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Original Article

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Morphometric Analysis of Mole Crabs (Anomura: Hippidae) from Ambon Island, Indonesia

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Abstract. In Maluku, mole crabs are only used as food ingredients by a small number of coastal communities. In Seilale Village, Nusaniwe District, Ambon Island, mole crabs (called "hotong") are processed by grilling or burning using skewers or thin wood, stirfried with kang vegetables, or fried. The regressions used are from the species of Hippa ovalis, H. marmorata and H. celaeno. This research was conducted in the waters of Rumahkay, Haria, and Amahusu Villages Morphometry results and growth analysis with allometry also showed a linear relationship on the growth of each species. Relevant results from the study showed a significant nutrient content in mole crab Hippa genus. Mole crabs Hippa genus which has abundant unsaturated fatty acid makes mole crabs have become an alternative that has a potentially high economic value, an alternative source of nutrition from fish, and an alternative source for income to the local community specifically in coastal sandy beach areas in general.

Keywords: Ambon Island; Mole Crabs; Morphometric

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INTRODUCTION

In Maluku, mole crabs are only used as food ingredients by a small number of coastal communities. In Seilale Village, Nusaniwe District, Ambon Island, mole crabs (called "hotong") are processed by grilling or burning using skewers or thin wood, stirfried with kang vegetables, or fried. The regressions used are from the species of Hippa ovalis, H. marmorata and H. celaeno (Silaban et al., 2020).

Ambon Island, situated between the Seram and Banda seas, is renowned for its rich marine biodiversity in the Maluku Province. Geographical positioning significantly influences the presence of diverse marine organisms, including macroalgae (Lumuindong et al. 2023; Limmon et al. 2023; Pattikawa 2018). The highly nutritious nature of sea antlers can be used as a new food source. Sea antlers are a group of crustaceans with potential and economic value for development as a source of protein and minerals to meet the food needs of the Indonesian people. Several studies have shown that sea antlers contain nutrients including carbohydrates, protein, minerals, fatty acids, and amino acids. (Hanifa et al. 2014; Silaban et al, 2020).

Its significant role is played in the water ecosystem by serving as a food source (Sheikhzadeh et al. 2022), functioning as a habitat and a source of nourishment for epifauna, providing essential sustenance for fish (Manikandan et al. 2022), sources as pigments, proteins, polysaccharides, and lipids (Pereira et al. 2017), function as economic value and benefit humans as medicine, foodstuffs, and industrial raw materials (Afreen et al. 2023), and natural fertilizers, and liquid waste treatment (Kustantinah et al. 2022; EL Boukhari et al. 2020). Environmental factors significantly influence life in marine waters. Warm tropical waters, enriched with sunlight and physicochemical factors, contribute to the abundance of organisms.

According to Wahl et al. (2021), temperature, salinity, and oxygen availability constantly fluctuate, causing stress that affects the interactions of marine organisms with their environment. The acidity or pH of seawater ranges from 6.87-8.12 and the temperature is 25.9-26.6°C. Salinity and CO_2 levels also play an important role in determining growth rates (Pei et al. 2021).

Found that diversity is influenced by salinity, temperature, brightness, depth, and current speed (physical factors), as well as levels of nitrate, orthophosphate, heavy metals, and pH (chemical factors). In addition to environmental factors, the substrate plays a crucial role in efficient growth. Furthermore, the species, size, and stability significantly influence the presence and diversity of these organisms. Biometric studies (morphological characteristics) have long been used in fisheries biology to measure distance and kinship relationships in categorizing phenotypic variations. There are differences in morphology and growth potential. Phenotypic characteristics include morphometrics and meristics. (Fitri Handayani, 2018). Morphometric measurements are measurements that can be measured, namely in the form of parts of the fish's body, for example the length of the head, the length of the neck, and the height or shape of the fish. The size of the fish indicates the size of the fish, a fish is said to be large if its length is more than 10 cm, which is meant by length is measured from the tip of the mouth to the tip of the tail (total length) (Madduppa, 2020).

MATERIALS AND METHODS

Study locations

This research was conducted in the waters of Rumahkay, Haria, and Amahusu Villages on Ambon Island, Maluku, Indonesia. Data collection locations are presented in Figure 1. The sampling locations, using probability sampling techniques, were selected based on the researcher's considerations. These considerations included high diversity of Mole Crabs (Anomura: Hippidae), easy access, and safety for sampling.

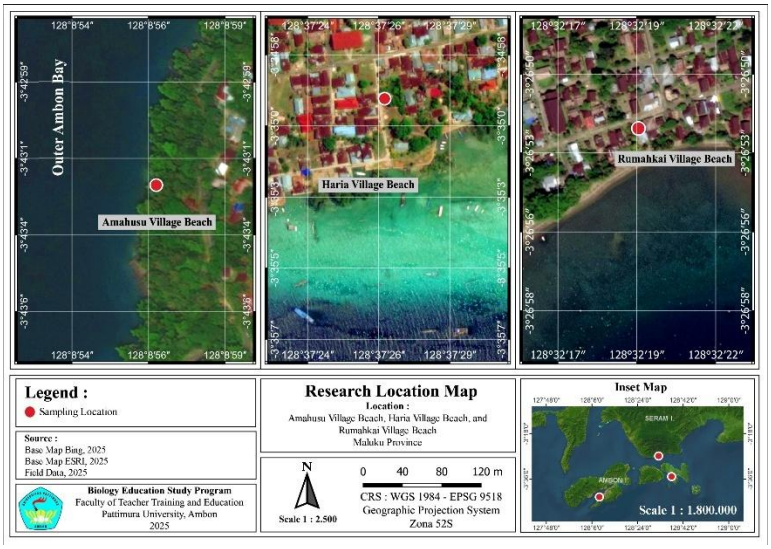


Figure 1. The research locations are on Ambon Island (Amahusu Village Beach), Seram Island (Rumahkai Village Beach) and Saparua Island (Haria Village Beach), Maluku, Indonesia

Procedures

Sample preparation

The locations to be explored were determined before commencing this study, and then physical and chemical environmental factors, including temperature, pH, salinity, and DO, were measured. Table 1 shows algae samples were collected during low tide using the line transect method. Those macroalgae found were stored in labeled plastic containers and transported to the laboratory for washing with running water, eliminating sand and dirt attached to the surface

Morphometric measurements

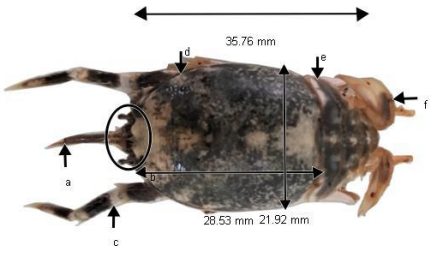
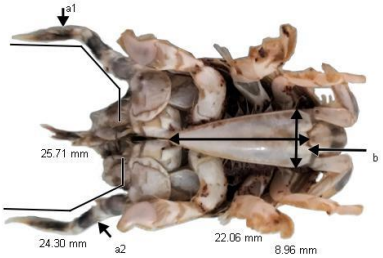
Morphometric measurements of the length and width of the thallus and holdfast were carried out on all samples of Mole Crabs (Anomura: Hippidae) Table 1.

RESULTS AND DISCUSSION

Mole Crabs (Anomura: Hippidae) morphometric characteristics

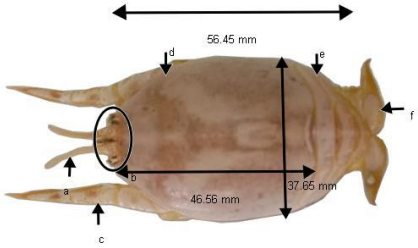
Morphometric measurements of Mole Crabs (Anomura: Hippidae) in this study were conducted based on the species observed. The Mole Crabs (Anomura: Hippidae) evaluated were the dorsal and ventral positions for all morphometric characteristics (Table 1).

Table 1. Morphometric measurements of Mole Crabs (Anomura: Hippidae) from Ambon Island, Maluku, Indonesia

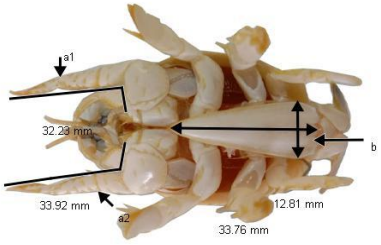
Mole Crabs (Anomura: Hippidae) from Amahusu	
	
(a)	**(b)**
Information (a) : Dorsal Position Body Length: 35.76 mm Carapace Length: 28.53 mm Carapace Width: 21.92 mm a: Antenna b: Frontal Lobe of the Carapace	Description (b): Ventral Position Left Leg Length (a1): 25.71 mm Right Leg Length (a2): 24.30 mm Telson Length: 22.06 mm Telson Width: 8.96 mm a1: Left Leg

c: Forelegs	a2: Right Leg
d: Carapace	b: Telson
e: Abdomen	
f: Uropod	

Mole Crabs (Anomura: Hippidae) from Haria



(c)

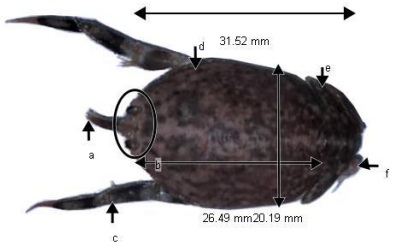


(d)

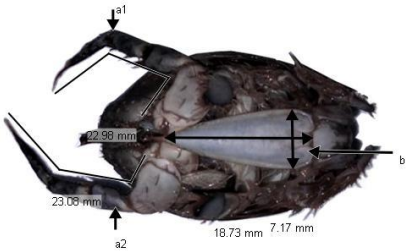
Description (c):
Dorsal Position
Body Length: 56.45 mm
Carapace Length: 46.56 mm
Carapace Width: 37.65 mm
a: Antenna
b: Frontal Lobe of the Carapace
c: Forelegs
d: Carapace
e: Abdomen
f: Uropod

Description (d):
Ventral Position
Left Leg Length (a1): 32.23 mm
Right Leg Length (a2): 33.92 mm
Telson Length: 22.06 mm
Telson Width: 8.96 mm
a1: Left Leg
a2: Right Leg
b: Telson

Mole Crabs (Anomura: Hippidae) from Rumahkay



(e)



(f)

Description (e):
Dorsal Position
Body Length: 56.45 mm
Carapace Length: 46.56 mm
Carapace Width: 37.65 mm
a: Antenna
b: Frontal Lobe of the Carapace
c: Forelegs
d: Carapace
e: Abdomen
f: Uropod

Description (f):
Ventral Position
Left Leg Length (a1): 32.23 mm
Right Leg Length (a2): 33.92 mm
Telson Length: 22.06 mm
Telson Width: 8.96 mm
a1: Left Leg
a2: Right Leg
b: Telson

Water content has direct effect on food quality. The decrease of water content in crispy food can be influenced by oil used for frying and type of flour. Elinda (2007) explained that water on the surface turns to steam because of direct contact with cooking oil. This causes the concentration of water on the surface of the material (food) is always lower than the concentration of water inside. The mass of water is diffused to the surface as the final moisture content of the fried product. Thus, during frying process, the water content of the material evaporates. In addition, water and hot air come out of the product due to the heat from the oil. This process also increases fat content, which replaces the space due to water evaporation during frying. During the

frying process, oil seeps into the surface and fills the space due to loss of water; thus, the volume of fat is balanced by the total volume of water that comes out from the fried material. Mallikarjunan et al (2017) stated that, during the frying process, there is a reduction in water content due to the evaporation of water.

Many morphometric studies of decapod crustaceans have shown significant relationships among some morphometric characters to carapace or total length (Wardiatno & Mashar 2013). In this study, covariance analysis was able to detect variations in carapace width and dactylus length at the same carapace length among Albunea symmista populations collected from three locations on Ambon Island, Maluku Province (Table 1).

Some researchers have indicated that the variation in morphometric characters of any species may be caused by various factors, such as geographic region (Hepp et al. 2012). including elevation and latitude, environmental conditions (Hausch et al. 2013; Wahidah et al. 2015). Qonita et al. (2015) showed that variations in morphology were due to environment conditions in the pile ark cockle (Anadara pilula), and this finding strengthened the argument of Barria et al. (2011) who hypothesized that morphological variations were brought about by adaptive responses to environmental conditions.

The separation formed between the three research sites is caused by their adaptation to the different environmental conditions on the two islands. The population of burrowing crustacean species is influenced by the sediment structure of their habitat. Rosenberg (2002) found differences in the shape of the claws of sand crabs living in sandy and muddy habitats, which shows a significant correlation between the shape of the claws and the habitat.

CONCLUSION

Morphometry results and growth analysis with allometry also showed a linear relationship on the growth of each species. Relevant results from the study showed a significant nutrient content in mole crab Hippa genus. Mole crabs Hippa genus which has abundant unsaturated fatty acid makes mole crabs have become an alternative that has a potentially high economic value, an alternative source of nutrition from fish, and an alternative source for income to the local community specifically in coastal sandy beach areas in general.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript

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