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The influence of feed and depth on the operation of bubu fishing tools in Pangkalan Kuras District, Pelalawan Regency, Riau Province

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Abstract
This research aims to determine the effective bait weight and depth for operating fish traps in Kesuma Village, Pangkalan Kuras District, Pelalawan Regency. Bait weights were categorized into 50 g, 100 g, and 150 g, while depths were divided into 1 m and 5 m increments. The research was conducted in January 2022 along the Nilo River in Kesuma Village. Experimental fishing was employed as the methodological approach, using a factorial randomized block design. The analysis of variance results on the catch quantity indicated that there were effects of bait, depth, and their interaction, with Fvalue > Fcritical. The analysis of variance results on the catch weight stated that there were effects of bait and depth, as Fvalue > Fcritical. In contrast, the interaction between bait and depth had Fvalue < Fcritical, indicating no interaction effect on catch weight. Based on the Least Significant Difference (LSD) test revealed that a bait weight of 150 g at a depth of 5 m was optimal for maximizing catch quantity. In comparison, a depth of 1 m with a bait weight of 150 g was preferable for achieving a heavier catch using fish traps.

1. INTRODUCTION

One of the districts in Pelalawan Regency is Pangkalan Kuras District. Fishermen in Pangkalan Kuras District, particularly in Kesuma Village, utilize a fishing gear called bubu for their fishing activities. The principal catches from the Bubu operated by fishermen in Kesuma Village are catfish (Mystus) and silurid catfish. Currently, there is no available information regarding the number of fishermen using Bubu in Kesuma Village, either at the Kesuma Village Office or the Pelalawan Fisheries Department. Based on an interview with Mr Fikri, a fisheries supervisor in Kesuma Village, it is estimated that around 30 fishermen are using Bubu, with each having an average of 30-40 units of Bubu traps.

The Bubu fishing gear operates passively and is influenced by various factors, including the bait weight. Sainte-Marie (1994) researched the relationship between bait weight and packaging on catch results using crab traps and found that increasing the bait weight can enhance the catch quantity up to a certain threshold. Caesario (2011) similarly demonstrated that as the bait weight increases, the release of bait scent also intensifies, thus attracting the attention of the target fish species. Furthermore, increased bait weight leads to a slower depletion than smaller bait quantities.

Fishermen in Kesuma Village also utilize bait when operating the Bubu fishing gear, specifically oil palm (*Elaeis braziliensis*), as it is one of the most abundant tree species found in the village. However, a challenge arises as the fishermen in Kesuma Village need specific regulations regarding bait weight for operating the Bubu fishing gear. The bait placed on the bubu fishing gear is typically

based on the fishermen's preference, approximately one handful or ±100 g. This customary practice among the fishermen in Kesuma Village prompted this research to investigate the influence of different bait weights on bubu operation in the Nilo River of Kesuma Village, Pangkalan Kuras District, Pelalawan Regency. This study will categorize bait weight into 50 g, 100 g, and 150 g. The selection of these bait weights is based on the fishermen's customary practices, as mentioned earlier, and on previous research conducted by Caesario (2011), which also categorized bait weights into 50 g, 100 g, and 150 g.

Another factor influencing the catch results of bubu fishing is depth. Based on the research findings of Dollu & Maro (2019) regarding the distribution patterns of bubu fishing gear, it is known that depths ranging from 0 to 5 m are extensively utilized by fishermen as bubu fishing areas. This is because these waters are influenced by natural processes from the land, resulting in a dynamic ecosystem with diverse biodiversity. Fishermen in Kesuma Village do not have specific regulations regarding depth when operating bubu fishing gear, but they typically operate bubu traps at 1 m and 5 m. This customary practice among fishermen also motivates this research to investigate the influence of depth on bubu operation in the Pangkalan Kuras District of Pelalawan Regency. Based on these explanations, it is necessary to research the effects of bait weight and water depth on operating bubu fishing gear in the Nilo River of Kesuma Village, Pangkalan Kuras District.

2. RESEARCH METHODS

Time and Place

This research was conducted in January 2022 and occurred along the Nilo River in Kesuma Village, Pangkalan Kuras District, Pelalawan Regency.

Materials and Tools

The materials used in this research included oil palm as bait, while the equipment utilized comprised bubu as the fish trap, a boat for transportation to the fishing ground, a smartphone camera for documentation, a laptop for data processing, a digital scale accurate to 0.01 g for weighing catches and bait, a roll meter, rope, and weights for measuring depth, a Secchi disk for measuring water clarity, pH paper for measuring water pH, and a thermometer for measuring water temperature.

Research method

The method utilized in this research is experimental fishing. According to Nazir (2003), the experimental method involves observation under artificial conditions, which the researcher creates. The experimental design employed in this study is the Randomized Block Design (RBD). The factorial design of RBD is an experiment conducted to determine the effects of two specific factors and the interaction between these factors on a response. The two factors in this study are bait with three levels and depth with two levels. The three levels of bait in this study are distinguished by weight, namely 50 g, 100 g, and 150 g. The two levels of depth factor are differentiated into 1 m and 5 m. The levels and combinations of treatments can be seen in Table 1.

Table 1. Levels and treatment combinations

Factor		*Treatment Combinations*
Bait (B)	Depth (D)	
50 g (B_1)	1 m (D_1)	B_1 on D_1
100 g (B_2)		B_2 on D_1
150 g (B_3)		B_3 on D_1
50 g (B_1)	5 m (D_2)	B_1 on D_2
100 g (B_2)		B_2 on D_2
150 g (B_3)		U_3 on D_2

Research Procedures

The steps conducted throughout the research are outlined as follows: 1) Preparation of the necessary equipment for the study, including weighing the bait to ensure uniformity and slicing it to facilitate scent dispersion. 2) Journey to the fishing ground, the designated area for fish capture. 3) Installation of the bubu traps at predetermined depths of 1 m and 5 m. The bubu traps are set up at 16:00 local time and left submerged for approximately 16 hours. 4) Retrieval of the bubu traps at 08:00 local time. The catch is categorized based on the species of fish captured after retrieval. Each species is weighed, and the quantity is recorded and documented. 5) Measure environmental parameters to assess the general conditions of the Nilo River, the primary fishing area in Kesuma Village. Ecological parameters measured in this study include temperature, clarity, current speed, and pH levels.

Data Analysis

The data collected in this study is then presented in the form of tables and graphs, along with other relevant information. The data is subsequently analyzed descriptively. The influence of bait and depth on the operation of the ubu traps regarding catch results is determined by analyzing variance (ANOVA). Before conducting the Fvalue test in the Analysis of Variance (ANOVA), a normality test is performed using the Kolmogorov-Smirnov test. If the significance value is > 0.05, indicating that the populations of bait and depth are typically distributed, the analysis of variance can proceed. Analysis of variance is employed to test hypotheses involving more than two populations or treatments. If the calculated Fvalue > F0.05, it indicates that the treatment significantly influences the catch results, and further, LSD (Least Significant Difference) testing is conducted.

3. RESULTS AND DISCUSSION

Construction of Bubu Fishing Gear

The bubu used in this study is a bottom-set type designed to be stationary at the bottom of the water. This bubu is circular, with a length of 80 cm and a diameter of 20 cm. The frame of the Bubu is constructed from samak wood (*Syzygium inophyllum* DC), consisting of 4 sections spaced 20 cm apart. Fishermen around the Nilo River commonly find samak wood. The body of the bubu is made of United brand polyethylene netting with a mesh size of 3.175 cm. The bubu used in this study consists of two openings. The first opening is slightly larger, with a diameter of 6 cm, and is located 50 cm from the second opening. The second opening is narrower than the first, with a diameter of 1 cm, and located 10 cm from the bait or where the catch accumulates. The last part of the bubu is the trap door for releasing the catch, with a diameter of 10 cm. After the catch is released, the net will be reassembled using polyethylene ropes.

Bait Specifications

The bait utilized in this research consists of whole oil palm fruit. Harsandi et al. (2015) highlight one of the advantages of using whole oil palm fruit as bait: its longevity due to its components' firmness and resistance to quick depletion. However, its slow scent dispersion process is a drawback, as the fruit fibers protect the oil aroma. To expedite the scent dispersion process, the fruit flesh of the oil palm will be sliced before being used as bait. This is aimed at accelerating the release of bait scent into the water. Findings from the study by Fitri & Purbayanto (2009) demonstrate that chopped fish bait releases fatty acids more rapidly than whole shrimp bait. The bait will not be directly inserted into the bubu; instead, it will be wrapped in yellow polymer mesh, typically used for fruit packaging. This wrapping prevents the sliced oil palm fruit flesh from escaping through the walls of the bubu.

Measurement Results of Environmental Parameters

The general condition of the Nilo River's water in this study was assessed by measuring several environmental parameters, including temperature, water clarity, current velocity, and pH. The temperature range of the Nilo River during the study period was between 25-29 ºC. Temperature plays

a crucial role in fish presence, as excessively high temperatures can induce stress in fish. The water clarity in this study varied between 13 cm and 29 cm. This level of clarity was considered low due to the capture being conducted during the rainy season, leading to increased runoff from the surrounding river area and subsequent turbidity.

Additionally, the current velocity in the study area was below 0.1 m/s, categorized as very slow, according to Mason (1991). The pH values in this study ranged from 4-5. Research conducted by Erlangga (2007) indicated that the Kampar River's pH tends to be acidic, ranging from 4.5-6, attributed to marshy areas in the Riau Province with low acidity levels.

Catch Results Based on Species

The total catch obtained from the bubu traps during this study amounted to 299 individuals, weighing 15,061.6 g, comprising 10 different fish species, as shown in Table 2.

Table 2. The fish species caught

No	Scientific Name	Number (of individuals)	Weight (g)
1	*Bagoides melapterus*	75	2070,6
2	*Hemibagus nemurus*	48	8583
3	*Kryptopterus cryptopterus*	53	1035
4	*Kryptopterus apagon*	25	932
5	*Mystus nigriceps*	34	895
6	*Siluroides eugneatus*	36	815
7	*Cyclocheilichthys apogon*	9	352
8	*Labiobarbus leptocheilus*	7	251
9	*Puntius orphoides*	7	109
10	*Puntius bulu*	5	60
Total		299	15102,6

Based on the number of individuals in this study, the dominant catch was the clown featherback, with 75 individuals or 25.1% of the total catch. *B. melapterus* dominated the catch due to the edges of the Nile River, which also serves as the area for trap fishing, being peatland areas covered with grass-like plants (Gramineae). Peat swamp plants like this grass play a significant role as spawning grounds for fish during the rainy season (Utomo et al., 2001). This study's dominant catch based on weight (g) was the clown featherback, weighing 8,853 g or 56.8% of its total catch. *H.nemurus* prefers hidden places and lives in groups at the bottom of water bodies. *H.nemurus*, belonging to the family Bagridae, has a high tolerance level to environments with low acidity levels, such as the Nile River, which ranges from 4 to 5. The water condition with low pH and brightness levels allows only certain fish species to adapt, survive, and reproduce (Santoso & Wahyudewantoro, 2019). This is why pH has a significant influence on the number of catches. Families such as Bagridae, including *H.nemurus*, *B.melapterus,* and *M.nigiceps*, as well as Siluridae families such as *K.cryptopterus*, *K.apagon*, and *S.eugneatus*, which are dominant catches in this study, have a high tolerance level to environments with low acidity levels. This is in line with the survey by Santoso & Wahyudewantoro (2019), where Bagridae and Siluridae families are commonly found in peat swamp areas. Sari et al. (2019) also mentioned that fish from the Siluridae family are generally found in low-pH and turbid waters.

Catch Results Based on Days

This research was conducted for 10 days, with each day constituting a single trial. The peak catch was observed on the 3rd and 6th days, 12% of the cumulative catch. Conversely, the lowest catches were documented on the 1st and 8th days, comprising 8% of the total catch. Daily catch data based on quantity are presented in Table 3.

Table 3. The daily catch results are based on the quantity

Days, date	Treatments						Total
	B_1		B_2		B_3		
	D_1	D_2	D_1	D_2	D_1	D_2	
Wednesday, 19-01-2022	3	6	1	4	4	7	25
Thursday, 20-01-2022	1	4	3	6	4	9	27
Friday, 21-01-2022	3	7	5	8	5	9	37
Saturday, 22-01-2022	3	1	4	6	5	10	29
Sunday, 23-01-2022	4	5	1	6	6	7	29
Monday, 24-01-2022	2	6	4	6	7	11	36
Tuesday, 25-01-2022	3	3	4	6	5	12	33
Wednesday, 26-01-2022	1	6	1	4	4	7	23
Thursday, 27-01-2022	3	3	4	6	5	10	31
Friday, 28-01-2022	1	3	3	6	4	12	29
Total	24	44	30	58	49	94	299

The maximum catch weight observed during this research occurred on days 3 and 6, comprising 12% of the total catch weight. Conversely, the minimum catch weight was recorded on day 2, constituting 7% of the total catch weight. Daily catch results based on weight are presented in Table 4.

Table 2. The catch results per day based on weight

Days, date	Treatments						Total
	B_1		B_2		B_3		
	D_1	D_2	D_1	D_2	D_1	D_2	
Wednesday, 19-01-2022	566	180	158	75	247	196,6	1422,6
Thursday, 20-01-2022	167	102	75	146,3	328	247,2	1065,5
Friday, 21-01-2022	215,2	153	414	175	535	273,2	1765,4
Saturday, 22-01-2022	368,2	28,2	526	131	334	317,2	1704,6
Sunday, 23-01-2022	277,2	138	167	162	600	180	1524,2
Monday, 24-01-2022	208,2	171	385	147	625	303	1839,2
Tuesday, 25-01-2022	88	32,3	240,2	274	606	346,2	1586,7
Wednesday, 26-01-2022	240	178,2	158	75	523	173	1347,2
Thursday, 27-01-2022	214,2	42,3	255	131	564	317,2	1523,7
Friday, 28-01-2022	20	32,3	212	274	439	346,2	1323,5
Total	2364	1057,3	2590,2	1590,3	4801	2699,8	15102,6

Environmental factors influence the catch quantity and weight on days 3 and 6. During the study, the weather was cloudy with rain on days 1 and 5, while days 3 and 6 experienced high tides, leading to a migration of bottom-dwelling fish towards the marshes. Lisna (2012) observed that during the rainy season, fish tend to move into inland waters and marshlands for spawning, resulting in higher catch rates. Fish populations thrive in habitats abundant with food sources, such as shallow areas with weak currents and plentiful aquatic vegetation. Research by Ridho et al. (2019) revealed that 3,406 fish from 17 species belonging to 10 families were captured during the rainy season, compared to 2,019 fish from 14 species belonging to 10 families during the dry season.

Catch Results Based on Treatment

Based on the total catch quantity for the treatment combination of a bait weight of 150 g at a depth of 5 m, the dominant catch was 75 individuals of mouse catfish. Regarding the catch weight, the treatment combination of a bait weight of 150 g at a depth of 1 m had a dominant weight of 8053 g, with Hemibagus nemurus being the dominant species. The lowest catch, in quantity and weight, was

observed in the treatment combination of a bait weight of 50 g at a depth of 1 m. The catch percentage based on different treatments is presented in Figure 1.

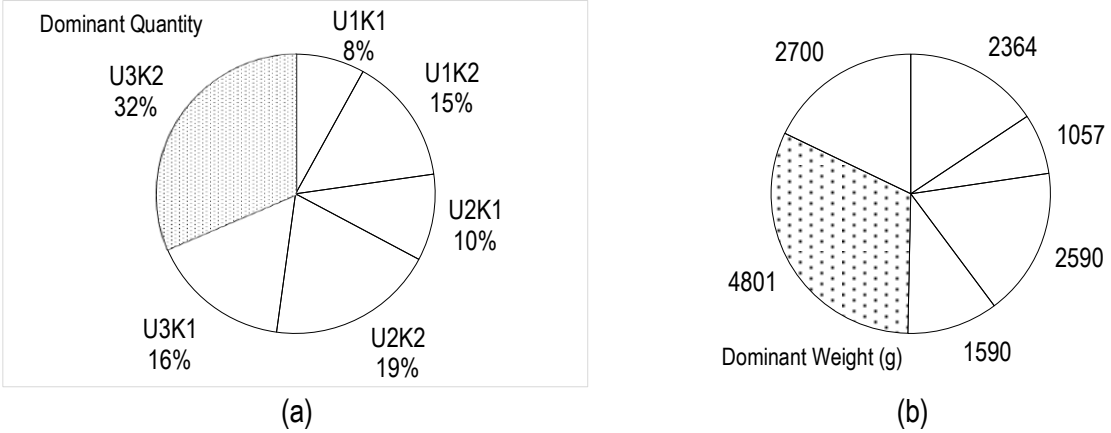

Figure 1. Percentage of catch quantity (a) and catch weight (b)

The Effect of Bait and Trap Depth

The increased catch quantity with a bait weight of 150 g is attributed to the more pungent odor emitted than the 50 g bait weight. Caesario (2011) states that increasing the bait weight increases the total catch quantity. According to Harsandi et al. (2015), palm fruit bait, known for its pungent odor, is due to the direct exposure of oil to water, leading to faster degradation reactions. Bait with high water content accelerates the spread of odor, enabling fish to respond to the scent emitted (Fitri & Purbayanto, 2009). Based on the findings of Permana et al. (2022), palm oil bait yields a higher catch quantity than other bait types. The difference in catch quantity is attributed to the fat content in the bait. Bait with higher fat content stimulates the target fish more effectively.

A depth of 5 meters in this study yields a higher catch quantity. This is attributed to depth influencing the level of ecological stability. A greater species diversity indicates higher stability in the water body. Based on the findings of this study, at a depth of 1 m, only the Bagridae family dominates. In contrast, at a depth of 5 m, the Siluridae family dominates along with several species from Bagridae. This suggests that only specific fish species can survive at a depth of 1 meter, whereas there is more variability at a depth of 5 meters. Environmental factors and high predation rates influence this at a depth of 1 meter.

The interaction between bait and depth significantly influences the catch, presumably because the current speed at 5 m is slower than a depth of 1 m. This aligns with the research of Priyantini & Irjan (2009), which suggests that the more profound the riverbed, the slower the river current, while closer to the surface, the faster the river current. According to Lino (2013), fast currents can cause uneven bait distribution, whereas slower currents result in a more even spread of bait odor around the trap.

The results of the analysis of variance (ANOVA) on the catch weight reveal that bait has an Fvalue of 18.107, which exceeds the Critical of 3.20, with a significance level of 0.000 < 0.05. Similarly, depth has a Fvalue of 24.912, exceeding Fcritical = 4.06, with a significance level of 0.000 < 0.05. However, the interaction between bait and depth has an Fvalue of 1.243, less than Fcritical = 3.20, with a significance level of 0.298 > 0.05. Since their interaction does not have a considerable impact, further tests on treatment interactions are not pursued.

The LSD test results indicate a significant difference among treatments regarding catch weight. Bait weighing 150 g yields a heavier catch compared to other bait weights. Based on depth, a depth of 1 m results in a heavier catch compared to a depth of 5 m. The heavier catch at a depth of 1 m is attributed to the dominance of catfish, which have the highest weight and dominate the catch at this depth. According to Vivakartika (1990), depth influences the types of fish caught and the diversity of fish sizes within the population. This aligns with the findings of Adlina (2014), where depth significantly influences catch weight because water bodies determine the ecological needs of fish, such as blue

crabs, which tend to have heavier weights at depths greater than 20 m compared to depths less than 20 m.

4. CONCLUSIONS

During the research, 299 fish were caught, with a combined weight of 15102.6 grams. The captured fish comprised 10 species, with *B.melapterus* being the dominant species in quantity and *H. nemurus* in weight.

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