

Composition and catch rate of fishing pot as eco-friendly fishing gear at the estuary of Bogowonto River in Kulon Progo Regency

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Abstract. The estuary of Bogowonto river in Kulon Progo Regency was habited by various species such as fish, shells, crabs, and snails. This research aimed to know the composition and catch rate of the fishing pot using various kinds of fodder. The method used in this research was catch identification and assessment of type, length and weight of the catch, and also the fishing pot's effectiveness as eco-friendly fishing gear. Data analysis was conducted by measuring fish length, catch composition, and catch rate of the fishing pot. The result showed the catch composition consisted of 8 types of species which are mangrove crab (5%), freshwater crab (0.81%), pufferfish (3.38%), orange-spotted grouper fish (0.14%), green tiger prawn (0.14%), giant tiger prawn (0.41%), banana prawn (0.14%) and freshwater snail (90%). The pot with fresh fish fodder had the highest number of catch (66.08%) compare to salted fish (23.51%) and roasted coconut (10.41%) fodder. The highest catch rate of fishing pot was observed on fresh fish fodder (35.42 g/fishing pot) compare to salted fish fodder (11.19 g/fishing pot) and roasted coconut fodder (4.61 g/fishing pot). Based on the result, fresh fish is considered a more effective fodder compared to salted fish and roasted coconut.

1 Introduction

South coastal area of Yogyakarta region has an extensive estuary waters area, one of them is the estuary area of Bogowonto river which located in Kulon Progo Regency. This sea is a habitat of various aquatic organisms, such as fish, shells, crabs, and snails [3]. However, currently the actual data or information related to catching by fishing pot and the types of fish resources caught are limited. The effectiveness of catching tools is considered passively, for example, fishing pot which is influenced by target species, habitat, fishing pot size, and the characteristics of the fishing pot [7]. Fishing pot has both excellence and minimal impacts on the environment [8]. Fishing pot is considered selective in term of catch size, catch result quality (live catch), type of catch (depend on the fodder), and increase of fish survival as non-target species, and it does not cause ghost fishing [1]. In this research, we used fishing pot with the same design, size and material. Different fodders were tested as treatments to assess their influence towards catch composition and catch rate of fishing pot in Bogowonto River estuary in Kulon Progo Regency. This research was also aimed to test the excellence of fishing pot and to improve the fishing activity in south coastal area of Yogyakarta Region.

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2 Materials and Methods

The tools that were used in this research are 30 cubes of fishing pot, scales, ruler, boat, stationery, GPS, bucket and digital camera. The materials that were used in this research are fodders that are generally used by fishermen: fresh fish, salted fish, and roasted coconut. Fresh fish was collected by fishermen when they had fishing using hand line. Salted fish fodder and coconut were bought from the local market. For the coconut fodder, it was roasted for 10 minutes. The method used in this research was *experimental fishing*, and the fishing ground was selected based on the information from local fishermen. The frame of fishing pot was made from steel and covered with *polyethylene multifilament* net [6]. Cube fishing pot was longlined, and 30 pots in total. Fishing pots was arranged based on their respective fodder (fresh fish, salted fish, and roasted coconut) with 10 fishing pots respectively. There are 10 trips in total, and was done in 1 month.

Fishing pots were immersed in the sea waters for 1 day or adjusted by weather conditions [4]. The fodders were placed in the pots properly, intended to attract the fish. The coordinate point of the pots was recorded using GPS. It was very helpful to determine the location of fishing pots was installed.

The catch results were classified based on the type of fodder. Data were gathered are length, weight, wide, sex and the type of catch result. Total length of fish was measured from the head to the tail and for snail was only measured by its weight [5]. The length of crab carapace is measured from *frontal spine* to the bottom edge of abdomen, while the wide cran carapace is measured from the last left side of *marginal spine* to the edge last right side of *marginal spine* [9]. The sex of crab can be seen through abdomen part. Male crab has abdomen with tapered triangle shape, while female crab has widening triangle shape [2].

3 Results and Discussion

3.1 Results

3.1.1. Composition of Catch

Catch result composition using cube fishing pot with three types of fodder at the estuary of Bogowonto river was provided in Table 1.

Table.1 Catch result of three fodders treatment

No	Catch Result	Treatment					
		A		B		C	
		Number (individual)	Weight (g)	Number (individual)	Weight (g)	Number (individual)	Weight (g)
1.	Mangrove Crab	26	2,246	9	442	2	59
2.	Freshwater Crab	1	16	3	64	2	30
3.	Puffer Fish	15	251	7	132	3	33
4.	Orange-spotted grouper fish	0	0	1	59	0	0
5.	Green tiger prawn	0	0	0	0	1	10
6.	Giant tiger prawn	0	0	0	0	3	115
7.	Banana Prawn	0	0	1	8	0	0
8.	Freshwater Snail	47	4,571	153	1,540	66	674
Total		89	7,084	174	2,245	77	921

A = Fresh fish fodder

C = Roasted coconut fodder

B = Salted fish fodder

Table 1 showed the catch result using cube fishing pot with three types of fodder, which are classified into 8 categories: mangrove crab, freshwater crab, puffers fish, orange-spotted grouper fish, green tiger prawn, giant tiger prawn, banana prawn, and freshwater snail. The orange-spotted grouper fish was only trapped inside of cube fishing pot with salted fish, green tiger prawn, and giant tiger prawn were trapped inside of cube fishing pot with roasted coconut, while banana prawn was trapped inside of salted fish fodder. The total amount of catch with fresh fish fodder were 489 (66.08%), salted fish fodder 174 (23.51%), and roasted coconut 77 (10.41%). The total weight of catch using fresh fish fodder was 7,084 g, salted fish fodder was 2,245 g, and roasted coconut fodder was 921 g. Catch result composition of cube fishing pot using three types of fodder are provided in Fig. 1.

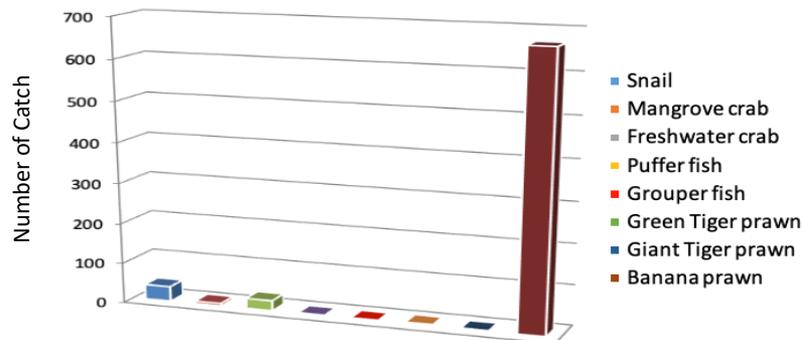


Fig.1 Catch result composition of cube fishing pot using three types of fodder

Fig. 1 showed that the catch result by cube fishing pot was dominated by freshwater snail as (90%) of the total amount. In other side, marine biota such as mangrove crab (5%), freshwater crab (0.81%), pufferfish (3.38%), Orange-spotted grouper fish (0.14%), Green tiger prawn (0.14%), Giant tiger prawn (0.41%) and banana prawn (0.14%). The total catch result during the research was 740 individuals. The catch composition of folded cube fishing pot based on the fodder can be seen in Fig. 2.

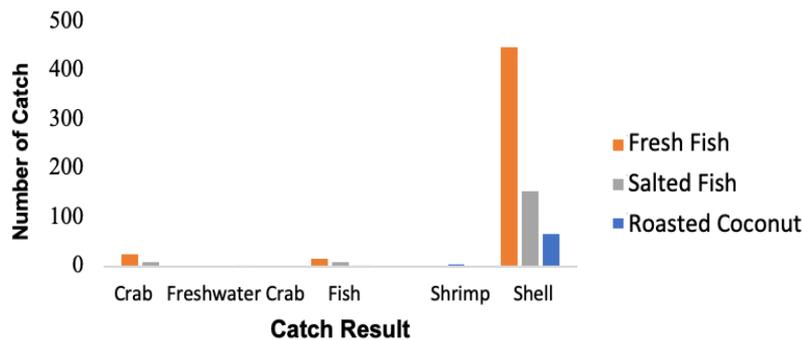


Fig.2. Catch result composition based on types of fodder

Fig. 2 showed comparison of composition the catch result mangrove crab, freshwater crab, fish, shrimp and shell are the biggest catch using freshwater fish as the fodder. The catch results which were not caught using fresh fish are Orange-spotted grouper fish, Green tiger prawn, Giant tiger prawn and banana prawn. The catch results which were not caught by salted fish as the fodder are Green tiger and Giant tiger prawn. Whilst Orange-spotted grouper fish and Banana prawn were not caught by roasted coconut fodder. The catch result composition using three kinds of fodder based on type of each trip are provided in Fig 3.

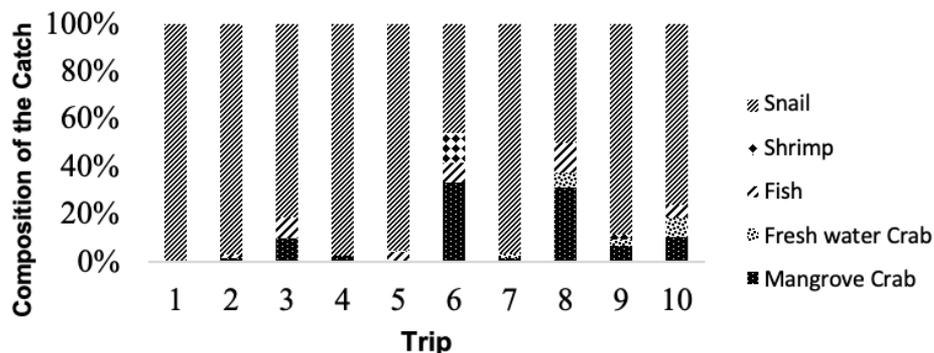


Fig. 3. Catch result composition from three types of fodder in trip

Fig 3. showed that catch result using three kinds of fishing pot is dominated by freshwater snail. The highest snail catch result is on the 5th trip (95.02%), while the lowest is in the 8th trip (50%). The highest shrimp catch result is on the 6th trip (12.5%), while the lowest is in the 5th trip (0.45%). The highest fish catch result is on the 3rd trip as much (9.09%), while the lowest is in the 1st, 4th, 7th and 9th trip (0%). The highest catch result of freshwater crab is on the 8th trip (6.25%). And the highest mangrove crab catch result is on the 6th trip (33.33%) whilst the lowest is in the 1st trip (0%).

3.1.2 Catch Rate

Biomass score of *catch per unit effort* (CPUE) is based on different amounts of trip. The score of fishing pot can be seen in Table 2.

Table 2. Biomass weight score of catch result per unit effort based on trip

Trip	Treatment					
	A		B		C	
	Weight (g)	CPUE (g/fishing pot)	Weight (g)	CPUE (g/trap)	Weight (g)	CPUE (g/fishing pot)
1	723	36.15	54	2.70	20	1.00
2	502	25.10	80	4.00	19	0.95
3	1,692	84.60	254	12.70	51	2.55
4	737	36.85	365	18.25	106	5.30
5	1,424	71.20	678	33.90	369	18.45
6	574	28.70	269	13.45	155	7.75
7	326	16.30	139	6.95	72	3.60
8	285	14.25	96	4.80	30	1.50
9	391	19.55	163	8.15	41	2.05
10	430	21.50	139	6.95	58	2.90
Total	7,084	354.20	2,237	111.85	921	46.05
Average	708.40	35.42	223.70	11.19	92.10	4.61

Source: Primary Data Analysis

Table 2 showed that the average of biomass weight of catch result by cube fishing pot with fresh fish fodder is 708.40 g, cube fishing pot with salted fish 223,70 g, and cube fishing pot with roasted coconut 92.10 g. Catch per unit effort (CPUE) of cube fishing pot with fresh fish fodder is 35.42 g/fishing pot, cube fishing pot with salted fish fodder is 11.19 g/fishing pot, and cube fishing pot with

roasted coconut fodder 4.61 g/fishing pot. The highest CPUE score was gained by cube fishing pot with fresh fish fodder in the 3rd trip 84.60 g/fishing pot, while the lowest CPUE score was the cube fishing pot with roasted coconut fodder in the 2nd trip as much 0.95 g/fishing pot. The result of One-way ANOVA is provided in Table 3.

Table 3. One-way ANOVA test of weight (gram) catch result

	Treatment	Mean	Std. Deviation	N	F _{rat}	F _{stat}
Ln_Weight	A	6.3924	0.59190	10	22.262	3.35
	B	5.1449	0.75728	10		
	C	4.0942	0.92734	10		
	Total	5.2105	1.21099	30		

Table 3. showed that based on One-way ANOVA test, the catch weight of cube fishing pot in the use of three types of fodder obtained score of $F_{ratio} (22.262) > F_{statistic} (3.35)$ with accuracy level of 95%. This result showed that H_0 was rejected, which means there is a significant difference towards catch weight results of fishing pot using three types of fodder. Therefore, the following test result or *Post Hoc* (LSD) in each treatment are provided in Table 4.

Table 4. *Post Hoc* towards weight (gram) of catch result

No.	Treatment	Sig.	Explanation
1.	A – B	0.001	Significantly Different
2.	A – C	0.000	Significantly Different
3.	B – C	0.005	Significantly Different

Table 4 shows that the catch result using fresh fish and salted fish fodder is significantly different with accuracy level of 95%. The weight of catch result using fresh fish fodder and roasted coconut fodder also significantly different with accuracy level 95%. The score of catch result per unit effort fishing pot or trap rate can be seen in table 5.

Table 5. Total score of biomass catch result per unit effort based on trip

Trip	Treatment					
	A		B		C	
	Total number	Trap rate (unit/ fishing pot)	Total number	Trap rate (unit/fishing pot)	Total number	Trap rate (unit/fishing pot)
1	72	3.60	5	0.25	2	0.10
2	48	2.40	8	0.40	2	0.10
3	87	4.35	18	0.90	5	0.25
4	55	2.75	37	1.85	11	0.55
5	129	6.45	57	2.85	35	1.75
6	12	0.60	6	0.30	6	0.30
7	29	1.45	13	0.65	7	0.35
8	9	0.45	5	0.25	1	0.05
9	25	1.25	14	0.70	3	0.15
10	23	1.15	9	0.45	5	0.25
Total	489	24.45	172	8.60	77	3.85
Average	48.90	2.45	17.20	0.86	7.70	0.39

Source : Primary Data Analysis

Table 5 showed that the average of biomass of cube fishing pot with fresh fish was 48 species, fishing pot with salted fish was 17 species, and fishing pot with roasted coconut fodder was 7 species. The average of trap rate of cube fishing pot with fresh fish was 2.45 species/fishing pot (48 species in 10 fishing pot). Cube fishing pot with salted fish is 0.86 species/fishing pot (17 species in 10 fishing pot), and cube fishing pot with roasted coconut 0.39 species/fishing pot (7 species in 10 pot). The highest trap rate score was reached on 5th trip of cube fishing pot with fresh fish are 6,45 species/fishing pot, while the lowest trap rate was reached on 8th trip of fishing pot with roasted coconut 0,05 species/fishing pot. The one-way ANOVA test result analysis towards the number of catch result was showed in Table 6.

Table 6. One way ANOVA test result towards the number of catch result

	Treatment	Mean	Std. Deviation	N	F _{ratio}	F _{stat}
Ln_Amount	A	3,5885	0,86019	10	12,989	3,35
	B	2,5036	0,82646	10		
	C	1,5395	1,00201	10		
	Total	2,5438	1,21569	30		

Table 6 showed that according to one way ANOVA test towards the number of catch based on treatment to three types of fodder obtained score $F_{ratio} (12,989) > F_{statistic} (3,35)$ with accuracy level 95%. This result shows that H_0 rejected which means there is a real difference towards the catch result of cube fishing pot using three types of fodder. Therefore, *Post Hoc* (LSD) catch number to each treatment are provided in table 7.

Table 7. *Post Hoc* towards the number of catch result

No.	Treatment	Sig.	Explanation
1.	A – B	0,012	Significantly different
2.	A – C	0,000	Significantly different
3.	B – C	0,024	Significantly different

Table 7 shows that the number of catch using fresh fish fodder and salted fish was significantly different with accuracy level of 95%. The number of catch using fresh fish fodder and roasted coconut fodder also significantly different with accuracy level of 95%. The number of catch using salted fish fodder and roasted coconut fodder was also significantly different with accuracy level of 95%.

Based on the obtained results, fresh fish fodder has the highest number of catch. It was showed that cube fishing pot with fresh fish fodder can be used by fishermen as an alternative fishing gears. Other fishing gears such as nets and hand line can be used alongside the cube fishing pot. While fishing pots were set in the waters, the fishermen can utilize net and hand line for active fishing. On the other hand, the catch of fishing pot is still alive, so they are still fresh when the fishing pots were lifted from the waters. Fishing pots is considered an eco-friendly fishing gears because it doesn't have bad impact on the catch, and the resulting fish and other caught species were in fresh condition. Such condition does not happen while fishing using net or handline, as most of the catch will be injured and tend to die.

4. Conclusion

The catch composition consisted of 8 types of species : *Scylla serrata* (5%), *Parathelphusa convexa* (0.81%), *Tetraodon retilularis* (3.,38%), *E. Coioides* (0.14%), *Metapennaeus burkenroadi* (0.14%), *Pennaeus semisulcatus* (0.41%), *Pennaeus merguensis* (0.14%), *Sulcospira testudinaria* (90%). Fresh fish fodder has 66.08% of total catch with 7,084 g of weight, salted fish 23.51% with 2,245 g, and roasted coconut 10.41% with 921 g in total. The highest catch rate of fishing pot reached by fresh fish

(35.42 g/unit) compared to salted fish (11.19 g/unit) and roasted coconut fodder (4.61 g/unit). Based on the result, fresh fish is the most effective fodder than salted fish and roasted coconut while it was used in the fish pot trap which operated in the estuary.

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