Morphometric study of southern velvet shrimp (*Metapenaeopsis palmensis*) captured during the night in the waters of Samboja, Kutai Kartanegara Regency

Anggi Dhafana Putri | Abdunnur Abdunnur | Muhammad Syahrir Ramang

Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Mulawarman University
Jl. Gunung Tabur No. 1. Kampus Gn. Kelua Samarinda 76123
E-mail: nggidhfnptr18gmail.com

ARTICLE INFO

Research Article

Article history:
Received June 4, 2023
Received in revised form December 1, 2023
Accepted January 2, 2024

DOI:

Keywords: *Southern velvet shrimp, morphometrics, Samboja District*

ABSTRACT

Southern valvet shrimp (M. palmensis) 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 South valvet shrimp (M. palmensis) 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 Southern valvet shrimp (M. palmensis). Morphometric studies on Southern valvet shrimp (M. palmensis) 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

A species of Penaeidea shrimp landed in Samboja, Kutai Kartanegara Regency, is the Red Rice Shrimp (*Metapenaeopsis palmensis*), which is commonly found in the waters of Samboja, Kutai Kartanegara. Red Rice Shrimp is an important crustacean commodity in these waters and holds high economic value, especially for shrimp from the Penaeidae family.

The collection of information on genetic variation measurements of shrimp can be done based on two characteristics: phenotype and genotype characteristics. Phenotype characteristics are assessed through morphometric, meristic, and morphometric methods. Genetic variation measurement is necessary to determine the genetic variation or relatedness. Measurement using the morphometric method is an effective technique for distinguishing body shapes in populations. Phenotypic measurements with the morphometric method are easier and cheaper to conduct compared to genotypic characteristic measurements (Kusrini et al., 2008). Morphometric measurement also aims to observe influential factors in the forms of a species.

Red Rice Shrimp belongs to the Penaeidae family, in which shrimp generally have one or more teeth under the rostrum that are not found in some other types of shrimp (King, 1995).

Research on morphometric measurements of Red Rice Shrimp has been conducted in Indonesian waters, but there is still a lack of studies in the waters of East Kalimantan Province. The waters of Samboja, located in East Kalimantan Province, also lack information on Red Rice Shrimp, resulting in less optimal management and utilization processes of Red Rice Shrimp. Based on this, research on the morphometric study of Red Rice Shrimp caught at night in Samboja Waters needs to be conducted. This research aims to provide information to the government and the public about the morphometric study of Red Rice Shrimp caught at night in Samboja Waters, Kutai Kartanegara.

METHODOLOGY

This research was conducted from November to December 2022, in the Kuala Samboja Waters, Kutai Kartanegara Regency, East Kalimantan Province, Indonesia (Figure 1). Samples of Red Rice Shrimp were obtained from the night catches of fishermen in Samboja Waters that had been landed. The Red Rice Shrimp were studied in the Laboratory of Aquatic Resources Conservation, Faculty of Fisheries and Marine Sciences, Mulawarman University.

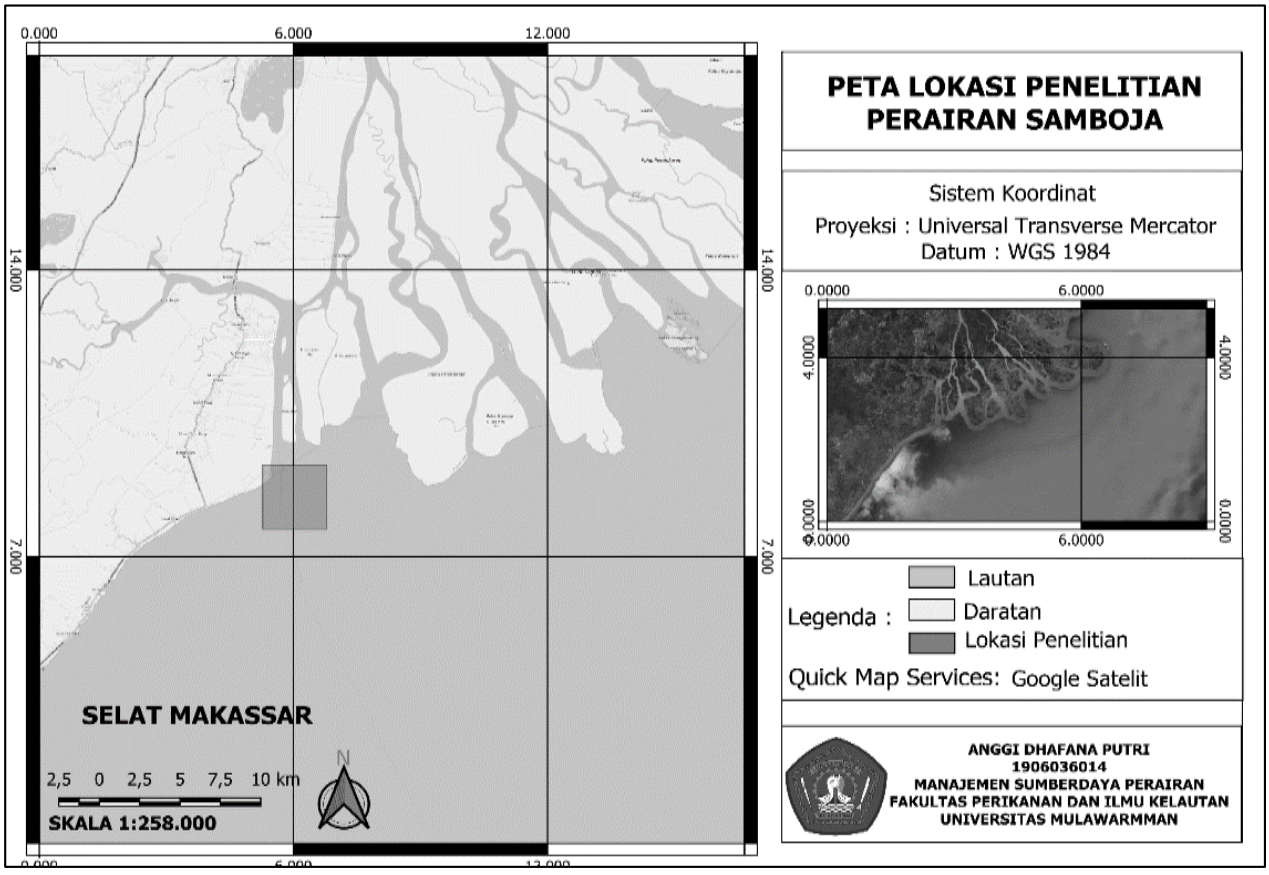

Figure 1. Study location map

Research Procedure

Sampling of Red Rice Shrimp was carried out in Samboja District, from fishermen who had landed their catches. The samples were then identified to ensure they were Red Rice Shrimp as desired for the

research object, using the identification book by Saputra (2008). A total of 250 Red Rice Shrimp samples were required, and measurements were carried out using a ruler and digital caliper. The measurements were conducted in the Laboratory of Aquatic Resource Management Conservation, Faculty of Fisheries and Marine Sciences, Mulawarman University.

The variables measured included 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 (TLS), prosertema length (PST), antennules length (PNL), total length (PTO), lower head length (PKB), first lower segment length (PPB), second lower segment length (PDB), third lower segment length (PTB), fourth lower segment length (PEB), fifth lower segment length (PLB), sixth lower segment length (PNB), tail length (PE), and length without head (PTK).

Data Analysis

Regression analysis between total length (PTO) and other morphometric characteristics was conducted to determine the morphometrics that influence the total length of Red Rice Shrimp (M. palmensis) in both males and females. The analysis used to examine this was analysis of covariance (ANCOVA) (Steel and Torrie, 1980). ANCOVA aims to identify the differences or influences among several groups while controlling for one or more factors (Andi, 2005). Generally, ANCOVA is used when the dependent variable (Y) is metric (interval and ratio) and there is at least one non-metric (nominal or ordinal) independent variable and one metric (interval and ratio) independent variable. Essentially, ANCOVA is a combination of variance analysis and regression analysis. The categorical (non-metric) independent variables are called factors, while the metric independent variables are called covariates. ANCOVA was analyzed using SPSS Statistics 22 software, with the hypotheses as follows:

- H0: There is no effect of the morphometric length on total length (PT)
- H1: There is an effect of the morphometric length on total length (PT)

Testing Criteria:

- Sig > 0.05: H0 is accepted, H1 is rejected
- Sig < 0.05: H0 is rejected, H1 is accepted

RESULT AND DISCUSSION

Research Location Conditions

The waters of Samboja, Kutai Kartanegara Regency, have significant fishery resource potential, making most of the residents of Kuala Samboja Village, Samboja District, Kutai Kartanegara Regency, engage in fishing as their primary occupation. Generally, fishermen in this area use mini trawls, purse seines, and trammel nets as fishing gear. Fishermen in these waters conduct fishing six times a week, with Red Rice Shrimp being caught at night. The distance traveled by fishermen to catch fish is approximately 2 miles per trip. The shrimp fishing season mainly occurs from November to December. During these months, the wind blows from the south, and the sea is stable, with not very large waves. Weather and sea conditions influence the fishing process, leading to variable catches and incomes for the fishermen.

Table 1. Morphometric data of red rice shrimp (*M. palmensis*)

No	Morphometric Characteristics	Length Range (mm)	Average (mm)	Mode (mm)
1	Total Length (L)	48.60 - 98.69	65.71	67.25
2	Rostrum Length (RST)	8.92 - 21.82	15.55	14.29
3	Head Length (PK)	18.22 - 35.70	30.38	27.48
4	First Segment Length (PRP)	2.38 - 7.29	4.35	4.23
5	Second Segment Length (PRD)	2.23 - 6.76	3.51	4.22
6	Third Segment Length (PRT)	3.28 - 8.99	6.57	5.83
7	Fourth Segment Length (PRE)	2.78 - 9.57	8.68	7.46
8	Fifth Segment Length (PRL)	3.43 - 10.41	5.88	4.13
9	Sixth Segment Length (PRN)	3.59 - 13.40	9.55	7.86
10	Telson Length	6.27 - 15.33	11.45	10.12
11	Lower Head Length (PKB)	10.56 - 23.42	17.77	18.07
12	First Lower Segment Length (PPB)	2.72 - 9.20	6.40	6.44
13	Second Lower Segment Length (PDB)	2.33 - 5.10	4.25	4.63
14	Third Lower Segment Length (PTB)	2.53 - 5.79	4.72	4.00
15	Fourth Lower Segment Length (PEB)	4.24 - 9.23	4.94	4.66
16	Fifth Lower Segment Length (PLB)	3.45 - 5.80	4.74	5.01
17	Sixth Lower Segment Length (PNB)	3.89 - 13.40	7.73	7.69
18	Tail Length (PE)	6.47 - 15.15	12.10	12.33
19	Length Without Head (PTK)	30.29 - 59.86	56.88	49.77

Morphometric Characteristics of Red Rice Shrimp (*M. palmensis*)

Nineteen morphometric characteristics were analyzed for Red Rice Shrimp. The total length of Red Rice Shrimp caught at night in the waters of Samboja, Kutai Kartanegara Regency, is of medium size.

ANCOVA Analysis (Analysis of Covariance)

Based on the research conducted on 250 samples of Red Rice Shrimp, 134 were male and 116 were female. To examine the relationship between total length (PTO) and other morphometric characteristics, a univariate analysis of variance (ANOVA univariate) was initially performed. Each morphometric characteristic was tested individually against PTO, as shown in Table 2.

Table 2. Univariate ANOVA results of the relationship between other morphometric characteristics and total length (PTO) partially

Morphometric Characteristics	Sig. Value
Rostrum Length (RST)	0.00
Head Length (PK)	0.00
First Segment Length (PRP)	0.00
Second Segment Length (PRD)	0.00
Third Segment Length (PRT)	0.00
Fourth Segment Length (PRE)	0.00
Fifth Segment Length (PRL)	0.00
Sixth Segment Length (PRN)	0.00
Telson Length (TLS)	0.00
Length Without Head (PTK)	0.00

Partial analysis (univariate ANOVA) conducted by PTO on 18 other morphometrics resulted in all morphometrics having a significance value of 0.00. Since the significance value is < 0.05, H1 is accepted, meaning that all morphometrics affect total length (PTO). The analysis results indicate that all morphometrics have a relationship or influence on total length (PTO). After conducting partial tests (univariate ANOVA) and identifying the influencing morphometrics, the analysis proceeded with ANCOVA to obtain significant results affecting total length (PTO) with other morphometrics.

Table 3. Results of ANCOVA Analysis on the Relationship of Total Length (PT) to other morphometric.

Morphometric	Sig.
Rostrum Length (RST)	0.615
Head Length (PK)	0.000
First Segment Length (PRP)	0.641
Second Segment Length (PRD)	0.872
Third Segment Length (PRT)	0.184
Fourth Segment Length (PRE)	0.000
Fifth Segment Length (PRL)	0.135
Sixth Segment Length (PRN)	0.040
Telson Length (TLS)	0.099
Excluding Head Length (PTK)	0.000
Carrying Head Length (PKB)	0.221
First Lower Segment Length (PPB)	0.688
Second Lower Segment Length (PDB)	0.624
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 3, it is evident that the most influential morphometrics on total length (PTO) are PK, PRE, PRN, PTK, PTB, PEB, PLB, PNB, and PE. This indicates that in Red Rice Shrimp (M. palmensis), both male and female genders are most influenced by nine morphometrics with significance values < 0.05: head length (PK) with a value of 0.000, fourth segment length (PRE) with 0.000, sixth segment length (PRN) with a significance value of 0.040, excluding head length (PTK) with a value of 0.000, third lower segment length (PTB) with 0.000, fourth lower segment length (PEB) with 0.000, fifth lower segment length (PLB) with 0.000, sixth lower segment length (PNB) with 0.000, and tail length (PE) with a value of 0.001. Morphometrics RST, PRP, PRD, PRT, PRL, TLS, PKB, PPB, and PDB have significance values > 0.05, hence accepting the null hypothesis (H0) that these morphometrics do not significantly affect total length (PTO). Out of the 18 morphometrics studied as variables affecting total length (PTO), nine were found to have significant effects, while nine did not. The influence of these nine morphometrics (PK, PRE, PRN, PTK, PTB, PEB, PLB, PNB, and PE) on total length between male and female genders may arise due to significant differences in these morphometrics affecting PTO. Differences in the range of morphometric characteristics could be attributed to variations in age and gender (Affandi et al., 1992).

CONCLUSION

1. Based on the analysis results, morphometric characteristics that influence total length (PTO) in male and female Red Rice Shrimp (M. palmensis) using partial analysis (univariate ANOVA) include all other morphometrics, totaling 18 morphometrics.
2. ANCOVA analysis revealed that nine morphometrics significantly influence PTO: head length (PK), fourth segment length (PRE), sixth segment length (PRN), excluding head length (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 hypothesis (H1) is based on the analysis results, indicating that these nine morphometrics have significance values < 0.05.

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