Morphometric of spear shrimp (*Parapenaeopsis hardwickii*) captured during the night in the waters of Samboja, Kutai Kartanegara

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ABSTRACT

Spear shrimp (*Parapenaeopsis hardwickii*) is one of the shrimps with the *Penaidae* family, morphometric measurements are carried out in order to see the things that affect the shape of the species. This study aimed to provide information about the morphometric study of Spear shrimp (*Parapenaeopsis hardwickii*) caught in the waters of Samboja, Kutai Kartanegara. This research was conducted in Samboja Waters, Kutai Kartanegara, in November-Desember 2022. The sample used was 250 Spear shrimp (*Parapenaeopsis hardwickii*). Morphometric studies on Spear shrimp (*Parapenaeopsis hardwickii*) used analysis with the analysis of covariant (ANCOVA) test to see the 18 morphometric covariates that affect the total length (PTO). Based on the results of the analysis of the ANOVA univariate test, it was found that 18 morphometrics had a significant value < 0.05 which means H1 was accepted, that all morphometrics affect PTO. Furthermore, the ANCOVA analysis was carried out, the results were 9 morphometrics which had sig <0.05, namely, head length (PK), length of the fourth internode (PRE), length of the sixth internode (PRN), headless length (PTK), length of the third lower segment (PTB), length of the fourth lower segment (PEB), length of the fifth lower segment (PLB), length of the sixth lower segment (PNB) and length of the tail (PE). Based on the results of the ANCOVA test. the most significant morphometric that influenced PTO was the 9 morphometry.

INTRODUCTION

The spotted shrimp (*Parapenaeopsis hardwickii*) is a commodity highly sought after by local communities. It belongs to the class Crustacea, order Decapoda, and family Penaeidae. Its distinguishing feature is the brownish-yellow spotted carapace resembling beans. This shrimp always has a rostrum with three or more teeth on top and none below (Rosli, 2021).

Information gathering on genetic variation in shrimp can be based on two characteristics: phenotypic and genotypic. Phenotypic characteristics include morphometric, meristic, and morphometric methods. Genetic variation measurement is crucial for determining genetic diversity or relatedness. Morphometric methods are effective in distinguishing body shapes within populations. Phenotypic measurement through morphometrics is easier and more cost-effective compared to genotypic measurements (Kusrini et al., 2008). Morphometric measurement aims to understand influential factors affecting species shapes.

Research on morphometric measurements of spotted shrimp has been conducted in Indonesian waters, but there is still a lack of data for East Kalimantan Province. Samboja waters in East Kalimantan

also lack information on spotted shrimp, hindering optimal management and utilization. Therefore, studying the morphometrics of spotted shrimp caught at night in Samboja waters is necessary. This research aims to provide information to the government and communities about the morphometric study of spotted shrimp caught at night in Samboja waters, Kutai Kartanegara.

METHODOLOGY

Research Time and Location

The research was conducted from November to December 2022 in Kuala Samboja waters, Kutai Kartanegara Regency, East Kalimantan Province, Indonesia (Figure 1). Samples of *Parapenaeopsis hardwickii* were obtained from the catches of fishermen during nighttime operations in Samboja waters and studied at the Laboratory of Conservation of Aquatic Resources, Faculty of Fisheries and Marine Science, Universitas Mulawarman.

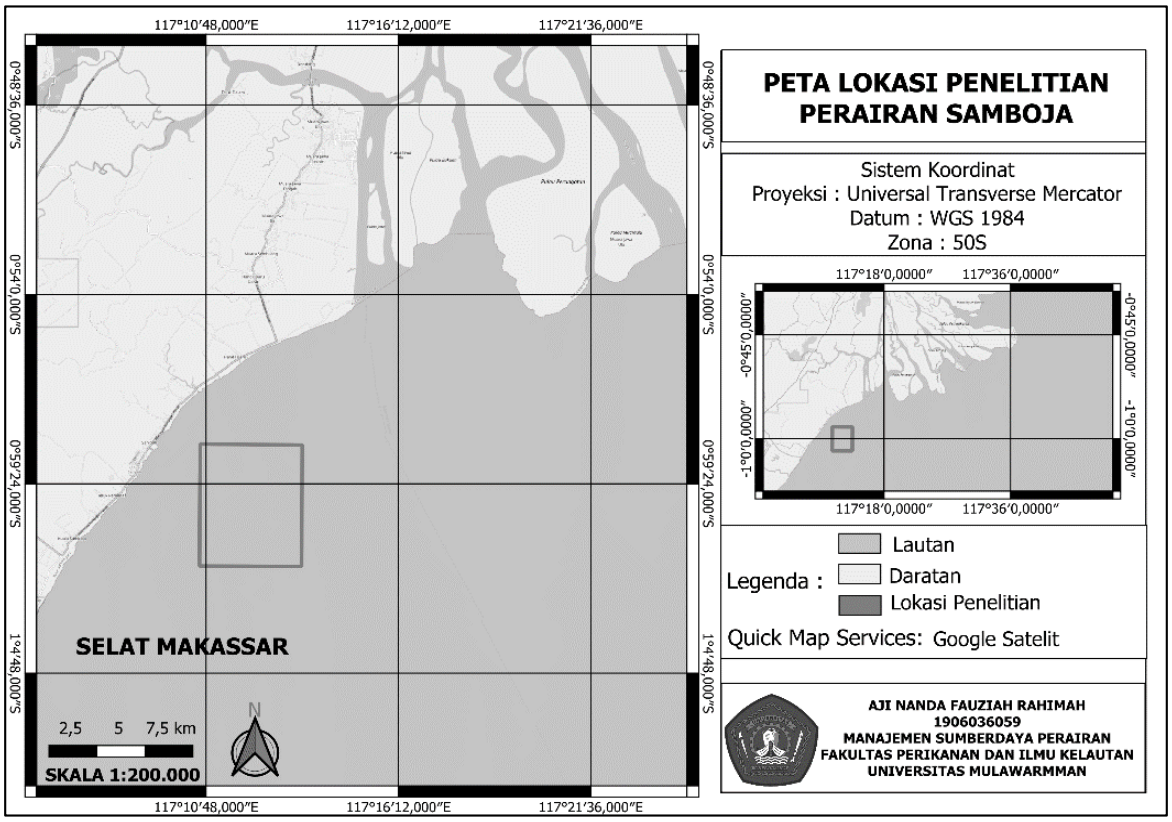

Figure 1. Study location map

Research Procedure

Samples of *Parapenaeopsis hardwickii* were collected from fishermen in Samboja Subdistrict and identified using Saputra's identification guide (2008) to confirm their species. A total of 250 shrimp samples were needed for the study. Measurements were conducted using rulers and digital calipers at the Laboratory of Conservation and Management of Aquatic Resources, Faculty of Fisheries and Marine Science, Universitas Mulawarman.

The variables measured (Figure 2) included: rostrum length (RST), head length (PK), length of the first segment (PRP), length of the second segment (PRD), length of the third segment (PRT), length of the fourth segment (PRE), length of the fifth segment (PRL), length of the sixth segment (PRN), telson length

(PT), prosertema length (PP), antenulles length (PAN), lower head length (PKB), length of the first lower segment (PPB), length of the second lower segment (PDB), length of the third lower segment (PTB), length of the fourth lower segment (PEB), length of the fifth lower segment (PLB), length of the sixth lower segment (PNB), tail length (PE), excluding head length (PTK), and total length (PTO).

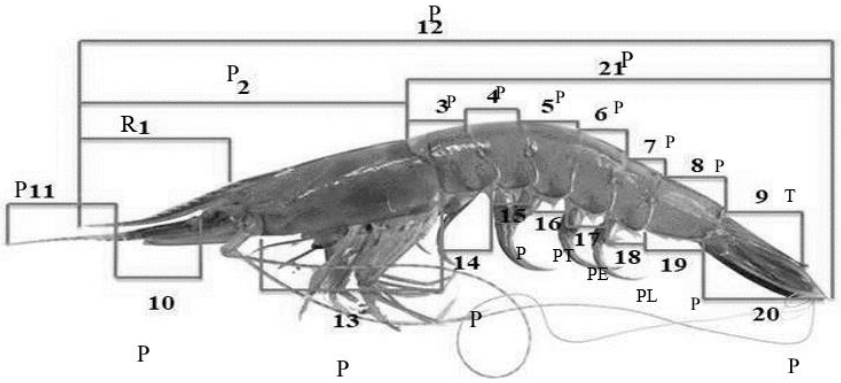

Figure 2. Illustration of shrimp morphometric

Data Analysis

Regression analysis between total length (PTO) and other morphometric characteristics was performed to determine which morphometrics influenced total length in male and *female Parapenaeopsis hardwickii*. The analysis used Analysis of Covariance (ANCOVA) as described by Steel and Torrie (1980). ANCOVA aims to assess differences or influences among groups controlled by one or more factors (Andi, 2005). It is typically used when the dependent variable Y is metric (interval or ratio) and there is at least one non-metric (nominal or ordinal) independent variable (factor) and one metric independent variable (covariate). ANCOVA was analyzed using SPSS Statistics 22 software, with the following hypotheses:

- H0: There is no influence of these morphometric lengths on total length (PTO).

- H1: There is an influence of these morphometric lengths on total length (PTO).

Testing Criteria:

- If Sig > 0.05, H0 is accepted and H1 is rejected.

- If Sig < 0.05, H0 is rejected and H1 is accepted.

RESULTS AND DISCUSSION

Research Location Conditions

Samboja Waters, Kutai Kartanegara Regency, holds significant fisheries resources, making fishing a primary livelihood for residents of Kuala Samboja Village, Samboja Subdistrict. Fishermen in this area typically use mini trawls, purse seines, and trammel nets. They fish six times a week, excluding Fridays, for 12 hours each day, targeting spotted shrimp (Parapenaeopsis hardwickii) at night. Fishermen travel approximately 2 miles per trip. The shrimp harvesting season is prominent from January to June when southerly winds prevail, ensuring stable sea conditions with moderate waves. Weather and sea conditions impact fishing processes, resulting in variable catch yields and incomes for fishermen.

Morphometric Characteristics of Spotted Shrimp (*Parapenaeopsis hardwickii*)

Nineteen morphometric characteristics were analyzed in spotted shrimp (*Parapenaeopsis hardwickii*). Based on total length, the size of spotted shrimp caught at night in Samboja Waters, Kutai Kartanegara Regency, is moderate.

Table 1. Morphometric data of spotted shrimp (*Parapenaeopsis hardwickii*)

No	Morphometric Characteristic	Length Range (mm)	Mean (mm)	Mode (mm)
1	Total Length (PTO)	92.48 - 110.58	89.16	87.25
2	Rostrum Length (RST)	16.98 - 29.98	24.42	23.29
3	Head Length (PK)	29.75 - 48.45	41.38	37.48
4	Length of First Segment (PRP)	4.24 - 8.21	4.58	4.23
5	Length of Second Segment (PRD)	4.13 - 8.26	6.33	5.22
6	Length of Third Segment (PRT)	4.72 - 10.13	7.57	6.83
7	Length of Fourth Segment (PRE)	5.28 - 9.64	8.68	7.46
8	Length of Fifth Segment (PRL)	3.43 - 10.41	5.88	4.13
9	Length of Sixth Segment (PRN)	4.59 - 12.78	9.55	7.86
10	Telson Length (PT)	9.16 - 13.95	11.45	10.12
11	Lower Head Length (PKB)	11.25 - 28.17	17.77	18.07
12	Length of First Lower Segment (PPB)	5.23 - 7.87	6.40	6.44
13	Length of Second Lower Segment (PDB)	2.97 - 6.77	5.25	4.63
14	Length of Third Lower Segment (PTB)	2.53 - 5.79	4.72	4.00
15	Length of Fourth Lower Segment (PEB)	4.24 - 7.23	4.94	4.60
16	Length of Fifth Lower Segment (PLB)	3.45 - 5.80	4.74	5.01
17	Length of Sixth Lower Segment (PNB)	5.53 - 8.24	6.73	6.69
18	Tail Length (PE)	11.20 - 17.09	14.10	14.33
19	Excluding Head Length (PTK)	45.52 - 72.88	57.88	49.77

ANCOVA Analysis (Analysis of Covariance)

Based on the results of the research conducted on 250 samples of speckled shrimp (*Parapenaeopsis hardwickii*), 18 males and 132 females were obtained. To observe the relationship between total length (PTO) and other morphometric variables, initially, univariate analysis of variance (anova univariate) was conducted partially or each morphometric variable was tested individually against PTO.

The partial analysis (univariate ANOVA) conducted on PTO with respect to 18 other morphometric variables resulted in a significant value of 0.00 for all morphometric variables. Since the significance value < 0.05, we accept the alternative hypothesis (H1), indicating that all morphometric variables influence total length (PTO). The analysis shows that all morphometric variables are related to or affect total length (PTO). After conducting the partial tests (univariate ANOVA) and identifying the influencing morphometric variables, the analysis proceeded with ANCOVA to obtain significant results influencing total length (PTO) with other morphometric variables.

Table 2. The results of ANCOVA analysis showing the significance levels (Sig.) of the relationship between each morphometric variable and Total Length (PTO).

Morphometric Variable	Sig.
Rostrum Length (RST)	0.612
Head Length (PK)	0.000
First Segment Length (PRP)	0.541
Second Segment Length (PRD)	0.749
Third Segment Length (PRT)	0.187
Fourth Segment Length (PRE)	0.000
Fifth Segment Length (PRL)	0.138
Sixth Segment Length (PRN)	0.038
Telson Length (PT)	0.094
Length Without Head (PTK)	0.000
Lower Head Length (PKB)	0.159
First Lower Segment Length (PPB)	0.688
Second Lower Segment Length (PDB)	0.524
Third Lower Segment Length (PTB)	0.000
Fourth Lower Segment Length (PEB)	0.000
Fifth Lower Segment Length (PLB)	0.000
Sixth Lower Segment Length (PNB)	0.000
Tail Length (PE)	0.001

In Table 2, it is evident that the morphometric variables most influencing total length (PTO) are PK, PRE, PRN, PTK, PTB, PEB, PLB, PNB, and PE. This indicates that in speckled shrimp (Parapenaeopsis hardwickii), both male and female sexes are most influenced by nine morphometric variables with significance levels < 0.05: head length (PK) with a value of 0.000, fourth segment length (PRE) with a value of 0.000, sixth segment length (PRN) with a significance level of 0.038, length without head (PTK) with a value of 0.000, third lower segment length (PTB) with a value of 0.000, fourth lower segment length (PEB) with a value of 0.000, fifth lower segment length (PLB) with a value of 0.000, sixth lower segment length (PNB) with a value of 0.000, and tail length (PE) with a value of 0.001.

The morphometric variables RST, PRP, PRD, PRT, PRL, TLS, PKB, PPB, and PDB have significance levels > 0.05, thus accepting the null hypothesis (H0) that these variables do not significantly influence total length (PTO). Among the 18 morphometric variables tested against total length (PTO), 9 were found to have a significant impact while the other 9 did not. The influence of these 9 morphometric variables (PK, PRE, PRN, PTK, PTB, PEB, PLB, PNB, and PE) on total length between male and female sexes may stem from significant differences, affecting PTO. These differences could be due to males having longer head lengths and differing significantly in the other 8 morphometric variables compared to females. Variations in morphometric characteristics can be attributed to differences in age and sex (Affandi et al., 1992).

CONCLUSION

1. Based on the analysis, morphometric characteristics influencing total length (PTO) in both male and female speckled shrimp (*Parapenaeopsis hardwickii*) using partial testing (univariate ANOVA) include all other morphometric variables, totaling 18 variables.
2. ANCOVA analysis revealed that 9 morphometric variables significantly influence PTO: head length (PK), fourth segment length (PRE), sixth segment length (PRN), length without head (PTK), third lower segment length (PTB), fourth lower segment length (PEB), fifth lower segment length (PLB), sixth lower segment length (PNB), and tail length (PE). The acceptance of the alternative hypothesis (H1) indicates that these 9 morphometric variables have significance levels < 0.05 based on the analysis results.

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