



## **Proportion and Total of Commodities Blue Swimming Crab (*Portunus pelagicus* Linnaeus, 1758) Catches in Gebang Mekar Village, Cirebon Regency, West Java Using Crab Gillnet and Collapsible Crab Trap**

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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**

Blue swimming crab (*Portunus pelagicus*) is one of the high economic value commodities which causes increased efforts to catch blue swimming crab in Indonesia. The effort of catching continues to increase the blue swimming crab resources in the nature that has decreased. Cirebon Regency is one of the largest blue swimming crab fishing centers in West Java with a total value of blue swimming crab production in 2017 by 7,347 tons/year. This research was conducted to determine the selectivity level of the crab gillnet and collapsible crab trap based on the proportion and total of catches obtained in Gebang Mekar Village, Cirebon Regency. Research was conducted in September 2019 – October 2019 in Gebang Mekar Village. For this research we used are primary data; collected directly during the observations includes catch type and weight of the catches and then interviews with several crab gillnet and collapsible crab trap fisherman and secondary data; data from official agencies and some literature. Our research suppose the moonlight phase effect of the blue swimming crab catch. Based on the research, it can be

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concluded that the crab gillnet with 3.5 inch mesh size and collapsible crab trap that operated in Gebang Mekar Village may be called a selective fishing gears but crab gillnet is more efficient as compared to collapsible crab.

**Keywords:** Blue swimming crab; crab gillnet; collapsible crab trap; selective.

## 1. INTRODUCTION

Indonesia, as an archipelago with more than 70% of its territory is sea, has enormous marine economic potential. According to the national reference data from the Coordinating Ministry for Maritime Affairs, based on the results of mapping and geospatial information conducted by the Geospatial Information Agency (BIG) and the Navy Hydro-Oceanography Center, the total area of Indonesian waters is around 6.4 million km<sup>2</sup>, of the total 8.3 million km<sup>2</sup> of Indonesian land and waters area. In 2017, the marine and fisheries sector contributes for the national fisheries production volume up to 23,186,442 tons with a production value of around 384.48 billion Rupiah. It is important to preserve Indonesia marine resources for sustainable fisheries 1. To realize sustainable capture fisheries in accordance with the provisions of the implementation of responsible fisheries (FAO Code of Conduct for Responsible Fisheries/CCRF), the exploitation of marine biological resources must be carried out responsibly.

Blue swimming crab (*Portunus pelagicus*) is one of the high economic value commodities which causes increased efforts to catch blue swimming crab in Indonesia. The effort of catching continues to increase the blue swimming crab resources in the nature that has decreased. Blue swimming crab cultivation efforts have been carried out, but Blue swimming crab seeds still depend on their availability in nature [2]. The value of blue swimming crab production in West Java Province has decreased from 2016 with a production value of 12,848 tons/year in 2017 decreased to 10,283 tons/year [3,4]. Cirebon Regency is one of the largest blue swimming crab fishing centers in West Java with a total value of blue swimming crab production in 2017 by 7,347 tons/year, then Karawang Regency ranks second with a total production value 1,391 tons/year and ranks the three are Indramayu Regency with a total production value 808 tons/year [4]. One of the blue swimming crab production areas in Cirebon Regency is Gebang Mekar Village, Gebang District.

This research was conducted to determine the selectivity level of the crab gillnet and collapsible

crab trap based on the proportion and total of catches obtained to preserve the sustainable fisheries in Gebang Mekar Village.

## 2. MATERIALS AND METHODS

Research was conducted in September 2019 – October 2019 in Gebang Mekar Village, Gebang District, Cirebon Regency, West Java with sampling locations in Hamlet 01, RT 19, Gebang Mekar Village. With material used in this research is the 3 GT motorized boat, crab gillnet with a 3.5 inches mesh size and collapsible crab trap, scale indicator, smartphone camera, stationery, data sheets and blue swimming crab catches that are used as research objects.

Research method using case study method with focuses intensively on one object certain level from catch proportion of fishing gear in Gebang Mekar Village by studying as a case and then quantitative descriptive analysis and quantitative approach for describe systematically and factually about facts and the correlation between variables investigated by collecting data and processing. The sampling method used in this research is the simple random sampling which allows each sampling unit as an element of the population to get the same opportunity to be sample. This sampling method is used because the population members are homogeneous with the operation of crab gillnet and collapsible crab trap on Blue Swimming Crab (*Portunus pelagicus*) commodities. While the method for collecting data uses the observation with catches type and weight of the catches, interviews with 45 respondent and documentation during research.

The data needed in this research are primary and secondary data. The primary data is collected directly during the observations includes catches type and weight of the catches from trip results using crab gillnet and collapsible crab trap carried out by Gebang Mekar Village fisherman. The primary data also includes the interviews with 20 crab gillnet fisherman, 20 collapsible crab trap fisherman and five boat owners related to fishing activities in the Gebang Mekar Village. While secondary data used to complete information about the research was covering the general state of the research area,

catch units, production data and some literature obtained from journals, books, dissertations, official agencies, etc.

According to Afania [5] and Oktavera [6] weight and total proportion of the main catch and by-catch are calculated using this formula:

1. Weight proportion of the main catch and by-catch.

- a. Weight proportion ( $P_{\text{MainCatch}}$ )

$$P_{\text{MainCatch}} = \frac{a_1}{a_1 + b_1} \times 100\%$$

- $a_1$ : Main catch weight  
 $b_1$ : By-catch weight

- b. Weight proportion ( $P_{\text{MainCatch}}$ )

$$P_{\text{By-catch}} = 100\% - P_{\text{MainCatch}}$$

2. Total proportion of the main catch and by-catch.

- a. Total proportion ( $Q_{\text{MainCatch}}$ )

$$Q_{\text{MainCatch}} = \frac{a_2}{a_2 + b_2} \times 100\%$$

- $a_2$ : Total main catch  
 $b_2$ : Total by-catch

- b. Weight proportion ( $Q_{\text{MainCatch}}$ )

$$Q_{\text{By-catch}} = 100\% - Q_{\text{MainCatch}}$$

### 3. RESULTS AND DISCUSSION

Research was conducted in September the first week through September the fourth week, where at the end of the first week and the second week entered into the phase of the bright moon. The different phases of the moon have a significant influence on the behavior of the crab (*Portunus pelagicus*), which is the stomach and eating.

#### 3.1 Catches Proportion

Catches of crab gillnet with 3.5 inch mesh size obtained from two trips in the waters of the Java Sea around the village of Gebang Mekar Cirebon as many as 62 individuals with a total weight of 6,003 grams or 6 kg. The number of species obtained by the crab gillnet is 9 different species (Table 1).

Table 1 indicates that the proportion of main catch weight is 87.5% with a total weight of 5,250 grams and the proportion of by catch weight is

12.54% with a total weight of 753 grams and then the percentage of the total main catches is 82.26% by 51 individuals and the percentage of bycatch is 17.74% by 11 individuals. The catch of collapsible crab gillnet with 2.3 inch height mouth opening and 4.3 inch width obtained from two trips in the Java Sea waters around the Gebang Mekar Village, Cirebon Regency as many as 53 individuals with a total weight of 3,955 grams or 3.9 kg. The number of species obtained by collapsible crab gillnet is 6 different species (Table 2).

Based on Table 2 the proportion of main catch weight is 92.3% with a total weight of 3,955 grams and the proportion of by-catches weight is 7.70% with a total weight of 330 grams and then the percentage of the number of main catches is 83.02% by 44 individuals and the percentage of by-catch amount of 16.98% by nine individuals.

The main catch of the blue swimming crab (*Portunus pelagicus*) from crab gillnet dominates with a percentage of 82.26% and a weight percentage of 87.5%, while the dominant by-catch is the mangrove crab (*Scylla serrata*) by four individuals with a percentage of the amount 6.45% and a total weight of 82 grams with a percentage of 1.37%. The main catch of blue swimming crab (*Portunus pelagicus*) from collapsible crab trap dominates with a percentage of the amount of 83.02% and a percentage weight of 92.3%, while the dominant by-catch is the mangrove crab (*Scylla serrata*) by three individuals with a percentage of the amount of 5.66% and a total weight of 40 grams with a percentage of 0.93%.

The by-catch that dominates from the crab gillnet and collapsible crab trap predominantly demersal fish which species diversity that is caught is due to the similarity of habitat between the target fish and non-target fish [7]. Portunidae crabs are often found on coarse/fine sand substrates and seagrass sand [8] and the Portunidae family has a high density because it can adapt well in its own environment [9].

Based on the results of research it is known that the net mesh and bubu fold already meet the requirements of fishing gear that is environmentally friendly or selective when viewed from the proportion of the catch because the percentage of the main catch is already greater than 60%. This is in accordance with Mallawa [10] that if the percentage of the main

**Table 1. Crab gillnet catches proportion**

Crab gillnet						
No	Catches	Scientific name	Total		Weight	
			Individual	Percentage	Gram	Percentage
<b>Main catch</b>						
1	Blue Swimming Crab	<i>Portunus pelagicus</i>	51	82,26%	5250	87,5%
<b>Total main catch</b>			<b>51</b>	<b>82,26%</b>	<b>5250</b>	<b>87,5%</b>
<b>By catch</b>						
1	Mangrove Crab	<i>Scylla serrata</i>	4	6,45%	82	1,37%
2	Vaname Shrimp	<i>Litopenaneus vannamei</i>	1	1,61%	80	1,33%
3	White Pomfret	<i>Pampus argenteus</i>	1	1,61%	124	2,07%
4	Frog Crab	<i>Ranina ranina</i>	1	1,61%	11	0,18%
5	Ipong-ipong Snail	<i>Fasciolaria salmo</i>	1	1,61%	59	0,98%
6	Ponyfishes	<i>Leiognathus sp</i>	1	1,61%	120	2,00%
7	Sea Cucumber	<i>Phyllophorus sp</i>	1	1,61%	266	4,43%
8	Starfish	<i>Notomyotida sp</i>	1	1,61%	11	0,18%
<b>Total by-catch</b>			<b>11</b>	<b>17,74%</b>	<b>753</b>	<b>12,54%</b>
<b>Total all catches</b>			<b>62</b>	<b>100%</b>	<b>6003</b>	<b>100%</b>

**Table 2. Collapsible crab trap catches proportion**

Collapsible crab trap						
No	Catches	Scientific name	Total		Bobot	
			Individual	Percentage	Gram	Percentage
<b>Main catch</b>						
1	Blue Swimming Crab	<i>Portunus pelagicus</i>	44	83,02%	3955	92,3%
<b>Total Main Catch</b>			<b>44</b>	<b>83,02%</b>	<b>3955</b>	<b>92,3%</b>
<b>By-catch</b>						
1	Kepiting Bakau	<i>Scylla serrata</i>	3	5,66%	40	0,93%
2	Ikan Gerabah	<i>Pristipomoides typus</i>	2	3,77%	74	1,73%
3	Udang Pletok (Mantis)	<i>Harpisquilla raphidea</i>	2	3,77%	46	1,07%
4	Ikan Peperek Bondolan	<i>Leiognathus sp</i>	1	1,89%	110	2,57%
5	Udang Vaname	<i>Litopenaneus vannamei</i>	1	1,89%	60	1,40%
<b>Total by-catch</b>			<b>9</b>	<b>16,98%</b>	<b>330</b>	<b>7,70%</b>
<b>Total all catches</b>			<b>53</b>	<b>100%</b>	<b>4285</b>	<b>100%</b>

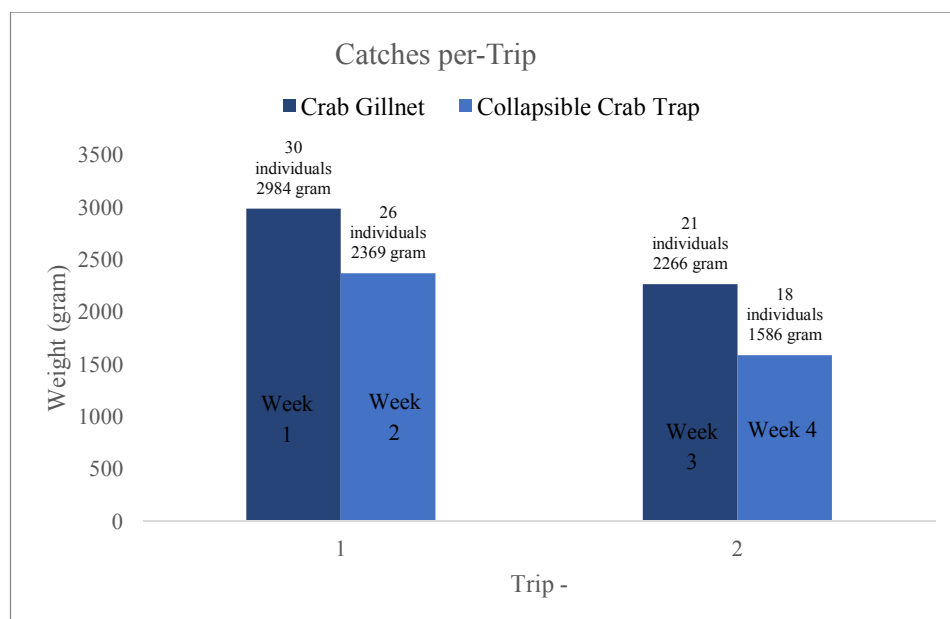
catch is in the range of 61-80%, the fishing gear is included in the criteria for environmentally friendly. Suadela [11] also states that if the proportion of the main target catch is greater or equal to 60% a fishing gear can be called selective because it includes a fishing gear that is environmentally friendly.

### 3.2 Blue Swimming Crab Total Catches

Based on Fig. 1 the total catch of blue swimming crab has decreased in weight and amount from the first trip to the second trip, the amount of catches is calculated based on the trip made for one day for each trip every week. The blue swimming crab catch on the first trip of the crab gillnet was conducted in the first week of September, the total weight of the blue swimming crabs are 2,984 grams by 30 individuals, then the second trip was conducted in the third week of September, the total weight of the blue swimming crabs are 2,266 grams by 21 individuals, and then the first trip for collapsible crab trap was conducted in the second week of September, the

total weight of the blue swimming crabs are 2,369 grams as many as 26 individuals; then the second trip was conducted in the fourth week of September with the total weight of the blue swimming crabs as 1,586 grams by 18 individuals, this could be due to the research conducted in September with the intensity of taking biweekly data for each fishing gear, where in, the first two weeks of September is the crab's fishing season. In accordance with Ihsan et al. [12], the blue swimming crab production in Pangkep Regency has increased again and reached its peak in September.

In the full moon phase the intensity of moonlight entering the waters is relatively high so which stimulates and enhances swimming behavior. In the dark moon phase, the moonlight entering the water is relatively non-existent so the waters become dark, this results in the blue swimming crab not doing *ruaya* activities and a reduction in feeding activity. This is indicated by the difference in the amount of catch between



**Fig. 1. Trip catches chart and the moonlight phase**

the dark moon and bright moon phases. Catches of the blue swimming crab in the Gebang Mekar Village during the bright moon phase at the first week and the second weeks tends to be more than in the dark moon phase at the end of the third week and the fourth week. This is in agreement with Ihsan and Wiyono [13] in the Pangkajene Islands, that the blue swimming crab tend to be more numerous caught during the bright moon phase, whereas in the dark moon phase lesser number of blue swimming crabs are caught.

Based on interviews with the fishermen of Gebang Mekar Village the peak season for catching the blue swimming crab is during the high wave season or the transitional season that occurs in June, July, August and September where this high wave causes the crab to swim to the surface so that it is easily caught by the crab gillnet [14], however the thing that caused the low yield of catches during the research was due to an internal conflict regarding the use of fishing gear in Gebang Mekar Village. Based on research that has been conducted, it is known that in Gebang Mekar Village, there are four commonly used fishing gears, namely crab gillnet, collapsible crab trap, arad and garuk. Crab gillnet and collapsible crab trap fishermen rarely do fishing activities because they are disturbed by fishermen who use arad and garuk, often destroying or even making the crab gillnet and collapsible crab trap disappear while being

operated so that the fishermen decided not to do fishing activities every day. Collapsible crab trap is a fishing tool whose risk of loss is higher than that of the crab gillnet because one trip is operated by 1000 pieces of collapsible crab trap, so the chance of loss is also higher, this results in the reduction of total amount of catches by collapsible crab trap than the crab gillnet. This is because of the collapsible crab trap fishermen are less frequent in fishing activities.

#### 4. CONCLUSIONS

Based on the research, it can be concluded that the crab gillnet with 3.5 inch mesh size and collapsible crab trap that operated in Gebang Mekar Village can be called a selective fishing gears but crab gillnet more efficient when compared with collapsible crab, because the catches amount of blue swimming crab from crab gillnet its more and then the best time for catch blue swimming crab is night in the moonlight phase.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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