A COMPARISON OF THE MICROMORPHOLOGY OF THE G1 OF FRESHWATER CRABS OF THE GENUS *GEOTHELPHUSA* (BRACHYURA, POTAMIDAE) FROM TAIWAN

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ABSTRACT

Scanning electron microscopy (SEM) was used to compare the micromorphology of the male first gonopods (G1) of 22 species of common Taiwanese potamid crabs of the genus *Geothelphusa* Stimpson, 1858. Electron micrographs were taken from dorsal, lateral, and apical views of the terminal segment, the sub-terminal segment, and the synovial membrane; and a total of five measurements was taken, i.e., synovial membrane length (SML) and width (SMW), sub-terminal segment width (SW), and terminal segment length (TSL) and width (TSW). In addition, the diameter of the apical opening of the ejaculatory canal (AD), the number of scale rings, the setal type, and the direction of the curve of the tip of the terminal segment were recorded. In adult female crabs, the mean of the diameter of the gonopores and the distance between these were also measured. The scanning electron micrographs of the G1 are all shown in the present paper.

RéSUMÉ

La microscopie électronique à balayage (SEM) a été utilisée pour comparer la micromorphologie des premiers gonopodes mâles (G1) de 22 espèces communes de crabs Potamidae de Taiwan du genre *Geothelphusa* Stimpson, 1858. Les microphotographies du segment terminal, du segment sub-terminal et de la membrane synoviale ont été prises en vues dorsales, latérales et apicales; un total de cinq mesures a été effectué, soient la longueur de la membrane synoviale (SML) et sa largeur (SMW), la largeur du segment sub-terminal (SW), ainsi que la longueur du segment terminal (TSL) et sa largeur (TSW). De plus, le diamètre de l’ouverture apicale du canal éjaculateur (AD), le nombre des anneaux d’écailles, le type de soies et la direction de la courbe de l’extrémité du segment terminal ont été examinés. Chez les crabs adultes femelles, la moyenne du diamètre des gonopores et la distance entre ces derniers ont été également mesurées. Les microphotographies à balayage des G1 sont toutes présentées dans le présent article.

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INTRODUCTION

The freshwater crabs of Taiwan comprise two families and four genera, viz., of the Potamidae Ortmann, 1896: *Geothelphusa* Stimpson, 1858, *Nanhaipotamon* Bott, 1968, and *Candidiopotamon* Bott, 1967; and of the Parathelphusidae Alcock, 1910: *Somanniathelphusa* Bott, 1968 (cf. Shy et al., 1994, 2000; Chen et al., 1998, 2003, 2005; Tan & Liu, 1998; Dai, 1999; Shy & Yu, 1999; Ng et al., 2001; Shy, 2005). All four genera include species from China, Japan, or other countries. However, the freshwater crabs from Taiwan belonging to these four genera are all endemic in Taiwan (Shy et al., 1994; Shy & Yu, 1999; Ng et al., 2001). There are 35 species in the genus *Geothelphusa* recorded from Taiwan now. Shih et al. (2004) used the small subsegment of the mitochondrial 16S rRNA encoding gene in partial sequencing (550 bp) to assess the systematics of the southern Taiwanese *Geothelphusa* species. They suggested some species would be synonyms. In view of the biological species concept, variation in the morphology of the copulatory organs should result in rapid reproductive isolation, and hence in acceleration of the speciation process (Mayr & Ashlock, 1991; Schluter, 1996). Therefore, we still use the taxonomic system of Shy et al. (1994) and Ng et al. (2001), which are based on differences in characters of the male first gonopod (G1) to distinguish between species of these freshwater crabs (Ng, 1988; Ng & Naiyanetr, 1993; Shy et al., 1994; Dai, 1999).

The aims of the this study are (1) to investigate the detailed micromorphology of the G1 with scanning electron microscopy (SEM) in order to supplement the gross morphology now depicted in line drawings in the early days of the systematic studies on this genus; (2) to identify species-defining gonopod characters, and thus use the morphology of the G1 as a key character in the taxonomy of the potamids of the genus *Geothelphusa* in Taiwan.

MATERIAL AND METHODS

For the present study, 22 of the more common Taiwanese species of *Geothelphusa* were selected, and of these toptype specimens were collected from the type locality (Shy et al., 1994). Specimens were examined, preserved in 70% ethanol, and deposited in the Department of Biological Sciences, National Sun Yat-sen University (NSYSU), Kaohsiung, and the National Taiwan Ocean University (NTOU), Keelung. The methods used in scanning electron microscopy by Felgenhauer (1987) were modified to observe the male G1 with the aid of a HITACHI S-2400 SEM equipped with a digital camera that stores the pictures. The pictures thus obtained were next transferred to a computer for comparison. A total of 1-3 individuals of each species was examined by SEM for the right G1,