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ABSTRACT

Melanoides tuberculata is a freshwater snail commonly known as the Red-Rim Melania. The snails have been reported as a first intermediate host of various parasitic trematodes. They are most widely distributed in Thailand across various regions and show high variation of shell morphological characters. So, the snail taxonomy needs to be clarified. This study aims to study the variation in morphological characteristics by using geometric morphometric analysis and to clarify the taxonomic boundaries of *M. tuberculata* throughout Thailand. A total of 180 snail samples were collected, and 3 morphotypes of the snails were detected. Geometric morphometric analysis and canonical variate analysis (CVA) revealed significant differences between 3 morphotypes as different species ($P < 0.05$). Shell shape geometry can be used to distinguish between these cryptic species mainly based on shape divergence. This study suggests that geometric morphometrics represent a convenient, low-cost method to complement morphological identification. However, the molecular phylogenetic analysis is needed for confirmation in the future study.

INTRODUCTION

Melanoides tuberculata belongs to the Mollusca phylum, the Gastropoda class, the Caenogastropoda order, and the Thiariidae family. There are reports of two species in Thailand: *M. tuberculata* and *M. jugicostis*. However, *M. tuberculata* is extensively spread throughout Thailand, including the north, northeast, east, central, and south. The snail also has a high variation of shell morphological characteristics. So, the snail taxonomy must be clarified.

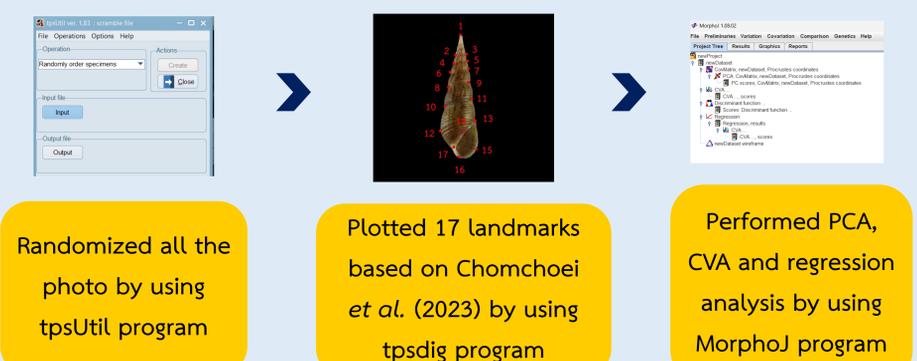
Geometric morphometrics provides methods for assessing the forms of objects using the coordinates of points on their surfaces. The geometric morphometrics revolution brought new techniques for answering problems about structure, habitats, classification, and biodiversity. So, the goals of this research are to investigate the variance in morphological traits using geometric morphometric analysis and to define the taxonomic limits of *M. tuberculata* throughout Thailand.

METHODS

Samples Preparation



Geometric Morphometric Analysis



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RESULTS

A total of 180 snail samples were collected, and 3 morphotypes of the snails were detected (Figure 1). Geometric morphometric analysis and canonical variate analysis (CVA) revealed significant differences between 3 morphotypes as different species ($P < 0.05$) and showed the difference between the aperture and apex of the shell (Figure 2).

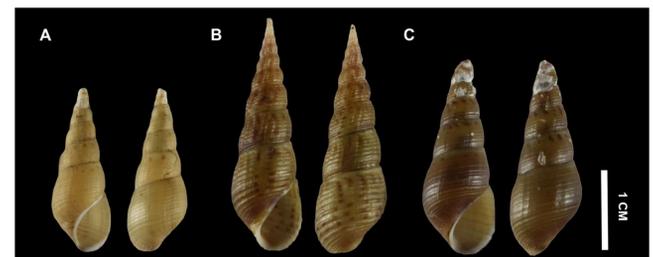


Figure 1 *Melanoides tuberculata* shapes classified to 3 morphotypes. (A) Morphotype A from Chiang Mai and Kamphaeng Phet. (B) Morphotype B from Sakon Nakhon and Ubon Ratchathani. (C) Morphotype C from Satun and Songkhla.

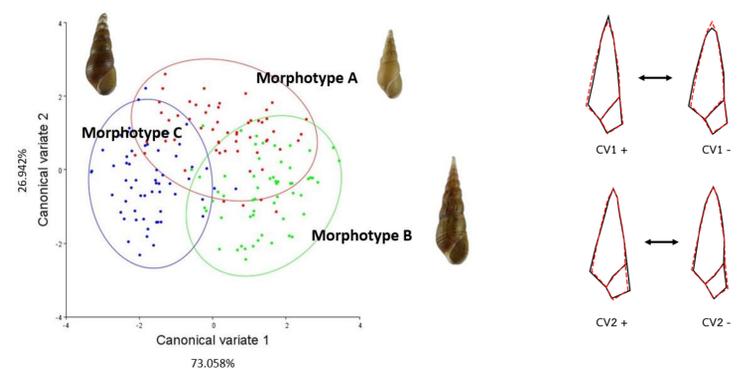


Figure 2 The diagram showed the distribution of shell shape analysis from the Canonical Variate Analysis (CVA) method.

CONCLUSION

In geometric morphometric analysis, the CVA based on shell shape variation with the three putative morphotypes of *M. tuberculata* provided a graphic display of the shape differences ($P < 0.05$). Overall, the shell shapes of the three putative morphotypes were rather well distinguished, even if these showed some overlap. This distinction was confirmed by the significant differences among the putative morphotypes. Shell shape geometry can be used to distinguish between these cryptic species mainly based on shape divergence.

REFERENCE

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