ISSN 1211-8788 *Acta Musei Moraviae, Scientiae biologicae* (Brno)
98(2): 327–334, 2013

Two new species of the enigmatic genus *Aquulavelia* (Hemiptera: Heteroptera: Veliidae) from Nepal and Bhutan

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ZETTEL H. 2013: Two new species of the enigmatic genus *Aquulavelia* (Hemiptera: Heteroptera: Veliidae) from Nepal and Bhutan. In: KMENT P., MALENOVSKÝ I. & KOLIBÁČ J. (eds.): Studies in Hemiptera in honour of Pavel Lauterer and Jaroslav L. Stehlík. *Acta Musei Moraviae, Scientiae biologicae* (Brno) **98(2):** 327–334. – *Aquulavelia* Thirumalai, 1999 is only known from the Indian subcontinent. Comparative notes on the genus and its type species, *Aquulavelia occulta* Thirumalai, 1999 from Arunachal Pradesh, north-eastern India, are given. Two new species are described: *Aquulavelia stehliki* sp.nov. from Nepal and *A. lautereri* sp.nov. from Bhutan. A key to species is provided.

Keywords. Gerromorpha, Veliidae, Microveliinae, true bugs, *Aquulavelia*, new species, key, Oriental Region, India, Nepal, Bhutan

Introduction

Aquulavelia Thirumalai, 1999 is a genus of Microveliinae known only from the Indian subcontinent. The only taxonomic paper addressing *Aquulavelia* is the original description by THIRUMALAI (1999), who described the genus and its type species, *Aquulavelia occulta*, from Arunachal Pradesh, north-eastern India, and mentioned a second, undescribed species from Madhya Pradesh in central north India. At that time Dr. Thirumalai kindly donated a pair of paratypes to the collection of the Natural History Museum, Vienna. Although I have seen considerable Gerromorpha material from the southern parts of the Himalayas since, only two specimens of *Aquulavelia* have been identified, one male from Nepal and one female from Bhutan. Both specimens belong to a hitherto undescribed species and are here formally described. This study aims to draw the attention of hemipterologists and limnologists to this still-enigmatic genus.

Material and methods

The Natural History Museum Vienna (NHMW) is the depository for all the type specimens studied. Inventory numbers are given. Label texts are cited.

Terminology and mode of description follow earlier publications of the author. Measurements are in millimetres and refer to maximum width, median length (pronotum, tergites), or maximum length (other structures), excluding pilosity, measured in straight lines. Stacked digital images (Figs 1, 2) were taken with a Leica DFC camera attached to a Leica MZ16 binocular microscope and processed with the help of the Leica Application Suite. These were then stacked with ZereneStacker 64-bit and processed with Adobe Photoshop 7.0. For the production of line drawings a camera lucida attached to an

Olympus BX40 compound microscope (Figs 3–8) and a Nikon SMZ800 binocular microscope (Figs 9, 10) was employed.

Taxonomy

Aquulavelia Thirumalai, 1999

Aquulavelia Thirumalai, 1999: 205. Type species: *Aquulavelia occulta* Thirumalai, 1999, by original designation.

Diagnosis (modified from THIRUMALAI 1999). Species of Microveliinae with small and slender body (Figs 1, 2); body length 2.3–3.1 mm; only apterous morph known. Numerous long setae present on thoracic dorsum, abdominal tergites and laterotergites, antennomere 1, and femora. Head anteriorly deflected. Eye large, situated close to pronotum. Antenna long, filiform (Fig. 1); antennomere 4 longest, antennomere 2 shorter than antennomeres 1 and 3. Pronotum of apterous morph covering entire mesonotum and metanotum medially (Figs 1, 2). Lateral evaporatorium with short channel, ending close to metacetabula with a tuft of long setae. Legs simple; protibia of male with short grasping comb; claws long, falcate, inserting preapically; arolia bristle-like. Abdomen with subparallel sides in male, quite convex sides in female (Figs 1, 2). Some or all tergites with transverse rows of standing black setae at approximately distal third. Tergite 1 with conspicuously swollen sides and deep median impression. Sternites with more or less distinct, very narrow median impression (hardly visible in *A. stehliki* sp.nov.). Segment 8 of male inserted caudally, slightly depressed. Genitalia small. Parameres symmetrical, slender, falciform (Figs 7, 8). Proctiger in both sexes pointed at apex (Figs 3–6). Gonocoxa 1 of female plate-like, unmodified.

Comparative notes and discussion. Although a phylogeny of Microveliinae of the world is not available, most genera – but not *Microvelia* Westwood, 1834 in the wider sense – seem to be justified by good sets of morphological characteristics. ANDERSEN & WEIR (2003) presented a table with 17 morphological characters for the 16 Australasian genera of Microveliinae (not including *Aquulavelia*) and some species groups of *Microvelia*; their cladogram of relationships indicates the polyphyly of *Microvelia*. THIRUMALAI (1999) compared *Aquulavelia* with *Neoalardus* Distant, 1912, *Baptista* Distant, 1903 and *Lathriovelia* Andersen 1989. Indeed, the overall similarities – namely the very elongated body – of *Aquulavelia* and *Neoalardus* are striking. However, *Neoalardus* differs significantly in the absence of a protibial grasping comb in the male and, in the apterous morph, by a medially visible metanotum, a totally differently structured tergite 1, and peculiar silverish spots on the sides of the metanotum and abdominal tergites 2, 4, and 6–8 (for *Neoalardus* see e.g. ZETTEL 1998). Males of *Baptista* usually have characteristic modifications of the profemur and the pregenital abdomen (see e.g. ANDERSEN 1989), except for the species of the *Baptista collaris* group from southeastern Asia which differ in a peculiar set of apomorphic characters, including protibial rows of stout, spine-like setae (in both sexes), sternite 7 of male medially angularly incised, and parameres distally dilated (ZETTEL 2004). The Malayan genus

Lathriovelia, the macropterous species of which inhabit water-filled bamboo internodes, also have some extreme apomorphies, including small eyes distant from the pronotal margin and tergite 6 produced into paired lobes (KOVAC & YANG 2000). Last but not least, *Aquulavelia* should not be regarded as an aberrant clade of *Microvelia*, because it shares a caudal insertion of abdominal segment 8 of the male with most other genera of Microveliinae, while in typical species of *Microvelia* (and also in the species of *Pseudovelia* Hoberlandt, 1950) male segment 8 takes a more ventrocaudal position.

Distribution. Nepal, Bhutan, India.

Habitats. THIRUMALAI (1999) reported *A. occulta* from "dark pits of a slow flowing mountain stream". *Aquulavelia lautereri* sp.nov. was collected on the gravel banks of a river around 30 metres wide, probably in puddles or in a small branch (M. A. Jäch, pers. comm.). Nothing is known about the collecting circumstances of *A. stehliki* sp.nov.

Key to species

1 Segment 1 of metatarsus longer than segment 2 (ca. 1.1–1.2×). Short appressed pilosity of all tergites relatively dense, surface hardly lustrous. 2

– Segment 1 of metatarsus slightly shorter than segment 2 (0.95×). Short appressed pilosity on tergites 3–8 (of female) reduced, tergites lustrous. Bhutan. ..... ***A. lautereri* sp.nov.**

2 Antenna very long, antennomere 1 distinctly longer than head length (♂: 1.23×, ♀ 1.15×). Only tergites 1–3 and 7 of male with transverse rows of long setae. ..... ***A. occulta* Thirumalai, 1999**

– Antenna comparatively short, length of antennomere 1 subequal to head length (♂: 1.03×). All tergites of male with transverse rows of long setae. ..... ***A. stehliki* sp.nov.**

Aquulavelia occulta Thirumalai, 1999 (Figs 3, 5, 7, 9)

Aquulavelia occulta Thirumalai, 1999: 206 (original description); THIRUMALAI (2002): 72 (catalogue).

Type material examined. Paratypes (1 apterous male, 1 apterous female): 'INDIA: Arunachal Pradesh \ Upper Subasiri District \ road to Getha, Yingklong \ 700 m, 31 Aug. 1994 \ leg. G. Thirumalai' (NHMW-Hemipt.-Inv.No. 000 014 428–429).

Diagnostic characters. Body length of male *c.* 2.5–2.9, of female *c*. 2.8–3.1. Yellowish; dorsum of head, dorsum and sides of thorax (except a distinct yellow transverse mark near pronotal fore-margin), entire tergites 1 and 2, sides of following tergites, medial margins of laterotergites, and stripes on sides of sternites more or less infuscated. Antenna very long, in male 0.85×, in female 0.72× body length; antennomere 1 longer than head length (male: 1.23×, female: 1.15×); antennomere 2 slender and elongated, in male 0.7×, in female 0.6× as long as antennomere 1; also antennomeres 3 and 4 longer than in *A. stehliki* sp.nov. Profemur of male not incrassate; grasping comb of male 0.15×

as long as entire protibia (Fig. 9). Abdominal tergites entirely covered with relatively dense, appressed short pilosity, except in male narrow midlines of tergites 4–7 bold and lustrous (in the female the midlines are also slightly impressed, but pilose). In male tergites 1–3, and 7 with transverse rows of long, black, erect setae; in females all tergites with such setae. Proctigers of both sexes strongly pointed (Figs 3, 5). Paramere slender, moderately long, with slight bend near mid-length (Fig. 7).

Comparative notes. See key and the notes for following species.

Aqualavelia stehliki sp.nov. (Figs 1, 4, 8, 10)

Type material. Holotype (apterous male): 'NEPAL: Harare Prov. \ Andhi Khola, S-63 \ 3.I.1994 \ leg. Suboth Sharma' (NHMW-Hemipt.-Inv.No. 000 014 430).

Description of apterous male. *Measurements*. Body length 2.35, width at metanotum 0.62. Head length 0.32, width 0.48. Distance between eyes 0.22. Lengths of antennomeres 1–4: 0.33, 0.21, 0.48, 0.55. Pronotum length 0.40, width 0.58. Lengths of leg segments: profemur 0.66, protibia 0.61, protarsus 0.24, mesofemur 0.77, mesotibia 0.73, mesotarsus 0.18+0.21, metafemur 0.91, metatibia 1.20, metatarsus 0.26+0.24. Abdomen width 0.54. Lengths of tergites 1–7: 0.17, 0.19, 0.19, 0.19, 0.20, 0.22, 0.21.

Colour (Fig. 1). Trunk yellow to yellowish-brown. Head with large, dark mark between eyes. Pronotum dark brown, except a distinct yellow transverse mark near fore-margin; dark stripes on sides of tergites, medial margins of laterotergites, and sides of sternites only narrowly infuscated. Antennae and legs entirely pale yellow.

Pilosity. Appressed pilosity covering the entire trunk; on some areas these hairs broader and silvery or golden lustrous, e.g. on entire pronotum and on tergites, but not forming clear marks. Long, black erect setae numerous; several such setae, of slightly varying length, on head dorsum, pronotum, and metanotum sides; on tergites forming not very regular transverse rows in posterior half, visible on tergites 1–7 (best seen in an anterodorsal aspect), 8, 6, 4, 4, 4, 3, 4 setae (as they are not symmetrically arranged, a few setae might be broken off); on all laterotergites a few standing setae of varying length; antennomere 1 with two long setae; profemur with several long setae in distal half of flexor side; mesofemur with a few setae at base of extensor side, and several setae more or less arranged in two rows on flexor side; metafemur with numerous setae more or less arranged in one row on extensor side and two rows on flexor side.

Structure. Mostly as in *A. occulta*, with the following exceptions: profemur slightly incrassate in distal half; grasping comb 0.12× as long as entire protibia (Fig. 10). Laterotergites 2–6 convex, connexiva appearing swollen. Median impression on sternites very inconspicuous, only recognizable on sternites 5 and 6. Proctiger moderately pointed (Fig. 4). Paramere moderately long, evenly curved (Fig. 8).

Comparative notes. *Aqualavelia stehliki* sp.nov. differs from *A. occulta* in its clearly shorter antennae. The entire antenna length is about 0.67× body length in the male of *A. stehliki* sp.nov., whereas it reaches 0.85× body length in the male of *A. occulta* (only

Fig 1. *Aquulavelia stehliki* sp.nov., holotype, male (abdominal segment 8 and genitalia dissected).

0.72× in the female). The male of *A. occulta* has a reduced number of long, erect setae on the tergites, especially tergites 4–6 have 0–1 erect setae. In the male of *A. stehliki* sp.nov., complete transverse rows of 3–8 standing setae are present. In the male of *A. occulta* the narrow midlines of tergites 4–7 are bold and lustrous, whereas in *A. stehliki* sp.nov. all tergites are entirely pilose. Moreover, *A. stehliki* sp.nov. is slightly smaller than *A. occulta*, its profemur slightly incrassate, and its protibial grasping comb slightly shorter. The genitalia of the two species are distinctive: the paramere of *A. stehliki* sp.nov. is more regularly curved and its proctiger is less pointed.

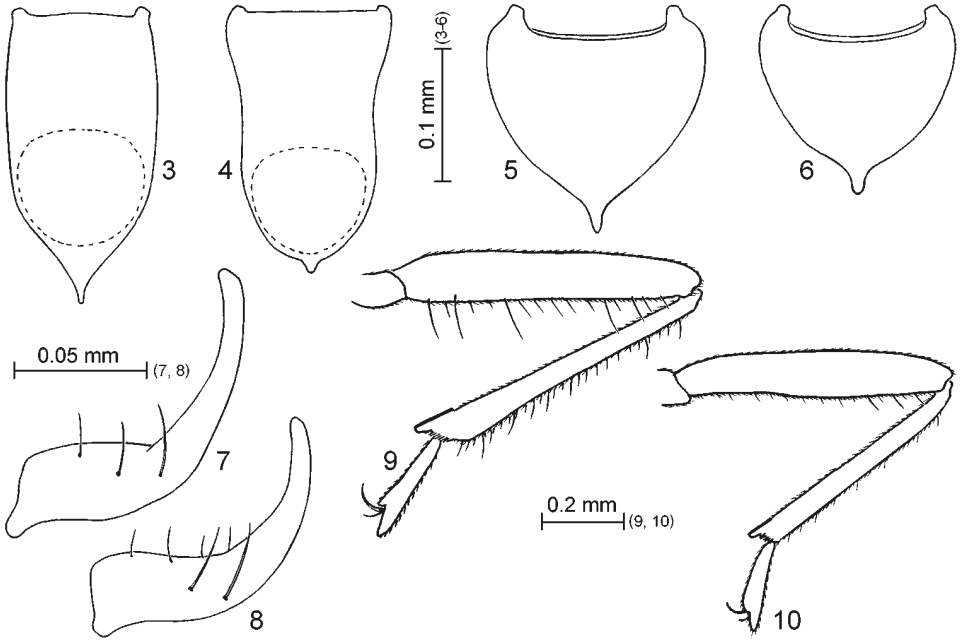
Etymology. This species is dedicated to Dr. Jaroslav Stehlík for the occasion of his 90th birthday.

Fig 2. *Aquulavelia lautereri* sp.nov., holotype, female.

***Aquulavelia lautereri* sp.nov.** (Figs 2, 6)

Type material. Holotype (apterous female): 'BHUTAN: Sarpang Prov. \ 11 km NW Sarpang \ Bhur Khola, ca. 350 m \ 26°55′23″N 90°23′51″E \ 27.11.2005, leg. M. Jäch (30)' (NHMW-Hemipt.-Inv.No. 000 014 431).

Description of apterous female. *Measurements*. Body length 2.69, width at metanotum 0.74. Head length 0.37, width 0.52. Distance between eyes 0.26. Lengths of antennomeres 1–2 (3 and 4 missing): 0.37, 0.26. Pronotum length 0.43, width 0.62. Lengths of leg segments: profemur 0.74, protibia 0.64, protarsus 0.29, mesofemur 0.86, mesotibia 0.84, mesotarsus 0.22+0.27, metafemur 1.05, metatibia 1.32, metatarsus 0.27+0.29. Abdomen width 0.76. Lengths of tergites 1–7: 0.20, 0.22, 0.23, 0.23, 0.26, 0.27, 0.30.



Figs 3–10. Diagnostic structures of *Aquulavelia* spp. 3–6 – proctigers: 3 – *A. occulta* Thirumalai, 1999, male; 4 – *A. stehliki* sp.nov., male; 5 – *A. occulta*, female; 6 – *A. lautereri* sp.nov., female. 7–8 – parameres: 7 – *A. occulta*; 8 – *A. stehliki* sp.nov. 9–10 – forelegs of males: 9 – *A. occulta*; 10 – *A. stehliki* sp.nov. Pilosity omitted in Figs 3–6, partly omitted in Figs 9 and 10.

Colour (Fig. 2). Ground colour of trunk yellow. Blackish-brown: dorsum of head and thorax, except a distinct yellow transverse mark near pronotal fore-margin, metapleura, abdominal tergites except for round yellow marks on tergites 1–6 and a narrow yellow midline on tergite 7, medial halves of all laterotergites, and broad continuous stripes on sides of sternites. Antennae and legs entirely brownish-yellow, bases of legs pale.

Pilosity. Appressed pilosity present on entire trunk, but sparse on tergites 3–8 and lateral parts of laterotergites and sternites; these areas therefore lustrous; on some areas, these hairs broader and silvery-lustrous, i.e., on head between eyes, entire pronotum, sides of tergites and medial margins of laterotergites, but not creating clear markings. Long, black erect setae numerous; several such setae, of slightly varying length, on head dorsum, pronotum, and metanotum sides; on some tergites forming slightly irregular transverse rows in posterior half, visible on tergites 1–8 (best seen in anterodorsal aspect), 14, 6, 5, 2, 0, 0, 11, 8 setae (as they are not symmetrically arranged, a few setae might be broken off); on all laterotergites a few setae of varying length; antennomere 1 with two long setae; profemur with two rows of long setae on flexor side; mesofemur and

metafemur each with numerous long setae, more or less arranged in several rows, but absent from anterior faces of femora.

Structure. Mostly as in *A. occulta*, except medial impression of tergite 1 shallower and apical spine of proctiger slightly shorter (Fig. 6).

Comparative notes. *Aqualavelia lautereri* sp.nov. differs from *A. occulta* in segment 1 of the metatarsus slightly shorter than segment 2 (longer in *A. occulta* and *A. stehliki* sp.nov.) and in antennal segment 1 as long as head length (longer in *A. occulta*). In the female (male unknown) tergites 3–8 are lustrous and their appressed pilosity is reduced; the proctiger spine is shorter (comp. Figs 5 and 6). Black coloration is more developed on the abdomen of *A. lautereri* sp.nov. than in *A. occulta*. Whereas in *A. lautereri* sp.nov. clearly delimited black stripes are developed at lateral parts of tergites, medial halves of laterotergites, and sublaterally on sternites, only weak infuscations are present in the same areas in *A. occulta*.

Etymology. This species is dedicated to Dr. Pavel Lauterer for the occasion of his 80th birthday.

Acknowledgements

I am very grateful to Dr. Manfred A. Jäch (Natural History Museum, Vienna), Prof. Dr. Suboth Sharma (Kathmandu University), and the late Dr. G. Thirumalai (Zoological Survey of India, Chennai) for providing specimens for this study. I also thank Tony Long (Svinošice) for helping to work up the English.

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