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EFFECT OF BAIT VARIATION ON THE CATCH OF BANANA SHRIMP (*Fenneropenaeus merguiensis*) USING DRAGON TRAPS IN THE WATERS OF TANGKOLAK BEACH, KARAWANG

Pengaruh Variasi Umpan Terhadap Hasil Tangkapan Udang Pisang (*Fenneropenaeus merguiensis*) dengan Menggunakan Perangkap Kombo di Perairan Pantai Tangkolak Karawang

Mursalim U[1*], Gilang Rusrita Aida[2], M. Tajuddin Noor[2]

[1]Fisheries Resources Utilization, Dr. Soetomo University, [2] Department of Fisheries Resources Utilization, Dr. Soetomo University

Semolowaru 84, Surabaya, East Java, Indonesia

[*]Corresponding author: mursalimum@gmail.com

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ABSTRACT

The dragon trap (*bubu naga*) is a passive fishing gear that is operated by placing it on the seabed, leaving it for several hours, and then lifting it to collect the catch. This study aimed to determine the most effective bait for catching banana shrimp (*Fenneropenaeus merguiensis*) in the coastal waters of Tangkolak Beach, Karawang. The research was conducted using an experimental fishing method with a Randomized Block Design (RBD), consisting of three treatments: seriding fish bait, tonguefish bait, and petek fish bait, with nine replications each. The catch data were analyzed using analysis of variance (ANOVA) followed by the Least Significant Difference (LSD) test to identify differences among treatments. The results showed that the use of seriding fish bait produced the highest catch, reaching 5,728 g, while the lowest catch was obtained with tonguefish bait, at 2,011 g. The LSD test indicated that bait type had a significant effect on the catch of banana shrimp. Therefore, seriding fish bait is recommended as the most effective bait for the operation of dragon traps in capturing banana shrimp in Tangkolak coastal waters.

Key words: Dragon Trap, Banana Shrimp, Fish Bait

ABSTRAK

Bubu naga merupakan salah satu alat tangkap pasif yang pengoperasiannya dilakukan dengan meletakkan bubu di dasar perairan, kemudian dibiarkan beberapa jam hingga diangkat untuk mengambil hasil tangkapan. Penelitian ini bertujuan untuk mengetahui jenis umpan ikan yang paling efektif terhadap hasil tangkapan udang jerbung (*Fenneropenaeus merguiensis*) di Pantai Tangkolak, Karawang. Metode yang digunakan adalah *experimental fishing* dengan Rancangan Acak Kelompok (RAK) yang terdiri atas tiga perlakuan, yaitu umpan ikan seriding, ikan lidah, dan ikan petek, masing-masing dengan sembilan ulangan. Data hasil tangkapan

dianalisis menggunakan sidik ragam (ANOVA) dan dilanjutkan dengan uji BNT untuk mengetahui perbedaan antarperlakuan. Hasil penelitian menunjukkan bahwa penggunaan umpan ikan seriding menghasilkan tangkapan tertinggi yaitu 5.728 g, sedangkan tangkapan terendah diperoleh pada umpan ikan lidah yaitu 2.011 g. Analisis uji BNT menunjukkan bahwa perbedaan jenis umpan berpengaruh nyata terhadap hasil tangkapan udang jerbung. Dengan demikian, umpan ikan seriding dapat direkomendasikan sebagai jenis umpan yang paling efektif dalam pengoperasian bubu naga untuk penangkapan udang jerbung di perairan Pantai Tangkolak, Karawang.

Kata Kunci: Bubu Naga, Udang Jerbung, Umpan Ikan

INTRODUCTION

The banana shrimp (*Fenneropenaeus merguiensis*) belongs to the class Crustacea, order Decapoda, and family Penaeidae. In general, this species is characterized by the presence of one or more teeth beneath the rostrum, a feature that distinguishes it from several other shrimp species (Bahamonde & Vila, 2023). Banana shrimp is considered an important commodity due to its high economic value and strong market demand. In Indonesia, fishing grounds for banana shrimp are distributed across almost all coastal waters, particularly in shallow areas around estuaries and mangrove ecosystems (Mhatre, 2024), including the northern coastal waters of Central Java. In this region, banana shrimp is one of the dominant species caught using arad nets (Umam *et al.,* 2021).

According to Bauer (2023), the shrimp commodities that support Indonesian fisheries largely consist of species belonging to the family Penaeidae, particularly large-sized shrimps (mainly for export) from the genera Penaeus and Metapenaeus. Among these, nine species are of significant economic importance and widely distributed throughout Indonesian waters. These include Penaeus merguiensis, P. indicus, and P. orientalis (banana shrimp group); P. monodon, P. semisulcatus, and P. latisulcatus (tiger shrimp group); and Metapenaeus ensis, M. monoceros, and M. dobsoni (dogol shrimp group) (Jorfi, 2022).

In Tangkolak waters, most fishers use traps (bubu naga) to catch banana shrimp. Besides shrimp, these traps also capture other species such as krosong shrimp, crabs, cuttlefish, and flounder. However, local fishers typically operate the traps without bait, or occasionally use trash fish as the main bait. Since the most effective bait for capturing banana shrimp (*Fenneropenaeus merguiensis*) in Tangkolak waters has not yet been determined, it is necessary to conduct research on the influence of different types of bait seriding fish, tonguefish, and petek fish on the catch of banana shrimp. The results of this study are expected to provide useful information for local fishers regarding the most effective bait for improving banana shrimp catches in Tangkolak, Karawang.

RESEARCH METHODS

This research was conducted from July 22 to August 2, 2024, at Tangkolak Beach, Cilamaya Wetan District, Karawang, West Java, Indonesia. The tools used in this study included stationery for recording data, a camera for documenting research activities, a dragon trap (bubu naga) as the fishing gear, a weighing scale for measuring the catch, and a laptop for data processing and analysis. The materials consisted of three types of fish bait, namely seriding fish, tonguefish, and petek fish, which were used as treatments, as well as the caught specimens, particularly banana shrimp (*Fenneropenaeus merguiensis*), which served as the research objects. The study applied an *experimental fishing* method with three bait treatments: seriding fish, tonguefish, and petek fish. The experimental design was based on a Randomized Block Design (RBD) with nine replications, resulting in 27 experimental units. Data collected included the number of individuals and the total weight (kg) of banana shrimp caught in each

treatment and replication, which were then converted into percentages for further analysis. Primary data were obtained directly from the experimental fishing results, specifically the catch performance of banana shrimp under different bait treatments. The dragon trap used in this study consisted of an entrance for the target species, supporting ropes, an iron frame, side weights, and a collecting chamber for the catch. Secondary data were collected through literature reviews and field interviews with local fishers who commonly operate dragon traps in Tangkolak waters. Interviews were conducted onboard while waiting for the traps to be retrieved, providing additional insights into local fishing practices

RESULT

General Condition of the Study Area

Tangkolak Beach is located in Sukakerta Village, Cilamaya Wetan District, Karawang Regency, West Java. Geographically, Karawang lies between 5º56'–6º34'S and 107º02'-107º40' E. Cilamaya Wetan District is a division of Cilamaya Wetan and Cilamaya Kulon sub-districts, with a total area of 69.66 km², or about 3.97% of the total area of Karawang Regency. The population of this district is approximately 75,863 people. Administratively, Sukakerta Village covers an area of 7.32 km² and is located along the northern coastal line of Java Sea. The administrative boundaries of Cilamaya Wetan District are as follows: North Java Sea, South Banyusari District, West Cilamaya Kulon District, and East Blanakan District.

Dragon Trap (Bubu Naga)

The dragon trap (*bubu naga*) is one of the fishing gears that has recently become popular among local fishermen for catching shrimp and fish. Fishermen at Tangkolak Beach prefer this gear because of its simple operation, foldable design, and ease of transportation in large quantities (Puspadewi *et al.,* 2023). The gear is operated by setting it on the seabed and leaving it submerged for several hours before lifting it to collect the catch.

According to Fachrussyah and Zaman (2021), traps are essentially passive fishing gear whose effectiveness relies on the movement of target species such as shrimp. As a passive gear, the dragon trap must be attractive enough to draw shrimp inside and effectively retain them. The fishing operation usually takes advantage of tidal conditions and is mostly conducted in the morning and afternoon. Sari *et al.,* (2021) classified the dragon trap as a type of fishing trap. It is elongated in shape, allowing fish or shrimp to easily enter but preventing their escape due to its funnel-shaped entrance. Structurally, the trap consists of two main parts: the body (a chamber where the catch is confined) and the funnel entrance. The principle is that shrimp enter the trap either to feed or to seek shelter. Previous studies (Hadi *et al.,* 2022; Melianti *et al.,* 2023) showed that the catch composition of dragon traps varies depending on weather conditions and the type of bait used. Similarly, studies in China (Yu *et al.,* 2022; Yu *et al.,* 2023) examined the selectivity of dragon traps toward black rockfish and the swimming crab (Charybdis japonica).

Catch composition is considered an important source of information for the sustainable management of fisheries resources (Fuah & Rahayu, 2023). In Karawang, small-scale fisheries are predominantly multispecies, yet proper catch data collection remains limited. Therefore, this study aimed to analyze the effect of different bait types (serinding fish, tongue sole, and ponyfish) on the catch composition of banana shrimp (*Fenneropenaeus merguiensis*).

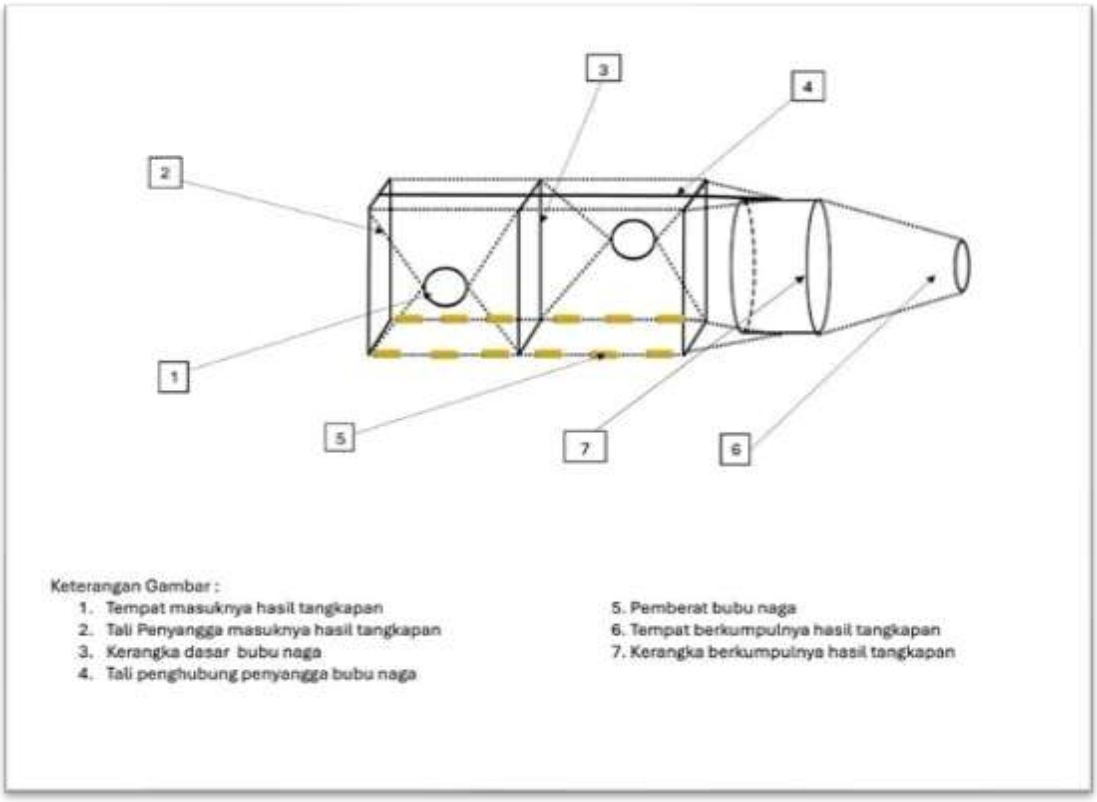

Figure 1. Construction of Dragon Trap

The dragon trap is constructed from several essential components that support its effectiveness and durability. The frame is generally made of strong materials such as iron or steel to maintain its shape during operation and storage, although in some regions wood or bamboo may also be used. The body of the trap is commonly built from wire, nylon, or plastic, with the choice of material depending on local availability, fishing practices, and target species. The funnel entrance is cone-shaped, designed to guide fish and shrimp into the trap while preventing them from escaping. Inside the trap, a bait holder is placed, typically made of wire or plastic mesh, where chopped or whole bait is secured. An exit door is located on the top or side of the trap, allowing fishermen to easily remove the catch. To ensure stability during fishing operations, the trap is equipped with a sinker or weight, usually made of iron, steel, or stone, which helps counteract the influence of tides, currents, and waves (Rukhayati *et al.,* 2025).

Overall, the dragon trap consists of two main structural parts: the mouth and the body. However, additional components such as the bait holder and exit door are not always present in every trap design. According to Slack and Smith (2001), traps generally consist of the following main parts: (i) the frame, which provides strength and stability; (ii) the body, serving as the chamber where the catch is confined; (iii) the funnel entrance, enabling easy entry but preventing exit; (iv) the bait holder, which functions to attract the target species; (v) the exit door, facilitating removal of the catch; and (vi) the sinker, ensuring that the trap remains in its original position during deployment (Figure 2).

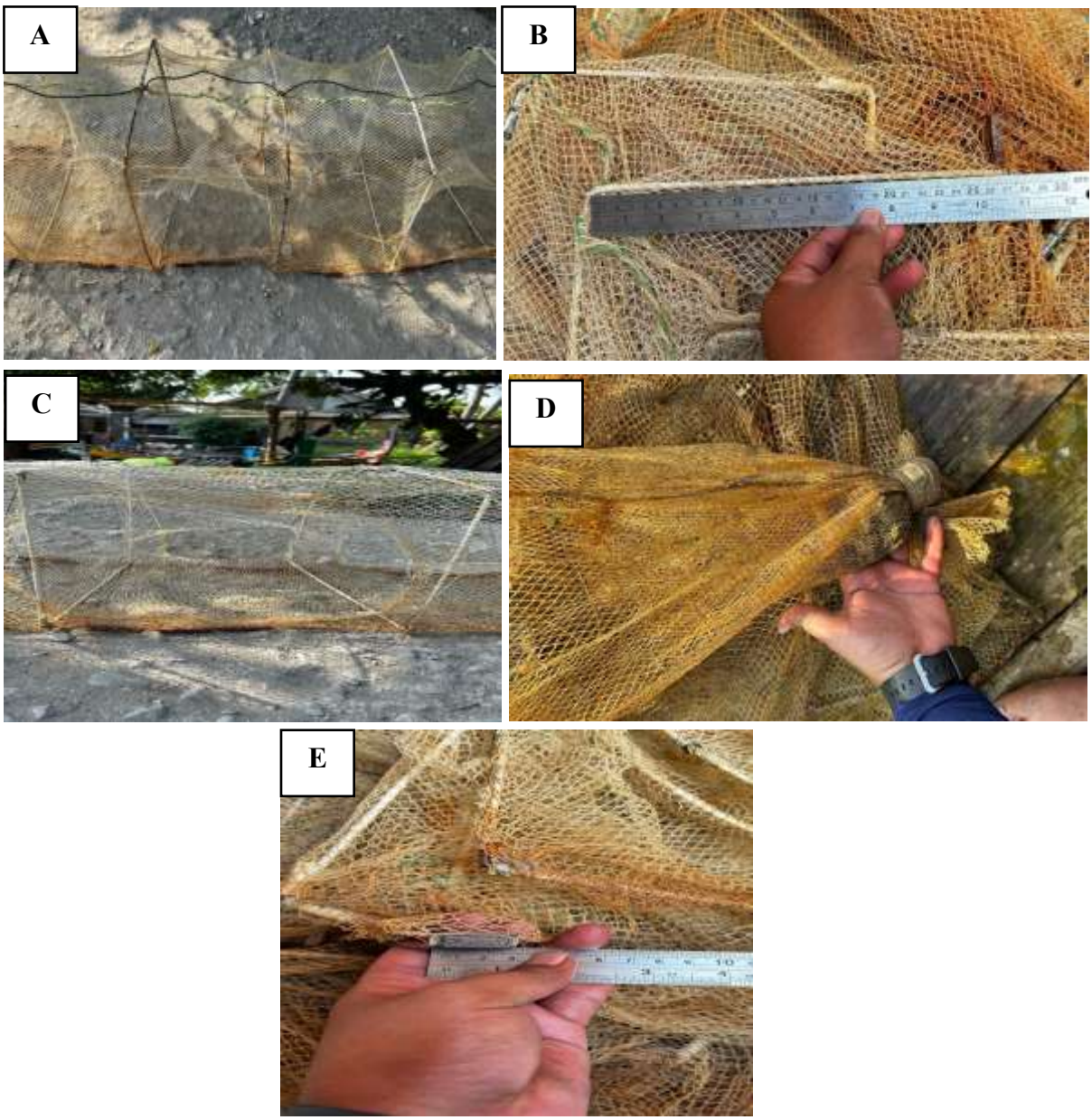

Figure 2. Structure of the Dragon Trap
(A. Frame, B. Funnel entrance, C. Bait holder, D. Exit door, E. Sinker)

Dragon Trap Catch Results

This study aimed to evaluate the effectiveness of different bait types in capturing banana shrimp (*Fenneropenaeus merguiensis*) using dragon traps. Three bait treatments were tested, namely seriding fish, tongue sole fish, and petek fish. A total of nine fishing trips were conducted, and the catches of banana shrimp were grouped according to the three bait treatments. The results of these catches are summarized in Table 1.

Table 1. Catch Data (g) of Banana Shrimp (*Fenneropenaeus merguiensis*) Using Different Baits During the Study

Replication	Treatment			Total
	A	B	C	
	Seriding Fish	Tounge sole Fish	Petek Fish	
1	629	225	383	1237
2	608	219	367	1194
3	597	213	330	1140
4	655	255	320	1230
5	686	205	312	1203
6	630	231	324	1185
7	633	221	340	1194
8	641	227	356	1224
9	649	215	344	1208
Total	5728	2011	3076	10815

Source: Processed primary data, 2024

The experimental fishing using dragon traps with three different types of bait (seriding fish, tongue sole fish, and petek fish) showed varying results in the total catch of banana shrimp (*Fenneropenaeus merguiensis*). The data presented in Table 3 indicates that the highest total catch was obtained using serial fish bait, with a cumulative weight of 5728 g, followed by petek fish bait with 3076 g, while the lowest catch was recorded using tongue sole fish bait with only 2011 g. The overall total catch from all treatments and replications was 10.815 g.

On average, the use of serial fish bait consistently produced higher catch weights across all nine replications, ranging from 597 g to 686 g per replication, with an overall average of 636.4 g. In contrast, tongue sole fish bait yielded the lowest catches, ranging from 205 g to 255 g, with an average of 223.4 g. Petek fish bait provided intermediate results, ranging between 312 g and 383 g, with an average of 341.8 g. These findings suggest that bait type significantly influences the efficiency of dragon traps in capturing banana shrimp (Imron & Zulkarnain, 2023).

Data Analysis of Catch Yields

During the banana shrimp (*Fenneropenaeus merguiensis*) fishing operations, the total catch obtained from nine fishing trips was 10,815 grams. The catch data in this study were then analyzed using a Randomized Block Design (RBD), as presented in the following Table 2:

Table 2. Analysis of Banana Shrimp Catch Results Using Different Fish Baits

Replication	Treatment			Total	Average
	A	B	C		
	Serinding fish	Tounge sole fish	Petek fish		
1	629	225	383	1237	412.3
2	608	219	367	1194	398
3	597	213	330	1140	380
4	655	255	320	1230	410
5	686	205	312	1203	401
6	630	231	324	1185	395
7	633	221	340	1194	398
8	641	227	356	1224	408
9	649	215	344	1208	402.7
Total	5728	2011	3076	10815	3605

Source: Processed primary data, 2024

During the fishing operations for banana shrimp (*Fenneropenaeus merguiensis*), the total catch obtained over nine fishing trips amounted to 10,815 grams. The catch data were then analyzed using a Randomized Block Design (RBD) based on three bait treatments: seriding fish (A), tongue sole fish (B), and petek fish (C). The results are presented in Table 5. The table shows that the treatment using seriding fish bait produced the highest catch, with a total weight of 5,728 grams and an average of 636.4 grams per trip. The use of petek fish bait resulted in a total catch of 3,076 grams with an average of 341.8 grams per trip. Meanwhile, the lowest catch was obtained using tongue sole fish bait, with a total of only 2,011 grams and an average of 223.4 grams per trip. Overall, the average catch per trip across all treatments was 360.5 grams. These findings indicate that the type of bait used had a significant influence on the catch yield of banana shrimp, with seriding fish being more effective compared to tongue sole fish and petek fish.

Analysis of the Effect of Different Baits

The data analysis of the effect of different baits (seriding fish, tongue sole, and petek fish) on the catch of banana shrimp (*Fenneropenaeus merguiensis*) was carried out using a Randomized Block Design (RBD). The results of the variance analysis (ANOVA) are presented in Table 3.

Table 3. Results of Variance Analysis (ANOVA)

Source of Variation	degree of freedom (df)	sum of squares (SS)	Mean square (MS)	F-value	F-table	
					5 %	1%
Treatment	2	814.201	407.100,5	1155,2	3,63	6,23
Block	8	2263,6	282.95	0,8	2,59	3,89
Error	16	9164,4	352,4	-	-	-
Total	26	-	-	-	-	-

Source: Processed primary data, 2024

Based on the variance analysis in Table 6, it can be seen that the calculated F-value for treatments is greater than both the F-table at 0.05 (3.63) and at 0.01 (6.23). This indicates a significant effect of bait type on the catch of banana shrimp (*Fenneropenaeus merguiensis*). Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted.

To determine the specific differences between treatments, a Least Significant Difference (LSD) test was conducted using the following formula:

$$LSD\ (\alpha) = \frac{ta}{2} : db_g\ x\ \sqrt{\frac{2\ MSE}{r}}$$

$$= (0{,}01;16)\ x\ \sqrt{2.\ 352{,}4}$$
$$9$$
$$= 2.58\ x\ 2.9$$
$$= 7.48$$

The results of the LSD test were then added to the average of each treatment, starting from the smallest mean value, as shown in Table 4.

Table 4. Results of LSD Test

Treatment	Mean	Notation	LSD Value
Seriding Fish Bait	636.4	A	643.8
Tongue Sole Fish Bait	223.4	B	230.8
Petek Fish Bait	341.8	C	349.2

Source: Processed primary data, 2024

Based on the results of the analysis of variance (ANOVA), the calculated F-value was greater than the F-table value. Therefore, the null hypothesis ($H_0 = 0$) is rejected, and the alternative hypothesis ($H_1 \neq 0$) is accepted, indicating that the treatments had a significant effect. The results of the Least Significant Difference (LSD) test further showed that there were significant differences among the treatments. The treatment with seriding fish bait produced the highest average catch (643.8 g) and was assigned the notation "a," indicating that seriding fish is the most suitable bait for use in dragon traps.

DISCUSSION

The present study demonstrated that bait type significantly influenced the catch performance of dragon traps targeting banana shrimp (*Fenneropenaeus merguiensis*). Among the three bait types tested, seriding fish consistently yielded the highest total catch weight across all replications, followed by petek fish, while tongue sole fish resulted in the lowest catch. Statistical analysis using ANOVA confirmed that these differences were significant ($p < 0.05$), and the LSD test further identified seriding fish as the most effective bait. The superior performance of seriding fish bait may be attributed to its stronger odor and higher attractiveness compared to tongue sole and petek fish. Being an oily fish, seriding likely releases stronger chemical cues into the water, thereby stimulating the foraging behavior of shrimp more effectively (Ocasio-Torres *et al.,* 2021). This finding is consistent with Fachrussyah and Zaman (2021), who emphasized that bait selection plays a crucial role in passive fishing gears such as traps, where the success of capture depends heavily on the bait's ability to attract the target species.

In contrast, tongue sole fish bait was found to be the least effective. The relatively low catch results may be due to its softer texture and weaker odor, which reduce its attractiveness to shrimp (Bøgwald *et al.,* 2024). Petek fish bait provided intermediate results, indicating that while it has potential as an alternative bait, it is less effective compared to seriding fish in maximizing shrimp catches. These findings align with Eckert (2022), who noted that good bait is characterized by a distinctive odor, affordability, and preference by the target species. Furthermore, Vrandich et al. (2024) explained that in trap fisheries, both baited and unbaited, various stimuli physical or chemical play an important role in triggering the curiosity and response of fish or crustaceans. Similarly, Bacheler (2024) highlighted that in traps targeting crustaceans such as crabs and shrimp, bait serves as the main stimulus to attract the target species into the trap through the funnel entrance, making escape difficult once inside. From a practical perspective, the results of this study are valuable for small-scale fisheries in Tangkolak, Karawang. By using seriding fish as bait, fishermen can optimize the efficiency of dragon traps, leading to higher shrimp yields and increased economic returns. Moreover, the use of effective bait reduces unnecessary fishing effort, thereby supporting the sustainable management of shrimp resources (Leitao *et al.,* 2023; Cerbule *et al.,* 2023; Derby *et al.,* 2024).

Overall, this study confirms that bait selection is a determining factor in the effectiveness of dragon traps. Seriding fish, due to its strong odor and higher attractiveness, proved to be the most suitable bait for banana shrimp fishing, while petek fish may serve as a secondary option when seriding is unavailable. Tongue sole fish, however, is not recommended as bait due to its limited effectiveness.

CONCLUSION

The results of this study indicate that bait type had a significant effect on the catch performance of banana shrimp (*Fenneropenaeus merguiensis*) using dragon traps at Tangkolak Beach, Karawang. Seriding fish yielded the highest total catch of 5,728 g, followed by petek fish with 3,076 g, and tongue sole fish with 2,011 g. Analysis of variance showed that the calculated F-value (1152.5) exceeded the F-table values at both the 5% (3.63) and 1% (6.23) significance levels, indicating highly significant differences among treatments. The LSD test further confirmed that all three bait types differed significantly, with seriding fish identified as the most effective bait for maximizing banana shrimp catches using dragon traps.

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