

Geometric morphometric analysis in female freshwater crabs of Sarawak (Borneo) permits addressing taxonomy-related problems

Jongkar Grinang¹, Indraneil Das¹ and Peter K.L. Ng²

¹ Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia

² Lee Kong Chian Natural History Museum, National University of Singapore, Singapore, Singapore

ABSTRACT

The taxonomy of freshwater crabs requires a paradigm change in methodological approaches, particularly in investigations that use morphological techniques. The traditional morphometric approach (two-dimensional measurements) tends to be inappropriate for the identification of freshwater crabs due to their variable external morphology and lack of gonopods (conventionally used for the identification of male crabs) in females. In this study, we explore the potential use of the geometric morphometric technique for identification of female freshwater crabs, and identify taxonomic key characteristics of species. The shape of the carapace could be a good characteristic for the identification of female crabs, especially when the geometric morphometric technique is used. It was observed that the shape of the carapace has an advantage over the shape of the pleon and chela because its relatively flat orientation allows more consistent and easier data preparation for geometric morphometric analysis. The geometric morphometric technique is inexpensive, relatively less time consuming to employ, and accurate. This technique is convenient when dissection to examine the gonopods is not possible, which can damage the specimen in the case of endangered or rare species. Since the technique was used herein for only two species, more compelling and extensive evidence is needed before the reliability of the method can be proven.

Subjects Mathematical Biology, Taxonomy

Keywords Freshwater crab, Geometric morphometrics, *Isolapotamon*, Taxonomy

INTRODUCTION

Geometric morphometrics is a rapidly evolving technique within the vast field of traditional morphometrics (*Rohlf & Marcus, 1993; Marcus & Corti, 1996; Zelditch et al., 2004*). The technique works on the hypothesis that landmarks on the body of an organism carry unique characteristics of the species (*Zelditch et al., 2004*). The three-dimensional approach is hailed as a revolution in morphometrics for its paradigm shift away from visualizing the results in terms of scatter plots (*Adams, Rohlf & Slice, 2004*). It has been successfully employed to discriminate variation among species and populations in a

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Corresponding author

Jongkar Grinang,
gjongkar@unimas.my

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