



## **Identification of Specifications and Catches of Sea Cucumber Dredge Gear in Cirebon Regency**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Sea cucumbers (*Holothuria* sp) are a leading export commodity for Indonesian fishermen. The increase in the selling price and demand for sea cucumbers in 2018 made fishermen in Cirebon Regency modify the fishing gear to maximize the catch of sea cucumbers which is called the sea cucumber dredge gear. The purpose of this research is to identify the specifications of the gear, catch, selectivity and productivity of the sea cucumber dredge gear operated in Cirebon Regency, West Java. The research was carried out in July 2019 - September 2020 in Gebang Mekar District. Fishing gear measurements were carried out along the fishing village of Gebang Mekar Village. The method used is a case study method with quantitative descriptive analysis to determine the specifications of the fishing gear and catches taken by interviewing fishermen. The results showed that sea cucumber dredge gear was included in the dredge gear category. The components consist of a mouth, a hook, a frame, a net, and a rope of varying sizes. The materials used are iron and stainless steel, weighing up to 50 kg. The main catch of sea cucumber in Cirebon Regency consists of *Phylloporus* sp or *ondol - ondol* and bycatch in the form of several demersal fish, with a total of 7 species. This fishing gear is classified as not selective because of its construction which has a net with a small mesh size (2-5 inches) so that this fishing gear captures many species of different sizes and the results of the calculation of the proportion show that bycatch has a percentage of 74,75%.

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## 1. INTRODUCTION

Sea cucumbers are one of the many marine biotas found in Indonesian waters. Indonesian waters are located between the Indian Ocean and the Pacific so it is the best habitat for sea cucumbers, with an estimated 20% of the total species of sea cucumbers found in the world found in Indonesia [1]. The selling price of sea cucumbers at the level of Fishermen is quite high, ranging between 600 thousand - 1 million rupiah [2] and is a leading export commodity of Indonesian Fishermen with an export volume reaching 1,231.6 tons in 2015. According to the Ministry of Maritime Affairs and Fisheries, most of the sea cucumbers are exported to China and Hong Kong.

In recent years, many regions have been aggressively exploiting sea cucumbers because of increasing demand [1]. The increasing demand for sea cucumbers has caused many Fishermen in various regions to start modifying their fishing gear to increase the catch of sea cucumbers. The fishing gear used is illegal fishing gear and the operation is carried out continuously. Uncontrolled fishing activities have a direct effect on reducing the amount of catch [3].

The waters of Cirebon Regency have the basic characteristics of waters with mud and sandy mud substrate [4] which causes many uses of fishing gear whose operations are carried out by being pulled along the bottom of the waters. The existence of this sandy mud base is also one of the habitats of sea cucumbers [5] so the Fishermen in this area modify a fishing gear called sea cucumber dredge gear.

According to [6] the fishing gear can be entered into the class of dredge gear, which is a kind of fishing gear whose operations are actively pulled down along a certain water area. Initially, this fishing gear was used to catch crabs, but along with the many demands for sea cucumbers from the fisher's market in the Cirebon regency, they modified the crabs dredge gear to sea cucumbers dredge gear to maximize the catch of sea cucumbers. Modification is done by adding the size to the stretch of iron, width, and size of the teeth.

Modification with the addition of size for sea cucumber dredge gear causes identification of

the specifications of the fishing gear because it is felt there is a difference in size with the size of the rake fishing gear issued by the Ministry of Maritime Affairs and Fisheries in the Minister of Maritime Affairs and Fisheries Regulation No.71 of 2016 concerning Fishing and Placement Paths Fishing Equipment in the Fisheries Management Region of the Republic of Indonesia. Garok will also have low selectivity, causing many sides of the catch (bycatch) [4], as well as the operation, is done one day of fishing causes the perceived need for an analysis of the composition of the catch due could cause significant impact on the environment as the basis for sustainable fisheries management.

## 2. MATERIALS AND METHODS

### 2.1 Time and Research Location

This research was conducted in July 2019 - October 2020. Samples were taken in February 2020 in Gebang Mekar Village, Cirebon Regency, West Java, Indonesia.

### 2.2 Materials and Tools

The object used in this study is the Sea Cucumber Garok used in the Gebang Mekar Village. The tools used in this study are meter, stationery, and camera.

### 2.3 Methods

The method used is a case study with a quantitative descriptive analysis. The sampling method in this research was purposive sampling, with the object being fishermen using sea cucumber dredge gear in Gebang Mekar Village. Data collection is done through observation and interviews.

### 2.4 Data Analysis

#### 2.4.1 Fishing gear specification questionnaire

Data and direct measurements of fishing gear specifications (size and material) were analyzed descriptively.

#### 2.4.2 Catch Composition of Catches are

Analyzed to find out the comparison proportion between main catches and bycatch, the catch

data that has been obtained is calculated using the formula [7]:

$$\text{The proportion of Main catch (\%)} = \frac{\text{Number of Main Catch}}{\text{Number of Catches}} \times 100\%$$

$$\text{The Proportion of Side Catch (\%)} = \frac{\text{Number of Side Catch}}{\text{Number of Catches}} \times 100\%$$

### 3. RESULTS AND DISCUSSION

#### 3.1 Fishing Gear Specification

The fishing gear identified (Fig. 1) during the study totaled 55 with different specifications for each component. The difference in the size of each dredge gear component affects the extent of the swept area and the number of catches per fishing gear operation. The constituents of 55 fishing gears were identified as 28 iron-based and 27 stainless- steel based.

Below are the specifications of dredges gear which are mostly found in the study area:

##### 3.1.1 Frame

The material used in this frame varies, some fishermen use the iron and some use a frame of *stainless steel*. The size varies depending on the width of the mouth of the body, the size of the data recorded has a value between 1.20 - 1.70 m for both sides with a base along the 3.10-3.20 m.

##### 3.1.2 Tooth

The teeth of the sea cucumber dredge gear are straight, made of iron, and stainless steel. The number of recorded teeth are around 45 – 63 pieces/1 unit, with a length of 13-19 cm and a distance of 4-7 cm. In the dredge gear group selectivity is also determined by the distance of the metal stretch in the cage and hole diameter [8].

##### 3.1.2.1 Beam

Rectangular body mouth with a width between 3.10 - 3.20 m, with a height of 31 - 50 cm. Made of iron.

##### 3.1.2.2 Net

Net used in conical bags and made of *polyethylene* (PE). The length of the net used varies between 7-10 m and has a *mesh size* of 2-5 inches, the size of the *mesh size* is different on the front, middle and back.

##### 3.1.2.3 Rope

The rope is made of *polyamide* (PA) and---- [HD] with a length of between 70-100 meters.

According to [9] Shrimps dredges gear in Semarang area are operated using weight in the form of a chain of 3 m long and weighing 7 kg. [10] also states that the crab dredge gear in Subang Regency weights the form of 4-5 pieces of iron or scrap steel. The sea cucumber's dredge gear recorded did not use ballast in its operation, this is because the size of the body's mouth and a large frame made of iron so that it no longer needs ballast because the weight of 1 sea cucumber dredge gear can reach 50 kg. This gear is also equipped with a rubber band that is connected between the frame, the mouth of the body, and the fork to make the active teeth scratch the bottom of the sheet.

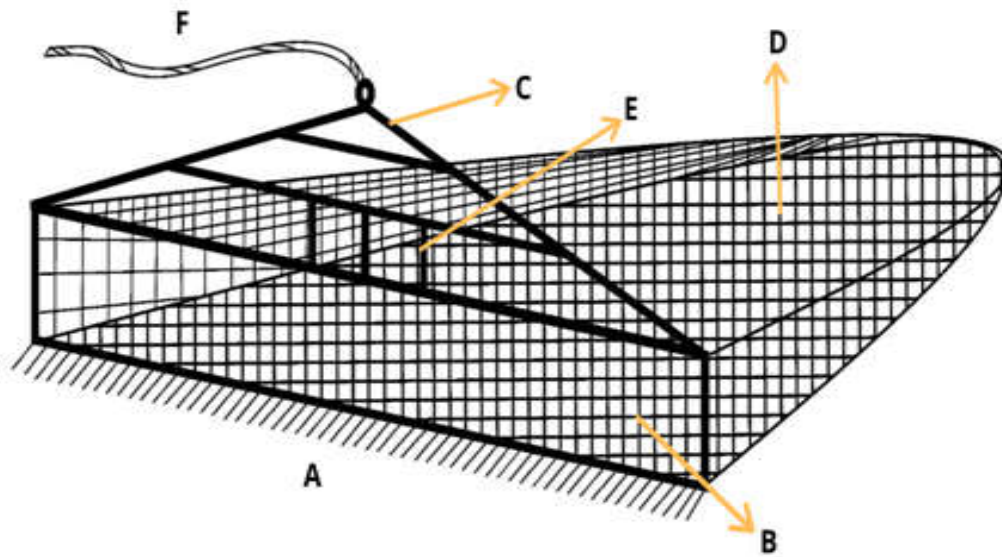
Sea cucumber dredges gear is said to be the result of modification because it has a larger size compared to the shrimp dredges gear in the research of [11] in Semarang City and [12] in Subang Waters. The construction of the shrimp dredges gear in the study is listed in Table 1.

The size of the sea cucumber dredge gear found in Cirebon Regency exceeds the standards set by the government. According to the Regulation of the Minister of Maritime Affairs and Fisheries No. 71 of 2016 article 26 paragraph 1 concerning Fishing Lines and Placement of Fishing Equipment in the Territory of the Republic of Indonesia State Fisheries Management, ship rake should have a size of mouth opening (body mouth) with a length of 2.5 m and 0.5 m high but the conditions on the ground indicate that the size of the mouth of the body is 3.10 m.

#### 3.2 Catches

The catch of sea cucumber dredge gear consists of several types of sea cucumbers and fish, both large and small (Table 2).

Sea Cucumber dredge gear in Cirebon Regency is devoted to catching round sea cucumbers (*Phylloporus* sp as known as ondol-ondol in local), but it is also not uncommon for fishermen to get other types of sea cucumbers such as sea cucumber and various demersal fish such as barracuda, stingray, black pomfret, shrimp and crab. The small number of catches obtained in February is caused by weather conditions that are being affected by the west season so that fishermen have a small duration of sea fishing and will return to shore when the waves have



**Fig. 1. Sketch of sea cucumber dredge gear**  
(a. Tooth, b. Beam, c. Frame, d. Net, e. Rubber, f. Rope)

**Table 1. Specification of Shrimp's Dredge Gear**

No	Component	Jayanto (2013)		Puspito (2013)	
		Size	Material	Size	Material
1	Tooth	10 cm	iron	12 cm	iron
2	Distance	1,5 cm	-	-	-
3	Beam	1,5 m	iron	1,05 m	wood
4	Net	2,5 -3m	-	2,5 m	PE
5	Mesh Size	1,25 inchi	-	1,5 inchi	PE
6	Rope	-	-	14 m	-

started to increase. According to [11], Shrimps dredge gear catch clams, prawns and crab with the highest composition is shellfish, whereas according to [12] the fishing gears also catch groups of snails and crabs. [13] study stated that the scallop dredges gear caught the great / king scallops and queen scallops.

Most catches are on trip 3, which is 11.6 kg, this is also influenced by the size of the large fishing gear. The catch on the 7th trip showed the least results, namely as much as 1.80 kg, this was caused by the high waves so that fishermen only did a single towing with a duration ranging from 15-20 minutes.

**Table 2. The catch of sea cucumber's dredge**

No	Catch	Trip						
		1	2	3	4	5	6	7
1	<i>Phylloporus</i> sp	1.03	0	3.41	0	2.9	0	0
2	<i>Holothuria scabra</i>	0	1.9	3.05	0	0	0	0
3	<i>Dasyatis</i> sp	0	0	1.39	0	0	0	0
4	<i>Sphyaena barracuda</i>	0	0	3.75	0	0	2.15	0
5	<i>Paratromateus niger</i>	1.43	0	0	2.3	0	2.6	0
6	<i>Portunus pelagicus</i>	2.8	2.16	0	1.35	3.1	1.05	0
7	<i>Penaeus monodon</i>	1.3	1.10	0	0	2.9	0	1.80
Total (kg)		6.56	5.16	11.6	3.65	8.9	5.8	1.80

Fishermen do more fishing in the east season, whereas in the western season the intensity of fishing activities is lower because of the large sea waves and the small amount of catch. The amount of catch in the west season tends to be less than the catch in the east season which occurs in June to August [14], even the majority of fishermen in Cirebon District will switch to using fishing gear nets to keep going to sea. Local fishermen stated that if they continued to use scratching, the money obtained would only be enough to replace fuel money and there were no benefits. [11] states that the costs required to buy supplies, fuel and ice for the operation of the dredges gear are Rp. 6,750,000.

The results of interviews with local fishermen also show that in August 2019 (East Season) sea cucumber garok fishermen have a very abundant catch especially for sea cucumber commodities, where fishermen can get a total catch of 6-7 quintals in one day.

#### 4. CONCLUSIONS

Sea cucumber dredges gear in Cirebon Regency is included in the category of boat dredge gear. The specifications of the sea cucumber arrow in Cirebon Regency consist of a body mouth made of iron and stainless steel with a size of 2.8 - 3.5 m, teeth (arrow) made of iron and stainless steel with a size of about 15 cm and totaling 45-63 pieces, a frame made of iron, 10 m netting made of polyethylene (PE) with 2-5 inch mesh size, PE rope with a size of 70-100 m. The main catches of sea cucumbers are round sea cucumbers (*Phylloporus* sp) and sand sea cucumbers (*Holothuria scabra*).

#### CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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