

**REVISION OF THE ORIENTAL BAMBOO-INHABITING
SEMIAQUATIC BUG GENUS *LATHRIOVELIA* ANDERSEN, 1989
(HETEROPTERA: VELIIDAE) WITH DESCRIPTION OF
L. RICKMERSI, NEW SPECIES, AND NOTES ON
THE GENUS *BAPTISTA* DISTANT, 1903**

Damir Kovac

Honorary Research Associate of the Department of Biological Sciences, National University of Singapore. Forschungsinstitut Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main, Germany (e-mail: dkovac@sng.uni-frankfurt.de)

Chang Man Yang

Zoological Reference Collection, Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore 119260, Republic of Singapore (e-mail: dbsycm@nus.edu.sg)

ABSTRACT. - The Oriental semiaquatic bug genus *Lathriovelina* Andersen is revised. A comparison is made with the closely related genus *Baptista* Distant. A new species, *L. rickmersi*, is described and *L. collaris* Andersen transferred to *Baptista*. *Lathriovelina* at present contains two species, *L. capitata* Andersen from Peninsular Malaysia and *L. rickmersi*, new species, occurring in Thailand, Peninsular Malaysia, Sabah and Sumatra. Both Microveliinae inhabit water-filled internode cavities of various bamboo species. The bugs enter the internodes through small holes in the culm wall bored by insects or woodpeckers. The highest internode colonized by a *Lathriovelina* was 18 m above ground. Both species mainly feed on collembolans or insects trapped on the water surface.

KEY WORDS. - Veliidae, Microveliinae, *Lathriovelina*, redescription, *L. rickmersi*, new species, *Baptista collaris*, new combination, bamboo, *Gigantochloa*, *Dendrocalamus*, *Schyzostachyum*, phytotelmata, Southeast Asia

INTRODUCTION

The family Veliidae comprises a very diverse group of semiaquatic bugs. They inhabit a wide range of aquatic habitats such as stagnant waters, streams, humid terrestrial or marine habitats (Andersen, 1982). Some species even live in "phytotelmata", small bodies of water in plant cavities, such as water-filled tree holes or pitchers of *Nepenthes*.

A number of endemic veliid species have been recorded from water-filled tree holes or arboreal bromeliads in the New World (Polhemus & Polhemus, 1991). They belong to the genera *Microvelia* Westwood (Microveliinae) and *Paravelia* Breddin (Veliinae). *Microvelia* has also been recorded from water-filled tree holes in the Oriental region (see Polhemus & Copeland, 1996, Polhemus, 1999). In Kenya the microveliine genus

Cylicovelina Polhemus & Copeland inhabits water-filled tree holes (Polhemus & Copeland, 1996).

In 1987 and 1988 DK found two new veliid species inhabiting water-filled bamboo internodes in Peninsular Malaysia during a survey inspired by N. M. Andersen's (1982) excellent book on semiaquatic bugs. One species was described by Andersen (1989) as *Lathriovelina capitata* on the basis of two specimens from the Natural History Museum, London. The second species was tentatively treated as *Baptista* sp. (Kovac & Yang, 1989; Kovac, 1994; Yang & Kovac, 1995). The Oriental microveliine genus *Baptista* Distant is closely related to *Lathriovelina* and contains four species occurring in cryptic and secluded habitats along streams (Andersen, 1989).

Andersen (1989) erected the genus *Lathriovelina* mainly on the basis of the head structure, which is unique among the Old World Microveliinae, since the eyes are distinctly

set apart from the anterior margin of the pronotum. He described two *Lathriovelina* species: *L. capitata* (type species) and *L. collaris*, both from Peninsular Malaysia. *L. capitata* was collected in Perak by H. M. Pendlebury (habitat unknown) and *L. collaris* in Pahang from a dark hole in a rocky bank of a stream (single apterous female, collected by J. Polhemus).

Due to the rich material collected in the recent years we were able to reassess the taxonomic position of the veliids inhabiting bamboo phytotelmata and to redefine and revise the genus *Lathriovelina*. The life history of *Lathriovelina capitata* Andersen and *L. rickmersi*, new species, will be described in a forthcoming paper.

MATERIALS AND METHODS

Most *Lathriovelina* specimens were collected in West Malaysia at the Ulu Gombak Field Studies Centre, University of Malaya. It is situated on the western slopes of the Main Range (Selangor Darul Ehsan, location: 3°19'32"N, 101°45'16"E, altitude c. 250 m). Other West Malaysian collecting sites included the Ulu Kinchin drainage at the Johore-Pahang border (collected during the Rompin-Endau Expedition of the Malaysian Nature Society in 1989), Genting Highlands, Frazer's Hills (both in Pahang) and the Temengor Forest Reserve in Hulu Perak (collected during the Belum Expedition of the Malaysian Nature Society in 1993). In East Malaysia (Sabah) the collecting was done near Poring Hot Springs, in West Sumatra near Bukittingi and in Thailand in the area south of Surat Thani and at the Khlong Lan National Park near Kampheng Phaet.

In Ulu Gombak, clumps of the large endemic bamboo *Gigantochloa scortechinii* Gamble are abundant along the Gombak river. The culms grow up to 25 m, the internodes are 20-60 cm long and the diameter is c. 8-10 cm. *Lathriovelina* was collected by felling bamboo culms and cutting open the internodes with a parang or a saw. Most *L. rickmersi* specimens were collected from "experimental internodes", which were used to study the animal community of decaying bamboo culms. For this purpose bamboo culms were felled and the upper parts of the internodes were cut in such a way that they could be opened and closed again (Fig. 1 in Kovac & Streit, 1996). After a few weeks the specimens were collected from the newly colonized internodes.

Specimens are deposited in the following depositories: The Natural History Museum (ex. British Museum (Natural History)), London (BMNH), England; John Polhemus Collection, Colorado (JTPC), U.S.A.; Naturhistorisches Museum, Wien (NHMW), Austria; Forschungsinstitut Senckenberg (Senckenberg Museum), Frankfurt (SMF), Germany; Zoological Museum, University of Copenhagen (ZMUC), Denmark; Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore. Technica terminology follows Andersen (1982). We also follow Andersen (pers. comm.) by using the term

"parameres" instead of "claspers".

TAXONOMY

FAMILY VELIIDAE
SUBFAMILY MICROVELIINAE

Genus *Lathriovelina* Andersen, 1989

Lathriovelina Andersen, 1989: 376.

Type species. - *Lathriovelina capitata* Andersen, 1989

Redescription. - Macropterous; body elongate, covered with pubescence of varying length. Head distinctly produced posteriorly, extending well behind hind margin of eyes; head only slightly deflected in front of eyes; head dorsally with a distinct median furrow and a pair of deep, pseudocellar pits; clypeus protruding, shiny; ventral lobes of head low, not touching prothorax, lower margin of ventral lobes almost straight. Hind margin of the head capsule as in Fig. 11, provided with a pair of long occipital apodemes. Eyes relatively small, globular, distinctly removed from anterior margin of pronotum, eye width less than 1/3 width of head between eyes. Antennal tubercles small but clearly visible from above; antennal segment 1 long and slightly curved, extending from 1/2 to more than 2/3 of its length beyond apex of head; segment 2 more slender and shorter than segment 1; segments 3 and 4 very slender, almost filiform, setose; segment 3 longest. Rostrum slender, with its apex reaching middle of mesosternum (after Andersen, 1989). Pronotum of macropterous form pentagonal in outline, with anterior margin deeply emarginated; anterolateral corners prominent, rounded; hind margin broadly rounded. Prosternum quite narrow, metasternum elevated, lateral scent grooves extending obliquely forwards; lateral evaporaria small, ovate, each with a tuft of hairs. Hind leg longer than middle leg; foreleg of male modified (*capitata*: forefemur basally thickened on ventral and curved with row of black hairs (Fig. 2); *rickmersi*: forefemur slightly curved in distal part, ventral with dark patch of long hair on proximal part and thickened (Fig. 12); foreleg of female not modified; middle femora in both sexes slightly constricted before apex, with ventral patch of short, dark hairs (Fig. 13), hind femora not modified; foretibia of male lined with hairs with a short grasping comb; middle tibia without a distinct row of long hairs on inner surface unlike in most other veliids, hind tibia slightly curved (Fig. 14). Tarsal segments slender; first segment of middle and hind tarsus longer than second segment; claws long, falcate, inserted distinctly before the apex of last tarsal segment; arolia at low magnification bristlelike, at high magnification (SEM) dorsal arolium flattened, ventral arolium basally widened, provided with minute bristles, apical part bristlelike (Fig. 25); Forewings may reach end of abdomen, usually slightly shorter (in large males of *rickmersi* part of tergite 7 exposed, Fig. 6), not covering

all of connexiva, four cells present (Fig. 8), the two distal cells large with posterior cell longest; basal 1/3 of wing thickened and covered with dense pile of short hairs; basal two cells with streaks. Distal part of wing with two large white spots (always present) and 1-2 additional small white spots (facultative).

Abdomen relatively long or extremely long (*rickmersi* males); sides in females distinctly curved (Fig. 7). Connexiva broad (in *capitata* posterior corner of laterotergite 7 distinctly expanded (Fig. 1), in *rickmersi* narrowed (Figs. 6, 17, 18)). Pregenital abdomen: hind margin of mediotergite 6 produced into paired lobes (*capitata*: strong elevation on sternum 7 (Fig. 24), *rickmersi*: segment 7 produced pleurally into a pilose tubercle (Figs. 18, 23)). Male genital segments small but distinctly protruding; segment 8 in *capitata* with lateral tubercles furnished with a tuft of short, dark hairs (Fig. 24); pygophore simple, proctiger narrow; parameres large, falciform, distally flattened, symmetrically developed. Female genital segments plainly visible behind sternum 7; first gonocoxae subquadrate; proctiger small, cone shaped.

Remarks. - The main distinctive character separating *Lathriovelina* and *Baptista* is the unique structure of the head: in *Lathriovelina* the head is more elongated, less deflected in front of the eyes, the eyes are smaller and distinctly set apart from the pronotum. The pronotal collar mentioned by Andersen (1989) is a misinterpretation and therefore not used as a diagnostic character (see Discussion). Additional distinguishing characteristics of *Lathriovelina* are: a) distal part of parameres flattened, b) first tarsal segments of middle and hind legs longer than the second tarsal segments (in *Baptista* tarsal segment 1 of middle leg shorter than tarsal segment 2; tarsal segment 1 of hind leg shorter or longer than tarsal segment 2), c) middle femur constricted at apex, with ventral patch of dark hairs, d) hind tibia slightly curved.

Habitat. - Bamboo phytotelmata.

Distribution. - Thailand, Peninsular Malaysia, Sumatra, Borneo.

***Lathriovelina capitata* Andersen, 1989**

(Figs. 1-5, 22, 24, 26)

Lathriovelina capitata Andersen, 1989: 377-379, Figs. 5, 43-48 (description, type locality: Perak, Malaysia); Kovac, 1994: 128 (biological notes, records: Selangor, Malaysia); Yang & Kovac, 1995: 287-295 (list, records: Perak, Malaysia); Kovac, 1998: 133 (biological notes)

Material examined. - HOLOTYPE: macropterous male. WEST MALAYSIA: Perak, F. M. S., Batang Padang, Jor Camp, 2500 ft., 3 Jun.1923, H. M. Pendlebury.

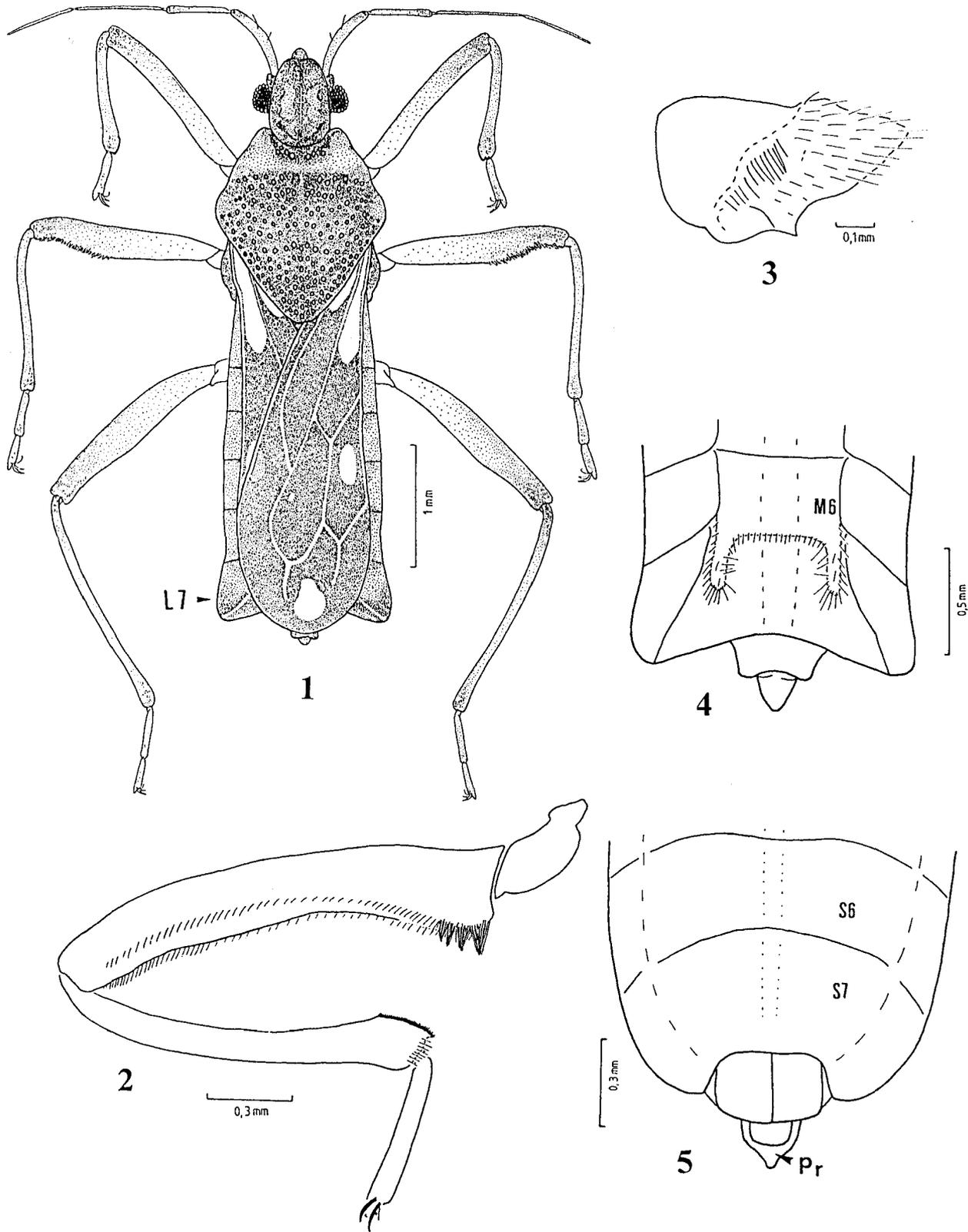
PARATYPE: macropterous female, same locality and date as holotype. Both specimens deposited at BMNH.

Other material: WEST MALAYSIA: 1 damaged female, same locality and date as type material (BMNH); 1 female, Selangor Darul Ehsan, Ulu Gombak FSC, altitude c. 250 m, decaying bamboo internode lying on the ground, 2 May 1988; 1 female, Ulu Gombak FSC, altitude c. 250 m, decaying bamboo internode lying on the ground, 28 Dec.1988; 1 male, Ulu Gombak FSC, altitude c. 250 m, upright bamboo, 21 Feb.1991 (6/10); 1 damaged male, Genting Highlands, c. 1000 m, upright bamboo, 24 Feb.1991 (11/31); 1 damaged female, Genting Highlands, c. 1000 m, upright bamboo, 28 Feb.1991 (15/13); 2 males, Genting Highlands, altitude c. 1000 m, upright bamboo, 6 Mar.1991 (18/3); 1 male, Ulu Gombak FSC, upright bamboo, 2 Apr.1991 (36/4); 1 male, Perak, Belum Expedition, upright bamboo (*Gigantochloa latifolia*), 2 Oct.1993; 1 female, Ulu Gombak FSC, upright bamboo, 20 Jul.1994 (B1/16); 3 males, 4 females, Ulu Gombak FSC, upright bamboo, different internodes, 15 Aug.1994 (JTPC: 1 male, 1 female; NHMW: 1 male, 1 female; ZMUC: 1 female; ZRC: 1 male, 1 female); 2 females, Ulu Gombak FSC, upright bamboo, 31 Aug.1994 (B8/9 + B8/16); 1 female, Ulu Gombak FSC, upright bamboo, 12 Sep.1994 (B12/8); 1 male, Ulu Gombak FSC, upright bamboo, 18 Aug.1995 (E3) (ZMUC); 1 male, Genting Highlands, upright bamboo (nest of a woodpecker?), 24 Sep.1995 (E7); 1 male, 1 female, Genting Highlands, upright bamboo (nest of a woodpecker?), 24 Sep.1995 (E13); 1 male, Ulu Gombak FSC, decaying bamboo (exp. int.), 22 Nov.1995 (I39); 3 females, Ulu Gombak FSC, upright bamboo internodes, 23 Nov.1995 (E11) (SMF; JTPC: 1 female); 1 male, Ulu Gombak FSC, upright bamboo, 26 Nov.1995 (E12) (JTPC); 1 male, 1 female, Ulu Gombak FSC, decaying bamboo (exp. int.), 20 Oct.1996 (B3); 1 female, Ulu Gombak FSC, upright bamboo, 2 May 1998; 1 male, 1 female, Ulu Gombak FSC, upright bamboo, 2 May 1998 (ZRC); 1 male, Ulu Gombak FSC, bamboo stump, together with exuvia, 10 Aug.1998; 1 male, Ulu Gombak FSC, upright bamboo, 25 Aug.1998; 1 female, Genting Highlands, upright bamboo shoot, 27 Nov.1999. All specimens collected from the bamboo *Gigantochloa scortechinii* are deposited at SMF, if not otherwise stated. All specimens leg. by D. Kovac.

Size. - Males, length 4.08-5.59 mm, maximum width across pronotum 1.23-1.62 mm, maximum width across widened laterotergites 7 1.04-1.78 (n = 16); females, length 4.28-5.62 mm, maximum width across pronotum 1.3-1.65 (n = 17). All specimens macropterous.

Description. - The external morphology of our specimens agrees with Andersen's (1989) description, except for the lack of the pronotal collar (see Discussion). Therefore, we only give the following additional characters and measurements:

In males the hind corners of mediotergite 6 are produced into paired pilose projections (Fig. 4) and there is a distinct median elevation on sternum 7, which is more pronounced in larger males (Fig. 24). In large males, the basal part of the forefemur is more thickened and provided with stronger tufts of black hairs than in small males (Fig. 2, compare with Fig. 46 in Andersen (1989)) and the posterior corners of laterotergites 7 are more expanded (compare Fig. 1 with Fig. 44 in Andersen (1989)). In larger forms of both sexes the middle femur



Figs. 1-5. *Lathriovelina capitata*, Andersen: 1, male, large form, 2, foreleg, male, large form, 3, abdominal segment 8, male, lateral view, 4, abdominal end, male, dorsal view, wings removed, 5, abdominal end, female, ventral view. L7, expanded laterotergite 7; M6, mediotergite 6; Pr, proctiger; S6, S7, abdominal sterna 6 and 7.

is more constricted at the apex and lined with stronger black hairs and the hind tibia is more curved.

In type specimens of *L. capitata* described by Andersen (1989) the antennae were not complete. In our specimens the antennae are about 1/2 of total length, length of segments I-IV in males: 0.72, 0.62, 0.77, 0.64 mm (n = 2); in females: 0.61, 0.54, 0.69, 0.59 (n = 2). The fine structure of praetarsus is the same as in *L. rickmersi* (see Fig. 25). The distal part of forewings has 2-3 white spots in both sexes: a large spot near the tip of the wing, a second large white spot in the smaller apical cell (anterior wing margin) and a third small and usually faint facultative spot (or sometimes a faint light streak) in the larger apical (central) cell. Specimens with 2 white spots : 3 white spots = 14 : 10 (n = 23). The white spots are inconspicuous in old museum material.

Habitat and biology. - *L. capitata* prefers water-filled bamboo internodes of living, upright bamboo culms belonging to *Gigantochloa scortechnii* Gamble, *G. latifolia* Ridl. and probably other tall bamboo species. It occurs in old bamboo culms as well as in older bamboo shoots. The bugs usually use holes bored by insects or other animals to enter the internode cavities. They prefer higher internodes (up to 18 m high). In rare cases *L. capitata* may also be found in decaying bamboo culms or in water-filled bamboo stumps. *L. capitata* feeds on small arthropods floating on the water surface. It is a common species, but less abundant than *L. rickmersi*.

Distribution. - Peninsular Malaysia. Altitude: 200 to 1120 m.

Remarks. - In addition to the male holotype and female paratype we examined a third *L. capitata* specimen from BMNH with the same locality and date as the type specimens. This specimen was not mentioned by Andersen (1989). It is a damaged female with both distal antennal segments, parts of the legs, the forewings and one hind wing missing. It bears the label "Baptista malayana Dover. Holotype, 1926". The note "ms name" is added on the same label in a different handwriting.

Lathriovelina rickmersi, new species

(Figs. 6-21, 23, 25)

Microveliinae gen. et sp. indet., Kovac & Yang, 1989: 283 (list, habitat, records: Pahang, Malaysia)

Baptista sp., Kovac, 1994: 128, Fig. 13 (biological notes, records: Selangor, Malaysia); Yang & Kovac, 1995: 289 (list, habitat, records: Perak, Malaysia); Kovac & Streit, 1996: 88, Fig. 3C (habitat, biological notes); Kovac, 1998: 136, Fig. 11 (habitat, biological notes)

Material examined. - HOLOTYPE: macropterous male, large form, WEST MALAYSIA: Selangor, Ulu Gombak Field Studies Centre, altitude 250 m, 15 Jun.1989, bamboo internodes of *Gigantochloa scortechnii*, leg. D. Kovac.

Holotype deposited at BMNH.

PARATYPES: WEST MALAYSIA: 4 males and 5 females, Selangor Darul Ehsan, Ulu Gombak FSC, decaying bamboo internodes, 15 Jun.1989 (BMNH); 8 males, 7 females, Ulu Gombak FSC, decaying bamboo internodes, 15 Jun.1989 (SMF); 4 males, 2 females, Ulu Gombak FSC, decaying bamboo internodes, 16 Nov.1991 (SMF); 26 males, 5 females, Ulu Gombak FSC, decaying bamboo internodes, 21 Sep.1993 (SMF); 1 male, Belum Expedition of the Malaysian Nature Society, Base Camp, 28 Dec.1993 (SMF); 18 males, 8 females, Ulu Gombak FSC, decaying bamboo internodes, 17 Aug.1994 (SMF); 26 males, 14 females, Ulu Gombak FSC, decaying bamboo internodes, 18 Aug.1994 (SMF; ZMUC: 5 males, 5 females; JTPC: 5 males, 5 females); 2 males, 3 females, Ulu Gombak FSC, decaying bamboo internodes, 14 Nov.1995 (SMF); 2 males, 3 females, Ulu Gombak FSC, decaying bamboo internodes, 26 Nov.1995 (SMF); 5 males, 5 females, Ulu Gombak FSC, decaying bamboo internodes, 28 Nov.1995 (ZRC); 8 males, 10 females, Ulu Gombak FSC, internodes of felled bamboo culms, 3 Oct.1996 (ZRC); 5 males, 5 females, Ulu Gombak FSC, internodes of felled bamboo culms, 3 Oct.1996 (JTPC); 10 males, 10 females, Ulu Gombak FSC, decaying bamboo internodes, 18 Sep.1998 (NHMW); 16 males, 11 females, Ulu Gombak FSC, decaying bamboo internodes, 25 Aug.1998 (ZRC); SABAH: 7 males, 5 females, Poring Hot Springs, upright bamboo, man made holes, 24 Oct.1996 (SMF); SUMATRA: 1 male, road between Bukittingi and Danau M., upright bamboo, man-made holes, 7 Nov.1996 (SMF); 2 males, 1 female, Bukittingi, upright bamboo, man-made holes, 8 Nov.1996; THAILAND: 1 female, near Surat Thani, bamboo stump, 15 Apr.1995; 2 males, 3 females, Khlong Lan National Park, near Kamphaeng Phaet, decaying bamboo culms, 22 Nov.96; 1 female, Khlong Lan Nat. Park, upright bamboo, c. 5 m high, 1 May 1999 (SMF). All specimens leg. by D. Kovac.

Size. - Holotype male: 5.53 mm; males, length 4.0-5.81 mm, maximum width across pronotum 1.04-1.36 (n = 60); females, length 3.44-4.56 mm, maximum width 1.06-1.32 mm (n = 60). All specimens macropterous.

Description. - **Colour:** Head dark brown to blackish, clypeus shining brown, antennal tubercles and pseudocellar spots shining dark. Antennae, rostrum and legs yellowish brown, last rostral segment black, basal parts of femora lighter, apices of femora gradually darker towards the distal end, terminal margin black. Pronotum brownish, anteriorly with a narrow reddish-brown band between the cervical constriction and pronotal lobe; lateral pronotum dark with reddish-brown parts anteriorly and below humeral elevation, ventral pronotum chestnut brown. Abdominal mediotergites dark-brown, laterotergites reddish-brown; ventral abdomen dark-brown to dark, external parts of laterotergites lighter, reddish brown; intersegmental limits of abdomen black. Forewings dark, both basal cells with a white streak, in the distal half of the forewing 2-4 white spots present, distributed as follows (Figs. 6, 7, 8): largest spot near the tip of the wing, second large white spot in the smaller apical cell (anterior wing margin), a very small spot in the larger apical (central) cell, small spot at the posterior wing margin, large spots

always present, small spots may be lacking; specimens with 2 white spots : 3 white spots : 4 white spots = 5 : 43 : 32 (n = 80).

Structural characters (male). - Body extremely long and slim (Fig. 6), head slightly shorter than wide across eyes (length 0.87 mm, width 0.93 mm, n = 10), posteriorly produced, extending well behind hind margin of eyes, eyes distinctly removed from anterior margin of prothorax, width of eye : head between the eyes = 0.31 (n = 10). Antennae about 1/2 total length (antenna : body length = 0.42-0.53, n = 10), antennal segment 1 slightly curved, segment 2 shorter and more slender, segments 3 and 4 setose and more slender than segments 1 and 2 (Fig. 10); length of segments I-IV: 0.56, 0.42, 0.72, 0.6 mm (n = 10).

Pronotum pentagonal (Fig. 10), with anterior margin deeply emarginated, about as long as wide (length 1.16 mm, width 1.15 mm, n = 10). Forefemur curved and constricted in distal third, in large form slightly thickened at the apex, with long hairs ventrally; foretibia curved, lined with a row of long hairs and thickened distally, length of grasping comb 0.1-0.14 mm (n = 10), about 1/8-1/9 of tibial length, tarsus one-segmented (Fig. 12). Middle femur slightly constricted at apex, with ventral patch of short dark hairs (in small form less pronounced and shorter, hairs pale); middle tibia not modified, tarsus two-segmented (Fig. 13), hind femur not modified, hind tibia slightly curved in large form, tarsus two-segmented (Fig. 14). Tarsal segments slender, claws long, hook-shaped, inserted distinctly before the apex of last tarsal segment; parempodia setiform and asymmetrical, arolia bristlelike at low magnification, under SEM fine structure as follows: dorsal arolium flattened, not very wide, basal third of ventral arolium widened, flat and mediany provided with minute bristles, apical part of ventral arolium bristlelike (Fig. 25). Lengths of leg segments (femur : tibia : tarsal 1 : tarsal 2, n = 10): Foreleg: 1.37 : 1.0 : 0.42 mm, middle leg: 1.26 : 1.13 : 0.28 : 0.25 mm, hind leg: 1.54 : 1.57 : 0.35 : 0.27 mm. Forewings not reaching tip of abdomen (exception: small females), covering tergite 7 in females and small males, in large males tergite 7 only partially covered (Fig. 6), with 4 cells, basal 1/3 of wing thickened and covered with dense pile of short hairs (Fig. 8). Hind wings with one closed cell (Fig. 9).

Pregenital abdomen about 1/2 total length (pregenital abdomen : total length = 0.48-0.62; n = 10), sides of abdomen almost parallel, converging distally (segment 6 and 7), connexiva broad, obliquely raised; hind margin of mediotergite 6 produced into paired pilose lobes (Figs. 6 and 17, large form), in small form lobes shorter and parallel-sided; segment 7 produced pleurally on each side into a pilose tubercle (Figs. 18, 23); segment 8 as in Fig. 19; pygophore simple, proctiger round at the apex, as in Fig. 20, parameres falciform and long (Fig. 16), distal part flattened.

Female: Head structure and antennae as in male, antennae slightly longer than 1/2 total length (antenna :

body length = 0.51-0.58, n = 10); lengths of segments I-IV: 0.48 : 0.35 : 0.63 : 0.56 mm (n = 10).

Forelegs not modified, middle femur especially in larger females slightly constricted before apex, ventrally with short, dark hairs, hind tibia slightly curved (Fig. 7); Lengths of leg segments (femur : tibia : tarsal 1 : tarsal 2, n = 10): foreleg: 1.06 : 0.82 : 0.36 mm, middle leg: 1.1 : 0.99 : 0.26 : 0.23 mm, hind leg: 1.3 : 1.36 : 0.31 : 0.25 mm. Wings as in male, forewings almost reaching tip of abdomen.

Pregenital abdomen about 1/2 total length (pregenital abdomen : total length = 0.47-0.5 mm, n = 10), sides of abdomen curved, connexiva broad, obliquely raised, pregenital segments not modified.

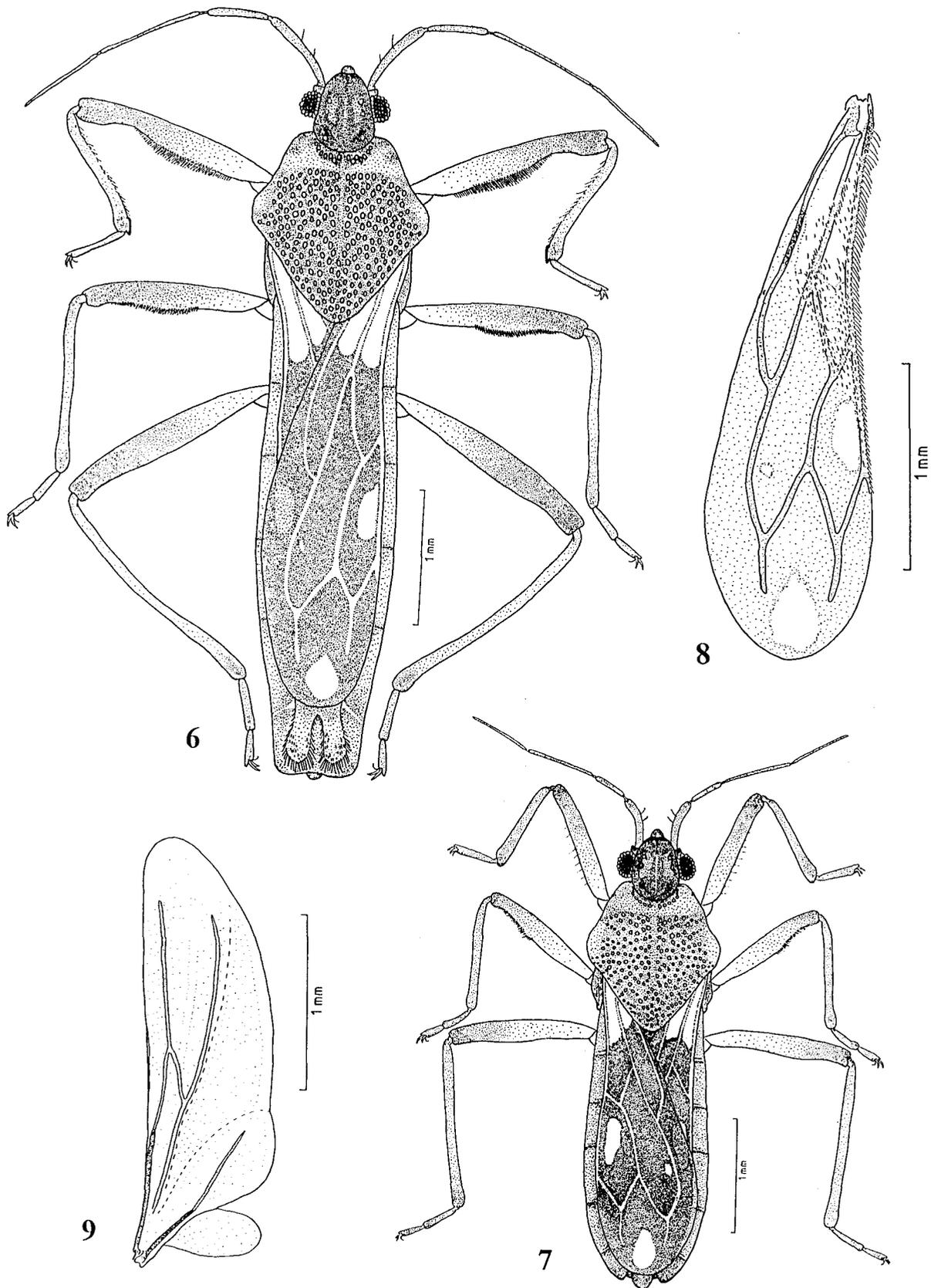
Etymology. - The species is named in honour of Peter S. Rickmers, who made it possible for D. Kovac to undertake a field trip to Malaysia during which he found the new species.

Habitat and biology. - *L. rickmersi* is a common species inhabiting water-filled bamboo internodes of tall bamboos, e. g., *Gigantochloa scortechinii* Gamble, *G. ligulata* Gamble, *G. latifolia* Ridl., *G. levis* (Blanco) Merril, *Dendrocalamus pendulus* Ridl., *Schyzostachyum grande* Ridle. and several unidentified species. The bugs use holes made by animals or cracks in the bamboo wall to enter the internode cavities. Animals boring such holes are beetles (for example, larvae of the leaf beetle *Lasiochila goryi* Guér. or adults of the long-horned beetle *Abryna regispetri* Paiva, see Kovac 1994; Kovac & Yong, 1992), caterpillars (species of Pyralidae), woodpeckers and others. The smallest hole used by *L. rickmersi* to colonise an internode was a 1.5 x 2.5 mm exit hole made by a pyralid larva.

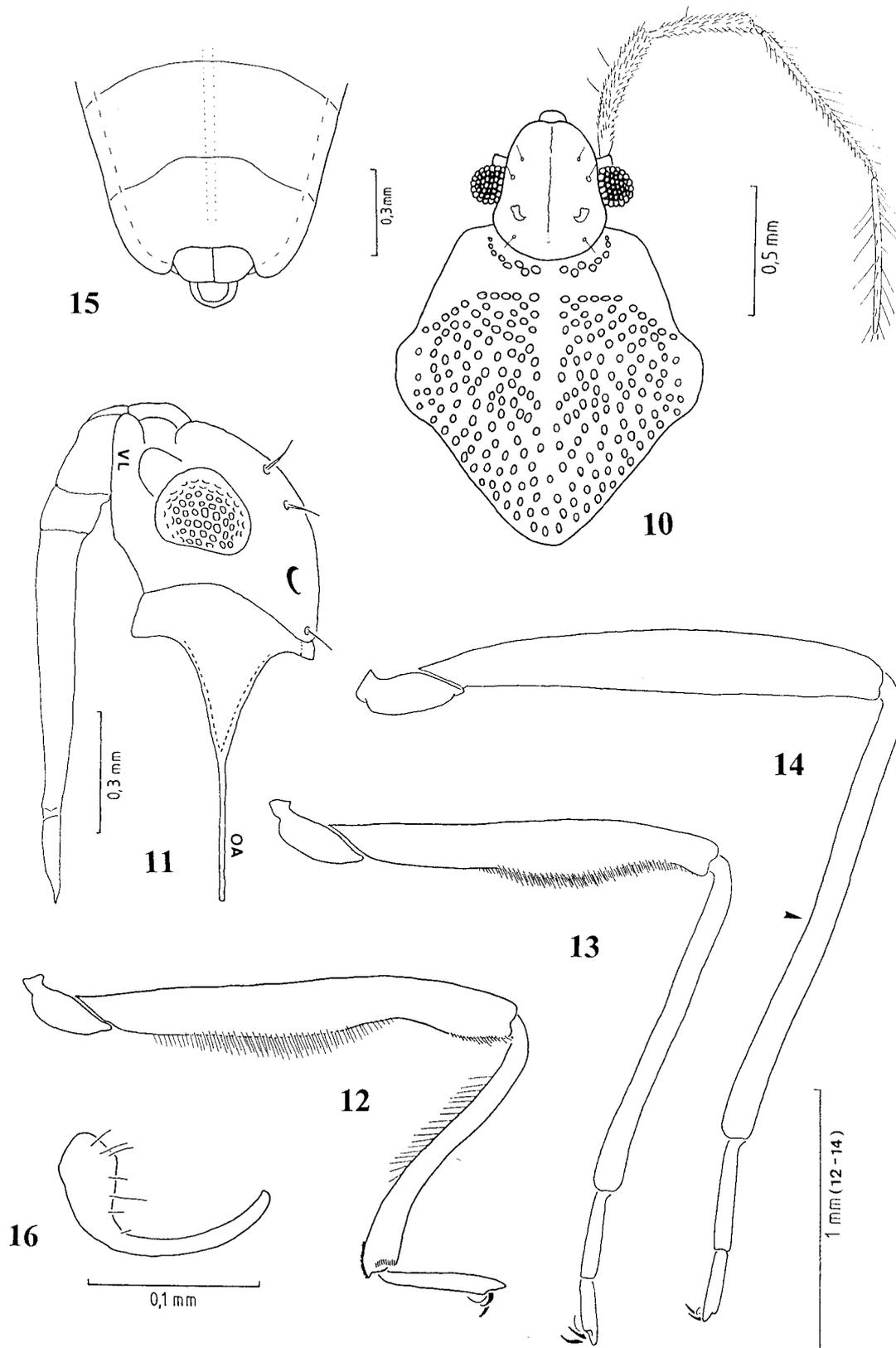
L. rickmersi is most abundant in internodes of decaying bamboo culms, but also occurs in lower internodes of living, upright bamboo culms or in older bamboo shoots. This species prefers internodes with middle-sized (length c. 7 mm) to small (length c. 2.5 mm) holes, but some individuals may also be found in water-filled bamboo stumps, which are apparently used as a temporary habitat only (brief stay, usually no nymphs). In bamboo stumps, the bugs hide clinging to the internode wall in the daytime and may be found openly on the water surface during night-time.

L. rickmersi is a specialized inhabitant of bamboo internodes. Only in one case two nymphs of *L. rickmersi* were found in water-filled leaf axils of *Colocasia esculenta* (L.) Schott (Araceae; common name: Taro), which is certainly an untypical habitat. One nymph was taken to the laboratory and molted to an adult.

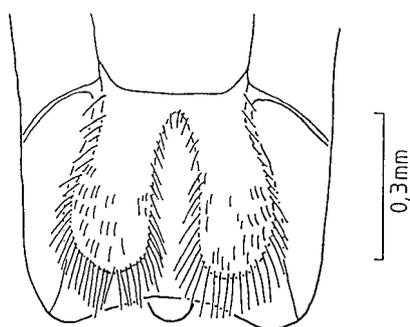
L. rickmersi feeds to a large extent on Collembola (c. 45% of the prey of nymphs and adults, n = 278), which it hunts actively on the water surface. The remaining prey items were terrestrial arthropods floating on the water surface. A small percentage of prey items were



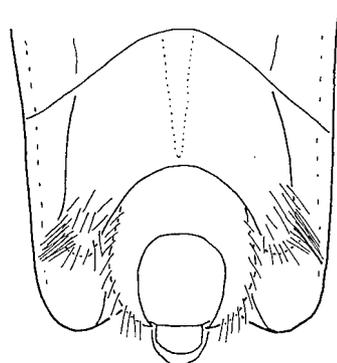
Figs. 6-9. *Lathriovelvia rickmersi*, new species: 6, male, large form, 7, female, 8, forewing, male, 9, hind wing, male.



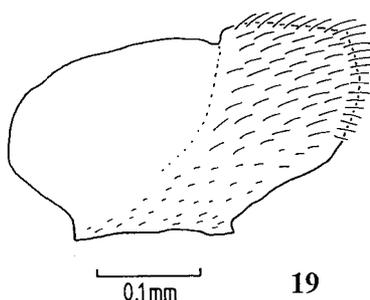
Figs. 10-16. *Lathriovelina rickmersi*, new species: 10, head, pronotum and antenna, male, dorsal view, 11, head, male, lateral view, 12, foreleg, male, large form, 13, middle leg, male, large form, 14, hind leg, male, large form, arrow: curved tibia, 15, abdominal end, female, ventral view, 16, left paramere, male. VL, ventral lobe, OA, occipital apodeme.



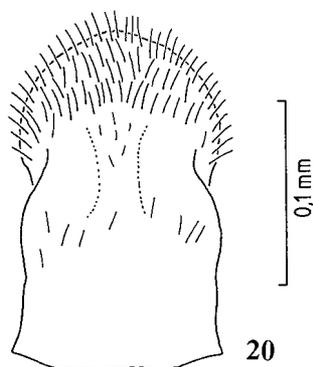
17



18



19



20

Figs. 17-20. *Lathriovelina rickmersi*, new species: 17, abdominal end, male, large form, dorsal view, wings removed, 18, abdominal end, male, large form, ventral view, 19, abdominal segment 8, male, lateral view, 20, proctiger, male, dorsal view.

aquatic animals caught just below the water surface, e. g. small larvae of *Scirtes* (Coleoptera, Scirtidae) or *Clogmia* (Diptera, Psychodidae) (Kovac & Streit, 1996).

Distribution. - Peninsular Malaysia, Thailand, Sumatra, Borneo. Altitude: 20 m (Endau-Rompin) up to 1100 m (Genting Highlands).

Remarks. - The males of *L. rickmersi* can easily be differentiated from the males of *L. capitata* by the long and slim body shape (in *capitata* males posterior corners of laterotergites 7 widened) and by the structure of the forelegs and genital segments. The females of *L. capitata* and *L. rickmersi* are very similar, but *capitata* females are generally much larger than *rickmersi* females and the tip of the abdomen (proctiger) is pointed in *capitata* and round in *rickmersi* (compare Figs. 5 and 15).

Genus *Baptista* Distant

Baptista Distant 1903: Fauna Br. India, Rhynch. 2 (1904): 173; Andersen, 1989: 363 (redescription)

Type species. - *Baptista gestroi* Distant, 1903: monobasic.

Baptista gestroi Distant, 1903

Baptista gestroi Distant 1903: Fauna Br. India, Rhynch. 2 (1904): 173; Andersen, 1989: 367, Figs. 1, 2 (Redescription)

Material examined. - HOLOTYPE macropterous male. BURMA: Carin, Asciiü Ghecù, 1400-1500 m, L. Fea, III-IV. 88 (BMNH).

Other material. - Female, same locality and date as holotype (BMNH).

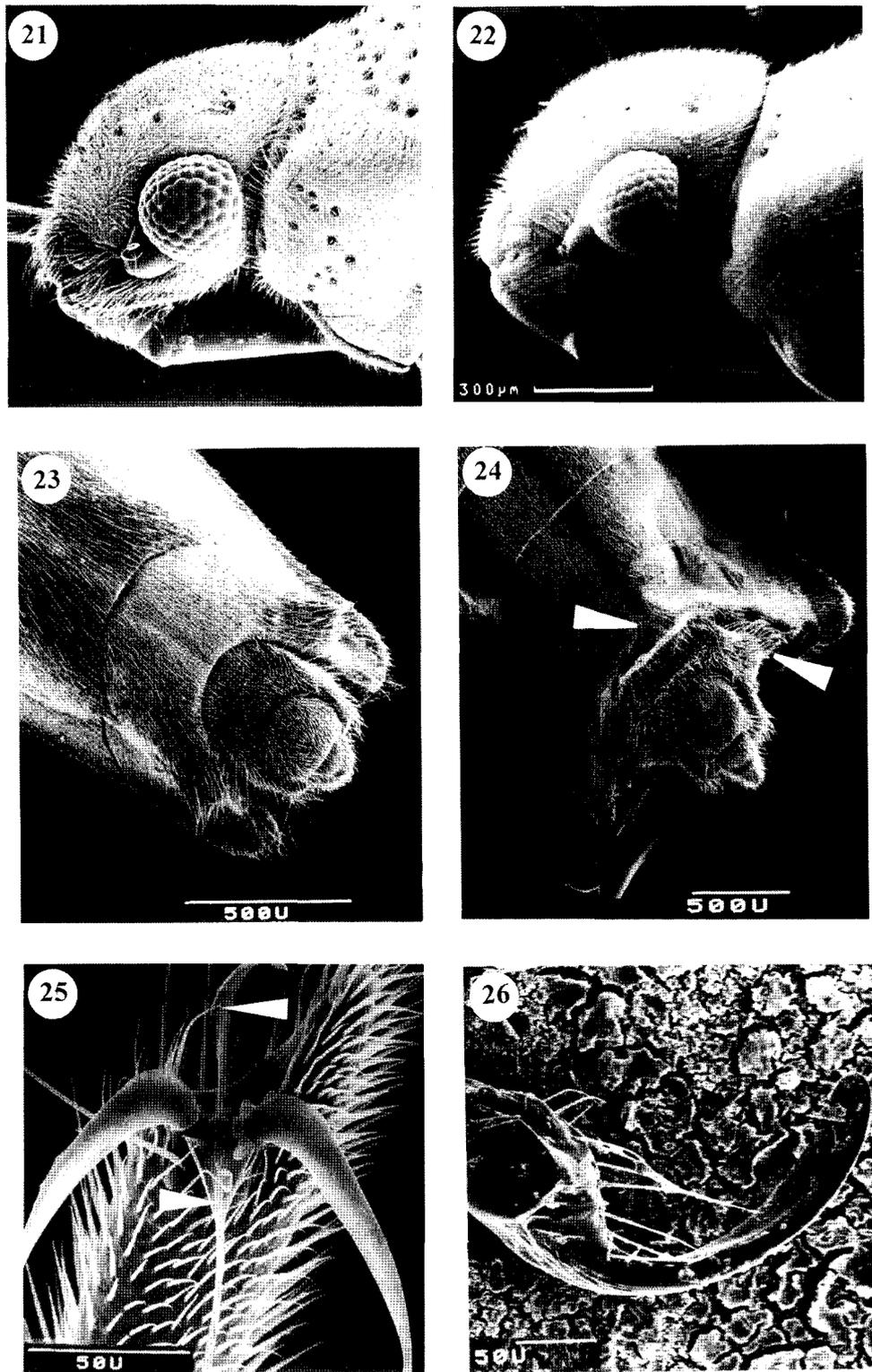
Remarks. - Andersen (1989) gave excellent descriptions of *Baptista gestroi* and other *Baptista* species. Therefore, we only add a few measurements and data for *B. gestroi* in the Table 1. We did not dissect the genital segments.

Baptista collaris (Andersen, 1989), new combination

Lathriovelina collaris Andersen, 1989: 379, Figs. 49, 50

Material examined. - HOLOTYPE: apterous female. WEST MALAYSIA: Pahang, stream 19 km E of Tapah, on Cameron Highlands rd., CL 2073, VIII-18785, taken from dark holes in rocky banks or "rock gardens", J. T. & D. A. Polhemus (JTTC). Holotype deposited in the J. T. Polhemus collection, Englewood, Colorado.

Remarks. - Andersen (1989) described this species under the genus *Lathriovelina* based on the occurrence of a pronotal collar and the considerable distance of the eye from the anterior margin of the prothorax. However, an



Figs. 21-26. *Lathriovelina rickmersi*, new species, and *L. capitata* Andersen, SEM-photographs: 21, *L. rickmersi*, head, male, lateral view, 22, *L. capitata*, head, male, lateral view, 23, *L. rickmersi*, abdominal end, male, large form, ventral view, 24, *L. capitata*, abdominal end, male, large form, ventral view, left arrow: median elevation on sternum 7, right arrow: haired tubercle on segment 8, 25, *L. rickmersi*, hind praetarsus, female, upper arrow: dorsal arolium, lower arrow: ventral arolium, 26, *L. capitata*, male paramere showing the flattened distal part.

examination of the holotype showed that the “pronotal collar” is a misinterpretation and that the head structure and other characters are similar to those of the *Baptista* species of the *femoralis*-group (see Discussion).

DISCUSSION

Andersen (1989) separated *Lathriovelina* from the closely related genus *Baptista* on the ground of the following characters: a) eyes distinctly set apart from anterior margin of pronotum, 2) pronotum provided with a distinct collar. Furthermore, he found that in *Lathriovelina* the abdominal segment 6 and/or segment 7 of the male is not strongly modified dorsally and/or ventrally, unlike in *Baptista* (Andersen, 1989 in Table 1, p. 366).

Initially, we treated the new species as *Baptista* sp. (Kovac, 1994, 1998; Kovac & Streit, 1996; Yang & Kovac 1995), because we could not detect any pronotal collar in our specimens. Besides, the eyes were in an intermediate position (set further apart from the pronotum than in *Baptista* but closer to the pronotum than in *L. capitata*), the abdominal segments 6 and 7 were modified, the forefemur was longer than the middle femur and had a similar shape as in some *Baptista* species (see Table 1).

However, a close examination of *L. rickmersi*, *L. capitata* and *Baptista collaris* revealed that the “pronotal collar” is just a part of the occipital region of the head. In live specimens the occipital region is kept retracted beneath the pronotum. The “pronotal collar” is only visible when the head is raised, e.g. during the grooming of the antennae. In all type specimens studied by Andersen (1989) the head has been fixed in the unnatural, raised position, thus giving the impression of a pronotal collar.

Although a detailed cladistic character analysis would be beyond the scope of this paper, a preliminary character analysis was made to be able to assign the new species to either *Baptista* or *Lathriovelina*. Based on the characters listed in Table 1, preliminary conclusions may be drawn about the systematic position of the new species and evolutionary trends within the closely related genera *Baptista* and *Lathriovelina*.

We think that both *L. capitata* and *L. rickmersi* are sufficiently distinct from the *Baptista* species to justify placing them in their own genus. A close relationship between *L. capitata* and *L. rickmersi* is supported by the following presumably apomorphic characters (see Table 1): 1) the unique structure of the head (eyes distinctly removed from pronotum), 2) the specific, distally flattened shape of the parameres, 3) the shape of the middle femur, 4) tarsal segment 1 of both middle and hind legs being longer than tarsal segment 2, 5) the curved hind tibia, and 6) the unique habitat preference.

Within *Lathriovelina*, *L. capitata* is considered to be more

derived than *L. rickmersi*: in *L. capitata* the eyes are further set apart from the pronotum than in *L. rickmersi* (in other veliids usually close to the pronotum) and the head is narrower. The lower number of white spots on the forewings of *L. capitata* may also be derived (see Table 1). Some characters appearing exclusively in *L. capitata* are: 1) femur basally widened, 2) forefemur shorter than middle femur, 3) occurrence of lateral, hairy tubercles on abdominal segment 8, 4) apex of male proctiger pointed, and 5) females on average larger than males. *L. capitata* also shows a higher degree of specialization concerning habitat preference, since this species prefers upright (live) bamboo culms and internodes higher up on the culm.

Within *Baptista* there are distinct differences between *Baptista gestroi* and the remaining *Baptista* species. For this reason we have combined *B. femoralis*, *B. digitata* and *B. angulata* in the *B. femoralis*-group (*B. collaris* in our opinion also belongs to this group, s. below). Characters confined to *B. gestroi* are the shape of the fore- and hind femur in the males. In *B. gestroi* the first middle tarsal segment is shorter or equal to the second (in the male holotype it is of the same length) and the first hind tarsal segment is longer or equal to the second (in the female described by Andersen (1989) of the same length). In the *femoralis*-group the first segments of both middle and hind leg are shorter than the second. Modifications of the abdominal segments are lacking in *B. gestroi* except for the widened connexival corners.

In *B. gestroi* the antennae are relatively flagelliform as compared to *Lathriovelina*: the third and fourth antennal segments are setose, very long and slender, and the two basal segments are relatively short. In *Lathriovelina* the third and fourth segments are relatively shorter and thicker than in *Baptista* and the two basal segments relatively longer. Thus, the ratio of antennal segments 1+2 to 3+4 increases in the following order: *B. gestroi*, *B. femoralis*-group, *L. rickmersi*, *L. capitata*. The ancestral type of the antenna in Veliidae is believed to be the so-called subflagelliform antenna, where like in *Lathriovelina* the two distal segments are more slender and pilose than the two proximal segments (Andersen, 1982). The flagelliform type, where the two apical segments are even more slender (leash-like), is probably derived and seems to be linked to (semi-) terrestrial habits (Štys, 1976). Since the third and fourth antennal segments of *B. gestroi* are particularly slender, they may be derived and indicate a semiterrestrial lifestyle.

We have transferred Andersen's *Lathriovelina collaris* to *Baptista*, because the examination of the holotype has shown that the eyes are close to the pronotum (compare the distance between the eye and the frontal edge of the “pronotal collar” in Andersen, 1989 in Fig. 50). Our view is also supported by the measurements of the head and the antennae: in *B. collaris* head width : head length is 1.16 (in the *femoralis*-group: 1.16 - 1.29) and the ratio of the antennal segments (1+2 : 3+4) is 0.62 (in the

Table 1. Differences between the closely related semiaquatic bug genera *Baptista* (*B. gestroi*, *B. femoralis*-group: *B. femoralis*, *B. digitata*, *B. angulata*, *B. collaris*) and *Lathriovelina* (*L. rickmersi*, new species, *L. capitata* Andersen). Measurements for the species of the *B. femoralis*-group taken from Andersen (1989). ¹ ratio of antennal segments (1+2:3+4); ² not in *B. angulata*. M=male, F=female.

Characters	<i>Baptista gestroi</i>	<i>B. femoralis</i> -group	<i>Lathriovelina rickmersi</i>	<i>L. capitata</i>
Head (width : length)	1.29	1.29-1.16	1.07	0.95
Antennal segments ¹ M	0.5	0.67-0.68	0.74	0.94
Antennal segments ¹ F	0.47	0.6-0.65	0.69	0.9
Position of eyes	close to pronotum	close to pronotum	set apart from pronotum	set apart from pronotum
White spots on wings	5-6	usually apterous	2-4 (mostly 3)	2-3 (mostly 2)
Mediotergite 6 M	no modifications	lateral projections	lateral projections	lateral projections
Abdominal segment 6 M	no modifications	lateral projections ²	no modifications	no modifications
Abdominal segment 7 M	no modifications	lateral projections	lateral projections	no modifications
Abdominal segment 8 M	no modifications	no modifications	no modifications	lateral hairy tubercles
Fore femur M (length)	fore f. > middle femur	fore f. > middle femur	fore f. > middle femur	fore f. < middle femur
Fore femur M (shape)	distally curved & widened	distally curved & widened	distally curved & widened	basally curved
Middle femur	no modifications	no modifications	distally tuft of hairs	distally tuft of hairs
Hind femur M	distally tuft of hairs	no modifications	no modifications	no modifications
Hind tibia	no modifications	no modifications	slightly curved	slightly curved
Middle tarsal segments	1≤2	1<2	1>2	1>2
Hind tarsal segments	1⊕2	1<2	1>2	1>2
Proctiger M	(not examined)	apex roundish	apex roundish	apex pointed
Parameres M	(not examined)	falciform	falciform, flattened	falciform, flattened
Wing morphs	macropterous?	mostly apterous	macropterous	macropterous
Length of males/ females	male > female	male > female	male > female	male < female
Habitat	streams?	streams/ rivers	bamboo phytotelmata	bamboo phytotelmata

femoralis-group: 0.6-0.65). Other characters supporting the transfer from *Lathriovelina* to *Baptista* are the lengths of the tarsal segments (tarsal segment 1 shorter than tarsal segment 2 in both middle and hind leg) the structure of the middle femur (not constricted before apex), the small size (length of female: 2.91 mm) and the apterous condition as well as the habitat ("watery dark hole in a rocky bank"). The female of *B. collaris* is not conspecific with females of other *Baptista* species described so far (*B. gestroi*, *B. femoralis*, *B. angulata*), however, the female of *B. digitata* from Thailand is not yet known.

Baptista and *Lathriovelina* both inhabit secluded and cryptic habitats. Species of the *B. femoralis* group were found among coarse litter in a seep area of a river bank (*B. femoralis*), in small water-filled cavities beneath turf at the foot of rock seeps and in small dark watery holes in rocks on stream banks (*B. angulata*, *B. collaris*, see Andersen, 1989). Since they inhabit relatively stable

habitats along streams and rivers they are mostly apterous (only in *B. angulata* a female macropterous specimen is known so far). The *Lathriovelina* species, which inhabit temporary habitats (bamboo phytotelmata) are always macropterous. The habitat preference of *B. gestroi* is not quite certain. One *Baptista gestroi* specimen was found in a small jungle stream (see Andersen, 1989). The three specimens of *B. gestroi* collected so far are macropterous, but they may have been collected from atypical habitats during dispersal (Andersen, 1989). This species may occur in a hidden habitat which has yet to be discovered.

Water-filled bamboo internodes with small entrance holes are a unique and peculiar habitat for semiaquatic bugs. In order to locate the internode cavities, the bugs have to search for small, inconspicuous holes in appropriate bamboo culms instead of homing in on reflecting water surfaces as many other aquatic insects do. Since bamboo often grows preferentially alongside

river banks it is conceivable that the presumably *Baptista*-like precursors of *Lathriovelina* entered internodes of fallen or upright bamboo culms which were near the water surface. Gradually they may have started to prefer the bamboo internode cavities, increasingly locating them also far away from streams and eventually becoming obligatory specialists of this habitat. In this way they were able to conquer a new, widespread and common habitat previously not used by semiaquatic bugs and became independent of large open waters.

KEY TO SPECIES OF *LATHRIOVELIA*

1. Male: Posterior corners of laterotergites 7 widened (Fig. 1), hind margin of mediotergite 6 produced into narrow, paired pilose projections (Fig. 4), forefemur basally thickened, with ventral row of black hairs (Fig. 2), shorter than middle femur.
Female: Ventral pregenital abdomen as in Fig. 5 and tip of abdomen (proctiger) pointed. Peninsular Malaysia. *L. capitata*
2. Male: Posterior corners of laterotergites 7 narrowed (Fig. 6), hind margin of mediotergite 6 produced into broad, paired pilose lobes (Fig. 17), forefemur distally slightly thickened and curved (Fig. 12), longer than middle femur.
Female: Ventral pregenital abdomen as in Fig. 15 and tip of abdomen (proctiger) round. Peninsular Malaysia, Thailand, Sumatra, Borneo.
..... *L. rickmersi*, new species

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