

Glochidium Shell Morphology of *Solenia khwaenoiensis* Panha & Deenin, 2003 (Bivalvia: Unionidae)

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ABSTRACT.– The glochidial shell morphology of *Solenia khwaenoiensis* from Khwaenoi River, Phitsanulok, Thailand, was studied. Electron micrographs of unique characteristics are described. *Solenia khwaenoiensis* shells are classified in the second group, which is unequivalve, unequilateral. However, the external and internal shell surfaces have unique porous structures. A hook-like shell appendix structure was also observed.

KEY WORDS: *Solenia khwaenoiensis*, Unionidae, Glochidium, Thailand

INTRODUCTION

At the present time people are paying more attention to freshwater mussels because of their unique parasitic life cycles and because in many countries including Thailand and Indo-China they are locally harvested and consumed as food. However, freshwater mussels are increasingly becoming endangered because of environmental problems and consequently

there are many campaigns trying to inform the public to conserve the environment which take a diverse array of approaches including educating the public about species diversity. Recently, Graf and Cummings (2007) reviewed the systematics of the global diversity of freshwater mussel species, and set out to describe the species-level diversity of the Unionoida by reviewing the secondary literature and developing a comprehensive taxonomic database. This database will be very useful world wide with the freely disseminated information readily being frequently updated. We have used it as a basis for the classification of Thai Unionoida but the Thai fauna clearly needs a major revision

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in details which when completed we anticipate will provide a significant improvement to the global information. Our present study here is a morphological survey of the glochidial stage of one species which has never been done before.

Female unionid mussels incubate eggs in their gill-chamber or marsupium. In the Margaritiferidae and Unionidae, the unfertilized eggs pass into the suprabranchial chamber and then down into the water tubes, or spaces, of the demibranchs which can be located, depending on the species, on all four demibranchs, the two demibranchs, or only special parts of the outer demibranchs (Brandt, 1974; Dartnall and Walkey, 1979; Dudgeon and Morton, 1984; Smith, 2001).

The fertilized eggs pass the early stages of development within the marsupial gill pouches. The larvae of certain species have a short, obligate parasitic stage (glochidium) in their life cycle. The glochidium are ectoparasites on the fins, gills and body surface of the fishes and are classified into two main types, distinguished by the presence (hooked) or absence (hookless) of marginal hooks on the valves. However, a further type is designated from its shell shape as the axe-head type (Arey, 1920). Glochidia shell morphology has been studied using both light and scanning electron microscopy (Arey, 1924, 1932; Kondo and Yamashita, 1980; Panha and Eongprakornkeaw, 1995). For the twelve species of Thai unionid mussels, the glochidia were divided into two groups, specifically (i) equivalve, equilateral, and (ii) unequivalve, unequilateral (Panha and Eongprakornkeaw, 1995). Recently, Deen et al., 2003 described a new species, *Solenia*

khwaenoiensis, based mainly on shell and karyotype characteristics, but provided no information on the glochidium. In January 2005, the glochidia of *S. khwaenoiensis* were found in many mussel individuals. We have now analysed their morphology using scanning electron microscopy (SEM) and the results are discussed in the present paper.

MATERIAL AND METHODS

Solenia khwaenoiensis mussels were collected from type locality, Khwae Noi River at Ban Ta Ngam, Wat Bot District, Phitsanulok Province, Thailand (March 2007), and the mature glochidia were collected from outer demibranchs of gravid female mussels and preserved in 70 % (v/v) ethanol (Fig. 1A) and then dehydrated in 95 % (v/v) ethanol followed by three changes (10 minutes each) of absolute ethanol prior to critical point drying. The dried specimens were picked up individually and individually mounted on the specimen stubs with double sided sticky tap so as to attain several different positions (orientations) between the samples. Specimens were then coated with gold by ion sputtering and subsequently examined by SEM (JEOL-JSM-5410LV) operating at 15 kV. Glochidial identification followed Panha and Eongprakornkeaw (1995).

RESULT

The glochidia of *S. khwaenoiensis* are classified in the second group, which is unequivalve, unequilateral (Fig. 1B), along with *Pseudodon*, *Uniandra*, *Physunio* and *Trapezoideus* species. The mean (± 1 S.D.)

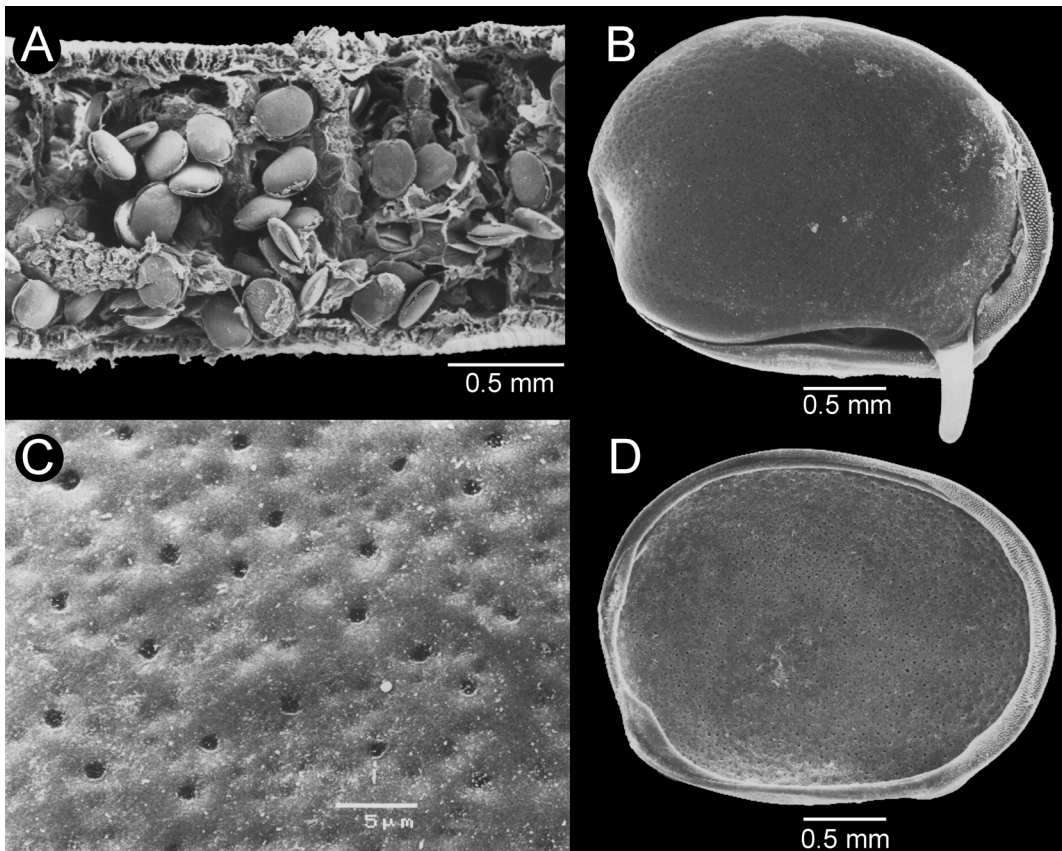


FIGURE 1. A. Electron micrographs showing an outer demibranch marsupial characteristic of *S. khwaenoiensis*, with glochidia inside. B. The glochidial shell structure showing unequivalve, unequilateral characteristics of the second group. C. The glochidial external porous shell surface structure of *S. khwaenoiensis*. D. The glochidial internal porous shell surface of *S. khwaenoiensis*.

shell height and lengths were 0.22 ± 0.03 and 0.28 ± 0.04 mm, respectively, with a glochidial index (Gln) of 0.0612. This is quite larger in size than other species, especially in shell height. The external shell surface structure has a characteristic unique porous structure which is different from other previous reported species (Panha and Eongprakornkeaw, 1995) (Fig. 1C). A hook-like shell appendix structure was also been observed (Fig. 1B). The internal shell surface also has a porous characteristic (Fig. 1D). These shell characteristics of *S. khwaenoiensis* are distinctly different from

other species and it lives in a unique habitat. However, the glochidium structure clearly showed the characteristics of the second group (unequivalve, unequilateral) (Fig. 1B).

DISCUSSION

The glochidia of *S. khwaenoiensis* are classified within the hookless category as are the other twelve Thai Unionoid species previously reported. The general shell structure is similar to that of *Physunio*

superbus, *Pseudodon cambodiensis* and *Uniandra contradens* within the second group (unequivalve, unequilateral). However, the external and internal shell surface structures have unique porous characteristics and the shell height value of *S. khwaenoiensis* is larger than all the other reported Thai species. These findings will provide useful informative characters to assist in *S. khwaenoiensis* identification and further classification of (Thai) freshwater unionid mussels.

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