due to many river flows[1]. Many river flows around Dumai City are supported by two large rivers, namely the Dumai River and the Mosque River, which flank it, resulting in the waters around Dumai City being fertile with mineral content carried by the river flows to the sea. Its strategic location on the east coast of Sumatra Island causes Dumai City to be used as the main gate in Sumatra, with the most significant port facilities in Riau Province.

Sondong fishing gear is a fishing gear that actively moves in the waters; in general, the shape and workings of this tool are almost the same as tangguk fishing gear; it is just that the sondong is bigger. When operated, the net stretches in the water in such a way as to use a wooden frame that is transverse or shaped like scissors, and in the middle latitude of the wood has been tied to the bow of the ship. The open space is placed net, then pushed by using a motorboat. The principle of catching fish and shrimp using sondong is by scooping. The difference is that if the sondong boat is scooped with a sondong net without using a boat, it is pushed by a boat.

The main target catch of sondong fishing gear is shrimp. Based on the research results of Syarifuddin[2]; Pramesthy et al.[3], the bycatch of sondong in Dumai is relatively high at 30%. This is because sondong is a

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type of trawl categorized as having low selectivity.

Sondong fishermen in Dumai already know that the sounding fishing gear they operate is prohibited because it includes push trawl; this can be seen because it has almost the same characteristics as surface trawl, namely fishing gear using a mesh bag with an open mouth. This follows PERMEN KP[4], which prohibits sondong fishing gear and has received warnings but no sanctions.

The banned sondong fishing gear based on KKP[5] is environmentally unfriendly[6]. States that ecologically friendly fishing gear is fishing gear that does not harm the environment, considering the extent to which the fishing gear damages the water bottom. The impact on the diversity of living things and the target composition of the catch, the presence of bycatch, and the capture of fish with a size below the catchable size[7]. Stated that the development of capture fisheries based on the Code of Conduct for Responsible Fisheries (CCRF) can be done to utilize the potential of capture fisheries optimally and can affect the economy and welfare of fishermen.

Among the criteria in the CCRF for determining environmentally friendly fishing gear are high selectivity and not damaging aquatic habitats. While sondong fishing gear has very low selectivity and its operation by pushing (dredge) to the bottom of the waters, it is still continuously used by local fishermen in Dumai City.

2. RESEARCH METHOD

Time and Place

This research was conducted in August 2022. The research was conducted in Dumai waters, specifically at the Riau Province Fishery Port UPT.

Methods

The method used in this research is to use the survey method on sondong fishing gear by conducting interviews with respondents and collecting data directly at the Riau Province Fishery Port UPT.

Procedures

The research procedures are as follows: (1) Identifying the construction of sondong fishing gear and participating directly when operated. Participate directly when operated. (2) Direct survey of the process of landing fish by fishermen to obtain data on the composition of the catch of sondong fishing gear.

(3) Collecting data on the type and morphometric size of captured shrimp[8,9]. (a) Total length (PTO) is the distance from the tip of the rostrum to the tip of the telson with the abdomen straightened. (b) Carapace length (PK) is the distance from the orbit's tip to the carapace's posterior side.

(4) Collect data on the type and size of fish, including total length and fish size data[10]. (a) Total Length (TL) is a measurement with a straight line distance starting from the tip of the front head to the tip of the rearmost tail fin. (b) Body Depth (BDH) is measured at the highest part of the body (between the dorsal and ventral parts). (c) composition of catch per kg.

(5) Scoring as a determinant of the friendliness of sondong fishing gear to the environment was obtained by filling out a questionnaire to 23 respondents consisting of 18 sondong fishermen (who acted as boat owners, skippers, and crew members), 2 agents, 2 employees of the Riau Provincial Fishing Port UPT, and 1 lecturer in aquatic resource utilization. How to score the criteria for environmentally friendly fishing gear that refers to the requirements FAO[11] and sub-criteria according to Taeran[12] can be seen in Table 1.

Table 1. Criteria and Sub-Criteria for Environmentally Friendly Fishing Gear (Taeran[12])

No	Criteria	Subcriteria	Score
1	Selective and environmentally safe fishing gear and practices (CCRF 1995, article 6, 6.6)	- The tool catches more than three species with vastly different sizes	1
		- Tools for catching three or fewer species of vastly different sizes	2
		- Tools for capturing less than three species of approximately the same size	3
		- A tool to catch only one species of approximately the same size	4
2	Protecting habitats (CCRF 1995, article 6, 6.8)	- Causes habitat destruction over large areas	1
		- Causes habitat destruction in narrow areas	2
		- Destroys some habitat in a narrow area	3
		- Safe for habitat	4
3	Ensure compliance with appropriate safety requirements for fishing vessels and fishers following international conventions (CCRF 1995, article 8, 8.2.5)	- Can cause death to fishermen	1
		- This can result in permanent disability for fishermen	2
		- Only causes temporary health problems	3
		- Safe for fishermen	4
4	Maintaining the fish quality assurance system (CCRF 1995, article 11, 11.1.2)	- Dead and rotten fish	1
		- Dead fish, fresh and physically disabled	2
		- Fresh dead fish	3
		- Live fish	4
5	Ensure the rights of consumers to safe, wholesome, and unadulterated fish and fishery products. (CCRF 1995, article 11, 11.1.1)	- Great chance of causing consumer death	1
		- Chance to cause consumer health problems	2
		- Relatively safe for consumers	3
		- Safe for consumers	4
6	Minimize catch of non-target species (CCRF 1995, article 6, 6.6)	- Bycatch consists of several types (species) that are not sold in the market	1
		- Bycatch consists of several types, and some are sold in the market	2
		- Bycatch less than three types and sell well in the market	3
		- Bycatch less than three kinds and high prices in the market	4
7	Safeguarding the biodiversity of ecosystems and the aquatic habitat (CCRF 1995, article 12, 12.10)	- Cause the death of all living things and damage the habitat	1
		- Lead to the death of several species and damage to the habitat	2
		- Cause the death of some species but do not destroy habitat	3
		- Safe for biodiversity	4

8	Endangered species are protected (CCRF 1995, article 7, 7.2.2)	-	Protected fish are often caught in fishing gear	1
		-	Protected fish caught several times	2
		-	Protected fish have been caught	3
		-	Protected fish are never caught	4

Data Analysis

Catch Composition

Descriptive statistical analysis was conducted on the research data. Catch composition data is made in percentages and depicted in diagrams. Percentage calculation with the formula:

$$\% X = \frac{\sum X}{n} \text{ x } 100\ \%$$

Description:

% X = Percentage of the number of results caught of type x
$\sum X$ = Number of catches x
n = Total number of catches

Environmentally Friendly Level of Fishing Gear

An environmentally friendly analysis was conducted to select destructive or damaging fishing units to fish resources, ecosystems, the surrounding environment, and communities[13]. Scoring to find the environmental friendliness of fishing gear is an assessment of the 4 sub-criteria by making a score from the lowest value to the highest value as follows: score 1 for the first sub-criterion, score 2 for the second criterion, score 3 for the third sub-criterion, score 4 for the fourth sub-criterion.

Reference points are made to determine the final score of each criterion for environmentally friendly fishing gear with the following formula:

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

Description:

X = Environmentally friendly score
Xn = Total score
N = Number of respondents

To determine the ranking, the maximum score is 32 points, while the category of environmentally friendly fishing gear will be divided into 4 indicators scoring the value range, namely[14]:

25 - 32 very environmentally friendly
17 - 24 environmentally friendly
9 - 16 not environmentally friendly
0 - 8 very environmentally unfriendly

3. RESULT AND DISCUSSION

Operation and Installation of Sondong Net

Sondong fishing gear operated at UPT Pelabuhan Perikanan Riau Province can be carried out by 1-3 fishermen and is usually operated on the bottom of waters that have mud or sand by going through 2 stages. The stage is carried out by paying attention to the state of tides and currents to maximize the catch obtained. The first stage is the installation of the net (setting), and the second stage is lifting the net (hauling).

The sondong net (setting) will be installed if the water conditions are low tide. The sondong fishing gear that will be operated is already located at the ship's bow. Fishermen will first install a wooden frame as a sondong foot for net installation. The 2 sondong legs are tied at the base of the legs using wooden straps so that they form like scissors. The sondong treads, complete with chains, are attached to the ends of the right leg and left leg of the bottom of the sondong fishing gear using bolts, and then the buoys are tied to the ends of the right leg and left leg of the top of the sondong fishing gear using buoy ropes. Installing the sondong net is done by tying the suitable ris rope and the left ris rope of the sondong net to the proper tread and left tread and tying the end of the sondong bag so the collected catch cannot come out. After all the skeletons and sondong nets have been installed, the fishing gear is ready to be dropped into the waters.

The process of lowering the sondong fishing gear begins to be carried out by fishermen by dropping the sondong foot along with the net into the water. When dropped into the water, the sondong foot will form scissors, the open mouth of the top of the net is tied with a rope at the bow of the ship, the sondong foot is tied to support near the bow of the ship and in the sondong bag there is a sondong binding rope which is then tied to the hull. The sondong net that has been dropped will sink in the water so that shrimp or other species caught will enter the sondong net. Sondong fishing gear can be operated for ± 7 hours.

Lifting the net (hauling) in sondong fishing gear is only done on some parts of the net but only on the sondong net bag. The engine is still on when fishermen do the hauling process for 20-30 minutes. The sondong suitcase in which the catch has been collected is immediately lifted and poured onto the boat, after which the bag is tied back and dropped back into the water. This is so that the shrimp in the bag do not accumulate too much and make it easier when lifting the catch. Shrimp already on the boat are immediately sorted by type and then put into a split container (dirigen). Furthermore, shrimp that have been sorted are given ice to maintain the quality of the catch so that the catch will remain fresh and avoid the process of decay.

Composition of Catches

Stated that the catch on sondong fishing gear varies. The catch obtained is not only the main target, but other types of fish are still caught, such as bycatch. The number of bycatch is not as large as the main catch in the form of shrimp.

Table 1. Composition of Catch

No	Catch type	Science name	Total (tail)	Weight (kg)
1	White shrimp	*Penaeus merguiensis*	2233813	6210
2	Red prawn	*Penaeus monodon*	500143	2969
3	Kelong shrimp	*Penaeus indicus*	89469	1130
4	White pomfret	*Pampus argenteus*	171	22
5	Gulamah	*Pseudocienna amovensis*	1424	45
6	Gangetic anchovy	*Thryssa mystax*	13759	246
7	Malung	*Muraenesox cinereus*	805	137
8	Stingray	*Dasyatis sp*	57	29
9	Crab	*Portunus Pelagicus*	243	24
		Total	2839884	10812

Table 1 shows that the catch of sondong fishing gear during the study was very diverse, consisting of shrimp and other fish. Although the fish caught are not the main purpose of catching sondong fishing gear, the fish landed are fish that have economic value.

The percentage of the specific weight of the catch of sondong fishing gear during the study is that white shrimp is more dominant than other types of catches with an average percentage of 57.44%, the second most sondong fishing gear catch is red prawn with an average percentage of 27.46%, kelong shrimp has a percentage not much different from red shrimp which is 10.45%. As for bycatch in the form of fish and crab, the total weight of the catch is less than the main catch (shrimp) during the research process. White pomfret has an average percentage of 0.20% of the catch and includes the least catch, gulamah with an average percentage of the catch of 0.42%, gangetic anchovy has an average percentage of the catch of 2.28%, malung has an average percentage of the catch of 1.27%, stingray has an average percentage of the catch of 0.27%, and the last type of catch is crab has an average percentage of the catch of 0.22%. A comparison of the percentage

weight of the catch of sondong fishing gear can be seen in Figure 1.

The main catch and bycatch of sondong fishing gear at UPT Pelabuhan Perikanan Riau Province can be seen in Table 2.

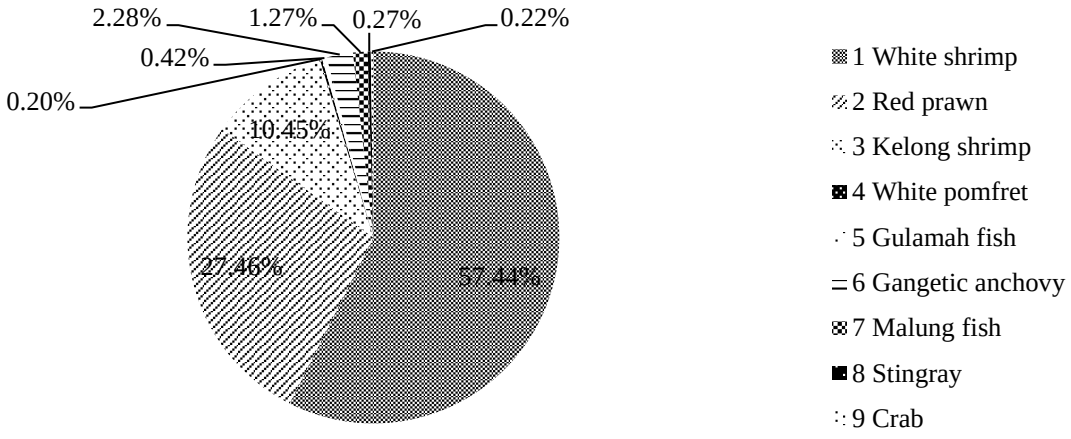

Figure 1. Percentage of Sondong Catch by Weight (kg)

Table 2. Main and Bycatch of Sondong Fishing Gear

No	Type of catch	Biota	Science name
1	Main catch	White Shrimp	*Penaeus merguiensis*
		Red prawn	*Penaeus monodon*
		Kelong Shrimp	*Penaeus indicus*
2	bycatch	White pomfret	*Pampus argenteus*
		Gulamah	*Pseudocienna amovensis*
		Gangetic anchovy	*Thryssa mystax*
		Malung	*Muraenesox cinereus*
		Stingray	*Dasyatis sp*
		Crab	*Portunus Pelagicus*

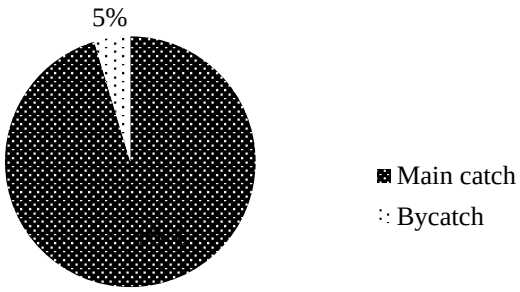

Figure 2. Percentage of Sondong Catch by Weight (kg)

The percentage of shrimp as the main catch in sondong fishing gear landed at the Riau Provincial Fisheries Port UPT is 95%. Shrimp are the main commodity used to capture fisheries in Dumai city[16]. The shrimp has a high economic value, so it becomes the main catch of sondong fishermen. It mostly lands at the Riau Province Fisheries Port Unit. The percentage of bycatch of sondong fishing gear during the study in the form of crabs and other types of fish was 5%. The bycatch of sondong fishing gear is not discarded because these fish still have a selling value, although the selling value is

not so high, and some are consumed by the fishermen themselves, so there is no discarded catch.

Catch Measurements

Morphometric measurements for all species of catch were obtained by directly measuring samples and weighing the weight of the catch, which was recorded during the sale of the catch to the agent. The measurement of catch types can be seen in Table 3.

Table 3. Measurement of Catch Types of Sondong Fishing Gear

No	Type of Catch	Total Length / TL/PTO (cm)	Height / BDH (cm)	Carapace length /PK (cm)	Total Weight
1	White shrimp	6,5 - 14	-	1,8 - 5	6.210
2	Red prawn	7,5 - 15	-	2,3 - 7	2.969
3	Kelong shrimp	12 - 21	-	3,5 - 7	1.130
4	White pomfret	24	19,5	-	22
5	Gulamah fish	17,5	5	-	45
6	Gangetic anchovy	10,5	2,5	-	246
7	Malung fish	93	9	-	137
8	Stingray	190	59	-	29
9	Crab	16,5	7,5	-	24

Table 4 shows that the catch of sondong fishing gear contradicts the sub-criteria for determining environmentally friendly fishing gear, namely selectivity by size and by type of catch proposed by Taeran[12] in sondong fishing gear catches more than three species with significantly different sizes.

Score and Analysis of the Environmental Friendliness of Sondong Fishing Gear

The environmental friendliness of sondong fishing gear in the Riau Provincial Fisheries Port Unit using criteria referring to FAO[11] and sub-criteria from Taeran[12]. The scoring of environmentally friendly sondong fishing gear at the Riau Provincial Fishing Port UPT can be seen in Figure 3.

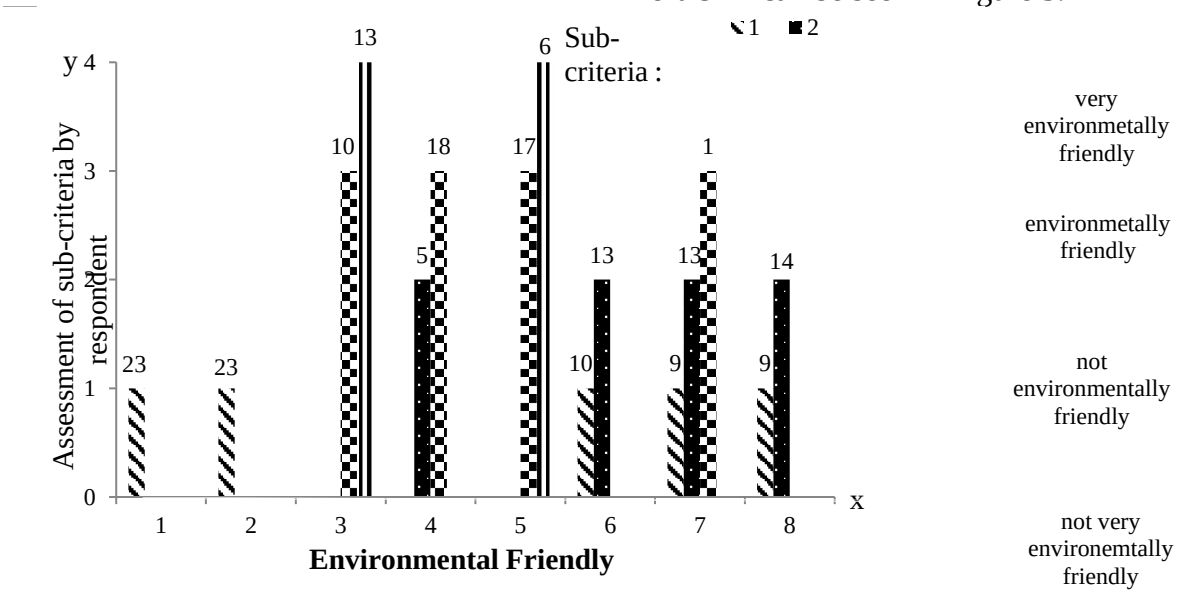

Figure 3. Eco-friendly Score

It is known that the x-axis shows eight criteria used to determine whether sondong fishing gear is environmentally friendly, and the y-axis indicates the number of

respondents to be interviewed in determining the environmental friendliness of sondong fishing gear. The scoring results on 23 respondents about the ecological friendliness of sondong fishing gear in the Riau Provincial Fishing Port UPT obtained a total score of 378. The total score will be entered into the matrix table[14]. The score obtained is 16.43, and it is included in the third assessment of the indicator scale, ranging from 9 - 16, with the category of sondong fishing gear, including fishing gear that is not environmentally friendly.

The first criterion is selective and environmentally safe fishing gear and methods listed in the CCRF (sub-article 6, 6.6). In this criterion, 23 or all respondents used selected sub-criterion 1, catching more than three species with significantly different size variations. The fishermen's catch is the main catch, and a bycatch is in the form of fish of various sizes. Bycatch caught still has economic value and selling price and is sometimes utilized by fishermen. However, the main catch in shrimp is far more than the bycatch, with a percentage of 95% and an average of catchable.

The second criterion is protecting habitats listed in the CCRF (sub-article 6.8). In this criterion, 23 respondents chose criterion 1, which is to cause damage to a large area, so special efforts must be made to protect the habitat from damage, pollution, and other impacts. This is known because sondong fishing gear is operated by scraping the bottom of the waters[17]. Sondong nets (drag trawls) are operated to explore the bottom of shallow waters (5-10) meters or drift below the water surface using motorboats/vessels measuring 2-7 GT. The catch is in the form of shrimp, and the impact of using sondong fishing gear is that it causes pollution of the aquatic environment around the place of operation of sondong fishing gear.

The third criterion is to ensure the compliance of fishers and fishing vessels with appropriate safety requirements following international conventions listed in the CCRF (sub-article 8.2.5). In this criterion, 13 respondents chose sub-criterion 4, which is safe for fishermen, and 10 chose sub-criterion 3, which is only temporary health problems. The level of danger received by fishermen in operation is shallow if the fishermen have skills and expertise[18].

The fourth criterion is maintaining the fish quality assurance system listed in the CCRF (sub-article 11.1.2). In this criterion, 18 respondents chose sub-criterion 3, namely dead and fresh fish, and 5 chose sub-criterion 2, namely dead, fresh, and physically deformed fish. Based on observations and interviews, it was stated that the catch was in a dead, fresh condition. This follows the research results Siregar[19] stating that the concentration of several heavy metals such as Pb, Cd, Cu, Ni, and Zn in fish meat samples in Dumai waters is still below the safe consumption limit by the provisions of the Director General of POM.

The fifth criterion is to guarantee the rights of consumers of safe, healthy, and unexpired fish and fishery products listed in CCRF (sub-article 11.1.1). In this criterion, 17 respondents chose sub-criterion 3, which is relatively safe for consumers, and 6 chose sub-criterion 4, which is safe for consumers. This is because this sondong fishing gear does not use toxic chemicals to catch fish[20]. The composition of the catch obtained is safe for consumers and does not cause poisoning or even death to consumers.

The sixth criterion was minimizing the bycatch of non-target species listed in the CCRF (sub-article 6.6). In this criterion, 13 respondents chose sub-criterion 2, i.e., bycatch of several species, and some are marketable, and 10 chose sub-criterion 1. Bycatch of several species and not marketable. The main catch of sondong fishing gear is shrimp, while the bycatch contains fish of more than a few species, some of which are sold in the market at low prices, and some are taken home by fishermen for their consumption or shared with neighbors.

The seventh criterion is protecting the biodiversity of aquatic ecosystems and habitats listed in CCRF (sub-article 12.10). In this criterion, 13 respondents chose sub-criterion 2, which causes the death of some species and damages the habitat; 9 respondents chose sub-criterion 1, which causes the death of all living things and damages the habitat; and 1 respondent chose criterion 3, which causes the death of some species but does not damage the habitat. Sondong fishing gear includes the fishing gear that actively moves in the waters; based on the classification Von Brandt[21], this tool can be classified as fishing with a driven method because it is operated by pushing the tool in the waters. The sondong fishing gear can cause damage and death to living things around it. Still, some fishermen argue that because the bottom of the seas operated by sondong fishing gear in the Riau Provincial Fishing Port UPT has mud and sand, it does not damage the existing aquatic habitat.

The eighth criterion was protected endangered species listed in the CCRF (sub-article 7.2.2). In this criterion, 14 respondents chose sub-criterion 2, namely protected fish caught several times, and 9 chose sub-criterion 1, namely protected fish often caught in fishing gear. When protected fish, including Horseshoe crabs, were seen, fishermen tended to release them back into the water.

4. CONCLUSION

The main catch in sondong fishing gear in the form of shrimp landed at the Riau Province Fishery Port UPT has a percentage of 95%. The shrimp has a high economic value, so it has become the main catch of sondong fishermen and the most landed catch. The percentage of bycatch of sondong fishing gear during the study in the form of crabs and other types of fish was 5%. The bycatch of sondong fishing gear is not discarded because these fish still have a selling value, although the selling value is not so high, and some are consumed by the fishermen themselves, so there is no discarded catch. Determination of the environmental friendliness of sondong fishing gear was conducted by interviewing 23 respondents at the Riau Province Fisheries Port UPT, which refers to 8 criteria and sub-criteria with a score of 16.43, which included the third score of the indicator scale ranging from 9 - 16 with the category of sondong fishing gear is not environmentally friendly fishing gear.

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