

# COMPARISON OF THE CATCH OF MANGROVE CRAB (*Scylla serrata*) BASED ON DIFFERENCES IN BAIT ON RAKKANG TRAPS IN SELAYAR ISLANDS REGENCY

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Manuscript Recived: 21 February 2022

Revision Accepted: 14 November 2025

## ABSTRACT

Mangrove crab (*Scylla serrata*) is an economically important fishery resource widely distributed across Indonesian waters and strongly associated with mangrove ecosystems, shallow coastal zones, and muddy intertidal habitats. As demand for mud crab continues to increase in both domestic and export markets, improving fishing efficiency through the selection of effective bait becomes essential, particularly for small-scale fisheries operating in mangrove areas. However, bait performance may vary depending on availability, attractiveness, and cost, and information comparing commonly used baits remains limited. This study evaluated the effectiveness of two bait types; stingray bait and chicken waste bait in capturing *S. serrata* using rakkang traps (*Bubu Rakkang*). A case study approach was applied by operating a single fishing gear type under comparable field conditions. Primary data were collected directly from trap catches using both bait treatments. Differences in catch performance between traps baited with stingray and those baited with chicken waste were analyzed using a paired (dependent) t-test to account for matched sampling conditions. The results showed no significant difference in mud crab catches between the two bait treatments, indicating that both stingray bait and chicken waste bait were equally effective in attracting and capturing *S. serrata*. These findings suggest that chicken waste can serve as a practical alternative to stingray bait, offering a potentially more accessible and cost-efficient option for fishers without compromising catch outcomes. The use of low-cost bait sources may contribute to improving the economic feasibility of mud crab fisheries in mangrove ecosystems while supporting sustainable utilization of locally available resources. Further studies are recommended to assess bait effectiveness across different seasons, tidal conditions, and size classes of *S. serrata* to strengthen management and operational recommendations for rakkang trap fisheries.

**Keywords:** *Scylla serrata*, rakkang trap, bait effectiveness, small-scale fisheries

## INTRODUCTION

The Selayar Islands Regency is one of the regencies in South Sulawesi Province, Indonesia, located at the southernmost part of the South Sulawesi Peninsula. Geographically, Selayar Islands Regency lies between 5°42'–7°35' S and 120°15'–122°30' E. The region is bordered by Bulukumba Regency and Bone Bay to the north, East Nusa Tenggara Province to

the east, and the Flores Sea and Makassar Strait to the west. This archipelagic area is dominated by marine waters and coastal ecosystems, providing high potential for fisheries and marine biodiversity resources.

The extensive coastal zone of Selayar Islands Regency includes several estuarine and intertidal areas that function as transitional habitats between freshwater and marine

ecosystems. These environments support the development of mangrove forests, which are known as highly productive ecosystems that provide shelter, feeding grounds, and nursery habitats for various aquatic organisms. One of the important fishery resources commonly associated with mangrove and estuarine ecosystems is the mangrove crab or mud crab (*Scylla serrata*) (Shelley & Lovatelli, 2011).

Mud crab (*S. serrata*) has high economic value due to its market demand and consumer preference for its meat quality, making it a promising resource for capture fisheries and potential aquaculture development in mangrove areas (Koniyo, 2020). This species typically inhabits mangrove-dominated coastal environments characterized by muddy or sandy-silt substrates, shallow waters, and protected areas that provide suitable conditions for feeding and survival.

Capture of *S. serrata* in Selayar waters is commonly conducted using passive fishing gears such as folding traps, gill nets, and handlines. Among these, trap-based fishing is widely applied because it is relatively simple, efficient, and selective when properly operated. Traps are fishing devices that are installed in the water for a certain period, allowing target species to enter while reducing their ability to escape (Sudirman & Mallawa, 2012). One type of trap that has been developed for mud crab fishing is the Bubu Rakkang, which combines

the structural characteristics of a traditional bubu trap and a rakkang design. This gear offers operational advantages because crabs are trapped during the feeding process, reducing the need for immediate retrieval compared to conventional rakkang systems (Assir & Palo, 2016).

Bait selection is a key factor influencing the effectiveness of trap fishing, particularly for mud crabs that rely strongly on chemoreception to locate food sources. Several studies have reported that animal-based baits with strong odor, such as chicken and stingray, can attract crabs more effectively due to their scent intensity (Muhamad et al., 2018; Suruan et al., 2019). However, practical bait choice in small-scale fisheries is often determined not only by attractiveness but also by availability, cost, and durability under field conditions.

Therefore, this study evaluated the effectiveness of two bait types—stingray bait and chicken waste bait (chicken by-products remaining after filleting, with minimal meat on the bones) for catching *S. serrata* using Bubu Rakkang traps in Selayar Islands Regency. This research aimed to determine whether different bait types significantly influence mud crab catch performance and to identify a practical bait option that is affordable, easily accessible at the study site, and suitable for routine fishing operations.

**MATERIAL AND METHOD**

This research was conducted in November 2021 - January 2022 in Padang Hamlet, Bontosunggu Village, Bontoharu District, Selayar Islands Regency, South

Sulawesi. The research location is shown in Figure 1.

The materials and tools used in this study were stingray bait, chicken waste bait, camera, rakkang trap, writing utensil, scales, ruler, sample plastic, and GPS.

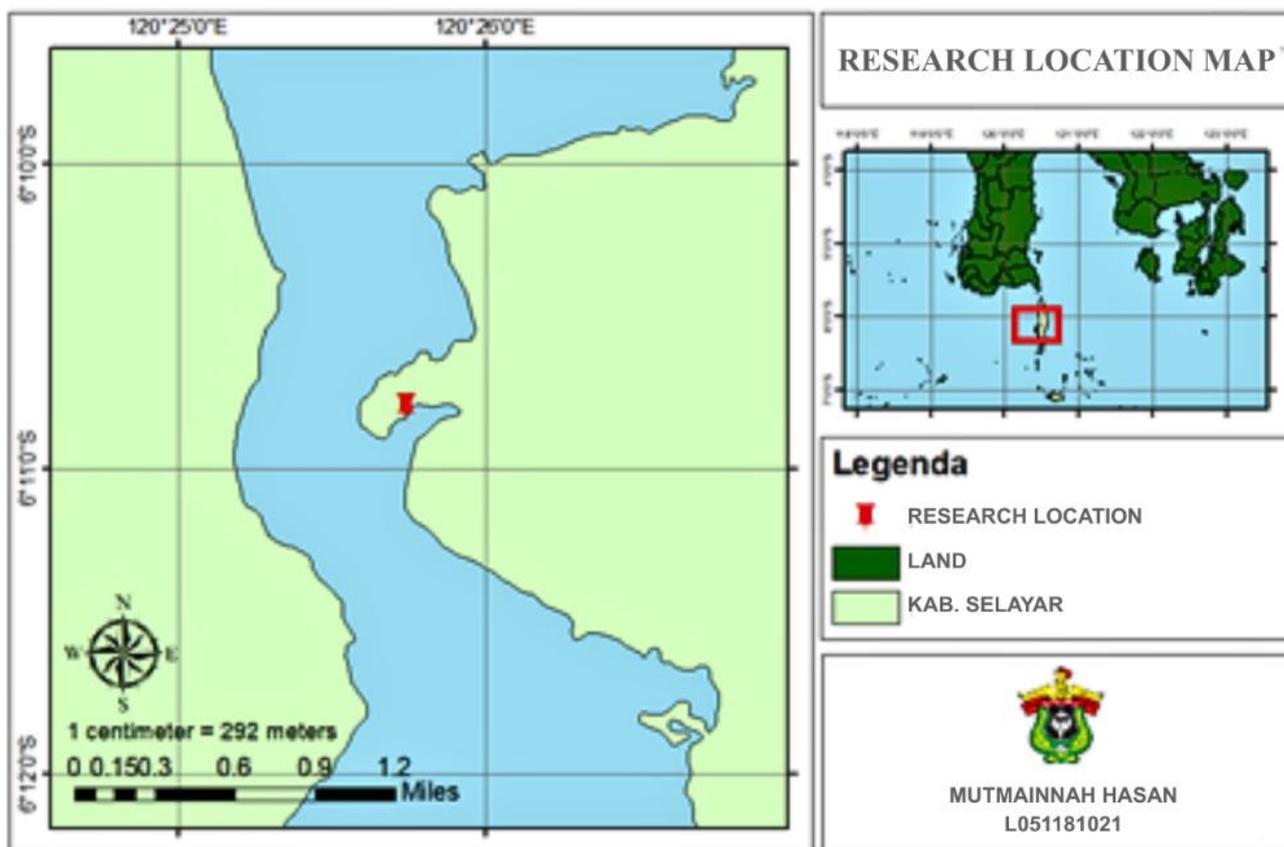


Figure 1. Map of research location

**Data Collection**

This study employed a case study approach by applying a single type of fishing gear, namely the Bubu Rakkang trap, to evaluate the effectiveness of different bait types for catching mud crab (*Scylla serrata*). Primary data were obtained through direct capture of *S. serrata* using Bubu Rakkang traps operated in the study area. The catch data from traps baited with stingray and

those baited with chicken waste were recorded for subsequent statistical analysis.

**Data Analysis**

*Normality Test*

Prior to hypothesis testing, the catch data were examined for normality using SPSS version 16.0. Data distribution was assessed using the Liliefors normality test (Sudjana, 2005). The standardized value was calculated using the following equation:

$$z_i = \frac{(X_i - \bar{X})}{s}$$

**where**  $X_i$  is the observed value,  $\bar{X}$  is the mean, and  $s$  is the standard deviation. The data were considered normally distributed when the significance value (p-value) was  $\geq 0.05$ ; otherwise, the data were considered not normally distributed (Hidayat, 2014).

#### Paired (Dependent) t-Test

To determine whether there was a significant difference in mud crab catches between traps using stingray bait and those using chicken waste bait, a paired (dependent) t-test was applied (Zar, 1984). The test statistics were calculated as:

$$t = \frac{\bar{d}}{S_{\bar{d}}}$$

**where**  $\bar{d}$  is the mean difference between paired observations, and  $S_{\bar{d}}$  is the standard error of the differences, expressed as:

$$S_{\bar{d}} = \frac{S_d}{\sqrt{n}}$$

**with**  $S_d$  as the standard deviation of the differences and  $n$  as the number of paired samples. Statistical testing was performed using SPSS version 16.0 to evaluate whether bait type affected the catch of *S. serrata*.

The hypotheses were defined as follows:

- $H_0$ : There is no significant difference in mud crab catches between Bubur Rakkang traps baited with stingray and those baited with chicken waste.

- $H_1$ : There is a significant difference in mud crab catches between Bubur Rakkang traps baited with stingray and those baited with chicken waste.

Decision criteria were based on a 95% confidence level ( $\alpha = 0.05$ ):

- If p-value  $\geq 0.05$ ,  $H_0$  is accepted (no significant difference).
- If p-value  $< 0.05$ ,  $H_0$  is rejected and  $H_1$  is accepted (significant difference).

## RESULTS AND DISCUSSION

### Rakkang Trap Operation

Traps are classified as passive fishing gears that operate by confining target organisms, allowing them to enter while preventing escape. In Indonesia, trap fisheries are widely practiced by small-scale fishers because the gear is relatively inexpensive, easy to deploy, and effective for catching demersal species such as crabs and bottom-associated fish. Trap-based fishing is therefore considered efficient for harvesting mud crab (*Scylla serrata*) in estuarine and mangrove environments.

In this study, the fishing gear used was a modified Rakkang trap (Figure 2), which integrates structural features designed to improve the trapping efficiency of mud crabs. The main advantage of this gear is that crabs are captured while feeding on bait, reducing the need for immediate retrieval compared to conventional rakkang systems. The trap was

equipped with buoys and sinkers to maintain its structure and ensure stable positioning during operation.



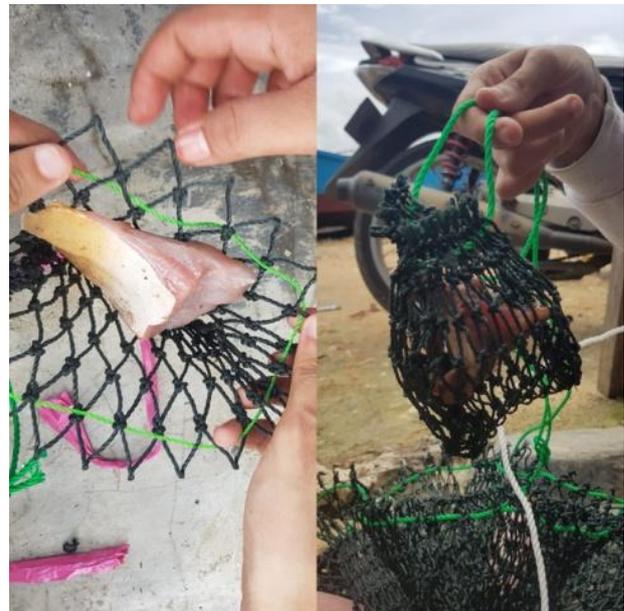
**Figure 2.** Rakkang trap.

The modification applied in this research included the addition of a 10 m towing rope tied to the bottom frame of the trap. This design improved hauling efficiency and reduced the risk of gear loss by allowing the trap to be secured to poles or stable objects near the estuary, thereby preventing it from being displaced by currents.

#### *Operation Procedure*

Prior to deployment, the rakkang traps and supporting components were inspected to ensure that the gear was complete and free from damage. Bait was then placed in the bait compartment of each trap (Figure 3). Fishing locations were selected in estuarine waters

surrounding mangrove forest areas, which are known as key habitats for mud crab.



**Figure 3.** Bait placement in the trap.

#### *Setting (Deployment)*

After preparation, the rakkang traps were deployed at predetermined fishing points (Figure 4). The towing rope attached to each trap was tied to a pole or stable object on land to minimize drifting and facilitate retrieval. Traps were soaked for approximately **3 hours** before being hauled.

To reduce sampling bias, traps were arranged using an alternating bait sequence (stingray bait and chicken waste bait). Replicates were deployed at different locations with an approximate distance of 100 m between replicates, while traps within each replicate were spaced 10 m apart. Each trap was operated twice per day, with a soaking time of 3 hours per setting.

Across five sampling days, deployment times were as follows:

- Day 1: 11:00 and 15:00
- Day 2: 09:00 and 13:00
- Day 3: 08:30 and 12:30
- Day 4: 09:00 and 13:00
- Day 5: 10:00 and 14:00



**Figure 4.** Setting of rakkang traps.

### Hauling

Hauling was conducted approximately 3 hours after deployment (Figure 5). During retrieval, the towing rope was pulled until the trap reached the shoreline. Captured crabs were removed and placed in labeled plastic bags to avoid mixing samples across locations or bait treatments.

The hauling schedule was as follows:

- Day 1: 14:00 and 18:00
- Day 2: 12:00 and 16:00
- Day 3: 11:30 and 15:30
- Day 4: 12:00 and 16:00

- Day 5: 13:00 and 17:00



**Figure 5.** Hauling of rakkang traps.

### Fishing Area

The field study was conducted in a mangrove-dominated estuarine area, which represents a natural habitat for mud crab (*Scylla serrata*). Padang Village is characterized by an extensive mangrove forest due to its coastal location, providing suitable environmental conditions for the occurrence of *S. serrata*. During the sampling period, three fishing points were selected as replication sites. Each fishing point was separated by approximately 100 m to reduce spatial overlap among sampling locations.

### Bait Types

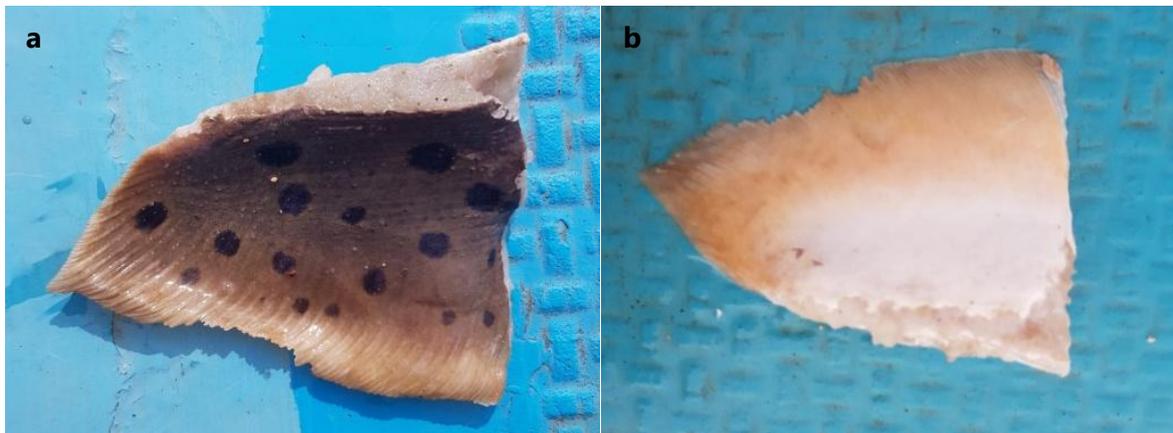
Bait is a critical factor affecting catch performance in mud crab trap fisheries, as crabs rely strongly on chemical cues to locate

food sources. In this study, two bait types were evaluated, namely stingray bait and chicken waste bait. Both bait types were selected because they are locally available, inexpensive, and able to remain intact for extended periods. The bait size used in all treatments ranged from approximately 9 to 14 cm.

#### *Stingray Bait*

Stingray meat is known to produce a strong odor and is relatively durable under

estuarine conditions. Based on interviews with local fishers in Padang hamlet (e.g., Mr. Rail), stingray bait is commonly used for mud crab fishing because it can be reused and does not require daily replacement. In this study, stingray bait remained intact even after two days of operation, with only a small portion consumed by the crabs. However, changes in odor and color were observed after one day of immersion, likely due to prolonged exposure to seawater.

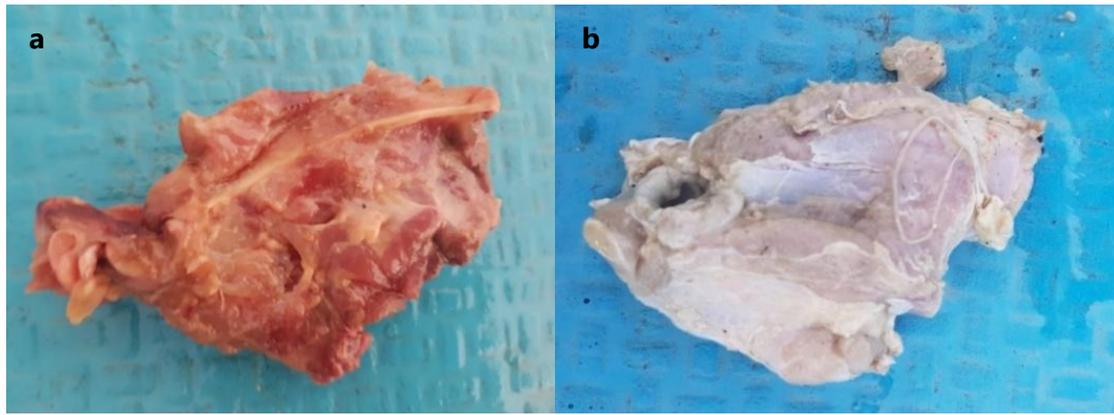


**Figure 6.** Stingray bait (a), Stingray bait after two days of use (b)

#### *Chicken Waste Bait*

Chicken-based bait has been widely reported as effective for crab fishing due to its strong smell. Commonly used chicken parts include the head and intestines; however, this study used chicken waste in the form of filleted chicken bones with small amounts of remaining

meat. This bait type is economically attractive because it is low-cost (approximately IDR 10,000 per kg) and easy to obtain locally. Similar to stingray bait, chicken waste bait remained usable for up to two days, although odor and color changes occurred after one day of immersion in seawater.

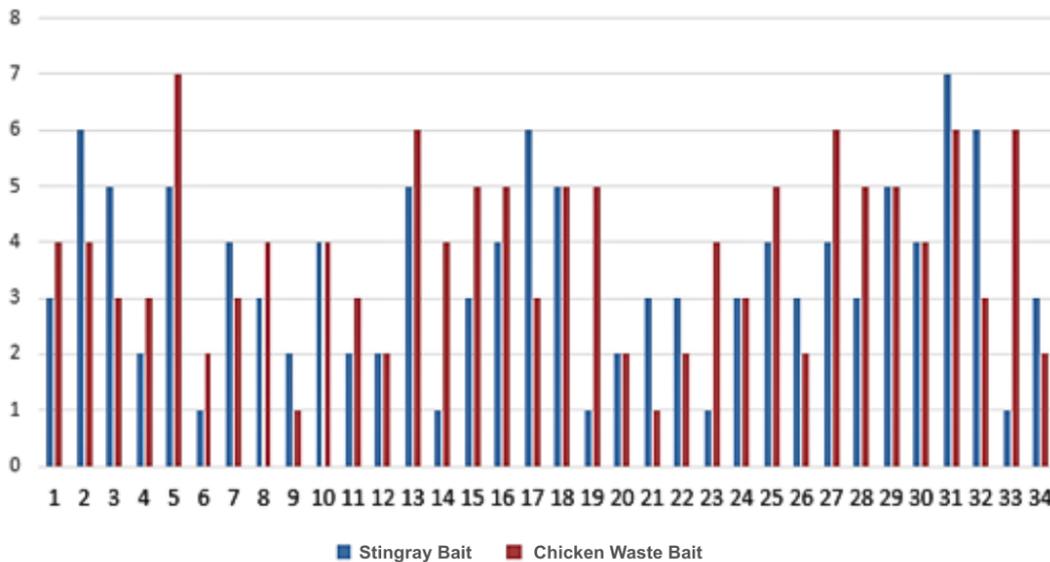


**Figure 7.** Chicken waste bait (a), Chicken waste bait after two days of use (b)

**Catch Composition and Catch Performance**

A total of 243 mud crabs (*S. serrata*) were captured during the study. Rakkang traps baited with chicken waste produced 127 individuals, whereas those baited with stingray

produced 116 individuals. Although chicken waste bait yielded a higher total catch, both bait types were effective for capturing *S. serrata* under the study conditions.

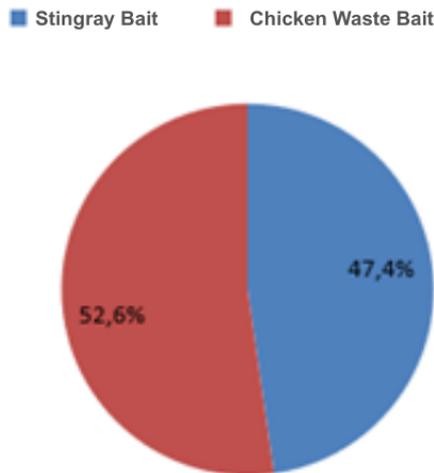


**Figure 8.** The graph of the catch of *S. serrata* in the 1st to 34th repetitions using stingray bait and chicken waste bait

In addition to mud crabs, a small number of fish were recorded as bycatch in traps baited with stingray. Two fish species were identified: beseng-beseng (*Merosatherina ladiges*) in the 14th replicate and round goby (*Neogobius melanostomus*) in the 16th replicate. No fish bycatch was recorded in the chicken waste bait treatment.

Overall, catch proportion showed 52.6% of mud crabs were captured using chicken waste bait and 47.4% using stingray bait. Catch variation among replications was observed in both bait treatments. The highest catch using chicken waste bait occurred in the 5th replication (7 crabs), while the lowest catch occurred in the 9th and 21st replications (1

crab each). In traps using stingray bait, the highest catch occurred in the 31st replication (7 crabs), while the lowest catches occurred in the 6th, 14th, 19th, 23rd, and 33rd replications (1 crab each).



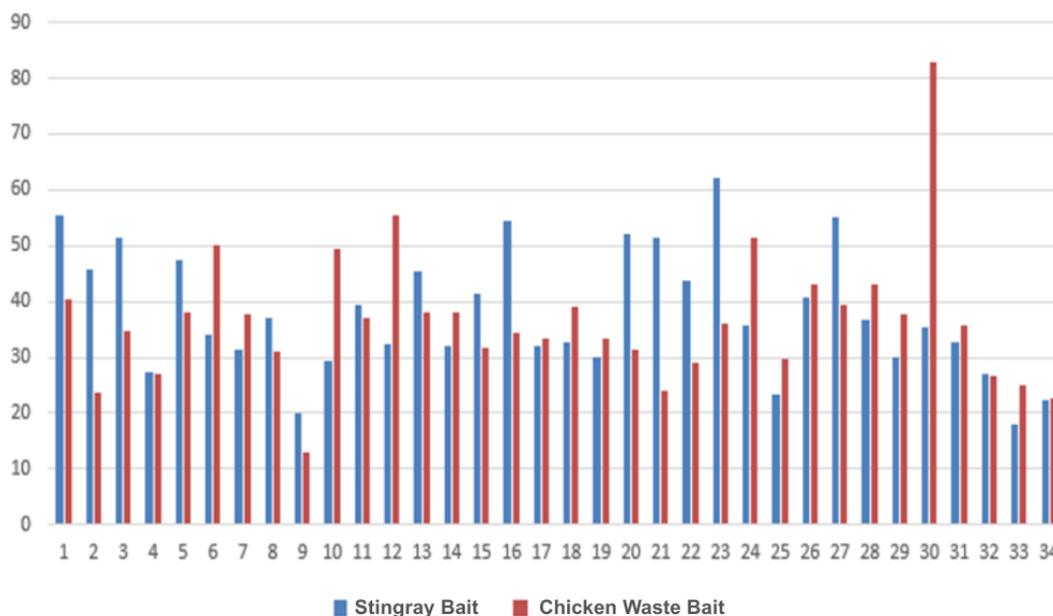
**Figure 9.** Percentage of catch of *S. serrata* in rakkang traps using stingray bait and chicken waste bait

The higher catch obtained using chicken waste bait is consistent with findings from Muhammad et al. (2018), who reported that chicken-based bait can produce greater crab

catches compared to other bait types, likely due to its strong aroma that enhances attraction. Importantly, all traps deployed during this study successfully captured mud crabs, indicating that both stingray and chicken waste bait were effective under local field conditions.

*Weight Composition of Mud Crab Catches in Rakkang Traps*

The total weight of mud crab (*Scylla serrata*) captured during 34 replications varied across fishing operations for both bait treatments. This variation indicates that the weight of individual crabs entering the traps was not constant and may be influenced by natural differences in crab size structure, activity, and local environmental conditions during deployment.



**Figure 10.** Graph of the average weight of *S. serrata* caught using stingray bait and chicken waste bait

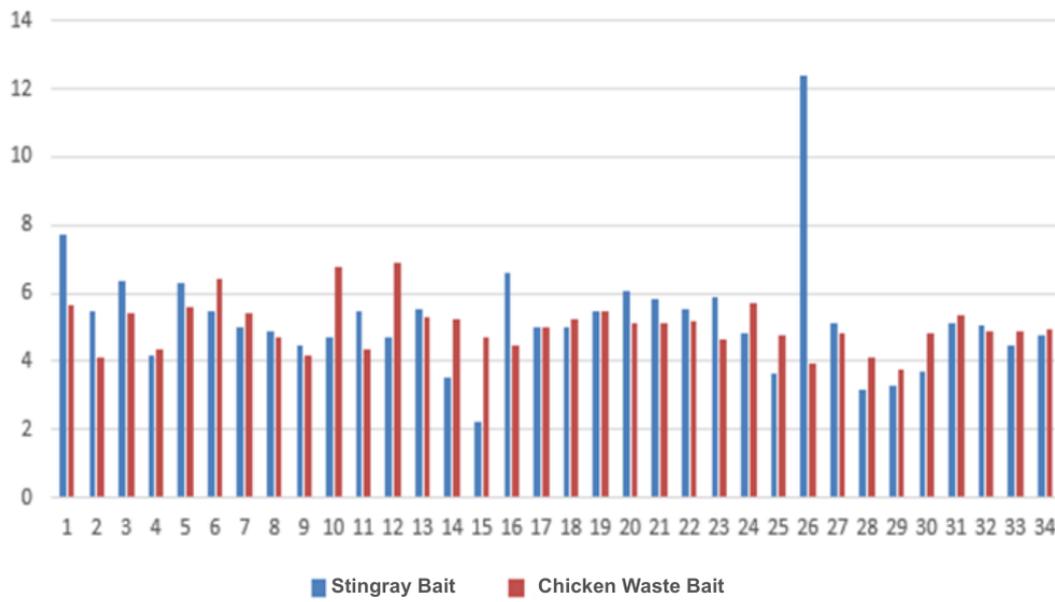
Based on the catch-weight distribution (Figure 10), rakkang traps baited with stingray produced the highest mean crab weight of 62 g in the 23rd replication, while the lowest mean weight was 18 g in the 33rd replication. Meanwhile, traps baited with chicken waste showed a wider range of weights. The highest mean crab weight using chicken waste bait was 83.75 g in the 30th replication, whereas the lowest mean weight was 13 g in the 9th replication. Overall, chicken waste bait tended to capture heavier individuals in certain replications, although weight fluctuations occurred in both treatments.

In addition to the target species, stingray bait produced minor fish bycatch, consisting of one beseng-beseng fish (*Merosatherina ladiges*) weighing 5 g and one round goby (*Neogobius melanostomus*) weighing 30 g. This suggests that stingray bait may occasionally attract non-target species, although the bycatch level observed in this study was very low and did not substantially affect the overall catch composition.

#### *Carapace Width Composition of Mud Crab Catches in Rakkang Traps*

The size distribution of *S. serrata* caught in rakkang traps was assessed using carapace width measurements. Crabs captured using stingray bait showed a carapace width range of 2.23–12.40 cm, indicating a broad size variation and the presence of both small and large individuals. In contrast, crabs captured using chicken waste bait ranged from 3.74–6.90 cm, suggesting a narrower size distribution dominated by medium-sized individuals.

The highest carapace width observed in stingray-baited traps was 12.40 cm (26th replication), while the lowest was 2.23 cm (15th replication). For chicken waste bait, the largest carapace width recorded was 6.90 cm (12th replication), whereas the smallest was 3.74 cm (29th replication). These results indicate that stingray bait had the potential to attract a wider range of crab sizes, including larger individuals, compared to chicken waste bait under the study conditions.



**Figure 11.** The graph of the composition of the average carapace width caught by *S. serrata* using stingray bait and chicken waste bait

Similar to the weight composition results, stingray bait also produced minor fish bycatch, including one *M. ladigesii* and one *N. melanostomus*. Meanwhile, chicken waste bait resulted exclusively in mud crab catches, with a total of 127 individuals of *S. serrata* captured across all replications.

**Comparison of Catches Between Bait Types**

Field observations in Padang Hamlet, Bontosunggu Village, Bontoharu District, Selayar Islands Regency (South Sulawesi, Indonesia) showed that rakkang traps baited with stingray captured a more diverse catch composition compared to chicken waste bait. Stingray bait produced three catch types, including mud crab (*Scylla serrata*) as the dominant target species, and two fish species as minor bycatch: beseng-beseng (*Merosatherina ladigesii*) and round goby

(*Neogobius melanostomus*). In contrast, chicken waste bait resulted exclusively in mud crab catches (*S. serrata*) without fish bycatch.

Although stingray bait produced additional bycatch species, chicken waste bait yielded a higher number of mud crabs overall. The bycatch recorded in stingray-baited traps consisted of *M. ladigesii* (6.7 cm total length) and *N. melanostomus* (15.1 cm total length), indicating that stingray bait may occasionally attract non-target organisms in mangrove-estuarine waters.

Statistical comparison using a paired (dependent) t-test in SPSS 16 showed a significant value of  $p = 0.239$ . Since  $p > 0.05$ , the null hypothesis ( $H_0$ ) was accepted, indicating that stingray bait and chicken waste bait did not differ significantly in terms of mud crab catch performance. This result suggests that both bait types are similarly effective for

capturing *S. serrata* using rakkang traps under the local conditions of the study site.

### Effect of Bait Freshness on Catch

Catch results during the sampling period suggested that bait freshness may influence the number of mud crabs captured. When fresh bait was used, the catch tended to increase, whereas traps operated using bait that had been submerged and reused from the previous day generally showed reduced catches. This pattern was observed across multiple days, where the use of new bait (Day 1, Day 3, and Day 5) was followed by higher catches, while the reuse of bait (Day 2 and Day 4) corresponded with decreased catches.

These findings indicate that bait freshness and odor intensity are important factors affecting the attractiveness of bait to *S. serrata*. As bait remains submerged, physical and chemical changes such as leaching and decomposition may alter odor release, potentially reducing its ability to attract crabs efficiently. Therefore, although both bait types were effective overall, maintaining bait freshness may improve catch consistency.

### CONCLUSION

The catch of mud crab (*Scylla serrata*) using rakkang traps baited with stingray was not significantly different from that using chicken waste bait ( $p > 0.05$ ). These findings indicate that both bait types are equally

attractive and effective for capturing *S. serrata*, and therefore can be used as practical alternatives in mud crab trap fisheries.

### REFERENCES

- Anonim. 2015. Kabupaten Kepulauan Selayar. <https://kepulauansehayarkab.go.id/> (Diakses 23 Juli 2021).
- Assir, A., & Palo, M. 2016. **Pengaruh penggunaan jenis umpan yang berbeda terhadap jumlah hasil tangkapan kepiting bakau (*Scylla* sp.) menggunakan rakkang trap di perairan Muara Sungai Appabatu, Kabupaten Kepulauan Selayar.** Jurnal IPTEKS PSP, 2(1), 406–410.
- Gunarso, W. 1985. **Tingkah laku ikan dalam hubungannya dengan metode dan taktik penangkapan ikan.** Diklat Mata Kuliah, Jurusan Pemanfaatan Sumberdaya Perikanan, Fakultas Perikanan IPB, 1(1), 135–149.
- Hidayat, A. 2014. **Tutorial independent t-test dengan SPSS.** <https://www.statistikian.com/2014/04/independen-t-test-dengan-spss.html> (Diakses 29 November 2021).
- Kasry, A. 1991. **Budidaya kepiting bakau dan biologi ringkas.** Jakarta: PT Bhratara Niaga Meda.
- Krebs, C. J. 1989. **Ecological methodology.** New York: Harper Collins Publishers.
- Muhamad, A., Olij, A. H., & Baruadi, A. 2018. **Pengaruh perbedaan jenis umpan terhadap hasil tangkapan kepiting bakau (*Scylla serrata*) di Kecamatan Kwandang Kabupaten Gorontalo Utara.** Nike: Jurnal Ilmiah Perikanan dan Kelautan, 6(2), 259–264.
- Shelley, C., & Lovatelli, A. 2011. **Mud crab aquaculture: A practical manual.** FAO Fisheries and Aquaculture Technical

- Paper 567. Rome: Food and Agriculture Organization of the United Nations, 78 p.
- Steel, R. G. D., & Torrie, J. H. 1993. **Prinsip dan prosedur statistika: Suatu pendekatan biometrik**. Jakarta: PT Gramedia Pustaka Utama.
- Sudirman., & Mallawa, A. 2012. **Teknik penangkapan ikan**. Jakarta: Rineka Cipta.
- Sudjana. 2005. **Metode statistika** (Edisi ke-7). Bandung: Tarsito.
- Suruan, S. S., Kalasuat, S., & Dasmasele, H. 2019. **Identifikasi alat tangkap ikan bubu di daerah konservasi Desa Patimburak Distrik Kokas Kabupaten Fakfak**. Jurnal Riset Perikanan dan Kelautan, 1(2), 101–109.
- Zar, J. H. 1984. **Biostatistical analysis (2nd ed.)**. USA: Library of Congress in Publication Data.