The Effect of Different Types of Bait on the Main Catch of Mud Crabs *(Scylla serrata)* Using Pento Fishing Gear in the Kerandin River, Lingga Regency, Riau Islands Province

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Abstract

The Kerandin River is located in North Lingga District, Lingga Regency, one of the districts in the Riau Islands Province. Geographically, Lingga Regency is situated between 0°20' N and 0°40' S and 103°30' E and 105°00' E. The residents of Kerandin Village earn their livelihood as farmers and fishermen. One of these potentials is the potential for fisheries, including both capture fisheries and aquaculture. The primary fishery commodity in Lingga Regency is the Mangrove Crab *(Scylla serrata)*. Mangrove crabs are a fishery product with significant economic value, typically caught using pento fishing gear. Pento is a static fishing tool that requires bait to operate. People in Kerandin Village use stingrays as bait. However, one potential bait in the Kerandin River is cheap and easy to obtain but has not been used as bait, namely mullet, which will be tested as an alternative bait for catching mangrove crabs. This research used the Experimental Fishing method, and the data were analyzed using normality tests and T-tests. The research showed that the bait for belukang *(Hexanematichthys sagor)* produced more crab catches than the bait for stingrays *(Trygon sephen)*. The T-test comparing these two bait types revealed a significant difference, with a value of -2.804 (df = 18) and a significance level of 0.006.

1. Introduction

The marine waters of Lingga Regency in the Riau Islands Province harbour a variety of natural resources with potential to boost the local economy, including in the fisheries sector. Mangrove forests serve as habitats for various marine species, one of which is the mangrove crab (Romdon, 2016). The mangrove crab *(Scylla serrata)*, which has high economic value, is one of the region's key commodities. The people of Lingga catch mangrove crabs using a trap known as a "pento." The most commonly used trap for catching mangrove crabs is a "bubu" made of bamboo, netting, or wire; the most common type is the folding bubu (Susanto & Irnawati, 2012).

Static fishing gear that attracts mangrove crabs using bait anchored to the seabed typically employs stingray *(Trygon* sp.*)* as bait. However, given its relatively high economic value, the use of stingray as bait necessitates the search for more economical alternatives.

The bait used in this study was the belukang *(Hexanematichthys sagor)*, which is abundantly available in the mangrove areas of the Kerandin River. In the Kerandin River, Lingga Regency, Riau Islands Province, this study was conducted over 10 days using two bait types.

The objective of this study was to determine how differences in bait types affect the number of mangrove crabs caught using the pento trap. Bait is a key factor in successful fishing, and selecting the right bait can increase catch yields.

2. Methodology

2.1. Time, Place, and Materials

The study was conducted on the Kerandin River, Kerandin Village, East Lingga Subdistrict, Lingga Regency, Riau Islands Province, in March 2023.

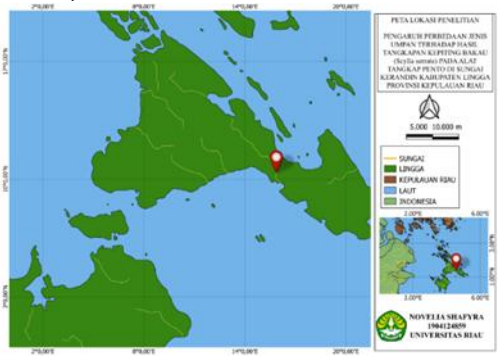

Figure 1. Study location

2.2. Method

In this study, an experimental method was used to compare crab catch results using stingray and belukang fish meat as bait in pento traps in the Kerandin River. Data collection was also conducted through interviews, observations, and documentation. Catch data, consisting of the number of individuals and catch weight, were collected over the 10-day study period.

During the study, 20 pento traps were used, and trap locations were selected purposively at sites where fishermen typically found crabs according to their usual practices. The pento traps were deployed at 5 stations, with each station equipped with 1 pento trap baited with stingray and 1 pento trap baited with belukang fish

2.3. Data Analysis

The catch data analyzed comprised the number of individuals (count) and the weight (kg) obtained during the study. The Shapiro-Wilk normality test and t-test were used to determine whether the sample came from a population with a normal distribution, at a significance level of 0.05.

The Shapiro-Wilk normality test determines whether the sample comes from a population with a specific distribution by comparing the sample data to in distributional assumption. In statistics, data are collected, grouped, and tabulated to obtain information about a specific issue. Df, or degrees of freedom, is the total number of observations in the sample (N) minus the number of estimated parameters, and the p-value, or significance value, is the error value obtained by the researcher from the results of statistical calculations.

A normality test is used to determine whether the collected data is normally distributed; if not, data transformation is performed, and a t-test is used to determine whether there are differences in catch results across various baits. The t-test used is based on the work of Sudjana (1984).

The t-table value is compared with the calculated t-value. If the calculated t is greater than the t-table value, then the different bait types do not result in a difference in catch results. If the calculated t is less than the t-table value, then the different bait types do not result in a difference in catch results.

3. Result and Discussion

Fishing Gear for Mangrove Crabs *(Scylla serrata)*

According to Sumali et al. (2012), fishing vessels generally use wood as the primary material because it is relatively inexpensive and easier to work with than steel or fibreglass. This study used a 4 m x 1 m wooden fishing boat propelled by two oars. A single person operates each boat. The fishing gear consists of a trap made from rattan (*Calamus axillaris*), shaped like a cylinder with a diameter of 46 cm and a height of 20 cm, featuring two entry points, and using a polyamide monofilament net with a mesh size of 2 cm and a thread count of 15. Poles with a diameter of 2.5 cm to 3 cm and a height of 1.5 m are used to anchor the pento to the bottom of the water. Various types of bait are used to lure crabs into the pento. Bait use varies across different water areas, and local communities use in differently. The pento fishing gear is used as follows.

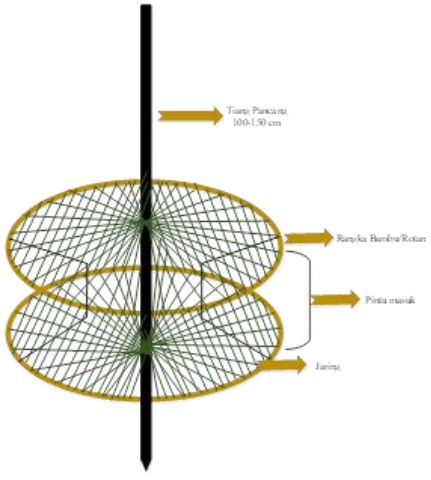

Figure 2. Pento fishing gear

According to Sirait (2018), the pento is a traditional passive fishing gear consisting of a fish trap made of bamboo, rattan, wire, iron, netting, wood, and plastic, designed in that fish cannot escape.

Fishing Areas

According to Romdon (2016), mangrove crab fishing grounds are located in brackish waters with mud and mangrove vegetation. Mangrove crabs often hide in the mud and dig burrows to live in. Fishermen in Kerandin Village catch mangrove crabs along the mangrove forests of the Kerandin River and the village coastline. They usually look for sheltered spots near the mangrove forests. Mangrove crabs can be caught year-round except during the rainy season. Effective harvesting occurs during high tide because the crabs emerge from their burrows. Tidal patterns influence harvesting operations. During the study, water clarity, depth, pH, and salinity were measured. The water had a transparency of 40–50 cm, with an average of 46 cm; a depth of 170–210 cm, with an average of 185 cm; and a pH of 7–8, with an average of 7.4. Salinity ranged from 20–28 ‰, with an average of 24.5 ‰.

Water conditions influence mangrove crab catch results. Water clarity affects mangrove crabs' ability to forage for food and protect themselves from predators. Clear water conditions support a healthy mangrove crab population. Water depth affects the habitat and activities of mangrove crabs. Water pH affects the balance of the mangrove ecosystem where mangrove crabs live. Extreme changes in pH can disrupt the ecosystem balance. Water salinity affects the concentration in dissolved oxygen. Understanding the relationship between water conditions and mangrove crab catches is important for the management and conservation of mangrove ecosystems and mangrove crab populations.

Bait for the Pento Trap

The bait used must attract the crabs to approach and consume it. In passive fishing, bait is the key to success. Bait selection varies depending on the water body and the crabs' feeding habits. The type and quality of bait influence catch yields. Pento fishermen typically use naturally available bait, such as stingrays, as they are easily accessible and affordable. In this study, two types of bait were used: fresh stingrays (*T. sephen*) and fresh belukang (*H. sagor*). According to the Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia No. 1 of 2021 concerning Protected Fish Species, the stingrays used are not included in the category of protected stingrays. The sagor fish and stingrays were cut, weighed, wrapped in gauze, and clamped to wooden stakes on the pento. The weight of the bait used in this study was 50 g per piece.

Pento Catch Results

Pento catch results during the study can be categorized into main catch (*S. serrata*), bycatch (*H. sagor*) and shrimp (*L. vannamei*), and discard (*Varanus* sp). Using stingray bait, the catch consisted of 49 mangrove crabs, 1 belukang fish, 3 shrimp, and 3 Varanus sp. The complete data are listed in the following Table 1.

Table 1. Catch results by species (number of individuals) using stingray *(T. sphen)* as bait

Day	Mangrove Crab *(S. serrata)*	Belukang *(H. sagor)*	*L. vannamei*	*Varanus* sp
1	8	1		
2	5		3	1
3	6			
4	5			
5	4			
6	5			
7	5			
8	3			1
9	4			1
10	4			
Total	49	1	3	3

During the study, the pento trap baited with belukang yielded a catch of 65 mangrove crabs, 2 belukang, 5 shrimp, and 4 *Varanus* sp. Complete data on the catch from the pento trap using belukang fish as bait is presented in the following Table 2. Weighing of the catch using

stingray bait during the study yielded a catch of 22,000 g of crabs, 300 g of belukang fish, 50 g of shrimp, and 3,800 g of *Varanus* sp. Complete data on the catch using stingray bait is shown in the following Table 3.

Table 2. Catch results by species (number of individuals) using *H. sagor* as bait

Day	Mangrove Crab *(S. serrata)*	Belukang *(H. sagor)*	*L. vannamei*	*Varanus* sp
1	8	1		
2	10		5	1
3	6			
4	5			
5	5			2
6	6			
7	9			
8	5	1		1
9	7			
10	8			
Total	69	2	5	4

Table 3. Catch results based on the number of species and weight (g) using stingray bait *(T. sephen)*

Day	Mangrove Crab *(S. serrata)*	Belukang *(H. sagor)*	*L. vannamei*	*Varanus* sp
1	2,800 g	300 g		
2	1,700 g		50 g	1,300 g
3	1,900 g			
4	1,400 g			
5	1,300 g			
6	1,500 g			
7	1,950 g			
8	1,000 g			1,200
9	1,700 g			1,500
10	1,400 g			
Total	16,700 g	300 g	50 g	3,800 g

Table 4. Catch results based on the number of species and weight (g) using belukang fish *(H. sagor)* as bait

Day	Mangrove Crab *(S. serrata)*	Belukang *(H. sagor)*	*L. vannamei*	*Varanus* sp
1	2,600 g	350 g		
2	2,900 g		100 g	1,500 g
3	1,800 g			
4	1,400 g			
5	1,300 g			3,500
6	2,400 g			
7	2,900 g			
8	1,500 g	300 g		1,300
9	2,300 g			
10	2,900 g			
Total	22,000 g	650 g	100 g	3,800 g

Weighing of the catch using belukang as bait during the study yielded a catch of 22,000 g of mangrove crabs, 650 g of belukang, 100 g of shrimp, and 6,300 g of *Varanus* sp (Table 4).

Comparison of Pento Catch Results

When examined in terms of catch results using stingray *(T.sephen)* and belukang *(H. sagor)* as bait, there was no difference in catch results. All catch species using stingray bait were also present in the catch using belukang bait, such as the mangrove crab (*S.serrata)*, which is classified as the main catch; the belukang fish and shrimp *(L.vannamei)*, which are classified as bycatch; and the *Varanus* sp, which is classified as discard.

The catch using the pento fishing gear with stingray bait yielded 49 mangrove crabs as the main catch, 1 belukang and 3 shrimp as bycatch, and 3 *Varanus* sp as discards. Meanwhile, using belukang fish as bait, the catch results were 69 mangrove crabs as the main catch, 2 belukang = and 5 shrimp as bycatch, and 4 *Varanus* sp as discard.

A comparison of catch quantities using a pento trap with stingray *(Trygon* sp.*)* as bait yielded *a* main catch of 16,700 g of mangrove crabs, a bycatch of 300 g of belukang fish and 50 g of shrimp, and *a discard* of 3,800 g of *Varanus* sp. Meanwhile, using belukang *(H. sagor)* as bait, the main catch of mangrove crabs was 22,000 g, the bycatch of belukang was 650 g, the bycatch of shrimp was 100 g, and the discarded *Varanus* sp totalled 6,300 g.

During the 10-day study in Kuala Tanjung Indah Village, Batubara Regency, North Sumatra Province, the crab catch using various types of bait was as follows: using chicken heads, 15 crabs were caught; using chicken intestines, 13 crabs; using parang-parang meat, 10 crabs; and using stingray meat, 8 crabs. According to Sirait (2018), mangrove crab catches using pento traps in Kuala Tanjung Indah Village, North Sumatra Province, yielded 15 crabs using chicken heads as bait, 13 crabs using chicken intestines, 10 crabs using parang-parang fish meat, and 8 crabs using stingray meat. Meanwhile, according to Sahat et al. (2014), the total catch of mangrove crabs using pento traps with chicken heads as bait was the highest at 82 crabs, followed by fish bait at 43 crabs, belangkas bait at 33 crabs, and mixed bait at 19 crabs.

Data Analysis of Main Catch

The main catch was tested for normality using stingray and belukang fish as bait to determine whether the collected data were normally distributed.

The results of the normality test using the Shapiro-Wilk method showed high test statistic values for both main catch samples regarding stingray and belukang fish bait, 0.883 and 0.905, respectively, each with 10 degrees of freedom. However, the significance (Sig.) values for each sample were higher than the normal level (0.05). There was no statistically significant difference in the rejection of the normality assumption between the two data groups, as determined by the Shapiro-Wilk test.

In this study, the difference in the main catch between the two groups was analyzed using an independent-samples t-test. The results showed a t-value of -2.804 with 18 degrees of freedom (df) and a significance level (p) of 0.006, indicating a significant difference between the two groups in the main catch.

The 95% confidence interval ranges from -2.00000 to 0.71336, with a mean difference of 0.012. Additionally, an independent samples *t-test* was conducted without the assumption of equal variances. The results showed a t-value of -2.804, df 16.844, and a p-value of 0.006. These results indicate a significant difference between the two groups; although the variances were unequal, the mean differences, 95% confidence intervals, and p-values for both tests were comparable. The catch results for the main catch group were, on average, higher than those of the other groups. The use of belukang fish bait resulted in a larger number of individuals than stingray bait.

4. C*onclusion*

The objective of this study was to determine how different types of bait affect mangrove crab catch rates and to identify the most effective bait for catching them. With df 18 and a significance level (p) of 0.006, the t-test between the two treatments yielded a t-value of -2.804. Based on the significance test results, the catch using belukang fish bait had a sig value of 0.006 > 0.05; thus, it can be concluded that there is a significant difference between the two bait categories tested. The research results indicate that belukang bait *(H.sagor)* yields more individuals (crabs) and greater crab weight compared to stingray bait *(T. sephen).*

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