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Comparison of Blue Swimmer Crab (*Portunus pelagicus*) Gill Net Catches at Different Depths in Salemo Island Waters, Pangkep Regency

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Abstract

This study aims to analyze the quantity and weight of blue swimmer crab (*Portunus pelagicus*) catches using gill nets at two different depth intervals (10–15 meters and 15–20 meters) in Salemo Island Waters, Pangkajene and Islands Regency. The research was conducted from April to June 2026 by directly following fishermen's fishing operations for 24 trips. Data collected included catch quantity (ind.) and catch weight (kg) at each depth. Data analysis was carried out descriptively and using Student's t-test statistical analysis after normality testing with the Lilliefors method.

The results showed that the total catch over 24 trips reached 297 individuals with a total weight of 31.1 kg. Catches at a depth of 15–20 meters were significantly higher, amounting to 192 individuals (64.65%) with a weight of 19.9 kg (an average of 8 individuals and 0.8 kg per trip), compared to the 10–15 meter depth which yielded only 105 individuals (35.35%) with a weight of 11.2 kg (an average of 4 individuals and 0.4 kg per trip). Student's t-test analysis revealed calculated t-values of 7.42 for catch quantity and 6.86 for catch weight, both of which were greater than the critical t-table value (2.01 at $\alpha = 0.05$). This proves that depth differences have a statistically significant effect on both the quantity and weight of blue swimmer crab catches. The 15–20 meter depth represents a more effective and productive fishing depth due to more stable habitat conditions and food availability for adult blue swimmer crabs.

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Keywords: Blue swimmer crab, *Portunus pelagicus*, Gill net, Fishing depth, Catch productivity

Introduction

Indonesia is the largest archipelagic country in the world with vast marine waters rich in marine biodiversity (Dahuri *et al.*, 2001) ^[4]. The capture fisheries sector makes a highly significant contribution to the national economy and the livelihoods of coastal communities (Ardiansyah, 2022) ^[3]. One of the coastal fishery commodities with high economic value is the blue swimmer crab (*Portunus pelagicus*). This product is one of Indonesia's main fisheries export commodities to various countries such as the United States, Japan, and European nations (FAO, 2022).

Pangkajene and Islands Regency (Pangkep) in South Sulawesi has a sea area of 11,464.44 km² with hundreds of small islands possessing abundant fisheries potential (DKP Pangkep, 2023). Salemo Island is one of the inhabited islands in North Liukang Tupabbiring District, where the majority of residents earn their living as blue swimmer crab fishermen. The fishing gear commonly used by fishermen in this region is the bottom gill net.

The success of catching blue swimmer crabs using gill nets is heavily influenced by environmental factors, one of which is water depth (Agus *et al.*, 2016) ^[1]. Water depth is directly related to oceanographic parameters such as temperature, salinity, light

penetration, water pressure, and bottom substrate type. Blue swimmer crabs tend to be distributed according to their maturity level and habitat preferences, where adult crabs are often found in deeper waters with muddy or sandy-muddy substrates (Kangas, 2000) ^[9]. To date, fishermen on Salemo Island operate at varying depths without scientific certainty regarding the most productive depth (Apriliyanto *et al.*, 2014) ^[2]. Therefore, this study is essential to compare the quantity and weight of blue swimmer crab gill net catches at depths of 10–15 meters and 15–20 meters.

Research Method

This research was conducted from April to June 2026 in the waters of Salemo Island, North Liukang Tupabbiring District, Pangkajene and Islands Regency, South Sulawesi.

Materials and Equipment

The equipment used in this study included monofilament gill net units with a mesh size of 3.5 inches, total net length of 750 meters, a 5 GT motorboat, analytical balance, writing instruments, and documentation camera. The research object was the caught blue swimmer crab (*Portunus pelagicus*).

Data Collection Procedure

The method utilized was a field survey method by participating in experimental fishing operations directly with fishermen for 24 trips. Net deployment was carried out simultaneously across two depth categories: 10–15 meters and 15–20 meters. Setting operations took place in the afternoon at 16:00 WITA, and hauling operations were conducted the following morning at 07:00 WITA, with a soaking time of approximately 15–20 hours.

Data Analysis

Data on the quantity (ind.) and weight (kg) of crabs were recorded for each trip. Prior to mean difference testing, data

normality was tested using the Lilliefors Test (Ghozali, 2021) ^[7]. Once confirmed to be normally distributed, analysis proceeded with Student's t-Test (Walpole, 1995) ^[10] using the formula:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{Sp \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

with pooled variance (Sp):

$$S_p = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1 + n_2 - 2}}$$

With:

$\bar{X}_1, \bar{X}_2$ = sample means

S_1^2, S_2^2 = sample variances

n_1, n_2 = sample sizes

Tested hypotheses:

H0: There is no significant difference in catch results at depths of 10–15 m and 15–20 meters.

H1: There is a significant difference in catch results at depths of 10–15 m and 15–20 meters.

Results and Discussion

Overview of Fishing Gear and Operations

The crab gill net used was made of transparent PA nylon monofilament with a mesh size of 3.5 inches. The gear construction consisted of PE upper float line, floats, net body, lower lead line, and lead sinkers. Operations were set along the seabed (bottom set gill net) to intercept crab movements as they actively forage at night (demersal/nocturnal).

Blue Swimmer Crab Catch by Depth

The total blue swimmer crab catch over 24 trips is presented in Table 1. Total catch obtained reached 297 individuals with a total weight of 31.1 kg.

Table 1: Blue Swimmer Crab Gill Net Catches by Water Depth in Salemo Island Waters

Trip	Quantity (ind.)		Weight (kg)	
	10–15 m	15–20 m	10–15 m	15–20 m
1	2	5	0.1	0.5
2	3	5	0.5	0.3
3	6	9	0.9	0.5
4	3	6	0.5	0.6
5	3	6	0.3	0.6
6	5	6	0.5	0.7
7	6	7	0.5	0.9
8	5	8	0.8	0.9
9	5	11	0.5	1.1
10	3	9	0.3	0.9
11	4	10	1.0	0.4
12	2	8	0.2	0.8
13	3	12	0.3	1.2
14	6	9	0.6	0.9
15	3	6	0.3	0.6
16	4	5	0.4	0.6
17	5	6	0.5	0.7
18	6	7	0.6	0.8
19	5	12	0.5	1.2
20	6	11	1.1	0.6
21	5	9	0.5	0.9
22	4	10	0.4	1.0
23	5	8	0.5	0.8
24	6	7	0.6	0.7
Total	105	192	11.2	19.9
Mean	4.38	8.00	0.47	0.83

Based on Table 1, catches at a depth of 15–20 meters were consistently higher in terms of both quantity and weight across every trip compared to the 10–15 meter depth. At 10–15 meters depth, an average of 4 ind./trip (0.47 kg/trip) was obtained, whereas at 15–20 meters depth, an average of 8 ind./trip (0.83 kg/trip) was recorded.

Table 2: Student's t-Test Results for Catch Quantity (ind.)

Parameter	t-Calculated	t-Table ($\alpha = 0.05$)	t-Table ($\alpha = 0.01$)	Conclusion
Catch Quantity	7.42	2.01	2.68	Highly Significant (H_0 Rejected)

Table 3: Student's t-Test Results for Catch Weight (kg)

Parameter	t-Cal	t-Table ($\alpha=0.05$)	t-Table ($\alpha=0.01$)	Conclusion
Catch Weight	6.86	2.01	2.68	Highly Significant (H_0 Rejected)

Statistical analysis results showed t -calculated $>$ t -table values at both the 95% ($\alpha = 0.05$) and 99% ($\alpha = 0.01$) confidence levels. This confirms that water depth exerts a highly significant influence on both the quantity and biomass of blue swimmer crabs caught by gill nets.

Discussion

The higher catches of blue swimmer crabs at depths of 15–20 meters compared to 10–15 meters are closely linked to the bioecology and habitat preferences of *Portunus pelagicus*. According to Kangas (2000)^[9] and Johnston & Yeoh (2021)^[8], young/juvenile crabs are predominantly active in shallow nearshore waters (nursery grounds), whereas larger, mature individuals ready to spawn migrate to deeper waters.

At depths of 15–20 meters in Salemo Island Waters, environmental conditions are relatively more stable against surface wave fluctuations and temperature shifts, and the bottom substrate is dominated by fine muddy sand, which is the preferred microhabitat for blue swimmer crabs to bury themselves and stalk prey (Agus *et al.*, 2016)^[1]. Furthermore, the availability of natural food such as benthos, small crustaceans, and mollusks is more abundant in this zone. Consequently, the abundance and movement activity of adult crabs at 15–20 meters depth are significantly higher, increasing the probability of crabs becoming entangled or gilled in the mesh of gill nets.

These findings align with studies by Wulandari *et al.* (2014)^[11] and Apriliyanto *et al.* (2014)^[2], which state that selecting the appropriate depth for fishing grounds is a critical determining factor in gill net fishing success. Directing fishing operations toward the 15–20 meter depth zone can significantly enhance the operational efficiency of Salemo Island fishermen.

Conclusion

Based on the research findings and data analysis, it can be concluded that:

1. Total blue swimmer crab catch at a depth of 15–20 meters reached 192 individuals with a weight of 19.9 kg, while at 10–15 meters depth it reached 105 individuals with a weight of 11.2 kg.
2. There is a highly significant difference in both quantity and weight of blue swimmer crab catches between 10–15 meters and 15–20 meters depth (t -calc $>$ t -table). A depth of 15–20 meters is the most effective fishing depth in Salemo Island Waters.

Statistical Comparative Analysis (Student's t-Test)

Statistical testing was performed to verify whether the difference in catches between depths was statistically significant. The test results are presented in Table 2 and Table 3.

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