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Morphometric Data of *Tachypleus gigas* and *Carcinoscorpius rotundicauda* from Pahang Balok River, Malaysia

Riwan Ramli[1*], Zaleha Kassim[2], Nurliyana Subli[3]

[1] Kulliyah of Allied Health Science, International Islamic University Malaysia (IIUM), Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25000, Kuantan, Pahang, Malaysia

[2] Institute of Planetary Survival for Sustainable Well-being, International Islamic University Malaysia (IIUM), Jln Penjara, 25100 Kuantan, Pahang, Malaysia

[3] Kulliyah of Science, International Islamic University Malaysia (IIUM), Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25000, Kuantan, Pahang, Malaysia

*****Corresponding author's e-mail: riwanramli@gmail.com

ABSTRACT

This study discovers new findings, prepares and compiles new information and database regarding horseshoe crab (HSC) especially morphometric of *T. gigas* and *C. rotundicauda* in Balok, Kuantan, Pahang. There are two stations during sampling for collecting the data. One station is at mangrove and another one station is at the beach. For each individual HSC, the sex, weight, and morphometric were taken. The process was repeated in approximately 2 hours during newly high tide. Findings indicate that male *T. gigas* is 31% smaller than the female in terms of size. In contrast, the male *C. rotundicauda* is 20% smaller than the female. Horseshoe crabs can range in size from 290 to 1200 grammes and 230 to 516 millimeters for female *T. gigas*, and from 180 to 420 grammes and 244 to 378 millimeters for male *T. gigas*. The size ranges for male and female *C. rotundicauda* are 100 to 260 grammes and 269 to 337 millimeters, respectively. The morphometric data are vital for monitoring and studying horseshoe crab growth and relations among various parts of their body. The compilation of morphometric data could also help to enhance the conservation of marine biological diversity activities. This study should be done rapidly to monitor the survivors and changes happening in the environment. Yet, year-round monitoring is important to establish the morphometric study of HSC.

Keywords: Horseshoe crab, Balok river, Morphometric

1 Introduction

Before the dinosaurs arrived, horseshoe crabs had been around for at least 100 million years (about 200 million years ago). The horseshoe crab (HSC) is a member of the expansive class of invertebrate creatures known as anthropods, but over time, this class is in danger of extinction (http://www.ceoe.udel.edu/horseshoecrab/History/index.html). Furthermore, there aren't many fossils of them due to their chitin-based shell, which degrades swiftly over time. The preserved fossil aids in their tracking. Non-allergenic sutures and wound-healing bandages are created from the polymer found in crab shells called chitin [1]. The study's sampling locations are on Peninsular Malaysia's East Coast. The species to be observed are the *T. gigas*

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and *C. rotundicauda*. Because they underwent relatively few modifications compared to their most recent fossilized cousins species discovered 450 million years ago, these unusual organisms are frequently referred to as "living fossils" [2]. Horseshoe crabs are essential to the ecology. First, since it is large enough to be easily observed and because its life cycle is so strongly influenced by environmental factors, it makes a useful indicator species for tracking the health of the coastal zone [3]. Despite having a tail that resembles a sword, horseshoe crabs are harmless. In actuality, human and coastal environment health depend on the health of the horseshoe crab [4]. The research on horseshoe crabs in Malaysia is still in its early stages and is not very extensive, particularly the research on the morphology and morphometry of these invertebrate arthropods. According to the International Symposium on the Science and Conservation of Horseshoe Crabs, *T. gigas* and *C. rotundicauda* have not yet been the subject of much research, but *L. polyphemus* has received the majority of attention. As a result, these two species are classified as data deficient (DD) on the World Conservation Union's Red List [4], which indicates there is insufficient information to determine if they are at risk of going extinct. Moreover, the estuary in Balok is getting busier with fisheries activities and boats because a jetty used for fisheries activities have already been built there. As time going, the water conditions especially at the jetties will become worst because of boats and also waste from land-side. These activities might affect the biological and ecosystem at the surrounding area. As time goes on, more eggs and juveniles of horseshoe crab die before maturing [5]. To ensure the sustainability of biological diversity within development, study has to be conducted.

Therefore, this study discovers new findings, prepares and compiles new information and database regarding horseshoe crab especially morphometric of *T. gigas* and *C. rotundicauda* in Balok, Kuantan, Pahang. The horseshoe crab morphometric data of *Tachypleus gigas* and *Carcinoscorpius rotundicauda* from Pahang Balok River, Malaysia, were examined in the current study.

2 Materials and Methods

The sampling site is consists of river mouth, river, mangrove area, beach, villages, tourism (chalet and hotel) and recreational activities and jetties for fisheries activities. There are two stations during sampling for collecting the data. One station is at mangrove and another one station is at the beach (approximately 100m along the river mouth). The target species in station one is *Tachypleus gigas*, while in station two is *Carcinoscorpius rotundicauda.* For horseshoe crabs morphometric data collection, basic counting method [6] with a little modification of random sampling was applied. The location in sampling site was suggested by villagers and local fisherman based on their experience at that area especially for mangrove because it consists of huge area in Balok. There are a few areas of mangrove had been identified, but based on the survey only one area were normally visited by mangrove

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horseshoe crab. *Tachypleus gigas* were observed along 70 m along the beach usually 2 hours at the early high tide while *Carcinoscorpius rotundicauda* were observed at the mangrove crucially at back mangrove when tides recede.

The sources of horseshoe crab were from the observation with helps from local people, catches by fisherman for commercial purposes and by-catch; those horseshoe crab that been trapped at the fisherman nets. All the collected horseshoe crab has been identified the sex, counted, measured, and were released back to the water. The samples were only released back to the water after all of them have been measured to avoid recaptured. In other scenes, the mating horseshoe crab was only measured after they finished mating. For each individual HSC, the sex, weight, and morphometric were taken. The process was repeated in approximately 2 hours during newly high tide.

3 Results

Findings indicate that male *T. gigas* is 31% smaller than the female in terms of size. In contrast, the male *C. rotundicauda* is 20% smaller than the female. There was a linear relationship between dorsal prosoma breadth (DPB) and regional length (RL), dorsal body length (DBL) and RL, and weight versus RL. The degrees of regression were 0.05, 0.15, and 0.08, respectively, indicating that the parameters increase proportionately with advancement of regional length. While the association between telson length (TL) and RL and between DPB and DBL was linear with high degrees of regression (0.78 and 0.50), telson length increased as regional length increased and DPB increased in a manner that was very proportionate to DBL. The maximum degree of DPB against DBL correlation associations for female *T. gigas* regression is 0.4195, indicating that both male and female *T. gigas* are growing with similar increases in DPB and DBL. The distribution of prosomal breadth less than 160 mm in DPB versus DBL is greatest in *C. rotundicauda*. A strong correlation of 0.8336 is produced by the linear relationship. Although there are fewer female *C. rotundicauda* individuals than males, the highest female correlation which is 0.9422 for the TL against RL is higher than the male correlation. The strong regression for this association demonstrates the rapid increases in telson length in the 300–400 mm regional length. Horseshoe crabs can range in size from 290 to 1200 grammes and 230 to 516 millimeters for female *T. gigas*, and from 180 to 420 grammes and 244 to 378 millimeters for male *T. gigas*. The size ranges for male and female *C. rotundicauda* are 100 to 260 grammes and 269 to 337 millimeters, respectively.

Section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4 Discussion

For both species, females are larger than males, the distinction between male and female body types is essentially the same [3]. Each set of body measurements truly provides data on the

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horseshoe crab's growth. It is also feasible to deduce that the allometric relationship between the various bodily parts has a purpose in the biology of the organism.

The morphometric data are vital for monitoring and studying horseshoe crab growth and relations among various parts of their body. The compilation of morphometric data could also help to enhance the conservation of marine biological diversity activities. This study should be done rapidly to monitor the survivors and changes happening in the environment. Yet, year-round monitoring is important to establish the morphometric study of horseshoe crab.

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