Morphometric of Tiger Shrimp (*Penaeus monodon*) Caught at Night in Samboja Waters Kutai Kartanegara Regency

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ARTICLE INFO

Research Article

Article history:
Received March 18, 2023
Received in revised form April 1, 2023
Accepted August 1, 2023

DOI: https://doi.org/10.30872/jipt.v2i2.632

Keywords: *Penaeus monodon, Morphometric, Samboja Kuala*

ABSTRACT

Tiger prawn (Penaeus monodon) is a type of shrimp from the Penaeidea family and is one of the caught in Samboja waters. This research was conducted in November-December 2022 in Samboja Kuala Waters, Kutai Kartanegara by catching shrimp at night using trawl fishing gear. The sample used was 100 tiger prawns (Penaeus monodon) with 42 females and 58 males. This study aims to determine the morphometric characters of tiger shrimp (Penaeus monodon) and to analyze the morphometric measurements. In the analysis using Ancova, the results obtained were 12 morphometric characters of tiger shrimp (Penaeus monodon) with significant values greater than 0.05, namely RST, PK, PRT, PRN, PT, PP, PKB, PTB, PNB, PE and PTK . So based on the initial hypothesis, if the significant number is greater than 0.05 Ho, it is accepted, which means that there is no relationship between the morphometrics of male and female tiger shrimp (Penaeus monodon).

INTRODUCTION

Shrimp is a flagship commodity of the fisheries sector, commonly exported in frozen form (Prasetyo, 2004). Shrimp is also a special fishery product, with specific qualities and relatively high nutritional value (Ilyas, 1993). Shrimp belongs to the subphylum Crustacea. Its body is divided into three parts: the head (cephalo), thorax (chest), and abdomen (belly), or sometimes the head and thorax are fused to form the cephalothorax. Shrimp has a segmented body, and its entire body is covered with a thick and hard chitinous exoskeleton. The weight of its head is approximately 36-49% of the total body weight, the meat is 24-41%, and the shell is 17-23% (Purwaningsih, 1995).

Shrimp plays a crucial role in ecosystem balance as it is one of the components in the aquatic food chain. According to Wowor et al. (2009) as cited in Taufik (2011), shrimp have an important role in maintaining ecosystem equilibrium. Furthermore, shrimp also significantly contribute to improving the livelihoods of fishermen due to its economic value. One of the shrimp species found in the waters of Samboja, East Kalimantan, is the Giant Tiger Prawn (*Penaeus monodon*). The fisheries result from this species have high economic value, making them highly beneficial for supporting the local economy in Samboja, East Kalimantan.

According to Penn (1975) as cited in Prasetiyo et al. (2014), shrimp are actively engaged in feeding during the night. Shrimp tend to move towards the ocean surface, especially under bright moonlight, and descend to lower layers when moonlight intensity is low or absent. Consequently, the night-time capture of Giant Tiger Prawn generally yields a larger catch compared to daytime captures. Additionally, for the management of Giant Tiger Prawn resources, information about morphological characteristics (morphometrics) is still required to identify species diversity and population units within a water body.

Based on these considerations, research on fundamental fisheries biology information, such as the description of morphometric characteristics, is necessary.

METHODOLOGY

Research Time and Location

The study was conducted from November to December 2022 in the waters of Samboja, Kutai Kartanegara Regency, East Kalimantan, Indonesia. The Giant Tiger Prawn was researched at the Aquatic Conservation Laboratory, Faculty of Fisheries and Marine Science, Universitas Mulawarman.

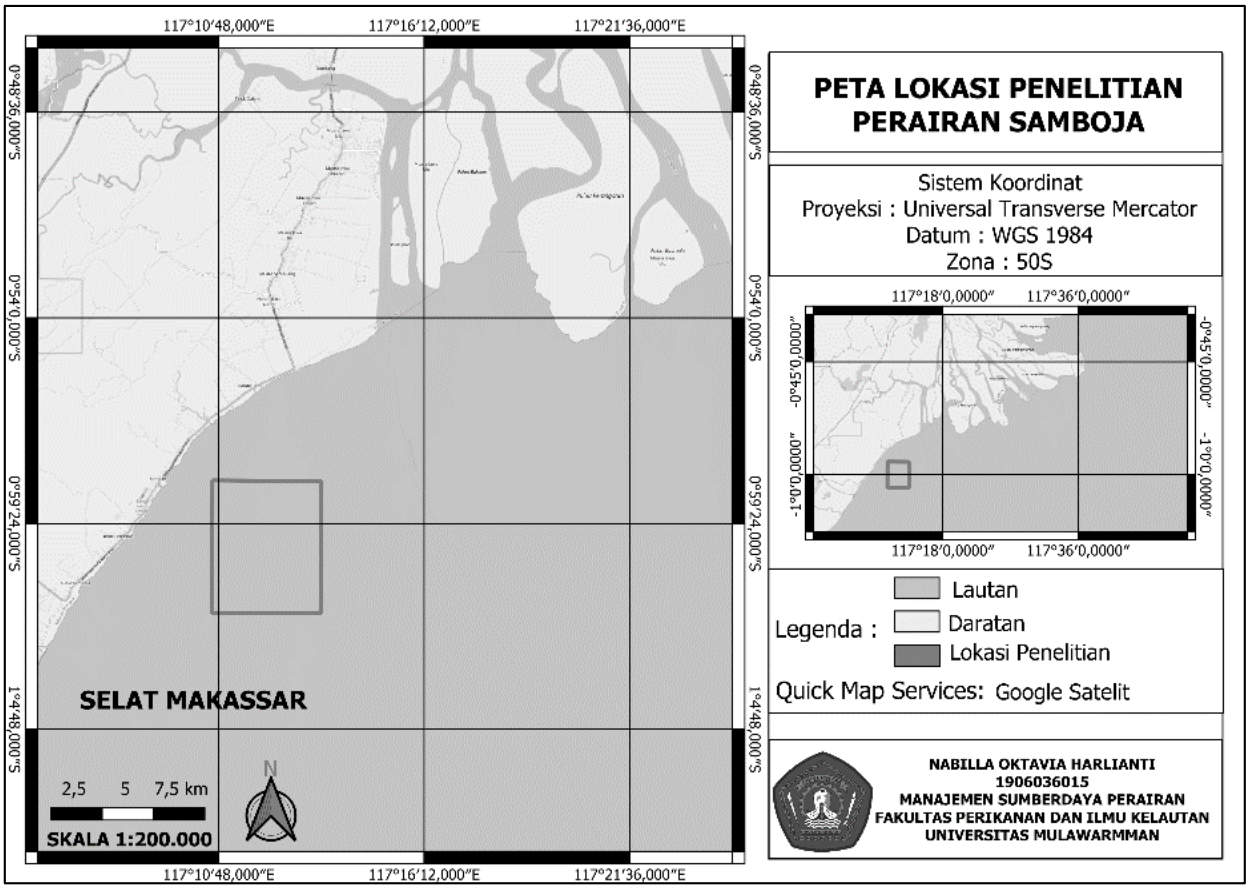

Figure 1. Research Location Map

Research Procedure

Sampling of the Giant Tiger Prawn was carried out in the Samboja Subdistrict by fishermen who had captured them using trawl fishing gear. Subsequently, the samples were identified to ensure that they corresponded to the Giant Tiger Prawn as per the research objective. This identification was performed using the identification book by Saputra (2008). A total of 100 specimens of Giant Tiger Prawn were used as samples. These specimens were then subjected to measurement using measuring tools such as rulers and digital calipers. The measurements were conducted at the Laboratory of Conservation and Management of Aquatic Resources, Faculty of Fisheries and Marine Science, Universitas Mulawarman.

Data Analysis

Analysis of Covariance (ANCOVA) is a test for differences or comparisons involving a dependent variable with interval or ratio data scale. ANCOVA can be used in both comparative and experimental research that involves existing groups and randomly formed groups. It is also used to enhance statistical tests by reducing variance within groups (error). The intended power refers to the test's ability to detect actual research findings, allowing the tester to reject a false null hypothesis (H_0).

ANCOVA analysis is conducted to examine differences between groups of male Giant Tiger Prawns and female Giant Tiger Prawns based on their morphometric characteristics. The analysis aims to determine whether there are significant differences or not. The hypothesis states that if the significant value is >0.05, then H0 is accepted, implying that the relationship between the covariate and the response variable is nonlinear. If the significant value is <0.05, then H0 is rejected, indicating that the relationship between the covariate and the response variable is linear.
The hypothesis at a 95% confidence level is as follows:

1. If H_0 is accepted, then there is no difference between the morphometric characteristics of male and female prawns.
2. If Ha is accepted, then there is a significant difference between the morphometric characteristics of male and female prawns.
3. If the significance (Sig.) value is >0.05, then H_0 is accepted and Ha is rejected.
4. If the significance (Sig.) value is <0.05, then H_0 is rejected and Ha is accepted.

RESULT AND DISCUSSION

Research Location Conditions

Samboja Subdistrict is situated within the Kutai Kartanegara Regency and holds significant potential in terms of aquatic resources and fisheries yields. This has led to a substantial portion of the population in Kuala Samboja Village, Samboja Subdistrict, Kutai Kartanegara Regency, engaging in fishing as their primary livelihood. Fishermen in this area commonly utilize trawl and rengge fishing gear.

Fishermen in the waters of Samboja are actively engaged in fishing for 6 days a week, dedicating 12 hours each day, predominantly during the night, to catch Giant Tiger Prawns. They cover a distance of approximately 2 nautical miles per fishing trip for catching fish. However, when it comes to capturing prawns, the distance covered can extend up to around 3 nautical miles per trip.

Analisis of Variance (Anova) dan Analisis of Covariance (Ancova)

ANCOVA analysis was conducted to examine the differences between the groups of male Giant Tiger Prawns, totaling 58 individuals, and female Giant Tiger Prawns, totaling 42 individuals. These prawns were captured during the night in the waters of Kuala Samboja, Samboja Subdistrict, Kutai Kartanegara Regency, based on their morphometric characteristics. The aim was to determine whether there are significant differences or not. The hypothesis, at a 95% confidence level, is as follows: If Ho is accepted then there is no relationship between male and female shrimp morphometrics, and if Ho is rejected then there is a significant relationship between male and female shrimp morphometrics ;Sig. >0.05 then Ho accepted Ha rejected; Sig. <0.05 then Ho rejected Ha accepted.

The ANCOVA analysis was conducted twice: a partial test and a simultaneous test of morphometric characteristics with total length (PTO) characteristic. The partial test was performed to identify the main effects and interaction effects of categorical independent variables (often referred to as factors) on the dependent metric variable. Meanwhile, the simultaneous test was conducted to compare a single morphometric characteristic while considering the influence of other morphometric characteristics.

Based on the results of the analysis conducted by comparing the length of each morphometric characteristic partially with the total length (PTO), the obtained results are presented in Table 1.

Table 1. Comparison of Overall Morphometric Characteristics with Total Length (PTO)

Number	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
1	Rostrum Length (RST)	2913.008	1	2913.008	3.807	.054
2	Head Length (PK)	5811.451	1	5811.451	7.904	.006
3	First Segment Length (PRP)	2344.686	1	2344.686	3.041	.084
4	Second Segment Length (PRD)	5449.361	1	5449.361	7.374	.008
5	Third Segment Length (PRT)	4360.210	1	4360.210	5.812	.018
6	Fourth Segment Length (PRE)	31.737	1	31.737	.040	.842
7	Fifth Segment Length (PRL)	1762.822	1	1762.822	2.269	.135
8	Sixth Segment Length (PRN)	2843.076	1	2843.076	3.712	.057
9	Telson Length (PT)	3829.403	1	3829.403	5.067	.027
10	Prosertema Length (PP)	6314.714	1	6314.714	8.649	.004
11	Antenulles Length (PAN)	2073.698	1	2073.698	2.680	.105
12	Lower Head Length (PKB)	7719.579	1	7719.579	10.788	.001
13	Lower First Segment Length (PPB)	1672.323	1	1672.323	2.150	.146
14	Lower Second Segment Length (PDB)	1515.689	1	1515.689	1.944	.166
15	Lower Third Segment Length (PTB)	2828.606	1	2828.606	3.693	.058
16	Lower Fourth Segment Length (PEB)	1901.530	1	1901.530	2.452	.121
17	Lower Fifth Segment Length (PLB)	2355.767	1	2355.767	3.056	.084
18	Lower Sixth Segment Length (PNB)	3614.397	1	3614.397	4.769	.031
19	Tail Length (PE)	4822.305	1	4822.305	6.469	.031
20	Length Excluding Head (PTK)	8767.721	1	8767.721	12.440	.001

The comparison of morphometric characteristics of Giant Tiger Prawns including Rostrum Length (RST), Head Length (PK), Second Segment Length (PRD), Third Segment Length (PRT), Sixth Segment Length (PRN), Telson Length (PT), Prosertema Length (PP), Lower Head Length (PKB), Lower Third Segment Length (PTB), Lower Sixth Segment Length (PNB), Tail Length (PE), and Length Excluding Head (PTK) with Total Length (PTO) reveals significant results where the significance value is <0.05. This indicates a significant relationship between these individual length measurements and the total length.

Based on the results of the analysis conducted by comparing the length of each morphometric characteristic simultaneously with the total length (PTO), the findings are presented as shown in Table 2.

Table 2. Simultaneous Analysis of Morphometric Characteristics with PTO Characteristic

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	19436.881[a]	13	1495.145	2.074	.024
Intercept	568.688	1	568.688	.789	.377
Rostrum Length (RST)	319.474	1	319.474	.443	.507
Head Length (PK)	432.480	1	432.480	.600	.441
Second Segment Length (PRD)	351.216	1	351.216	.487	.487
Third Segment Length (PRT)	3.281	1	3.281	.005	.946
Sixth Segment Length (PRN)	126.897	1	126.897	.176	.676
Telson Length (PT)	428.500	1	428.500	.595	.443
Prosertema Length (PP)	977.499	1	977.499	1.356	.247
Lower Head Length (PKB)	227.992	1	227.992	.316	.575
Lower Third Segment Length (PTB)	174.943	1	174.943	.243	.623
Lower Sixth Segment Length (PNB)	265.329	1	265.329	.368	.546
Tail Length (PE)	153.234	1	153.234	.213	.646
Length Excluding Head (PTK)	1434.473	1	1434.473	1.990	.162
Sex (JK)	96.612	1	96.612	.134	.715
Error	61982.754	86	720.730		
Total	3628321.391	100			
Corrected Total	81419.635		99		

R Squared = .239 (Adjusted R Squared = .124)

Based on the results of the simultaneous analysis of morphometric characteristics of Giant Tiger Prawns with Total Length (PTO), it is found that out of the 12 characteristics, the significance values are >0.05. This indicates that there is no relationship between these 12 morphometric characteristics of male and female Giant Tiger Prawns.

CONCLUSION

Based on the conducted analysis, the conclusions are as follows:

1. Morphometric measurements of Giant Tiger Prawns (*Penaeus monodon*) were carried out using calipers, measuring a total of 22 morphometric characteristics: Rostrum Length (RST), Head Length (PK), First Segment Length (PRP), Second Segment Length (PRD), Third Segment Length (PRT), Fourth Segment Length (PRE), Fifth Segment Length (PRL), Sixth Segment Length (PRN), Telson Length (PT), Prosertema Length (PP), Antenulles Length (PAN), Lower Head Length (PKB), Lower First Segment Length (PPB), Lower Second Segment Length (PDB), Lower Third Segment Length (PTB), Lower Fourth Segment Length (PEB), Lower Fifth Segment Length (PLB), Lower Sixth Segment Length (PNB), Tail Length (PE), Length Excluding Head (PTK), and Total Length (PTO).
2. Based on the analysis results using the ANCOVA method, 12 morphometric characteristics of Giant Tiger Prawns (*Penaeus monodon*) have significance values greater than 0.05: Rostrum Length (RST), Head Length (PK), Third Segment Length (PRT), Sixth Segment Length (PRN), Telson Length (PT), Prosertema Length (PP), Lower Head Length (PKB), Lower Third Segment Length (PTB), Lower Sixth Segment Length (PNB), Tail Length (PE), and Length Excluding Head (PTK). Therefore, based on the initial hypothesis, if the significance value is greater than 0.05, Ho is accepted, indicating that there is no relationship between morphometric characteristics of male and female Giant Tiger Prawns (*Penaeus monodon*).

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