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The Effect of Bait on The Catch Composition of Square Folding Trap in Rawa Pening Semarang Regency

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ABSTRACT

This study aims to determine the effect of the type of bait on the composition of the catch fish, catch rate, and trap rate using square folding traps. The study was conducted at three fishing locations in October 2019-January 2020 using the experimental fishing method. The operation of square folding traps was done by a total of 60 units. The types of bait used are golden snails, shrimp paste, and trash fish. Fish catches were recorded in number, type, length, and weight, and analyzed using one-way anova test and kruskal wallis test. The composition of the square folding traps catches consists of six species. Marble goby (*Oxyeleotris marmorata*) is the most dominant catch (60%). The highest catch rate was obtained from square folding traps which were using golden snail as bait at 173.50 g/trip, then trash fish as bait at 76.88 g/trip and shrimp paste feed at 59.22 g/trip. The highest trap rate is golden snail bait of 12.33%. The bait treatment gives a real difference to the amount and weight of the catch, the golden snail bait gives the highest total number and weight of the catch compared to other baits.

Keywords: Bait, Square Folding trap, Snail, Rawa pening, Shrimp paste.

1. Introduction

Rawa Pening is one of inland waters with a wide area of 2,670 ha, at about 463 m above sea level, which is lies between Banyubiru, Ambarawa, Bawen, and Tuntang Sub-Districts. The water of Rawa Pening originates from 17 rivers which end in southern, southwestern, western and northern of Rawa Pening, while the outlet is flowing through Tuntang River situated in the northeast (Indrayati, 2018). The total water capacity of Rawa Pening estimated around 25-65 million m^3 and commonly used as irrigation of rice fields, electricity generators, fisheries, household needs and tourism. Rawapening and its resources played a significant role in supporting people's lives either ecologically, economically, or socially.

Most of the people who live around Rawa Pening area became a fisherman. According to Utomo (2013), the development of fishery production has increased by more than 50% from year to year. The dependence of local farmers and fisherman on Rawa Pening will continue to increase and get bigger as well. The fish catches in Rawa Pening ranges from of 1.042–1.134 tonnes/year. The communities around Rawa Pening are generally engaged in providing fish seeds, fish farming, fishing and fish trading, as well as handicraft making of the water hyacinth. Rawa Pening has high potential especially in capture fishery, therefore it is necessary to take advantage of these inland waters in an environmentally friendly and sustainable manner.

The square folding trap is known as a fish trap locally called "bubu", which is associated with the guiding barriers. According to Von Brandt (2005), bubu is categorized as a passive trap. In principle, fish trap is made to manipulate fish's sight capability, thereby fish will be entrapped inside. It can also be called 'fishing pots' or 'fishing baskets' (Perdana et al., 2016), made from various basic materials, braided in such a way to prevent fish from freeing itself. The traps used by the Rawa Pening fishermen are mostly made of bamboo and plastic. Placing fish bait inside trap will increase its trapping efficiency (here, you should add some references on fish baits). The typical bait that used by fisherman as fish attractor was fish trash, instead of golden snails, bran, salted fish. Therefore, it is necessary to evaluate the effectiveness of bait in its operations. For this reason we carried out field experiment to determine the most effective bait type used for the square folding trap in Rawa Pening. Outcome of study could be useful for fishermen welfare.

2. Materials and Methods

The field experiment was conducted in Rawa Pening located on coordinate point about S 07°16'27.33"- E 110°26'04.66" until S 07°17'06.34"- E 110°26'06.28". Research activity was started from December 2019 to January 2020. Data were collected from 15 fishing trips. There are 60 units of square folding trap used in this study and each treatment of bait uses 20 units of traps. A total of 60 units of the square folding traps consisted of 20 units using golden snail bait, 20 units using trash fish bait, and 20 units using shrimp paste bait. The installation of traps is carried out alternately. The square folding trap was operated by connecting it to 1.5 meters and each end of the rope is tied to floats. The design of the square folding trap installation is indicated in Figure 1.

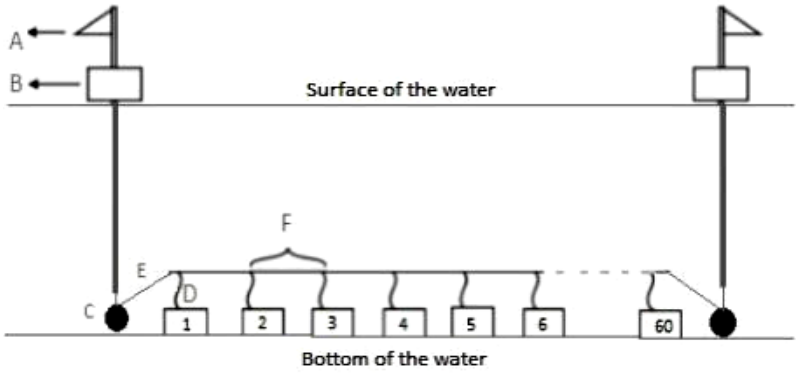

Figure 1. The design of square folding trap installation

Explanation:

A. Sign Flag (Plastic)
B. Float (*Styrofoam*)
C. Ballast
D. 1 m Connecting Rope
E. 5 m Float Rope
F. 1,5 m Rope between fish trap

The research instrument used square folding trap, GPS (Global Positioning System), scale with 1 g accuracy, length measuring device with 0.1 cm accuracy, stationary, camera, bucket and motorboat. The square folding traps were constructed with the same size (38x27x17 cm) and dimension. They were made of iron frame and covered by polyethylene multifilament with 0.5 inches stretched mesh size. As the experimental treatment, three types of bait are applied i.e. golden snail, shrimp paste, and trash fish. The weight of bait used each trap ranges from 10 g. The square folding trap design was shown in Figure 2.

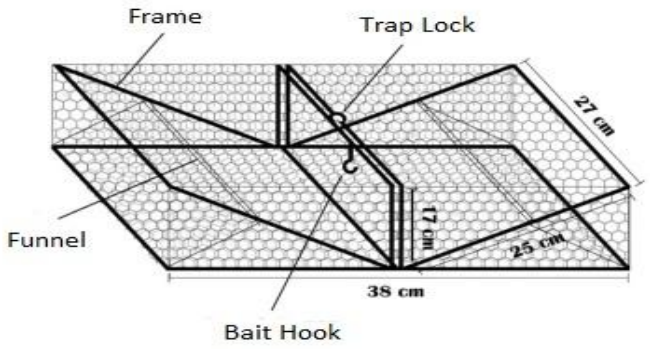

Figure 2. Design of square folding trap

The types of fish caught will be analyzed descriptively. The type of catch is recorded, the total length (cm) and weight (g) are recorded, as well as the number of individuals, the trap rate (%) and the production of the catch / CPUE (g) is calculated, especially for lobster and shrimp catches, the width of the carapace is measured. The catch data is described descriptively using tables and graphics. The data were processed using composition analysis and capture rate analysis. Composition analysis is used to determine the percentage of individuals in a trial at a particular location. How to calculate the composition as follows:

$$\text{Composition (\%)} = (n / N) \times 100\%$$

Information:
n = the number of fish species;
N = the total catch.

The amount of fish caught per fishing effort or CPUE (Catch Per Unit Effort), was calculated by the following formula:

$$\text{CPUE} = \text{Catch} / \text{Effort}$$

Information:
Catch = the amount of catch (g);
Effort = effort to catch (trip).

Trap rate analysis is used to determine the ability of the traps to catch the catch. Trap rate was calculated by the following formula:

$$\text{TR (\%)} = (\text{Bubu filled} / \text{Total}) \times 100\%$$

Information:
Bubu filled = the number of traps filled with the catch;
Total = the total number of traps used in the treatment.

3. Results and Discussion

Result

The fishes species caught using square folding trap with golden snail, shrimp paste and trash fish as bait is. A total of 6 species belonging to 5 families were collected from baited traps (Table 1). The catch composition consisted of 4 species of fish, there are *Oxyeleotris marmorata*, *Oreochromis mossambicus*, *Amphilophus amarillo*, *Osteochillus vittatus*, and 2 species of crustacea, *Cherax quadricarinatus* and *Macrobracium idea*.

Table 1. Fish species caught using square folding trap in Rawa Pening

No	Species Name	English Name	Family	Golden Snail		Shrimp Paste		Trash Fish	
				Total (fish)	Weight (g)	Total (fish)	Weight (g)	Total (fish)	Weight (g)
1	*Oxyeleotris marmorata*	Marble goby	Eleotridae	22	2134,3	20	888,4	14	708,2
2	*Cherax quadricarinatus*	Red claws freshwater lobster	Parastacidae	5	164,9	0	0	11	279
3	*Macrobrachium idea*	Freshwater shrimp	Palaemonidae	5	20,2	0	0	3	11,1
4	*Oreochromis mossambicus*	Mozambique Tilapia	Cichlidae	7	190,5	0	0	4	108,8
5	*Amphilophus amarillo*	Red devil	Cichlidae	1	16,6	0	0	1	46,2
6	*Osteochillus vittatus*	Nilem	Cyprinidae	1	76,1	0	0	0	0
	Total			41	2602,6	20	888,4	33	1153,3

Table 1 indicates that fishes species caught by square folding trap with golden snail as bait was more diverse and higher in term of number and weight of fish than using shrimp paste and trash fish as baits. The fish caught using golden snail as bait was marble goby (*O. marmorata*), red claws freshwater lobster (*C. quadricarinatus*), freshwater shrimp (*M. idea*), tilapia (*O. mossambicus*), red devil (*A. amarillo*) and nilem (*O. vitatus*). The total of fish caught using golden snail as bait was 41 fishes with total weight 2602,6 g. The fish caught using shrimp paste was 20 marble goby (*O. marmorata*) with total weight 888,4 g, while using trash fish as bait was marble goby (*O. marmorata*), red claws freshwater lobster (*C. quadricarinatus*), freshwater shrimp (*M. idea*), tilapia (*O. mossambicus*) and red devil (*A. amarillo*). The total of fish caught using trash fish as bait was 33 individu with total weight 1153,3 g. The composition of fish caught using square folding trap is shown in Figure 3.

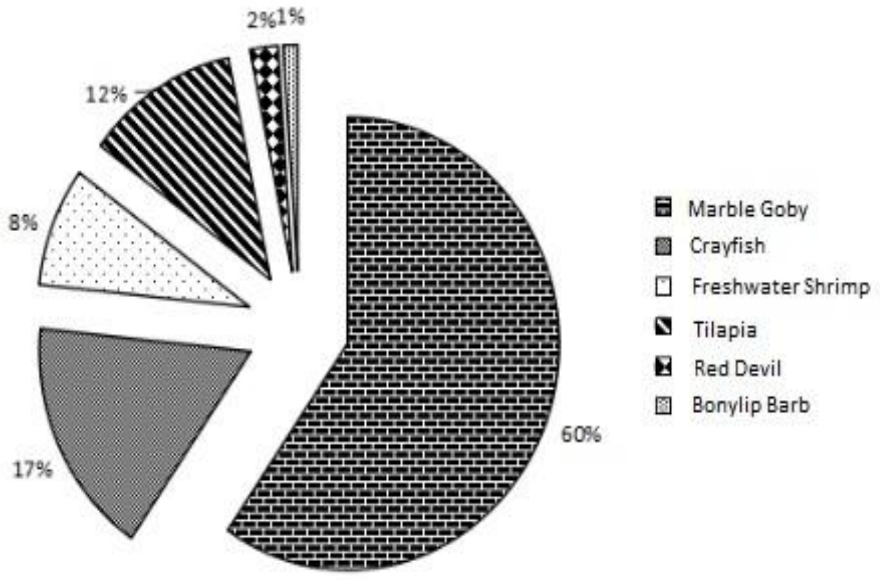

Figure 3. The composition of fish catch using square folding traps Rawa Pening

Figure 3 showed that the most dominant species caught by square folding trap in Rawa Pening was marble goby (60%), followed by lobster (17%), tilapia (12%), shrimp (8%) , red devil (2) and nilem (1%). The catch per unit effort (CPUE) of square folding trap can be seen in Table 2.

Table 2. The amount of fish caught per unit effort using square folding traps based on the trip

Trip	Golden Snail		Shrimp Paste		Trash Fish	
	Weight (g)	CPUE (g/trap)	Weight (g)	CPUE (g/trap)	Weight (g)	CPUE (g/trap)
1	45,4	2,27	80	4	21,3	1,06
2	97,9	4,89	86	4,3	46,2	2,31
3	80,2	4,01	62,9	3,14	178,3	8,91
4	129	6,45	122,4	6,12	50,6	2,53
5	47,7	2,38	56,5	2,82	73,6	3,68
6	372,5	18,62	60,7	3,03	125,4	6,27
7	123,3	6,16	29,8	1,49	37,9	1,89
8	64,1	3,20	34,5	1,72	44,6	2,23
9	182,7	9,13	89,3	4,46	141,7	7,08
10	230	11,5	52,7	2,63	127,1	6,35
11	832,5	41,62	51,2	2,56	83,6	4,18
12	76,8	3,84	39,4	1,97	59	2,95
13	86,4	4,32	39,7	1,98	35,6	1,78
14	98,1	4,90	29,3	1,46	42,9	2,14
15	136	6,8	54	2,7	85,5	4,27
Total	2602,6	130,13	888,4	44,42	1153,3	57,66
Average	173,50	8,67	59,22	2,96	76,88	3,84

Table 2 showed the average of weight of fish caught using square folding trap with golden snail as bait was 173,50 g, followed by shrimp paste was 59,22 g, and trash fish was 76,88 g. The highest CPUE was obtained by folding trap using golden snail as the bait (8,67 g/trap), and the lowest one was obtained using shrimp paste as the bait (2,96 g/trap). The trap rate of square folding trap showed at Table 3.

Table 3. Trap rate of square folding traps in Rawa Pening

Trip	Golden Snail		Shrimp Paste		Trash Fish	
	Filled Trap	Trap Rate (%)	Filled Trap	Trap Rate (%)	Filled Trap	Trap Rate (%)
1	2	10	2	10	1	5
2	2	10	2	10	1	5
3	2	10	1	5	3	15
4	2	10	2	10	2	10
5	2	10	1	5	1	5
6	6	30	2	10	2	10
7	3	15	1	5	2	10
8	1	5	1	5	1	5
9	3	15	1	5	4	20
10	3	15	1	5	2	10
11	2	10	1	5	3	15
12	2	10	1	5	3	15
13	2	10	1	5	2	10
14	2	10	1	5	2	10
15	3	15	2	10	1	5

Total	37	185	20	100	30	150
Average	2,46	12,33	1,33	6,66	2	10

Table 3 showed the highest trap rate was obtained by square folding trap using golden snail as the bait as amount 12,33 % (ranged 5-30%), while the lowest trap rate was obtained by square folding trap using shrimp paste as much as 6,66% (ranged 5-10%).

Data on the number of catches were analyzed to determine the effect of using multiple bait on the number of catches using SPSS with the Kruskal Wallis test. The results of the statistical analysis showed that Asym. Sig (0.001) alpha (0.05), then H0 is rejected, which means that there is a significant difference in the treatment of the number of catches in units of of quantity, there isi a significant difference in the treatment of bait types. Statistical analysis shows that the catch in weight units has a significant difference in the type of bait treatment, with F count 7,109> F table 3,219 at the 95% confidence level, then H0 is rejected. H0 rejected means that there is an effect of the type of bait treatment on the weight of the catch.

Discussion

Trap fishing is one of the important fishing technique around the world, in which, bait plays a key role and decides the success (Lokkeborg et al., 1990; Masilan & Neethiselvan, 2018). The use of golden snail as bait results in the highest rate of fish caught compared to trash fish and shrimp paste as bait. Bait plays a role as an attractor that could give both physical and chemical stimuli. A chemical stimulus, as opposed to visual and acoustic stimuli has two properties that are most important for the use of bait to capture fish. First, a chemical stimulus disperses over long ranges and can be detected by fish from very long distances. Second, a chemical stimulus lasts for a long period of time, whereas visual and acoustic signals fade immediately after being transmitted. The odor of bait in the water could stimulate receptor in fish organ, therefore the fish will move closer to the bait in the trap. Bait odor is the most important parameter in attracting fish to the gear (Løkkeborg et al., 2014). The odor of attractor was produced by amino acid as a part of the protein chain. Therefore, the chemical content of the bait becomes a determining factor of effectiveness of the bait (Taibin, 1984; Riyanto, 2008). The difference of fish caught in total might be affected by type of bait used, due to the odor produced by chemical content such as amino acid of those materials. Based Susanto (2010), the golden snail posseses water (81,19%), protein (10,30%), fat (0,51%), ash (4,07%), acid insoluble ash (0,30%), and carbohydrate (3,93%). The total fish caught using golden snail as bait posesses the highest number, because golden snail produces a fresh aroma to fishes, which could attract and lure fish into the traps. The fresh aroma of golden snail is caused by using the live gold snail which is turned off and immediately used, not the bait that has become decayed. Once the fish is close to the bait, other factors, such as size and shape, increase in importance for attracting the fish to attack the bait. Additional factors, such as the firmness of the bait and how well it holds to the hook, are important characteristics influencing the final effectiveness of each type of bait, as they determine how long the bait stays on the hook of the fishing gear (Kumar et al. 2016; Sistiaga et al. 2018).

The fish catch composition is dominated by marble goby and shrimp. Monintja and Martasuganda (1990) states that shrimps and fishes can easily be trapped inside traps because of one of many factors which is odor produced by bait. Crustaceae's sense of odor is very sensitive and accurate in detecting smells even though the smells is already changed by environmental factors. According to Stoner (2004) and Fitri (2011), olfactory organ of fish will be more active than its visual organ because detecting food by receiving chemical signs will be easier than directly using its visual organ. Rawa Pening has a muddy substrate, shallow, and a smooth current in several spots. Marble goby inhabit in freshwater such as in a river, lake, reservoir, and swamp. This fish was also likely to live in a water that was shallow, slow moving current, muddy bottom waters and has a lot of emerging aquatic plants for protection. Another factor that causes fish for being caught in a trap was the formation of microhabitate inside square folding trap. As mentioned by Wibowo et al. (2004), the existence of aquatic plants in a certain amount will create a microhabitate needed by fishes as a shelter or hiding spot, feeding ground, spawning ground, and nursery ground.

The size of funnel in square folding trap tends to be too narrow. Consequently, it will be difficult for big fishes to get caught. Based on the distribution data, the fishes caught are dominated by small fishes which entails to the lower catch rate. The number of catch per unit effort (CPUE) of square folding trap

with golden snail as bait was 130.13 g/trip or 8.67 g/trap, shrimp paste as bait is 44.42 g/trip or 2.96 g/trap and trash fish as bait is 57.66 g/trip or 3.84 g/trap. While for the trap rate, the highest rate was gained by golden snail as bait (12.33%), followed by trash fish (10%) and shrimp paste (6.66%). Several factors that affect catch rate of square folding trap are fishing ground and the season which was the trap operated (Arios et al., 2013). In the beginning of rainy season, mass death of fish often occurs in Rawa Pening, caused by up-welling process, the low-oxygen water from bottom move to the surface layer. The rest of water hyacinth harvest, fish feed and dirt will sediment and rot at the bottom of waters which causes the lower degree of oxygen in the waters. Rain water, which possesses a lower temperature and a higher specific gravity will be moved down to the bottom, therefore, a part of the bottom waters which a lower degree of oxygen will be moving up to the surface water, and causing death of fish (Poernomo dan Utomo, 2013). Besides, the waste from upriver that flows down to Rawa Pening causes the lower degree of dissolved oxygen (Utomo, 2014).

According to Baskoro and Effendy (2005), characteristics of effective bait are having a specific smell and durable, however, its abundance and availability was also becoming the most important reason of using the bait. In line with Slack (2001), a characteristic of effective bait is its abundance. This statement is supported by Martasuganda (2003) who declares that a good bait is typical with its availability and low price. In case of Rawa Pening, all bait needs are easily obtained. The golden snail population was abundant and can be found not only in the swamp itself, but also in surrounding the rice fields. Besides, using golden snail as bait also helps the rice farmers overcoming their pest problem. Trash fish (freshwater fish) is also easy to obtain around aquatic plants, in which trash fish will accumulate after being swept by water flow. Collection of trash fish in a large quantities will take a much longer time and it is evidently ineffective compared to collecting golden snail as bait. Shrimp paste can be easily obtained from markets or stores with an affordable price. In spite of its affordable price, shrimp paste as bait is not as effective as golden snail and trash fish. Statistical analysis based on weight or number of fish caught using golden snail, shrimp paste, and trash fish as bait, indicate that type of bait used has a significant difference of effect in fish catching. Golden snail becomes the most effective bait in terms of price, abundance, fish catch, trap rate, and catch rate. Using golden snail as bait can also be useful in decreasing pest problem that is often experienced by rice farmers.

4. Conclusions

The catch composition was dominated by Marble goby. The use of golden snail as bait was considered the most effective among other baits in term of catch number, CPUE and trap rate. The funnel trap entrance should be refined to improve the trap effectiveness and the different baits can have different effects on large and small fish, which is crucial information for both fishermen and fisheries managers. Therefore, the further research is needed.

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