

**NEW RECORDS OF *CYCLESTHERIA HISLOPI* (BAIRD, 1859)
(CRUSTACEA: BRANCHIOPODA: DIPLOSTRACA: CYCLESTHERIDA)
IN SOUTHEAST ASIA**

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ABSTRACT. – New records of the clam shrimp *Cyclestheria hislopi* are reported for Southeast Asia, including the first records from Malaysia, where the species was found in tin mine lakes, and records from Java and Cambodia.

KEY WORDS. – *Cyclestheria*, clam shrimp, Southeast Asia, distribution.

INTRODUCTION

Although “conchostracan” branchiopods (the suborders Laevicaudata, Spinicaudata, and Cyclestherida, formerly treated as comprising the order Conchostraca; see Martin & Davis, 2001) are known from eastern Asia, records from Southeast Asia are rare. East Asian clam shrimp, reviewed recently by Naganawa (1999), include numerous records of six nominal species from Japan (also see Grygier et al., 2002), seven species from China (with many other Chinese nominal species purportedly being their junior synonyms) (Naganawa, 1999; Naganawa & Orgiljanova, 2000), three species from Korea (Yoon & Kim, 1992, 2000), two species from the Baikal region of southern Siberia (Naganawa, 1999), and six from Mongolia (Brtek et al., 1984; Naganawa et al., 2001, Naganawa & Zagas, 2002). In contrast, records from Southeast Asia include only the species *Cyclestheria hislopi* (Baird, 1859), although one of us (MJG, unpublished data) has examined a sample of *Eulimnadia* sp. from northeastern Thailand. *Cyclestheria hislopi*, the sole member of the family Cyclestheriidae and the suborder Cyclestherida (= Cyclostraca of Naganawa, 2001), was originally described by Baird (1859) from India and has been reported subsequently from other Asian localities as well as Australia; North, Central, and South America; and Africa (as summarized by Olesen et al., 1996). In Southeast Asia, *C. hislopi* has until now been reported from Bung Borafet,

which is a reservoir at the head of the Chao Phraya Delta near the city of Nakhon Sawan in central Thailand (Junk, 1977), from rice fields just north of Udon Thani, northeastern Thailand (Heckman, 1979), and from unspecified localities in Java, Sumatra, and Sulawesi. These latter Indonesian localities, depicted on a map in Olesen et al. (1996: Fig. 1), are in turn based on a paper by Brehm (1939), who did not disclose where his information originated. Brehm (1939) only associated the researchers with the respective localities without specific reference to published works or personal communication: Celebes (Brady; Woltereck, Wallacea Expedition); Sumatra (Stingelin); Java (Grochmalicki). We have been unable to trace these leads further. In his world list of branchiopod genera and their distributions, Belk (1996: 18) listed only *Cyclestheria* in Southeast Asia (by implication, since he summarized its distribution as “alle Kontinente ... in tropischen und subtropischen Regionen”).

In the spring of 2002, the first two authors received for examination a small collection of *Cyclestheria hislopi* sent by Catherine Yule, Monash University, Sunway Campus, Malaysia. The clam shrimp had been collected by M. Chin from a tin mine lake in Kepong, Kuala Lumpur, Malaysia, and represented the first report of any species of clam shrimp from Malaysia. This collection prompted us to look further into additional distributions of *Cyclestheria hislopi* in Southeast Asia, and to eventual collaboration with the third

author, who independently had been collecting distributional records of this and other species from other Southeast Asia localities. In this note, we present those additional data.

SYSTEMATICS

CLASS BRANCHIOPODA LATREILLE
 ORDER DIPLOSTRACA GERSTAECKER
 SUBORDER CYCLESTHERIDA SARS
 FAMILY CYCLESTHERIIDAE SARS

Cyclestheria hislopi (Baird, 1859)

Material Examined. – **Malaysia.** – LACM CR 2001-011.1. Kepong, Kuala Lumpur. From a tin mine lake (under the management of the Perbadanan Kemajuan Negeri Selangor [PKNS] local council in the suburb of Kelana Jaya) near the center of the city and infested with water hyacinths. Collected 17 Aug.2001 by Melissa Chin (Monash University). Gift to LACM (Natural History Museum of Los Angeles County) from Catherine Yule (Monash University Sunway Campus). Approximately 64 specimens, all apparently female, of which 26 were either ovigerous or had developing eggs visible through the thin cuticle of the trunk somites. The size range was from 1.3 mm (small individuals that could not be sexed) to 3.1 mm for a large female carrying well-developed embryos (Fig. 1). Ovigerous females ranged from those carrying spherical eggs dorsally to those carrying well-developed

embryos beneath the dorsal confines of the valves; larger individuals carried embryos that were more fully developed. The smallest brooding individual measured 2.4 mm in carapace length. Additional collections, not seen by us, have since come from two other lakes, one in the suburb of Ampang (approximately 30 km from the PKNS lake) that yielded more than 500 specimens, and one across the road from the PKNS lake (C. Yule, personal communication).

Cambodia. – Approximately 75 individuals were collected in August and September, 2000, by Drs. Akifumi Ohtaka (Hirosaki University) and Haruo Katakura (Hokkaido University) near the northeastern part of Lake Tonle Sap, and near Phnom Penh. Qualitative collections were made with 0.1 mm- and 0.5 mm-mesh hand-nets. All specimens were fixed in formalin and later transferred to ethanol.

St. 2. Among aquatic vegetation (*Utricularia* sp.) around tea vendor's boat, Chongkneas, Lake Tonle Sap, near Siem Reap, Cambodia, coll. A. Ohtaka and H. Katakura, 30 Aug.2000. Four specimens of 1.2 - 2.7 mm in carapace length.

St. 3. Several littoral sites with aquatic vegetation along shore of Lake Tonle Sap on both sides of causeway leading to Phnom Krom, near Siem Reap, Cambodia, coll. A. Ohtaka and H. Katakura, 31 Aug.2000 and 1 Sep.2000. About 70 individuals of 0.9 - 3.5 mm in carapace length. Of the 35 specimens that were examined in detail, 15 with brood of spherical eggs, developed embryos, or bivalved young ready to be released; smallest brooding specimen 2.3 mm in carapace length.

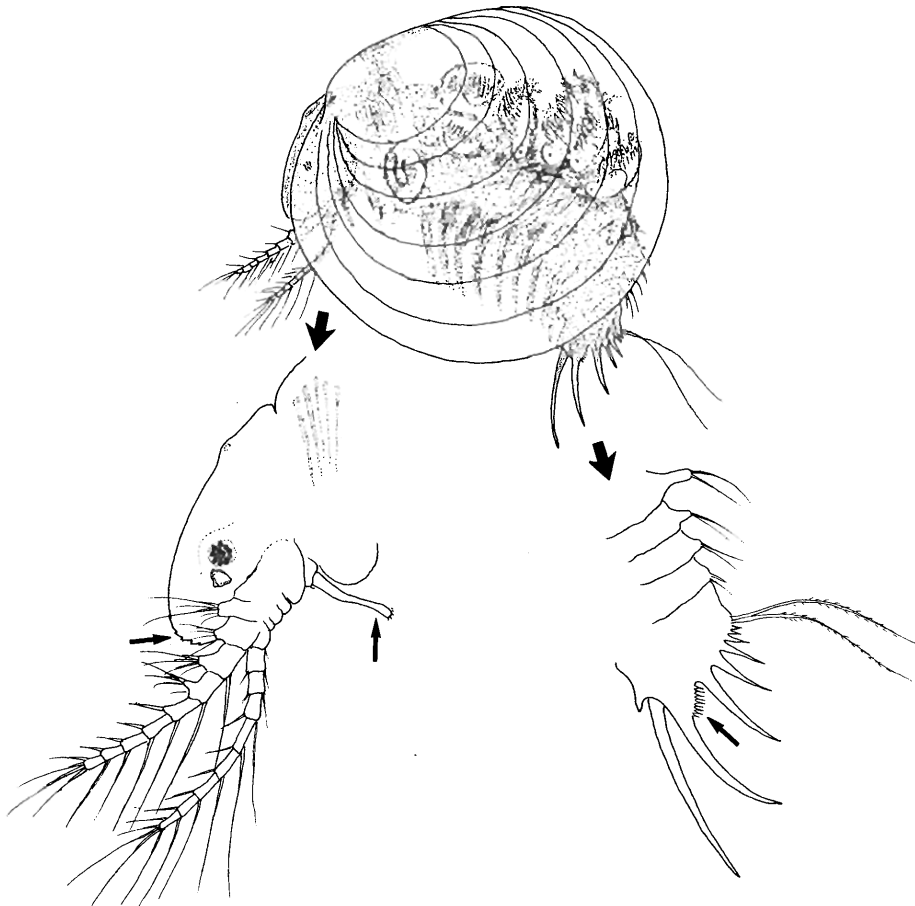


Fig. 1. One of the largest individuals (3.1 mm at widest point across the carapace) of *Cyclestheria hislopi* from the Malaysia specimens (LACM CR 2001-011.1) reported herein. Large arrows indicate areas enlarged to show detail while the smaller arrows highlight characters unique to the species, such as the serrated anterior rostral border, tubular first antenna, and heavily spinose posterior region. Note also the nearly circular carapace valves and developing embryos within the valves, both of which are also characteristic of *Cyclestheria*.

St. 8. Paddy field at Pich Nil near Kompong Speu, near Phnom Penh, coll. A. Ohtaka and H. Katakura, 7 Sep.2000. One specimen of 1.2 mm in carapace length.

Most of the above-mentioned material has been deposited in the Lake Biwa Museum (Shiga Prefecture, Japan), but voucher specimens comprising approximately one third of the most abundant lot (St. 3) have been deposited in the Division of Biological Sciences, Graduate School of Science, Hokkaido University (Sapporo).

Java. – Lake Bojongsari, Bogor, Java, Indonesia, coll. A. Ohtaka and Y. Sudarso, 3 Mar.2001. Forty-four individuals of 0.9 – 3.6 mm in carapace length. Of 29 specimens examined in detail, 5 brooding spherical eggs, 2 brooding developed embryos; smallest brooding specimen 2.4 mm in carapace length. The sample is to be divided between the Lake Biwa Museum (29 specimens), the Museum Zoologicum Bogoriense (Bogor, Indonesia; 10 specimens), and Dr. Ohtaka's personal collection at Hirosaki University (Hirosaki, Japan; 5 specimens).

Morphology and Identification. – The distinctive morphology of *Cyclestheria hislopi* (Fig. 1) makes identification of this species relatively easy throughout its range. The nearly circular carapace (carapace height 85 – 88% of length in Cambodian and Javan specimens of brooding size), serrated anterodorsal border of the rostrum, lack of a fornix on the rostrum, simple tubular antennule, and spinose telson, when considered together, are characters unique among the bivalved branchiopods. Additionally, it is the only clam shrimp that completes its embryonic development within the confines of the carapace valves (Fig. 1). In contrast, the young of other members of the group hatch from eggs at a nauplius stage. *Cyclestheria hislopi* also passes through a series of larval stages, some of which are perhaps the equivalent of a naupliar stage, but these stages occur within the confines of the egg membrane prior to eclosion at “larval stage V” (see Olesen, 1999). Although only about 40% (26 of 64) of the Malaysian specimens were in some stage of ovigery (i.e., with eggs or embryos carried beneath the carapace or with developing eggs visible through the trunk cuticle), nearly all of the specimens that appeared mature enough to bear eggs were doing so. Most specimens without any sign of eggs were very small. Larger specimens, such as the one depicted in Fig. 1, had larger and more fully developed embryos, and indeed some of the individuals counted by us as “nonovigerous” were probably just recently hatched. As has been the case with nearly all previous collections of this species, no males were found (for an exception see Olesen et al., 1996).

Cyclestheria hislopi has no close relatives. It is probably the only representative of its family, the Cyclestheriidae. A second species described in that family, *Paracyclestheria sinensis* Shen & Dai, 1987, from China, was possibly based on juvenile stages of *C. hislopi*, according to Olesen et al. (1996). The relationship of the family Cyclestheriidae to other groups of branchiopods remains unclear; the family has been placed in the Spinicaudata (among the former Conchostraca) or placed in its own suborder Cyclestherida (see discussions in Martin & Davis, 2001; Spears & Abele, 2000; Braband et al., 2002).

Distribution. – In their description of the male of *Cyclestheria hislopi*, Olesen et al. (1996) listed all known occurrences of the species worldwide. *Cyclestheria hislopi* has a circumtropical distribution, occurring from approximately 30° N to 35° S latitude. In Southeast Asia, Olesen et al. (1996) mapped it in Thailand (based on the record of Junk, 1977) and in Sumatra, Java, and Sulawesi (based on Brehm, 1939). Based on the known distribution of *C. hislopi*, our new records of the species in Malaysia, Java, and Cambodia are not surprising.

ACKNOWLEDGEMENTS

We thank Jørgen Olesen (Zoologisk Museum, Copenhagen) for confirming the identification of the Cambodian and Javanese specimens in the collections of the third author (MJG) at the Lake Biwa Museum and for helping to locate literature. We also thank Dr. Catherine Yule for sending the Malaysian specimens to the first two authors and Drs. Akifumi Ohtaka (Hirosaki University) and Haruo Katakura (Hokkaido University) for sharing with MJG information and specimens collected in Cambodia as part of the “Comprehensive Survey for the Preservation and Development of Lake Tonle Sap and its Vicinity” sponsored by the Infrastructure Development Institute (Kokusai Kensetsu Gijutsu Kyokai). We thank A. Ohtaka and Y. Sudarso for sharing with MJG specimens of *Cyclestheria* collected in Java as part of the project “Environmental Conservation and Land Use Management of Wetland Ecosystems in Southeast Asia,” conducted under the Core University program between Hokkaido University in Japan and the Research and Development Center for Biology - LIPI - in Indonesia and sponsored by the Japan Society for the Promotion of Science. This work was directly supported by a grant from the PEET initiative (Partnerships for Enhancing Expertise in Taxonomy) of the National Science Foundation (grant DEB 9978193) to J. W. Martin and D. K. Jacobs. It is also a product of Lake Biwa Museum Cooperative Research Project K0007, “Research on Large Branchiopods (Fairy Shrimp, Tadpole Shrimp, Clam Shrimp) Inhabiting Rice Paddies”. Finally, we thank Brian Timms and Hidetoshi Naganawa for their help in finding literature on branchiopods of Southeast Asia.

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